Test Booklet Code

E5

AKANH

No. :

This Booklet contains 24 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
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5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
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9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

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: in words _____

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Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

Centre Superintendent : _____

1. Flippers of Penguins and Dolphins are examples of :
   (1) Adaptive radiation
   (2) Convergent evolution
   (3) Industrial melanism
   (4) Natural selection

2. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
   (1) Cytokinin
   (2) Gibberellin
   (3) Ethylene
   (4) Abscisic acid

3. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :
   (1) Nutritive value
   (2) Growth response
   (3) Defence action
   (4) Effect on reproduction

4. The body of the ovule is fused within the funicle at :
   (1) Hilum
   (2) Micropyle
   (3) Nucellus
   (4) Chalaza

5. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(iv)	(iii)	(ii)	(i)

6. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :
   (1) Transpiration
   (2) Root pressure
   (3) Imbibition
   (4) Plasmolysis

7. Which of the following is **not** an inhibitory substance governing seed dormancy ?
   (1) Gibberellic acid
   (2) Abscisic acid
   (3) Phenolic acid
   (4) Para-ascorbic acid

8. Identify the **incorrect** statement.
   (1) Heart wood does not conduct water but gives mechanical support.
   (2) Sapwood is involved in conduction of water and minerals from root to leaf.
   (3) Sapwood is the innermost secondary xylem and is lighter in colour.
   (4) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.

9. Choose the **correct** pair from the following :
   (1) Ligases - Join the two DNA molecules
   (2) Polymerases - Break the DNA into fragments
   (3) Nucleases - Separate the two strands of DNA
   (4) Exonucleases - Make cuts at specific positions within DNA

10. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?
   (1) Out crossing
   (2) Mutational breeding
   (3) Cross breeding
   (4) Inbreeding

11. Dissolution of the synaptonemal complex occurs during :

(1) Pachytene
(2) Zygotene
(3) Diplotene
(4) Leptotene

12. Match the following diseases with the causative organism and select the **correct** option.

	Column - I		**Column - II**
(a)	Typhoid	(i)	*Wuchereria*
(b)	Pneumonia	(ii)	*Plasmodium*
(c)	Filariasis	(iii)	*Salmonella*
(d)	Malaria	(iv)	*Haemophilus*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(iv)	(i)	(ii)	(iii)

13. According to Robert May, the global species diversity is about :

(1) 1.5 million
(2) 20 million
(3) 50 million
(4) 7 million

14. In light reaction, plastoquinone facilitates the transfer of electrons from :

(1) PS-II to $Cytb_6f$ complex
(2) $Cytb_6f$ complex to PS-I
(3) PS-I to $NADP^+$
(4) PS-I to ATP synthase

15. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(ii)	(i)	(iv)	(iii)

16. Which of the following statements are **true** for the phylum-Chordata ?

(a) In Urochordata notochord extends from head to tail and it is present throughout their life.
(b) In Vertebrata notochord is present during the embryonic period only.
(c) Central nervous system is dorsal and hollow.
(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

(1) (d) and (c)
(2) (c) and (a)
(3) (a) and (b)
(4) (b) and (c)

17. Select the option including all sexually transmitted diseases.

(1) Gonorrhoea, Syphilis, Genital herpes
(2) Gonorrhoea, Malaria, Genital herpes
(3) AIDS, Malaria, Filaria
(4) Cancer, AIDS, Syphilis

18. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(i)	(iv)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iv)	(ii)	(i)	(iii)
(4)	(i)	(ii)	(iv)	(iii)

19. Cuboidal epithelium with brush border of microvilli is found in :

(1) lining of intestine
(2) ducts of salivary glands
(3) proximal convoluted tubule of nephron
(4) eustachian tube

20. Identify the **wrong** statement with reference to transport of oxygen.

(1) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

(2) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

(3) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

(4) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

21. Goblet cells of alimentary canal are modified from :

(1) Squamous epithelial cells

(2) Columnar epithelial cells

(3) Chondrocytes

(4) Compound epithelial cells

22. Identify the **wrong** statement with regard to Restriction Enzymes.

(1) Each restriction enzyme functions by inspecting the length of a DNA sequence.

(2) They cut the strand of DNA at palindromic sites.

(3) They are useful in genetic engineering.

(4) Sticky ends can be joined by using DNA ligases.

23. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Mendel

(2) Sutton

(3) Boveri

(4) Morgan

24. Identify the **correct** statement with reference to human digestive system.

(1) Ileum opens into small intestine.

(2) Serosa is the innermost layer of the alimentary canal.

(3) Ileum is a highly coiled part.

(4) Vermiform appendix arises from duodenum.

25. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

(1) The gene (I) has three alleles.

(2) A person will have only two of the three alleles.

(3) When I^A and I^B are present together, they express same type of sugar.

(4) Allele 'i' does not produce any sugar.

26. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iv)	(i)	(iii)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(iv)	(iii)	(i)	(ii)

27. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

(1) Ammonia alone

(2) Nitrate alone

(3) Ammonia and oxygen

(4) Ammonia and hydrogen

28. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Gregarious, polyphagous pest	(i)	*Asterias*
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	*Ctenoplana*
(d)	Bioluminescence	(iv)	*Locusta*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(ii)	(i)	(iii)	(iv)

29. Snow-blindness in Antarctic region is due to :

(1) Freezing of fluids in the eye by low temperature

(2) Inflammation of cornea due to high dose of UV-B radiation

(3) High reflection of light from snow

(4) Damage to retina caused by infra-red rays

30. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

(1) Gross primary productivity is always less than net primary productivity.

(2) Gross primary productivity is always more than net primary productivity.

(3) Gross primary productivity and Net primary productivity are one and same.

(4) There is no relationship between Gross primary productivity and Net primary productivity.

31. Select the **correct** statement.

(1) Glucocorticoids stimulate gluconeogenesis.

(2) Glucagon is associated with hypoglycemia.

(3) Insulin acts on pancreatic cells and adipocytes.

(4) Insulin is associated with hyperglycemia.

32. Select the **correct** events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter-costal muscles

(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

(1) (a) and (b)

(2) (c) and (d)

(3) (a), (b) and (d)

(4) only (d)

33. Match the following concerning essential elements and their functions in plants :

(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iv)	(iii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(i)	(ii)	(iii)

34. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

(1) ZIFT and IUT

(2) GIFT and ZIFT

(3) ICSI and ZIFT

(4) GIFT and ICSI

35. The infectious stage of *Plasmodium* that enters the human body is :

(1) Trophozoites

(2) Sporozoites

(3) Female gametocytes

(4) Male gametocytes

36. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

(1) High concentration of Estrogen

(2) High concentration of Progesterone

(3) Low concentration of LH

(4) Low concentration of FSH

37. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Uremia and Ketonuria

(2) Uremia and Renal Calculi

(3) Ketonuria and Glycosuria

(4) Renal calculi and Hyperglycaemia

38. Name the enzyme that facilitates opening of DNA helix during transcription.

(1) DNA ligase

(2) DNA helicase

(3) DNA polymerase

(4) RNA polymerase

39. Match the trophic levels with their **correct** species examples in grassland ecosystem.

(a)	Fourth trophic level	(i)	Crow
(b)	Second trophic level	(ii)	Vulture
(c)	First trophic level	(iii)	Rabbit
(d)	Third trophic level	(iv)	Grass

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(iv)	(i)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(i)	(ii)	(iii)	(iv)

40. Match the following :

(a)	Inhibitor of catalytic activity	(i)	Ricin
(b)	Possess peptide bonds	(ii)	Malonate
(c)	Cell wall material in fungi	(iii)	Chitin
(d)	Secondary metabolite	(iv)	Collagen

Choose the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iv)	(iii)	(i)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(ii)	(iii)	(i)	(iv)

41. The first phase of translation is :

(1) Binding of mRNA to ribosome

(2) Recognition of DNA molecule

(3) Aminoacylation of tRNA

(4) Recognition of an anti-codon

42. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

(1) Chitin, cholesterol

(2) Glycerol, trypsin

(3) Cellulose, lecithin

(4) Inulin, insulin

43. Which of the following statements about inclusion bodies is **incorrect** ?

(1) They are not bound by any membrane.

(2) These are involved in ingestion of food particles.

(3) They lie free in the cytoplasm.

(4) These represent reserve material in cytoplasm.

44. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	*Bacillus thuringiensis*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(i)	(ii)	(iii)	(iv)

45. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

(1) DNA synthesis or replication takes place.

(2) Reorganisation of all cell components takes place.

(3) Cell is metabolically active, grows but does not replicate its DNA.

(4) Nuclear Division takes place.

46. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

(1) Primary sludge

(2) Floating debris

(3) Effluents of primary treatment

(4) Activated sludge

47. Which of the following statements is **correct** ?

(1) Adenine pairs with thymine through two H-bonds.

(2) Adenine pairs with thymine through one H-bond.

(3) Adenine pairs with thymine through three H-bonds.

(4) Adenine does not pair with thymine.

48. The sequence that controls the copy number of the linked DNA in the vector, is termed :

(1) Selectable marker

(2) Ori site

(3) Palindromic sequence

(4) Recognition site

49. Select the **correct** match.

(1) Haemophilia - Y linked

(2) Phenylketonuria - Autosomal dominant trait

(3) Sickle cell anaemia - Autosomal recessive trait, chromosome-11

(4) Thalassemia - X linked

50. Which of the following is **not** an attribute of a population ?

(1) Sex ratio

(2) Natality

(3) Mortality

(4) Species interaction

51. Strobili or cones are found in :

(1) *Salvinia*

(2) *Pteris*

(3) *Marchantia*

(4) *Equisetum*

52. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

(1) Endoplasmic reticulum

(2) Peroxisomes

(3) Golgi bodies

(4) Polysomes

53. Which of the following is **correct** about viroids ?

(1) They have RNA with protein coat.

(2) They have free RNA without protein coat.

(3) They have DNA with protein coat.

(4) They have free DNA without protein coat.

54. The process of growth is maximum during :

(1) Log phase

(2) Lag phase

(3) Senescence

(4) Dormancy

55. Which of the following regions of the globe exhibits highest species diversity ?

(1) Western Ghats of India

(2) Madagascar

(3) Himalayas

(4) Amazon forests

56. The number of substrate level phosphorylations in one turn of citric acid cycle is :

(1) Zero

(2) One

(3) Two

(4) Three

57. Meiotic division of the secondary oocyte is completed :

(1) Prior to ovulation

(2) At the time of copulation

(3) After zygote formation

(4) At the time of fusion of a sperm with an ovum

58. Which of the following pairs is of unicellular algae ?

(1) *Laminaria* and *Sargassum*

(2) *Gelidium* and *Gracilaria*

(3) *Anabaena* and *Volvox*

(4) *Chlorella* and *Spirulina*

59. The QRS complex in a standard ECG represents :

(1) Repolarisation of auricles

(2) Depolarisation of auricles

(3) Depolarisation of ventricles

(4) Repolarisation of ventricles

60. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

(1) M phase

(2) G_1 phase

(3) S phase

(4) G_2 phase

61. Match the following with respect to meiosis :

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(iv)	(iii)	(i)

62. Which one of the following is the most abundant protein in the animals ?

(1) Haemoglobin

(2) Collagen

(3) Lectin

(4) Insulin

63. The ovary is half inferior in :

(1) Brinjal

(2) Mustard

(3) Sunflower

(4) Plum

64. Ray florets have :

(1) Inferior ovary

(2) Superior ovary

(3) Hypogynous ovary

(4) Half inferior ovary

65. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

(1) 2 molecules of 3-C compound

(2) 1 molecule of 3-C compound

(3) 1 molecule of 6-C compound

(4) 1 molecule of 4-C compound and 1 molecule of 2-C compound

66. The plant parts which consist of two generations - one within the other :

(a) Pollen grains inside the anther

(b) Germinated pollen grain with two male gametes

(c) Seed inside the fruit

(d) Embryo sac inside the ovule

(1) (a) only

(2) (a), (b) and (c)

(3) (c) and (d)

(4) (a) and (d)

67. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Eosinophils	(i)	Immune response
(b)	Basophils	(ii)	Phagocytosis
(c)	Neutrophils	(iii)	Release histaminase, destructive enzymes
(d)	Lymphocytes	(iv)	Release granules containing histamine

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(i)	(iii)	(iv)

68. Bilaterally symmetrical and acoelomate animals are exemplified by :
(1) Ctenophora
(2) Platyhelminthes
(3) Aschelminthes
(4) Annelida

69. Identify the basic amino acid from the following.
(1) Tyrosine
(2) Glutamic Acid
(3) Lysine
(4) Valine

70. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(c)	Bulbo-urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(i)	(iv)	(ii)	(iii)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(ii)	(iii)	(iv)	(i)

71. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :
(1) Insect pests
(2) Fungal diseases
(3) Plant nematodes
(4) Insect predators

72. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	6 - 15 pairs of gill slits	(i)	*Trygon*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(iv)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iv)	(ii)	(iii)	(i)
(4)	(i)	(iv)	(iii)	(ii)

73. Floridean starch has structure similar to :
(1) Starch and cellulose
(2) Amylopectin and glycogen
(3) Mannitol and algin
(4) Laminarin and cellulose

74. Which of the following statements is **not correct** ?
(1) In man insulin is synthesised as a proinsulin.
(2) The proinsulin has an extra peptide called C-peptide.
(3) The functional insulin has A and B chains linked together by hydrogen bonds.
(4) Genetically engineered insulin is produced in *E-Coli*.

75. If the head of cockroach is removed, it may live for few days because :
(1) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
(2) the cockroach does not have nervous system.
(3) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
(4) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.

76. The enzyme enterokinase helps in conversion of :
(1) protein into polypeptides
(2) trypsinogen into trypsin
(3) caseinogen into casein
(4) pepsinogen into pepsin

77. The transverse section of a plant shows following anatomical features :
(a) Large number of scattered vascular bundles surrounded by bundle sheath.
(b) Large conspicuous parenchymatous ground tissue.
(c) Vascular bundles conjoint and closed.
(d) Phloem parenchyma absent.

Identify the category of plant and its part :
(1) Monocotyledonous stem
(2) Monocotyledonous root
(3) Dicotyledonous stem
(4) Dicotyledonous root

78. In water hyacinth and water lily, pollination takes place by :

(1) insects or wind

(2) water currents only

(3) wind and water

(4) insects and water

79. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

(1) Acetocarmine in bright blue light

(2) Ethidium bromide in UV radiation

(3) Acetocarmine in UV radiation

(4) Ethidium bromide in infrared radiation

80. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

(1) 4

(2) 2

(3) 14

(4) 8

81. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

(a) Darwin's Finches of Galapagos islands.

(b) Herbicide resistant weeds.

(c) Drug resistant eukaryotes.

(d) Man-created breeds of domesticated animals like dogs.

(1) only (a)

(2) (a) and (c)

(3) (b), (c) and (d)

(4) only (d)

82. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iv)	(iii)	(i)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(iii)	(iv)	(i)	(ii)

83. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

(1) CH_4, H_2, NH_3 and water vapor at 800°C

(2) CH_3, H_2, NH_4 and water vapor at 800°C

(3) CH_4, H_2, NH_3 and water vapor at 600°C

(4) CH_3, H_2, NH_3 and water vapor at 600°C

84. Embryological support for evolution was disapproved by :

(1) Karl Ernst von Baer

(2) Alfred Wallace

(3) Charles Darwin

(4) Oparin

85. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

(1) 2.0 meters

(2) 2.5 meters

(3) 2.2 meters

(4) 2.7 meters

86. Identify the **wrong** statement with reference to immunity.

(1) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

(2) When ready-made antibodies are directly given, it is called "Passive immunity".

(3) Active immunity is quick and gives full response.

(4) Foetus receives some antibodies from mother, it is an example for passive immunity.

87. The specific palindromic sequence which is recognized by EcoRI is :

(1) 5' - GAATTC - 3'
3' - CTTAAG - 5'

(2) 5' - GGAACC - 3'
3' - CCTTGG - 5'

(3) 5' - CTTAAG - 3'
3' - GAATTC - 5'

(4) 5' - GGATCC - 3'
3' - CCTAGG - 5'

88. Which of the following would help in prevention of diuresis ?

(1) More water reabsorption due to undersecretion of ADH

(2) Reabsorption of Na^+ and water from renal tubules due to aldosterone

(3) Atrial natriuretic factor causes vasoconstriction

(4) Decrease in secretion of renin by JG cells

89. Montreal protocol was signed in 1987 for control of :

(1) Transport of Genetically modified organisms from one country to another

(2) Emission of ozone depleting substances

(3) Release of Green House gases

(4) Disposal of e-wastes

90. The roots that originate from the base of the stem are :

(1) Fibrous roots

(2) Primary roots

(3) Prop roots

(4) Lateral roots

91. The solids which have the negative temperature coefficient of resistance are :

(1) metals

(2) insulators only

(3) semiconductors only

(4) insulators and semiconductors

92. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in m^2 V^{-1} s^{-1} of :

(1) 2.25×10^{15}

(2) 2.5×10^{6}

(3) 2.5×10^{-6}

(4) 2.25×10^{-15}

93. For transistor action, which of the following statements is **correct** ?

(1) Base, emitter and collector regions should have same doping concentrations.

(2) Base, emitter and collector regions should have same size.

(3) Both emitter junction as well as the collector junction are forward biased.

(4) The base region must be very thin and lightly doped.

94. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

(1) 523 Hz

(2) 524 Hz

(3) 536 Hz

(4) 537 Hz

95. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{MgL_1}{AL}$

(2) $\frac{Mg(L_1 - L)}{AL}$

(3) $\frac{MgL}{AL_1}$

(4) $\frac{MgL}{A(L_1 - L)}$

96. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2. The energy received by the surface during time span of 1 minute is :

(1) 10×10^3 J

(2) 12×10^3 J

(3) 24×10^3 J

(4) 48×10^3 J

97. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) π rad

(2) $\frac{3\pi}{2}$ rad

(3) $\frac{\pi}{2}$ rad

(4) zero

98. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

(1) 2.5 g

(2) 5.0 g

(3) 10.0 g

(4) 20.0 g

99. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) zero

(2) 0.5

(3) 1.0

(4) -1.0

100. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) double

(2) half

(3) four times

(4) one-fourth

101. Dimensions of stress are :

(1) $[ML T^{-2}]$

(2) $[ML^2 T^{-2}]$

(3) $[ML^0 T^{-2}]$

(4) $[ML^{-1} T^{-2}]$

102. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

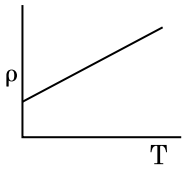
(1) $6\hat{i}$ N m

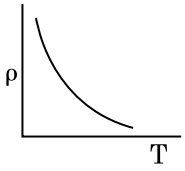
(2) $6\hat{j}$ N m

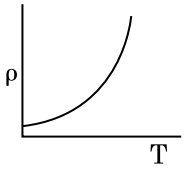
(3) $-6\hat{i}$ N m

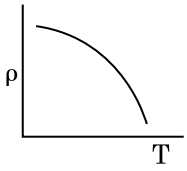
(4) $6\hat{k}$ N m

103. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

(1) 

(2) 

(3) 

(4) 

104. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : (R = 8.3 J mol^{-1} K^{-1})

(1) 0.5 kg/m^3

(2) 0.2 kg/m^3

(3) 0.1 kg/m^3

(4) 0.02 kg/m^3

105. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) c : 1

(2) 1 : 1

(3) 1 : c

(4) $1 : c^2$

106. For which one of the following, Bohr model is **not** valid ?

(1) Hydrogen atom

(2) Singly ionised helium atom (He^+)

(3) Deuteron atom

(4) Singly ionised neon atom (Ne^+)

107. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 6.28×10^{-4} T

(2) 3.14×10^{-4} T

(3) 6.28×10^{-5} T

(4) 3.14×10^{-5} T

108. The Brewsters angle i_b for an interface should be :

(1) $0° < i_b < 30°$

(2) $30° < i_b < 45°$

(3) $45° < i_b < 90°$

(4) $i_b = 90°$

109. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

(1) 48 N

(2) 32 N

(3) 30 N

(4) 24 N

110. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

(1) 0.01 mm

(2) 0.25 mm

(3) 0.5 mm

(4) 1.0 mm

111. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

(1) $\frac{1}{\sqrt{2}\, n\pi d}$

(2) $\frac{1}{\sqrt{2}\, n\pi d^2}$

(3) $\frac{1}{\sqrt{2}\, n^2\pi d^2}$

(4) $\frac{1}{\sqrt{2}\, n^2\pi^2 d^2}$

112. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10$ m/s^2)

(1) 360 m

(2) 340 m

(3) 320 m

(4) 300 m

113. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

(1) zero

(2) 0.5 N/C

(3) 1 N/C

(4) 5 N/C

114. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)

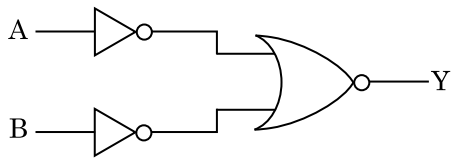
(1) $\frac{1}{2} k_B T$

(2) $\frac{3}{2} k_B T$

(3) $\frac{5}{2} k_B T$

(4) $\frac{7}{2} k_B T$

115. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(2)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(3)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(4)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

116. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 6

(2) 0.6

(3) 0.06

(4) 0.006

117. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

(1) 33 cm

(2) 50 cm

(3) 67 cm

(4) 80 cm

118. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 1.28×10^4 N/C

(2) 1.28×10^5 N/C

(3) 1.28×10^6 N/C

(4) 1.28×10^7 N/C

119. Taking into account of the significant figures, what is the value of 9.99 m – 0.0099 m ?

(1) 9.9801 m

(2) 9.98 m

(3) 9.980 m

(4) 9.9 m

120. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 1.7 A

(2) 2.05 A

(3) 2.5 A

(4) 25.1 A

121. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

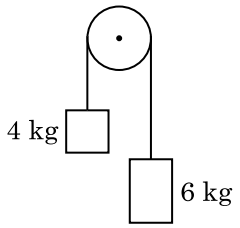
(1) isothermal

(2) adiabatic

(3) isochoric

(4) isobaric

122. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g

(2) g/2

(3) g/5

(4) g/10

123. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10 V

(2) 10^2 V

(3) 10^3 V

(4) 10^4 V

124. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{144}_{56}Ba$

(2) $^{91}_{40}Zr$

(3) $^{101}_{36}Kr$

(4) $^{103}_{36}Kr$

125. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\epsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})

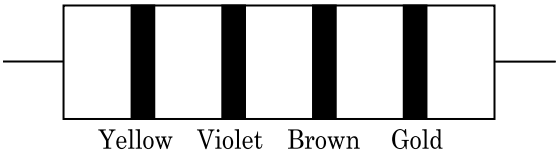
(1) 0.44×10^{-13} C^2 N^{-1} m^{-2}

(2) 1.77×10^{-12} C^2 N^{-1} m^{-2}

(3) 0.44×10^{-10} C^2 N^{-1} m^{-2}

(4) 5.00 C^2 N^{-1} m^{-2}

126. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 470 kΩ, 5%

(2) 47 kΩ, 10%

(3) 4.7 kΩ, 5%

(4) 470 Ω, 5%

127. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.0×10^{-2} m

(2) 1.0×10^{-1} m

(3) 1.5×10^{-1} m

(4) 1.5×10^{-2} m

128. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(1) doubled

(2) four times

(3) one-fourth

(4) zero

129. The energy equivalent of 0.5 g of a substance is :

(1) 4.5×10^{16} J

(2) 4.5×10^{13} J

(3) 1.5×10^{13} J

(4) 0.5×10^{13} J

130. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 50 V

(2) 200 V

(3) 400 V

(4) zero

131. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) $\frac{A}{2\mu}$

(2) $\frac{2A}{\mu}$

(3) μA

(4) $\frac{\mu A}{2}$

132. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

(1) $\frac{27}{8}$

(2) $\frac{9}{4}$

(3) $\frac{3}{2}$

(4) $\frac{5}{3}$

133. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) $2.4\pi \times 10^{-4}$ T m A^{-1}

(2) 8.0×10^{-5} T m A^{-1}

(3) $2.4\pi \times 10^{-5}$ T m A^{-1}

(4) $2.4\pi \times 10^{-7}$ T m A^{-1}

134. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 3.66×10^{-7} rad

(2) 1.83×10^{-7} rad

(3) 7.32×10^{-7} rad

(4) 6.00×10^{-7} rad

135. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) forward bias only

(2) reverse bias only

(3) both forward bias and reverse bias

(4) increase in forward current

136. What is the change in oxidation number of carbon in the following reaction ?

$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$

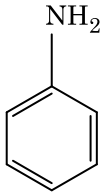
(1) $+4$ to $+4$

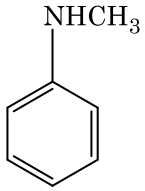
(2) 0 to $+4$

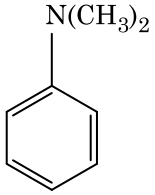
(3) -4 to $+4$

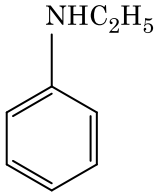
(4) 0 to -4

137. Which of the following amine will give the carbylamine test ?

(1) 

(2) 

(3) 

(4) 

138. The mixture which shows positive deviation from Raoult's law is :

(1) Ethanol + Acetone

(2) Benzene + Toluene

(3) Acetone + Chloroform

(4) Chloroethane + Bromoethane

139. An increase in the concentration of the reactants of a reaction leads to change in :

(1) activation energy

(2) heat of reaction

(3) threshold energy

(4) collision frequency

140. Sucrose on hydrolysis gives :

(1) β-D-Glucose + α-D-Fructose

(2) α-D-Glucose + β-D-Glucose

(3) α-D-Glucose + β-D-Fructose

(4) α-D-Fructose + β-D-Fructose

141. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

(1) $-$I effect of $-CH_3$ groups

(2) $+$R effect of $-CH_3$ groups

(3) $-$R effect of $-CH_3$ groups

(4) Hyperconjugation

142. Identify the **correct** statement from the following :

(1) Wrought iron is impure iron with 4% carbon.

(2) Blister copper has blistered appearance due to evolution of CO_2.

(3) Vapour phase refining is carried out for Nickel by Van Arkel method.

(4) Pig iron can be moulded into a variety of shapes.

143. Identify the **incorrect** match.

	Name	**IUPAC Official Name**	
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

(1) (a), (i)

(2) (b), (ii)

(3) (c), (iii)

(4) (d), (iv)

144. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 1

(2) 2

(3) 3

(4) 4

145. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

(1) $\frac{\sqrt{3}}{4} \times 288$ pm

(2) $\frac{\sqrt{2}}{4} \times 288$ pm

(3) $\frac{4}{\sqrt{3}} \times 288$ pm

(4) $\frac{4}{\sqrt{2}} \times 288$ pm

146. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

(1) Aldol condensation

(2) Cannizzaro's reaction

(3) Cross Cannizzaro's reaction

(4) Cross Aldol condensation

147. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 2×10^{-13} M

(2) 2×10^{-8} M

(3) 1×10^{-13} M

(4) 1×10^{8} M

148. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :

(1) $\Delta_r H > 0$ and $\Delta_r S > 0$

(2) $\Delta_r H > 0$ and $\Delta_r S < 0$

(3) $\Delta_r H < 0$ and $\Delta_r S > 0$

(4) $\Delta_r H < 0$ and $\Delta_r S < 0$

149. Which of the following is a basic amino acid ?

(1) Serine

(2) Alanine

(3) Tyrosine

(4) Lysine

150. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

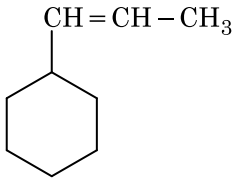
(1) $-8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(2 \times 10^{13})$

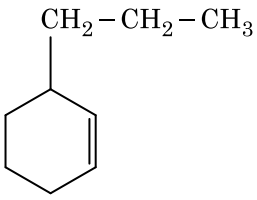
(2) $8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(2 \times 10^{13})$

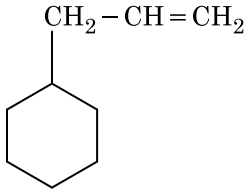
(3) $8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(3 \times 10^{13})$

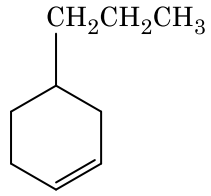
(4) $-8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(4 \times 10^{13})$

151. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

(1) 

(2) 

(3) 

(4) 

152. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 9 bar

(2) 12 bar

(3) 15 bar

(4) 18 bar

153. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(ii)	(iv)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(i)	(iii)	(ii)	(iv)

154. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

(1) Iron

(2) Copper

(3) Calcium

(4) Potassium

155. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

156. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction

(b) Follows Zaitsev rule

(c) Dehydrohalogenation reaction

(d) Dehydration reaction

(1) (a), (b), (c)

(2) (a), (c), (d)

(3) (b), (c), (d)

(4) (a), (b), (d)

157. Paper chromatography is an example of :

(1) Adsorption chromatography

(2) Partition chromatography

(3) Thin layer chromatography

(4) Column chromatography

158. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q = 0$, $\Delta T = 0$ and $w = 0$

(2) $q = 0$, $\Delta T < 0$ and $w > 0$

(3) $q < 0$, $\Delta T = 0$ and $w = 0$

(4) $q > 0$, $\Delta T > 0$ and $w > 0$

159. Which of the following set of molecules will have zero dipole moment ?

(1) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

(2) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

(3) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

(4) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

160. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

(1) 71, 104 and 71

(2) 104, 71 and 71

(3) 71, 71 and 104

(4) 175, 104 and 71

161. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

(1) Hydrogen gas

(2) Oxygen gas

(3) H_2S gas

(4) SO_2 gas

162. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (a), (b) and (c) only

(2) (a) and (c) only

(3) (b) and (c) only

(4) (c) and (d) only

163. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

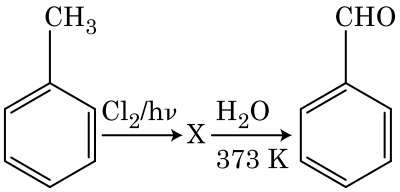
(1) $CuSO_4$

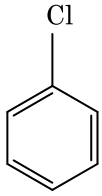
(2) $[Cu(NH_3)_4]^{2+}$

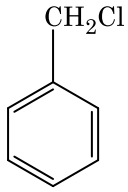
(3) $Cu(OH)_2$

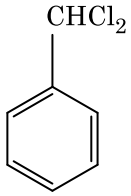
(4) $CuCO_3 \cdot Cu(OH)_2$

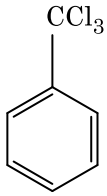
164. Identify compound X in the following sequence of reactions :



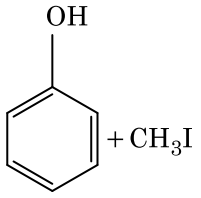
(1) 

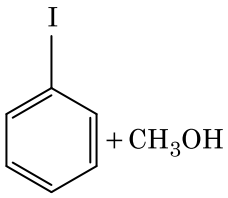
(2) 

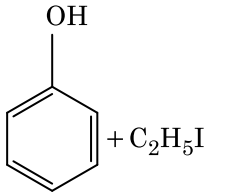
(3) 

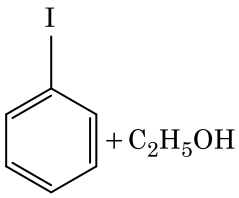
(4) 

165. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

166. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

(1) 0.20 K

(2) 0.80 K

(3) 0.40 K

(4) 0.60 K

167. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

(1) Isopropyl alcohol

(2) Sec. butyl alcohol

(3) Tert. butyl alcohol

(4) Isobutyl alcohol

168. The rate constant for a first order reaction is 4.606×10^{-3} s^{-1}. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 100 s

(2) 200 s

(3) 500 s

(4) 1000 s

169. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?

(1) Both $MgCl_2$ and $CaCl_2$

(2) Only NaCl

(3) Only $MgCl_2$

(4) NaCl, $MgCl_2$ and $CaCl_2$

170. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

(1) H_2SO_3, sulphurous acid

(2) H_2SO_4, sulphuric acid

(3) $H_2S_2O_8$, peroxodisulphuric acid

(4) $H_2S_2O_7$, pyrosulphuric acid

171. Which of the following is a natural polymer ?

(1) *cis*-1,4-polyisoprene

(2) poly (Butadiene-styrene)

(3) polybutadiene

(4) poly (Butadiene-acrylonitrile)

172. Identify a molecule which does **not** exist.

(1) He_2

(2) Li_2

(3) C_2

(4) O_2

173. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Viscosity

(2) Solubility

(3) Stability of the colloidal particles

(4) Size of the colloidal particles

174. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 3.87 BM

(2) 4.90 BM

(3) 5.92 BM

(4) 2.84 BM

175. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

(1) n-Hexane

(2) 2,3-Dimethylbutane

(3) n-Heptane

(4) n-Butane

176. Which one of the followings has maximum number of atoms ?

(1) 1 g of Ag(s) [Atomic mass of Ag = 108]

(2) 1 g of Mg(s) [Atomic mass of Mg = 24]

(3) 1 g of O_2(g) [Atomic mass of O = 16]

(4) 1 g of Li(s) [Atomic mass of Li = 7]

177. Identify the **incorrect** statement.

(1) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

(2) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(3) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

(4) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

178. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

(1) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

(2) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

(3) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

(4) $CN^- < C_2O_4^{2-} < SCN^- < F^-$

179. Which of the following is a cationic detergent ?

(1) Sodium lauryl sulphate

(2) Sodium stearate

(3) Cetyltrimethyl ammonium bromide

(4) Sodium dodecylbenzene sulphonate

180. Which of the following is **not** correct about carbon monoxide ?

(1) It forms carboxyhaemoglobin.

(2) It reduces oxygen carrying ability of blood.

(3) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

(4) It is produced due to incomplete combustion.

- o 0 o -

Space For Rough Work

Space For Rough Work

Space For Rough Work

Test Booklet Code

F5

AKANH

No. :

This Booklet contains 24 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **F5.** Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

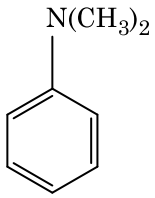
Centre Superintendent : _____

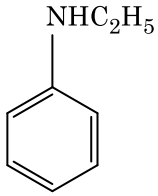
1. Which of the following is a natural polymer ?
   (1) polybutadiene
   (2) poly (Butadiene-acrylonitrile)
   (3) *cis*-1,4-polyisoprene
   (4) poly (Butadiene-styrene)

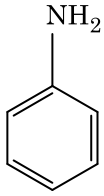
2. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.
   (1) Calcium
   (2) Potassium
   (3) Iron
   (4) Copper

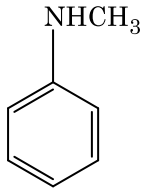
3. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?
   (1) Only $MgCl_2$
   (2) NaCl, $MgCl_2$ and $CaCl_2$
   (3) Both $MgCl_2$ and $CaCl_2$
   (4) Only NaCl

4. Which of the following amine will give the carbylamine test ?

   (1) 

   (2) 

   (3) 

   (4) 

5. The mixture which shows positive deviation from Raoult's law is :
   (1) Acetone + Chloroform
   (2) Chloroethane + Bromoethane
   (3) Ethanol + Acetone
   (4) Benzene + Toluene

6. Which of the following is **not** correct about carbon monoxide ?
   (1) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
   (2) It is produced due to incomplete combustion.
   (3) It forms carboxyhaemoglobin.
   (4) It reduces oxygen carrying ability of blood.

7. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :
   (1) 0.40 K
   (2) 0.60 K
   (3) 0.20 K
   (4) 0.80 K

8. Sucrose on hydrolysis gives :
   (1) α-D-Glucose + β-D-Fructose
   (2) α-D-Fructose + β-D-Fructose
   (3) β-D-Glucose + α-D-Fructose
   (4) α-D-Glucose + β-D-Glucose

9. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (b) and (c) only

(2) (c) and (d) only

(3) (a), (b) and (c) only

(4) (a) and (c) only

10. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction

(b) Follows Zaitsev rule

(c) Dehydrohalogenation reaction

(d) Dehydration reaction

(1) (b), (c), (d)

(2) (a), (b), (d)

(3) (a), (b), (c)

(4) (a), (c), (d)

11. Paper chromatography is an example of :

(1) Thin layer chromatography

(2) Column chromatography

(3) Adsorption chromatography

(4) Partition chromatography

12. Identify the **incorrect** match.

	Name		**IUPAC Official Name**
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

(1) (c), (iii)

(2) (d), (iv)

(3) (a), (i)

(4) (b), (ii)

13. Identify the **correct** statement from the following :

(1) Vapour phase refining is carried out for Nickel by Van Arkel method.

(2) Pig iron can be moulded into a variety of shapes.

(3) Wrought iron is impure iron with 4% carbon.

(4) Blister copper has blistered appearance due to evolution of CO_2.

14. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

(1) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

(2) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

(3) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

(4) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

15. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 3

(2) 4

(3) 1

(4) 2

16. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iii)	(i)	(ii)	(iv)
(4)	(iii)	(ii)	(i)	(iv)

17. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 1×10^{-13} M

(2) 1×10^{8} M

(3) 2×10^{-13} M

(4) 2×10^{-8} M

18. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Stability of the colloidal particles

(2) Size of the colloidal particles

(3) Viscosity

(4) Solubility

19. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

(1) $H_2S_2O_8$, peroxodisulphuric acid

(2) $H_2S_2O_7$, pyrosulphuric acid

(3) H_2SO_3, sulphurous acid

(4) H_2SO_4, sulphuric acid

20. Identify the **incorrect** statement.

(1) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

(2) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

(3) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

(4) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

21. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

(1) Cross Cannizzaro's reaction

(2) Cross Aldol condensation

(3) Aldol condensation

(4) Cannizzaro's reaction

22. The rate constant for a first order reaction is $4.606 \times 10^{-3}\ s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 500 s

(2) 1000 s

(3) 100 s

(4) 200 s

23. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

(1) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

(2) $CN^- < C_2O_4^{2-} < SCN^- < F^-$

(3) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

(4) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

24. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 15 bar

(2) 18 bar

(3) 9 bar

(4) 12 bar

25. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

(1) 71, 71 and 104

(2) 175, 104 and 71

(3) 71, 104 and 71

(4) 104, 71 and 71

26. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

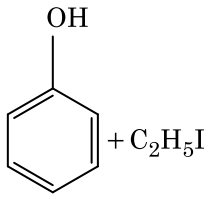
(1) $Cu(OH)_2$

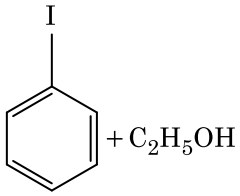
(2) $CuCO_3 \cdot Cu(OH)_2$

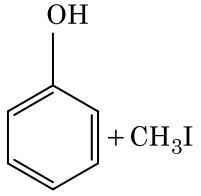
(3) $CuSO_4$

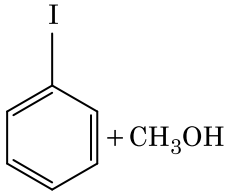
(4) $[Cu(NH_3)_4]^{2+}$

27. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

28. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

(1) n-Heptane

(2) n-Butane

(3) n-Hexane

(4) 2,3-Dimethylbutane

29. An increase in the concentration of the reactants of a reaction leads to change in :

(1) threshold energy

(2) collision frequency

(3) activation energy

(4) heat of reaction

30. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

(1) H_2S gas

(2) SO_2 gas

(3) Hydrogen gas

(4) Oxygen gas

31. Which of the following is a basic amino acid ?

(1) Tyrosine

(2) Lysine

(3) Serine

(4) Alanine

32. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

(1) Tert. butyl alcohol

(2) Isobutyl alcohol

(3) Isopropyl alcohol

(4) Sec. butyl alcohol

33. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :

(1) $\Delta_r H < 0$ and $\Delta_r S > 0$

(2) $\Delta_r H < 0$ and $\Delta_r S < 0$

(3) $\Delta_r H > 0$ and $\Delta_r S > 0$

(4) $\Delta_r H > 0$ and $\Delta_r S < 0$

34. Which one of the followings has maximum number of atoms ?

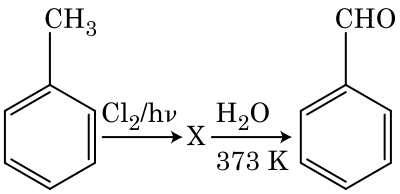
(1) 1 g of $O_2(g)$ [Atomic mass of O = 16]

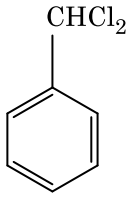
(2) 1 g of Li(s) [Atomic mass of Li = 7]

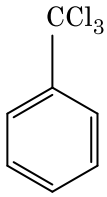
(3) 1 g of Ag(s) [Atomic mass of Ag = 108]

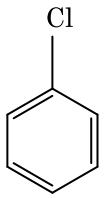
(4) 1 g of Mg(s) [Atomic mass of Mg = 24]

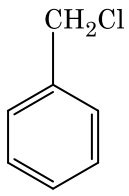
35. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

36. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(ii)	(i)	(iv)	(iii)

37. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

(1) $-$R effect of $-CH_3$ groups

(2) Hyperconjugation

(3) $-$I effect of $-CH_3$ groups

(4) $+$R effect of $-CH_3$ groups

38. Which of the following set of molecules will have zero dipole moment ?

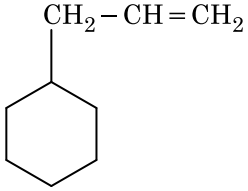
(1) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

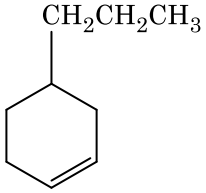
(2) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

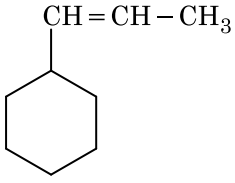
(3) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

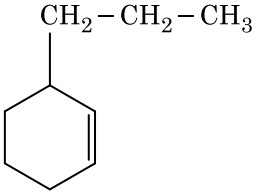
(4) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

39. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

(1) 

(2) 

(3) 

(4) 

40. Identify a molecule which does **not** exist.

(1) C_2

(2) O_2

(3) He_2

(4) Li_2

41. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q < 0, \Delta T = 0$ and $w = 0$

(2) $q > 0, \Delta T > 0$ and $w > 0$

(3) $q = 0, \Delta T = 0$ and $w = 0$

(4) $q = 0, \Delta T < 0$ and $w > 0$

42. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

(1) $\frac{4}{\sqrt{3}} \times 288$ pm

(2) $\frac{4}{\sqrt{2}} \times 288$ pm

(3) $\frac{\sqrt{3}}{4} \times 288$ pm

(4) $\frac{\sqrt{2}}{4} \times 288$ pm

43. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 5.92 BM

(2) 2.84 BM

(3) 3.87 BM

(4) 4.90 BM

44. Which of the following is a cationic detergent ?

(1) Cetyltrimethyl ammonium bromide

(2) Sodium dodecylbenzene sulphonate

(3) Sodium lauryl sulphate

(4) Sodium stearate

45. What is the change in oxidation number of carbon in the following reaction ?

$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$

(1) -4 to $+4$

(2) 0 to -4

(3) $+4$ to $+4$

(4) 0 to $+4$

46. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

(1) 30 N

(2) 24 N

(3) 48 N

(4) 32 N

47. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) $2.4\pi \times 10^{-5}$ T m A^{-1}

(2) $2.4\pi \times 10^{-7}$ T m A^{-1}

(3) $2.4\pi \times 10^{-4}$ T m A^{-1}

(4) 8.0×10^{-5} T m A^{-1}

48. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 6.28×10^{-5} T

(2) 3.14×10^{-5} T

(3) 6.28×10^{-4} T

(4) 3.14×10^{-4} T

49. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{101}_{36}Kr$

(2) $^{103}_{36}Kr$

(3) $^{144}_{56}Ba$

(4) $^{91}_{40}Zr$

50. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

(1) $-6\hat{i}$ N m

(2) $6\hat{k}$ N m

(3) $6\hat{i}$ N m

(4) $6\hat{j}$ N m

51. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2. The energy received by the surface during time span of 1 minute is :

(1) 24×10^3 J

(2) 48×10^3 J

(3) 10×10^3 J

(4) 12×10^3 J

52. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : (R = 8.3 J mol^{-1} K^{-1})

(1) 0.1 kg/m^3

(2) 0.02 kg/m^3

(3) 0.5 kg/m^3

(4) 0.2 kg/m^3

53. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

(1) $\frac{1}{\sqrt{2}\,n^2\pi d^2}$

(2) $\frac{1}{\sqrt{2}\,n^2\pi^2 d^2}$

(3) $\frac{1}{\sqrt{2}\,n\pi d}$

(4) $\frac{1}{\sqrt{2}\,n\pi d^2}$

54. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in m^2 V^{-1} s^{-1} of :

(1) 2.5×10^{-6}

(2) 2.25×10^{-15}

(3) 2.25×10^{15}

(4) 2.5×10^{6}

55. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) $\frac{\pi}{2}$ rad

(2) zero

(3) π rad

(4) $\frac{3\pi}{2}$ rad

56. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

(1) 67 cm

(2) 80 cm

(3) 33 cm

(4) 50 cm

57. Taking into account of the significant figures, what is the value of 9.99 m − 0.0099 m ?

(1) 9.980 m

(2) 9.9 m

(3) 9.9801 m

(4) 9.98 m

58. For transistor action, which of the following statements is **correct** ?

(1) Both emitter junction as well as the collector junction are forward biased.

(2) The base region must be very thin and lightly doped.

(3) Base, emitter and collector regions should have same doping concentrations.

(4) Base, emitter and collector regions should have same size.

59. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)

(1) $\frac{5}{2}k_BT$

(2) $\frac{7}{2}k_BT$

(3) $\frac{1}{2}k_BT$

(4) $\frac{3}{2}k_BT$

60. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

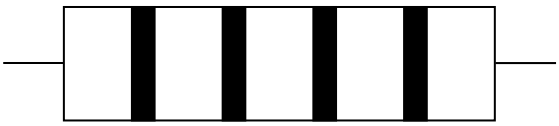
(1) 1 N/C

(2) 5 N/C

(3) zero

(4) 0.5 N/C

61. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 4.7 kΩ, 5%

(2) 470 Ω, 5%

(3) 470 kΩ, 5%

(4) 47 kΩ, 10%

62. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) 1 : c

(2) 1 : c^2

(3) c : 1

(4) 1 : 1

63. The Brewsters angle i_b for an interface should be :

(1) $45° < i_b < 90°$

(2) $i_b = 90°$

(3) $0° < i_b < 30°$

(4) $30° < i_b < 45°$

64. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

(1) 536 Hz

(2) 537 Hz

(3) 523 Hz

(4) 524 Hz

65. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

(1) 10.0 g

(2) 20.0 g

(3) 2.5 g

(4) 5.0 g

66. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.5×10^{-1} m

(2) 1.5×10^{-2} m

(3) 1.0×10^{-2} m

(4) 1.0×10^{-1} m

67. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\epsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})

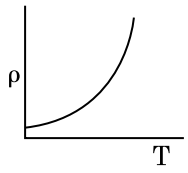
(1) 0.44×10^{-10} C^2 N^{-1} m^{-2}

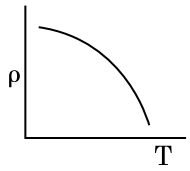
(2) 5.00 C^2 N^{-1} m^{-2}

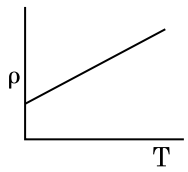
(3) 0.44×10^{-13} C^2 N^{-1} m^{-2}

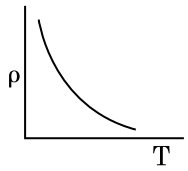
(4) 1.77×10^{-12} C^2 N^{-1} m^{-2}

68. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

(1) 

(2) 

(3) 

(4) 

69. For which one of the following, Bohr model is **not** valid ?

(1) Deuteron atom

(2) Singly ionised neon atom (Ne^+)

(3) Hydrogen atom

(4) Singly ionised helium atom (He^+)

70. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 400 V

(2) zero

(3) 50 V

(4) 200 V

71. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) μA

(2) $\frac{\mu A}{2}$

(3) $\frac{A}{2\mu}$

(4) $\frac{2A}{\mu}$

72. The energy equivalent of 0.5 g of a substance is :

(1) 1.5×10^{13} J

(2) 0.5×10^{13} J

(3) 4.5×10^{16} J

(4) 4.5×10^{13} J

73. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 7.32×10^{-7} rad

(2) 6.00×10^{-7} rad

(3) 3.66×10^{-7} rad

(4) 1.83×10^{-7} rad

74. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(1) one-fourth

(2) zero

(3) doubled

(4) four times

75. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10^3 V

(2) 10^4 V

(3) 10 V

(4) 10^2 V

76. Dimensions of stress are :

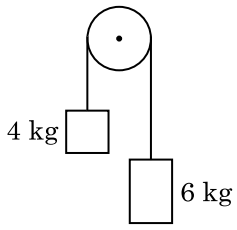
(1) $[ML^0T^{-2}]$

(2) $[ML^{-1}T^{-2}]$

(3) $[MLT^{-2}]$

(4) $[ML^2T^{-2}]$

77. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g/5

(2) g/10

(3) g

(4) g/2

78. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) 1.0

(2) -1.0

(3) zero

(4) 0.5

79. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

(1) isochoric

(2) isobaric

(3) isothermal

(4) adiabatic

80. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10\ m/s^2$)

(1) 320 m

(2) 300 m

(3) 360 m

(4) 340 m

81. The solids which have the negative temperature coefficient of resistance are :

(1) semiconductors only

(2) insulators and semiconductors

(3) metals

(4) insulators only

82. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

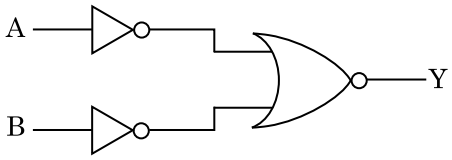
(1) $\frac{3}{2}$

(2) $\frac{5}{3}$

(3) $\frac{27}{8}$

(4) $\frac{9}{4}$

83. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(2)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(3)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(4)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

84. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) four times

(2) one-fourth

(3) double

(4) half

85. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 2.5 A

(2) 25.1 A

(3) 1.7 A

(4) 2.05 A

86. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

(1) 0.5 mm

(2) 1.0 mm

(3) 0.01 mm

(4) 0.25 mm

87. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 0.06

(2) 0.006

(3) 6

(4) 0.6

88. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{MgL}{AL_1}$

(2) $\frac{MgL}{A(L_1 - L)}$

(3) $\frac{MgL_1}{AL}$

(4) $\frac{Mg(L_1 - L)}{AL}$

89. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) both forward bias and reverse bias

(2) increase in forward current

(3) forward bias only

(4) reverse bias only

90. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 1.28×10^6 N/C

(2) 1.28×10^7 N/C

(3) 1.28×10^4 N/C

(4) 1.28×10^5 N/C

91. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(iv)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iv)	(iii)	(i)	(ii)

92. Identify the basic amino acid from the following.

(1) Lysine

(2) Valine

(3) Tyrosine

(4) Glutamic Acid

93. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(iii)	(ii)	(i)	(iv)

94. Match the following :

(a)	Inhibitor of catalytic activity	(i)	Ricin
(b)	Possess peptide bonds	(ii)	Malonate
(c)	Cell wall material in fungi	(iii)	Chitin
(d)	Secondary metabolite	(iv)	Collagen

Choose the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(ii)	(iii)	(i)	(iv)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iii)	(i)	(iv)	(ii)

95. Dissolution of the synaptonemal complex occurs during :

(1) Diplotene
(2) Leptotene
(3) Pachytene
(4) Zygotene

96. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

(1) ICSI and ZIFT
(2) GIFT and ICSI
(3) ZIFT and IUT
(4) GIFT and ZIFT

97. Which of the following is **correct** about viroids ?

(1) They have DNA with protein coat.
(2) They have free DNA without protein coat.
(3) They have RNA with protein coat.
(4) They have free RNA without protein coat.

98. Which of the following pairs is of unicellular algae ?

(1) *Anabaena* and *Volvox*
(2) *Chlorella* and *Spirulina*
(3) *Laminaria* and *Sargassum*
(4) *Gelidium* and *Gracilaria*

99. Which one of the following is the most abundant protein in the animals ?

(1) Lectin
(2) Insulin
(3) Haemoglobin
(4) Collagen

100. The infectious stage of *Plasmodium* that enters the human body is :

(1) Female gametocytes
(2) Male gametocytes
(3) Trophozoites
(4) Sporozoites

101. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

(1) Defence action
(2) Effect on reproduction
(3) Nutritive value
(4) Growth response

102. Snow-blindness in Antarctic region is due to :

(1) High reflection of light from snow
(2) Damage to retina caused by infra-red rays
(3) Freezing of fluids in the eye by low temperature
(4) Inflammation of cornea due to high dose of UV-B radiation

103. Which of the following statements is **correct** ?

(1) Adenine pairs with thymine through three H-bonds.
(2) Adenine does not pair with thymine.
(3) Adenine pairs with thymine through two H-bonds.
(4) Adenine pairs with thymine through one H-bond.

104. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

(1) CH_4, H_2, NH_3 and water vapor at 600°C
(2) CH_3, H_2, NH_3 and water vapor at 600°C
(3) CH_4, H_2, NH_3 and water vapor at 800°C
(4) CH_3, H_2, NH_4 and water vapor at 800°C

105. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	6 - 15 pairs of gill slits	(i)	*Trygon*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(ii)	(iii)	(i)
(2)	(i)	(iv)	(iii)	(ii)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(iii)	(iv)	(i)	(ii)

106. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

(1) 2.2 meters
(2) 2.7 meters
(3) 2.0 meters
(4) 2.5 meters

107. The specific palindromic sequence which is recognized by EcoRI is :

(1) 5' - CTTAAG - 3'
3' - GAATTC - 5'
(2) 5' - GGATCC - 3'
3' - CCTAGG - 5'
(3) 5' - GAATTC - 3'
3' - CTTAAG - 5'
(4) 5' - GGAACC - 3'
3' - CCTTGG - 5'

108. The body of the ovule is fused within the funicle at :

(1) Nucellus
(2) Chalaza
(3) Hilum
(4) Micropyle

109. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(iv)	(i)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(ii)	(iv)	(i)	(iii)
(4)	(i)	(iii)	(ii)	(iv)

110. Goblet cells of alimentary canal are modified from :

(1) Chondrocytes
(2) Compound epithelial cells
(3) Squamous epithelial cells
(4) Columnar epithelial cells

111. The transverse section of a plant shows following anatomical features :

(a) Large number of scattered vascular bundles surrounded by bundle sheath.
(b) Large conspicuous parenchymatous ground tissue.
(c) Vascular bundles conjoint and closed.
(d) Phloem parenchyma absent.

Identify the category of plant and its part :

(1) Dicotyledonous stem
(2) Dicotyledonous root
(3) Monocotyledonous stem
(4) Monocotyledonous root

112. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

(1) Cross breeding
(2) Inbreeding
(3) Out crossing
(4) Mutational breeding

113. The roots that originate from the base of the stem are :

(1) Prop roots

(2) Lateral roots

(3) Fibrous roots

(4) Primary roots

114. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

(1) Cell is metabolically active, grows but does not replicate its DNA.

(2) Nuclear Division takes place.

(3) DNA synthesis or replication takes place.

(4) Reorganisation of all cell components takes place.

115. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

(1) Plant nematodes

(2) Insect predators

(3) Insect pests

(4) Fungal diseases

116. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

(1) 1 molecule of 6-C compound

(2) 1 molecule of 4-C compound and 1 molecule of 2-C compound

(3) 2 molecules of 3-C compound

(4) 1 molecule of 3-C compound

117. If the head of cockroach is removed, it may live for few days because :

(1) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

(2) the head holds a $1/3^{rd}$ of a nervous system while the rest is situated along the dorsal part of its body.

(3) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

(4) the cockroach does not have nervous system.

118. Meiotic division of the secondary oocyte is completed :

(1) After zygote formation

(2) At the time of fusion of a sperm with an ovum

(3) Prior to ovulation

(4) At the time of copulation

119. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

(1) Low concentration of LH

(2) Low concentration of FSH

(3) High concentration of Estrogen

(4) High concentration of Progesterone

120. Floridean starch has structure similar to :

(1) Mannitol and algin

(2) Laminarin and cellulose

(3) Starch and cellulose

(4) Amylopectin and glycogen

121. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

(1) Ethylene

(2) Abscisic acid

(3) Cytokinin

(4) Gibberellin

122. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

(1) Imbibition

(2) Plasmolysis

(3) Transpiration

(4) Root pressure

123. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

(1) 14

(2) 8

(3) 4

(4) 2

124. Name the enzyme that facilitates opening of DNA helix during transcription.

(1) DNA polymerase

(2) RNA polymerase

(3) DNA ligase

(4) DNA helicase

125. Select the option including all sexually transmitted diseases.

(1) AIDS, Malaria, Filaria

(2) Cancer, AIDS, Syphilis

(3) Gonorrhoea, Syphilis, Genital herpes

(4) Gonorrhoea, Malaria, Genital herpes

126. The enzyme enterokinase helps in conversion of :

(1) caseinogen into casein

(2) pepsinogen into pepsin

(3) protein into polypeptides

(4) trypsinogen into trypsin

127. Bilaterally symmetrical and acoelomate animals are exemplified by :

(1) Aschelminthes

(2) Annelida

(3) Ctenophora

(4) Platyhelminthes

128. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Boveri

(2) Morgan

(3) Mendel

(4) Sutton

129. Strobili or cones are found in :

(1) *Marchantia*

(2) *Equisetum*

(3) *Salvinia*

(4) *Pteris*

130. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

(1) Golgi bodies

(2) Polysomes

(3) Endoplasmic reticulum

(4) Peroxisomes

131. Identify the **correct** statement with reference to human digestive system.

(1) Ileum is a highly coiled part.

(2) Vermiform appendix arises from duodenum.

(3) Ileum opens into small intestine.

(4) Serosa is the innermost layer of the alimentary canal.

132. The QRS complex in a standard ECG represents :

(1) Depolarisation of ventricles

(2) Repolarisation of ventricles

(3) Repolarisation of auricles

(4) Depolarisation of auricles

133. Match the following diseases with the causative organism and select the **correct** option.

	Column - I		**Column - II**
(a)	Typhoid	(i)	*Wuchereria*
(b)	Pneumonia	(ii)	*Plasmodium*
(c)	Filariasis	(iii)	*Salmonella*
(d)	Malaria	(iv)	*Haemophilus*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iii)	(iv)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iii)	(iv)	(i)	(ii)

134. Montreal protocol was signed in 1987 for control of :

(1) Release of Green House gases

(2) Disposal of e-wastes

(3) Transport of Genetically modified organisms from one country to another

(4) Emission of ozone depleting substances

135. Choose the **correct** pair from the following :

(1) Nucleases - Separate the two strands of DNA

(2) Exonucleases - Make cuts at specific positions within DNA

(3) Ligases - Join the two DNA molecules

(4) Polymerases - Break the DNA into fragments

136. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iv)	(iii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(ii)	(i)	(iv)	(iii)

137. Which of the following is **not** an attribute of a population ?

(1) Mortality

(2) Species interaction

(3) Sex ratio

(4) Natality

138. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Ketonuria and Glycosuria

(2) Renal calculi and Hyperglycaemia

(3) Uremia and Ketonuria

(4) Uremia and Renal Calculi

139. The first phase of translation is :

(1) Aminoacylation of tRNA

(2) Recognition of an anti-codon

(3) Binding of mRNA to ribosome

(4) Recognition of DNA molecule

140. According to Robert May, the global species diversity is about :

(1) 50 million

(2) 7 million

(3) 1.5 million

(4) 20 million

141. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

(1) S phase

(2) G_2 phase

(3) M phase

(4) G_1 phase

142. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

(1) Gross primary productivity and Net primary productivity are one and same.

(2) There is no relationship between Gross primary productivity and Net primary productivity.

(3) Gross primary productivity is always less than net primary productivity.

(4) Gross primary productivity is always more than net primary productivity.

143. The number of substrate level phosphorylations in one turn of citric acid cycle is :

(1) Two

(2) Three

(3) Zero

(4) One

144. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Gregarious, polyphagous pest	(i)	*Asterias*
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	*Ctenoplana*
(d)	Bioluminescence	(iv)	*Locusta*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(ii)	(i)	(iii)	(iv)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iv)	(i)	(ii)	(iii)

145. The ovary is half inferior in :

(1) Sunflower

(2) Plum

(3) Brinjal

(4) Mustard

146. Match the trophic levels with their **correct** species examples in grassland ecosystem.

(a)	Fourth trophic level	(i)	Crow
(b)	Second trophic level	(ii)	Vulture
(c)	First trophic level	(iii)	Rabbit
(d)	Third trophic level	(iv)	Grass

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(iii)	(ii)	(i)	(iv)

147. The sequence that controls the copy number of the linked DNA in the vector, is termed :

(1) Palindromic sequence

(2) Recognition site

(3) Selectable marker

(4) Ori site

148. In light reaction, plastoquinone facilitates the transfer of electrons from :

(1) PS-I to $NADP^+$

(2) PS-I to ATP synthase

(3) PS-II to $Cytb_6f$ complex

(4) $Cytb_6f$ complex to PS-I

149. In water hyacinth and water lily, pollination takes place by :

(1) wind and water

(2) insects and water

(3) insects or wind

(4) water currents only

150. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

(1) Ammonia and oxygen

(2) Ammonia and hydrogen

(3) Ammonia alone

(4) Nitrate alone

151. Which of the following is **not** an inhibitory substance governing seed dormancy ?

(1) Phenolic acid

(2) Para-ascorbic acid

(3) Gibberellic acid

(4) Abscisic acid

152. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

(1) When I^A and I^B are present together, they express same type of sugar.

(2) Allele 'i' does not produce any sugar.

(3) The gene (I) has three alleles.

(4) A person will have only two of the three alleles.

153. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

(1) Effluents of primary treatment

(2) Activated sludge

(3) Primary sludge

(4) Floating debris

154. Match the following with respect to meiosis :

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iv)	(iii)
(2)	(ii)	(iv)	(iii)	(i)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

155. Embryological support for evolution was disapproved by :

(1) Charles Darwin

(2) Oparin

(3) Karl Ernst von Baer

(4) Alfred Wallace

156. Identify the **incorrect** statement.

(1) Sapwood is the innermost secondary xylem and is lighter in colour.

(2) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.

(3) Heart wood does not conduct water but gives mechanical support.

(4) Sapwood is involved in conduction of water and minerals from root to leaf.

157. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(c)	Bulbo-urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(iv)	(i)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(i)	(iv)	(ii)	(iii)

158. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Eosinophils	(i)	Immune response
(b)	Basophils	(ii)	Phagocytosis
(c)	Neutrophils	(iii)	Release histaminase, destructive enzymes
(d)	Lymphocytes	(iv)	Release granules containing histamine

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iv)	(iii)
(2)	(ii)	(i)	(iii)	(iv)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(i)	(ii)	(iii)

159. Which of the following would help in prevention of diuresis ?

(1) Atrial natriuretic factor causes vasoconstriction

(2) Decrease in secretion of renin by JG cells

(3) More water reabsorption due to undersecretion of ADH

(4) Reabsorption of Na^+ and water from renal tubules due to aldosterone

160. Match the following concerning essential elements and their functions in plants :

(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(iv)	(iii)	(ii)	(i)

161. Select the **correct** events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter-costal muscles

(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

(1) (a), (b) and (d)

(2) only (d)

(3) (a) and (b)

(4) (c) and (d)

162. Cuboidal epithelium with brush border of microvilli is found in :

(1) proximal convoluted tubule of nephron

(2) eustachian tube

(3) lining of intestine

(4) ducts of salivary glands

163. Identify the **wrong** statement with regard to Restriction Enzymes.

(1) They are useful in genetic engineering.

(2) Sticky ends can be joined by using DNA ligases.

(3) Each restriction enzyme functions by inspecting the length of a DNA sequence.

(4) They cut the strand of DNA at palindromic sites.

164. Select the **correct** match.

(1) Sickle cell anaemia - Autosomal recessive trait, chromosome-11

(2) Thalassemia - X linked

(3) Haemophilia - Y linked

(4) Phenylketonuria - Autosomal dominant trait

165. The process of growth is maximum during :

(1) Senescence

(2) Dormancy

(3) Log phase

(4) Lag phase

166. Identify the **wrong** statement with reference to transport of oxygen.

(1) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

(2) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

(3) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

(4) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

167. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(ii)	(i)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(iii)	(i)	(iv)	(ii)

168. Which of the following statements about inclusion bodies is **incorrect** ?

(1) They lie free in the cytoplasm.

(2) These represent reserve material in cytoplasm.

(3) They are not bound by any membrane.

(4) These are involved in ingestion of food particles.

169. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	*Bacillus thuringiensis*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(iv)	(i)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(iii)	(ii)	(i)	(iv)

170. Identify the **wrong** statement with reference to immunity.

(1) Active immunity is quick and gives full response.

(2) Foetus receives some antibodies from mother, it is an example for passive immunity.

(3) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

(4) When ready-made antibodies are directly given, it is called "Passive immunity".

171. Which of the following statements are **true** for the phylum-Chordata ?

(a) In Urochordata notochord extends from head to tail and it is present throughout their life.

(b) In Vertebrata notochord is present during the embryonic period only.

(c) Central nervous system is dorsal and hollow.

(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

(1) (a) and (b)

(2) (b) and (c)

(3) (d) and (c)

(4) (c) and (a)

172. Which of the following statements is **not correct** ?

(1) The functional insulin has A and B chains linked together by hydrogen bonds.

(2) Genetically engineered insulin is produced in *E-Coli*.

(3) In man insulin is synthesised as a proinsulin.

(4) The proinsulin has an extra peptide called C-peptide.

173. Select the **correct** statement.

(1) Insulin acts on pancreatic cells and adipocytes.

(2) Insulin is associated with hyperglycemia.

(3) Glucocorticoids stimulate gluconeogenesis.

(4) Glucagon is associated with hypoglycemia.

174. Which of the following regions of the globe exhibits highest species diversity ?

(1) Himalayas

(2) Amazon forests

(3) Western Ghats of India

(4) Madagascar

175. The plant parts which consist of two generations - one within the other :

(a) Pollen grains inside the anther

(b) Germinated pollen grain with two male gametes

(c) Seed inside the fruit

(d) Embryo sac inside the ovule

(1) (c) and (d)

(2) (a) and (d)

(3) (a) only

(4) (a), (b) and (c)

176. Flippers of Penguins and Dolphins are examples of :

(1) Industrial melanism

(2) Natural selection

(3) Adaptive radiation

(4) Convergent evolution

177. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

(1) Acetocarmine in UV radiation

(2) Ethidium bromide in infrared radiation

(3) Acetocarmine in bright blue light

(4) Ethidium bromide in UV radiation

178. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

(1) Cellulose, lecithin

(2) Inulin, insulin

(3) Chitin, cholesterol

(4) Glycerol, trypsin

179. Ray florets have :

(1) Hypogynous ovary

(2) Half inferior ovary

(3) Inferior ovary

(4) Superior ovary

180. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

(a) Darwin's Finches of Galapagos islands.

(b) Herbicide resistant weeds.

(c) Drug resistant eukaryotes.

(d) Man-created breeds of domesticated animals like dogs.

(1) (b), (c) and (d)

(2) only (d)

(3) only (a)

(4) (a) and (c)

- o 0 o -

Space For Rough Work

Space For Rough Work

Space For Rough Work

Test Booklet Code

G5

AKANH

No. :

This Booklet contains 24 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **G5.** Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

Centre Superintendent : _____

1. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

(1) 2.5 meters
(2) 2.2 meters
(3) 2.7 meters
(4) 2.0 meters

2. Bilaterally symmetrical and acoelomate animals are exemplified by :

(1) Platyhelminthes
(2) Aschelminthes
(3) Annelida
(4) Ctenophora

3. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Gregarious, polyphagous pest	(i)	*Asterias*
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	*Ctenoplana*
(d)	Bioluminescence	(iv)	*Locusta*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(i)	(iii)	(ii)	(iv)

4. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

(1) Peroxisomes
(2) Golgi bodies
(3) Polysomes
(4) Endoplasmic reticulum

5. The QRS complex in a standard ECG represents :

(1) Depolarisation of auricles
(2) Depolarisation of ventricles
(3) Repolarisation of ventricles
(4) Repolarisation of auricles

6. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(ii)	(iv)	(i)	(iii)

7. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Sutton
(2) Boveri
(3) Morgan
(4) Mendel

8. Identify the **incorrect** statement.

(1) Sapwood is involved in conduction of water and minerals from root to leaf.
(2) Sapwood is the innermost secondary xylem and is lighter in colour.
(3) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
(4) Heart wood does not conduct water but gives mechanical support.

9. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(iv)	(iii)	(i)	(ii)

10. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(ii)	(iv)	(iii)	(i)

11. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

(1) Glycerol, trypsin

(2) Cellulose, lecithin

(3) Inulin, insulin

(4) Chitin, cholesterol

12. Name the enzyme that facilitates opening of DNA helix during transcription.

(1) DNA helicase

(2) DNA polymerase

(3) RNA polymerase

(4) DNA ligase

13. If the head of cockroach is removed, it may live for few days because :

(1) the cockroach does not have nervous system.

(2) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

(3) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.

(4) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

14. Select the **correct** events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter-costal muscles

(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

(1) (c) and (d)

(2) (a), (b) and (d)

(3) only (d)

(4) (a) and (b)

15. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

(1) Mutational breeding

(2) Cross breeding

(3) Inbreeding

(4) Out crossing

16. Which one of the following is the most abundant protein in the animals ?

(1) Collagen

(2) Lectin

(3) Insulin

(4) Haemoglobin

17. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

(1) 2

(2) 14

(3) 8

(4) 4

18. The body of the ovule is fused within the funicle at :

(1) Micropyle

(2) Nucellus

(3) Chalaza

(4) Hilum

19. Which of the following is **correct** about viroids ?

(1) They have free RNA without protein coat.

(2) They have DNA with protein coat.

(3) They have free DNA without protein coat.

(4) They have RNA with protein coat.

20. The number of substrate level phosphorylations in one turn of citric acid cycle is :

(1) One

(2) Two

(3) Three

(4) Zero

21. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

(1) Nitrate alone

(2) Ammonia and oxygen

(3) Ammonia and hydrogen

(4) Ammonia alone

22. Match the following diseases with the causative organism and select the **correct** option.

	Column - I		**Column - II**
(a)	Typhoid	(i)	*Wuchereria*
(b)	Pneumonia	(ii)	*Plasmodium*
(c)	Filariasis	(iii)	*Salmonella*
(d)	Malaria	(iv)	*Haemophilus*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(ii)	(i)	(iii)	(iv)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(i)	(iii)	(ii)	(iv)

23. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

(1) CH_3, H_2, NH_4 and water vapor at 800°C

(2) CH_4, H_2, NH_3 and water vapor at 600°C

(3) CH_3, H_2, NH_3 and water vapor at 600°C

(4) CH_4, H_2, NH_3 and water vapor at 800°C

24. Which of the following statements is **correct** ?

(1) Adenine pairs with thymine through one H-bond.

(2) Adenine pairs with thymine through three H-bonds.

(3) Adenine does not pair with thymine.

(4) Adenine pairs with thymine through two H-bonds.

25. Match the following with respect to meiosis :

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iii)	(iv)	(i)	(ii)

26. Choose the **correct** pair from the following :

(1)	Polymerases	-	Break the DNA into fragments
(2)	Nucleases	-	Separate the two strands of DNA
(3)	Exonucleases	-	Make cuts at specific positions within DNA
(4)	Ligases	-	Join the two DNA molecules

27. Select the option including all sexually transmitted diseases.

(1) Gonorrhoea, Malaria, Genital herpes

(2) AIDS, Malaria, Filaria

(3) Cancer, AIDS, Syphilis

(4) Gonorrhoea, Syphilis, Genital herpes

28. Embryological support for evolution was disapproved by :

(1) Alfred Wallace

(2) Charles Darwin

(3) Oparin

(4) Karl Ernst von Baer

29. The roots that originate from the base of the stem are :

(1) Primary roots

(2) Prop roots

(3) Lateral roots

(4) Fibrous roots

30. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

(1) Ethidium bromide in UV radiation

(2) Acetocarmine in UV radiation

(3) Ethidium bromide in infrared radiation

(4) Acetocarmine in bright blue light

31. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

(1) High concentration of Progesterone

(2) Low concentration of LH

(3) Low concentration of FSH

(4) High concentration of Estrogen

32. Goblet cells of alimentary canal are modified from :

(1) Columnar epithelial cells

(2) Chondrocytes

(3) Compound epithelial cells

(4) Squamous epithelial cells

33. Snow-blindness in Antarctic region is due to :

(1) Inflammation of cornea due to high dose of UV-B radiation

(2) High reflection of light from snow

(3) Damage to retina caused by infra-red rays

(4) Freezing of fluids in the eye by low temperature

34. Match the following concerning essential elements and their functions in plants :

(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(ii)	(i)	(iv)	(iii)

35. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

(1) Fungal diseases

(2) Plant nematodes

(3) Insect predators

(4) Insect pests

36. Ray florets have :

(1) Superior ovary

(2) Hypogynous ovary

(3) Half inferior ovary

(4) Inferior ovary

37. Montreal protocol was signed in 1987 for control of :

(1) Emission of ozone depleting substances

(2) Release of Green House gases

(3) Disposal of e-wastes

(4) Transport of Genetically modified organisms from one country to another

38. Identify the **wrong** statement with regard to Restriction Enzymes.

(1) They cut the strand of DNA at palindromic sites.

(2) They are useful in genetic engineering.

(3) Sticky ends can be joined by using DNA ligases.

(4) Each restriction enzyme functions by inspecting the length of a DNA sequence.

39. The infectious stage of *Plasmodium* that enters the human body is :

(1) Sporozoites

(2) Female gametocytes

(3) Male gametocytes

(4) Trophozoites

40. Meiotic division of the secondary oocyte is completed :

(1) At the time of copulation

(2) After zygote formation

(3) At the time of fusion of a sperm with an ovum

(4) Prior to ovulation

41. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

(1) 1 molecule of 3-C compound

(2) 1 molecule of 6-C compound

(3) 1 molecule of 4-C compound and 1 molecule of 2-C compound

(4) 2 molecules of 3-C compound

42. Which of the following statements are **true** for the phylum-Chordata ?

(a) In Urochordata notochord extends from head to tail and it is present throughout their life.

(b) In Vertebrata notochord is present during the embryonic period only.

(c) Central nervous system is dorsal and hollow.

(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

(1) (c) and (a)

(2) (a) and (b)

(3) (b) and (c)

(4) (d) and (c)

43. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iv)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iii)	(iv)	(ii)	(i)

44. Which of the following pairs is of unicellular algae ?

(1) *Gelidium* and *Gracilaria*

(2) *Anabaena* and *Volvox*

(3) *Chlorella* and *Spirulina*

(4) *Laminaria* and *Sargassum*

45. In light reaction, plastoquinone facilitates the transfer of electrons from :

(1) $Cytb_6f$ complex to PS-I

(2) PS-I to $NADP^+$

(3) PS-I to ATP synthase

(4) PS-II to $Cytb_6f$ complex

46. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Uremia and Renal Calculi

(2) Ketonuria and Glycosuria

(3) Renal calculi and Hyperglycaemia

(4) Uremia and Ketonuria

47. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

(1) Growth response

(2) Defence action

(3) Effect on reproduction

(4) Nutritive value

48. Which of the following would help in prevention of diuresis ?

(1) Reabsorption of Na^+ and water from renal tubules due to aldosterone

(2) Atrial natriuretic factor causes vasoconstriction

(3) Decrease in secretion of renin by JG cells

(4) More water reabsorption due to undersecretion of ADH

49. Select the **correct** match.

(1) Phenylketonuria - Autosomal dominant trait

(2) Sickle cell anaemia - Autosomal recessive trait, chromosome-11

(3) Thalassemia - X linked

(4) Haemophilia - Y linked

50. Which of the following is **not** an attribute of a population ?

(1) Natality

(2) Mortality

(3) Species interaction

(4) Sex ratio

51. Which of the following statements about inclusion bodies is **incorrect** ?

(1) These are involved in ingestion of food particles.

(2) They lie free in the cytoplasm.

(3) These represent reserve material in cytoplasm.

(4) They are not bound by any membrane.

52. The transverse section of a plant shows following anatomical features :

(a) Large number of scattered vascular bundles surrounded by bundle sheath.

(b) Large conspicuous parenchymatous ground tissue.

(c) Vascular bundles conjoint and closed.

(d) Phloem parenchyma absent.

Identify the category of plant and its part :

(1) Monocotyledonous root

(2) Dicotyledonous stem

(3) Dicotyledonous root

(4) Monocotyledonous stem

53. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

(1) Gross primary productivity is always more than net primary productivity.

(2) Gross primary productivity and Net primary productivity are one and same.

(3) There is no relationship between Gross primary productivity and Net primary productivity.

(4) Gross primary productivity is always less than net primary productivity.

54. In water hyacinth and water lily, pollination takes place by :

(1) water currents only

(2) wind and water

(3) insects and water

(4) insects or wind

55. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

(1) Floating debris

(2) Effluents of primary treatment

(3) Activated sludge

(4) Primary sludge

56. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

(1) Root pressure

(2) Imbibition

(3) Plasmolysis

(4) Transpiration

57. Cuboidal epithelium with brush border of microvilli is found in :

(1) ducts of salivary glands

(2) proximal convoluted tubule of nephron

(3) eustachian tube

(4) lining of intestine

58. Select the **correct** statement.

(1) Glucagon is associated with hypoglycemia.

(2) Insulin acts on pancreatic cells and adipocytes.

(3) Insulin is associated with hyperglycemia.

(4) Glucocorticoids stimulate gluconeogenesis.

59. Which of the following is **not** an inhibitory substance governing seed dormancy ?

(1) Abscisic acid

(2) Phenolic acid

(3) Para-ascorbic acid

(4) Gibberellic acid

60. According to Robert May, the global species diversity is about :

(1) 20 million

(2) 50 million

(3) 7 million

(4) 1.5 million

61. Match the trophic levels with their **correct** species examples in grassland ecosystem.

(a)	Fourth trophic level	(i)	Crow
(b)	Second trophic level	(ii)	Vulture
(c)	First trophic level	(iii)	Rabbit
(d)	Third trophic level	(iv)	Grass

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(ii)	(iii)	(iv)	(i)

62. The first phase of translation is :

(1) Recognition of DNA molecule
(2) Aminoacylation of tRNA
(3) Recognition of an anti-codon
(4) Binding of mRNA to ribosome

63. Strobili or cones are found in :

(1) *Pteris*
(2) *Marchantia*
(3) *Equisetum*
(4) *Salvinia*

64. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	6 - 15 pairs of gill slits	(i)	*Trygon*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(ii)	(iii)	(i)
(3)	(i)	(iv)	(iii)	(ii)
(4)	(ii)	(iii)	(iv)	(i)

65. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

(1) G_1 phase
(2) S phase
(3) G_2 phase
(4) M phase

66. Identify the **correct** statement with reference to human digestive system.

(1) Serosa is the innermost layer of the alimentary canal.
(2) Ileum is a highly coiled part.
(3) Vermiform appendix arises from duodenum.
(4) Ileum opens into small intestine.

67. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

(1) GIFT and ZIFT
(2) ICSI and ZIFT
(3) GIFT and ICSI
(4) ZIFT and IUT

68. The plant parts which consist of two generations - one within the other :

(a) Pollen grains inside the anther
(b) Germinated pollen grain with two male gametes
(c) Seed inside the fruit
(d) Embryo sac inside the ovule

(1) (a), (b) and (c)
(2) (c) and (d)
(3) (a) and (d)
(4) (a) only

69. Dissolution of the synaptonemal complex occurs during :

(1) Zygotene
(2) Diplotene
(3) Leptotene
(4) Pachytene

70. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iv)	(ii)	(i)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(iii)	(i)	(iv)

71. The ovary is half inferior in :

(1) Mustard
(2) Sunflower
(3) Plum
(4) Brinjal

72. Identify the basic amino acid from the following.

(1) Glutamic Acid
(2) Lysine
(3) Valine
(4) Tyrosine

73. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Eosinophils	(i)	Immune response
(b)	Basophils	(ii)	Phagocytosis
(c)	Neutrophils	(iii)	Release histaminase, destructive enzymes
(d)	Lymphocytes	(iv)	Release granules containing histamine

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(iii)	(iv)	(ii)	(i)

74. Match the following :

(a)	Inhibitor of catalytic activity	(i)	Ricin
(b)	Possess peptide bonds	(ii)	Malonate
(c)	Cell wall material in fungi	(iii)	Chitin
(d)	Secondary metabolite	(iv)	Collagen

Choose the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(ii)	(iv)	(iii)	(i)

75. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

(1) Reorganisation of all cell components takes place.
(2) Cell is metabolically active, grows but does not replicate its DNA.
(3) Nuclear Division takes place.
(4) DNA synthesis or replication takes place.

76. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

(1) Gibberellin
(2) Ethylene
(3) Abscisic acid
(4) Cytokinin

77. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

(1) A person will have only two of the three alleles.
(2) When I^A and I^B are present together, they express same type of sugar.
(3) Allele 'i' does not produce any sugar.
(4) The gene (I) has three alleles.

78. Identify the **wrong** statement with reference to immunity.

(1) When ready-made antibodies are directly given, it is called "Passive immunity".
(2) Active immunity is quick and gives full response.
(3) Foetus receives some antibodies from mother, it is an example for passive immunity.
(4) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

79. The enzyme enterokinase helps in conversion of :

(1) trypsinogen into trypsin

(2) caseinogen into casein

(3) pepsinogen into pepsin

(4) protein into polypeptides

80. The specific palindromic sequence which is recognized by EcoRI is :

(1) 5' - GGAACC - 3'
3' - CCTTGG - 5'

(2) 5' - CTTAAG - 3'
3' - GAATTC - 5'

(3) 5' - GGATCC - 3'
3' - CCTAGG - 5'

(4) 5' - GAATTC - 3'
3' - CTTAAG - 5'

81. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	*Bacillus thuringiensis*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(iv)	(i)	(ii)	(iii)

82. Floridean starch has structure similar to :

(1) Amylopectin and glycogen

(2) Mannitol and algin

(3) Laminarin and cellulose

(4) Starch and cellulose

83. Which of the following statements is **not correct** ?

(1) The proinsulin has an extra peptide called C-peptide.

(2) The functional insulin has A and B chains linked together by hydrogen bonds.

(3) Genetically engineered insulin is produced in *E-Coli*.

(4) In man insulin is synthesised as a proinsulin.

84. Flippers of Penguins and Dolphins are examples of :

(1) Convergent evolution

(2) Industrial melanism

(3) Natural selection

(4) Adaptive radiation

85. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

(a) Darwin's Finches of Galapagos islands.

(b) Herbicide resistant weeds.

(c) Drug resistant eukaryotes.

(d) Man-created breeds of domesticated animals like dogs.

(1) (a) and (c)

(2) (b), (c) and (d)

(3) only (d)

(4) only (a)

86. Identify the **wrong** statement with reference to transport of oxygen.

(1) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

(2) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

(3) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

(4) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

87. The process of growth is maximum during :

(1) Lag phase

(2) Senescence

(3) Dormancy

(4) Log phase

88. Which of the following regions of the globe exhibits highest species diversity ?

(1) Madagascar

(2) Himalayas

(3) Amazon forests

(4) Western Ghats of India

89. The sequence that controls the copy number of the linked DNA in the vector, is termed :

(1) Ori site
(2) Palindromic sequence
(3) Recognition site
(4) Selectable marker

90. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(c)	Bulbo-urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iv)	(ii)	(iii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(iv)	(iii)	(i)	(ii)

91. Sucrose on hydrolysis gives :

(1) α-D-Glucose + β-D-Glucose
(2) α-D-Glucose + β-D-Fructose
(3) α-D-Fructose + β-D-Fructose
(4) β-D-Glucose + α-D-Fructose

92. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction
(b) Follows Zaitsev rule
(c) Dehydrohalogenation reaction
(d) Dehydration reaction

(1) (a), (c), (d)
(2) (b), (c), (d)
(3) (a), (b), (d)
(4) (a), (b), (c)

93. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 2
(2) 3
(3) 4
(4) 1

94. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

(1) $\frac{\sqrt{2}}{4} \times 288$ pm
(2) $\frac{4}{\sqrt{3}} \times 288$ pm
(3) $\frac{4}{\sqrt{2}} \times 288$ pm
(4) $\frac{\sqrt{3}}{4} \times 288$ pm

95. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?

(1) Only NaCl
(2) Only $MgCl_2$
(3) NaCl, $MgCl_2$ and $CaCl_2$
(4) Both $MgCl_2$ and $CaCl_2$

96. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 2×10^{-8} M
(2) 1×10^{-13} M
(3) 1×10^{8} M
(4) 2×10^{-13} M

97. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :

(1) $\Delta_r H > 0$ and $\Delta_r S < 0$
(2) $\Delta_r H < 0$ and $\Delta_r S > 0$
(3) $\Delta_r H < 0$ and $\Delta_r S < 0$
(4) $\Delta_r H > 0$ and $\Delta_r S > 0$

98. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

(1) $SCN^- < F^- < CN^- < C_2O_4^{2-}$
(2) $F^- < SCN^- < C_2O_4^{2-} < CN^-$
(3) $CN^- < C_2O_4^{2-} < SCN^- < F^-$
(4) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

99. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 4.90 BM
(2) 5.92 BM
(3) 2.84 BM
(4) 3.87 BM

100. Which of the following set of molecules will have zero dipole moment ?

(1) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

(2) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

(3) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

(4) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

101. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

(1) Copper

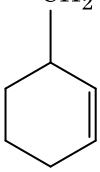
(2) Calcium

(3) Potassium

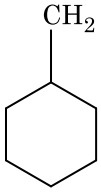
(4) Iron

102. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

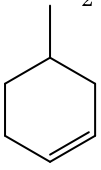
(1) $CH_2-CH_2-CH_3$



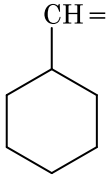
(2) $CH_2-CH=CH_2$



(3) $CH_2CH_2CH_3$



(4) $CH=CH-CH_3$



103. The rate constant for a first order reaction is $4.606 \times 10^{-3}\ s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 200 s

(2) 500 s

(3) 1000 s

(4) 100 s

104. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

(1) Sec. butyl alcohol

(2) Tert. butyl alcohol

(3) Isobutyl alcohol

(4) Isopropyl alcohol

105. Which of the following is a natural polymer ?

(1) poly (Butadiene-styrene)

(2) polybutadiene

(3) poly (Butadiene-acrylonitrile)

(4) *cis*-1,4-polyisoprene

106. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (a) and (c) only

(2) (b) and (c) only

(3) (c) and (d) only

(4) (a), (b) and (c) only

107. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q = 0, \Delta T < 0$ and $w > 0$

(2) $q < 0, \Delta T = 0$ and $w = 0$

(3) $q > 0, \Delta T > 0$ and $w > 0$

(4) $q = 0, \Delta T = 0$ and $w = 0$

108. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

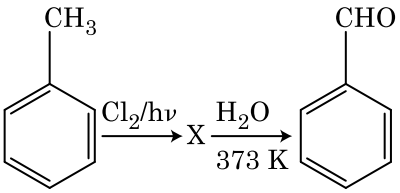
(1) H_2SO_4, sulphuric acid

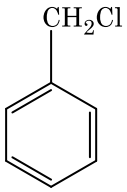
(2) $H_2S_2O_8$, peroxodisulphuric acid

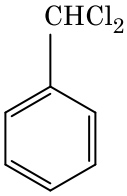
(3) $H_2S_2O_7$, pyrosulphuric acid

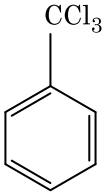
(4) H_2SO_3, sulphurous acid

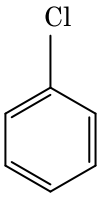
109. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

110. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

(1) 104, 71 and 71

(2) 71, 71 and 104

(3) 175, 104 and 71

(4) 71, 104 and 71

111. Identify the **incorrect** statement.

(1) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(2) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

(3) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

(4) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

112. Which of the following is a cationic detergent ?

(1) Sodium stearate

(2) Cetyltrimethyl ammonium bromide

(3) Sodium dodecylbenzene sulphonate

(4) Sodium lauryl sulphate

113. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

(1) 0.80 K

(2) 0.40 K

(3) 0.60 K

(4) 0.20 K

114. Identify the **incorrect** match.

	Name		**IUPAC Official Name**
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

(1) (b), (ii)

(2) (c), (iii)

(3) (d), (iv)

(4) (a), (i)

115. The mixture which shows positive deviation from Raoult's law is :

(1) Benzene + Toluene

(2) Acetone + Chloroform

(3) Chloroethane + Bromoethane

(4) Ethanol + Acetone

116. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iv)	(iii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(i)	(ii)	(iii)	(iv)

117. Which one of the followings has maximum number of atoms ?

(1) 1 g of Mg(s) [Atomic mass of Mg = 24]

(2) 1 g of O_2(g) [Atomic mass of O = 16]

(3) 1 g of Li(s) [Atomic mass of Li = 7]

(4) 1 g of Ag(s) [Atomic mass of Ag = 108]

118. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

(1) Cannizzaro's reaction

(2) Cross Cannizzaro's reaction

(3) Cross Aldol condensation

(4) Aldol condensation

119. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

(1) + R effect of $-CH_3$ groups

(2) − R effect of $-CH_3$ groups

(3) Hyperconjugation

(4) − I effect of $-CH_3$ groups

120. Which of the following is **not** correct about carbon monoxide ?

(1) It reduces oxygen carrying ability of blood.

(2) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

(3) It is produced due to incomplete combustion.

(4) It forms carboxyhaemoglobin.

121. Which of the following is a basic amino acid ?

(1) Alanine

(2) Tyrosine

(3) Lysine

(4) Serine

122. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

(1) $[Cu(NH_3)_4]^{2+}$

(2) $Cu(OH)_2$

(3) $CuCO_3 \cdot Cu(OH)_2$

(4) $CuSO_4$

123. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 12 bar

(2) 15 bar

(3) 18 bar

(4) 9 bar

124. Identify the **correct** statement from the following :

(1) Blister copper has blistered appearance due to evolution of CO_2.

(2) Vapour phase refining is carried out for Nickel by Van Arkel method.

(3) Pig iron can be moulded into a variety of shapes.

(4) Wrought iron is impure iron with 4% carbon.

125. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

(1) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

(2) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

(3) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

(4) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

126. Identify a molecule which does **not** exist.

(1) Li_2

(2) C_2

(3) O_2

(4) He_2

127. An increase in the concentration of the reactants of a reaction leads to change in :

(1) heat of reaction

(2) threshold energy

(3) collision frequency

(4) activation energy

128. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

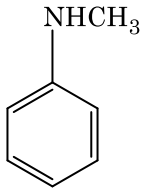
(1) 2,3-Dimethylbutane

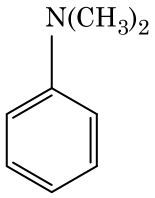
(2) n-Heptane

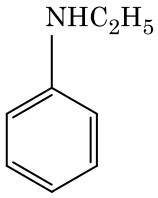
(3) n-Butane

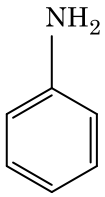
(4) n-Hexane

129. Which of the following amine will give the carbylamine test ?

(1) 

(2) 

(3) 

(4) 

130. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

(1) Oxygen gas

(2) H_2S gas

(3) SO_2 gas

(4) Hydrogen gas

131. What is the change in oxidation number of carbon in the following reaction ?

$$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$$

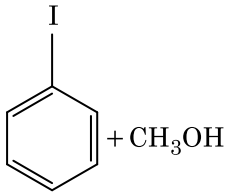
(1) 0 to +4

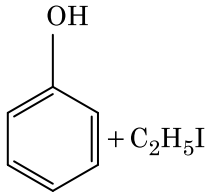
(2) −4 to +4

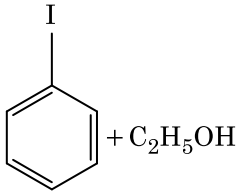
(3) 0 to −4

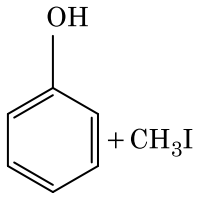
(4) +4 to +4

132. Anisole on cleavage with HI gives :

(1)  $+ CH_3OH$

(2)  $+ C_2H_5I$

(3)  $+ C_2H_5OH$

(4)  $+ CH_3I$

133. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Solubility

(2) Stability of the colloidal particles

(3) Size of the colloidal particles

(4) Viscosity

134. Paper chromatography is an example of :

(1) Partition chromatography

(2) Thin layer chromatography

(3) Column chromatography

(4) Adsorption chromatography

135. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iii)	(i)	(ii)	(iv)

136. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) 0.5

(2) 1.0

(3) -1.0

(4) zero

137. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{Mg(L_1 - L)}{AL}$

(2) $\frac{MgL}{AL_1}$

(3) $\frac{MgL}{A(L_1 - L)}$

(4) $\frac{MgL_1}{AL}$

138. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 3.14×10^{-4} T

(2) 6.28×10^{-5} T

(3) 3.14×10^{-5} T

(4) 6.28×10^{-4} T

139. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) $\frac{2A}{\mu}$

(2) μA

(3) $\frac{\mu A}{2}$

(4) $\frac{A}{2\mu}$

140. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

(1) 0.5 N/C

(2) 1 N/C

(3) 5 N/C

(4) zero

141. For which one of the following, Bohr model is **not** valid ?

(1) Singly ionised helium atom (He^+)

(2) Deuteron atom

(3) Singly ionised neon atom (Ne^+)

(4) Hydrogen atom

142. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2. The energy received by the surface during time span of 1 minute is :

(1) 12×10^3 J

(2) 24×10^3 J

(3) 48×10^3 J

(4) 10×10^3 J

143. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10^2 V

(2) 10^3 V

(3) 10^4 V

(4) 10 V

144. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

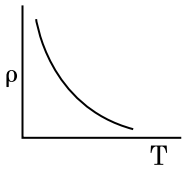
(1) 32 N

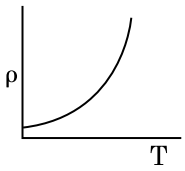
(2) 30 N

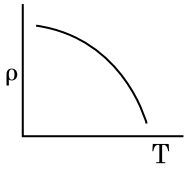
(3) 24 N

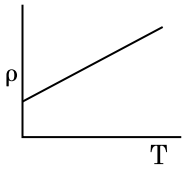
(4) 48 N

145. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

(1) 

(2) 

(3) 

(4) 

146. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(1) four times

(2) one-fourth

(3) zero

(4) doubled

147. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 2.05 A

(2) 2.5 A

(3) 25.1 A

(4) 1.7 A

148. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 1.83×10^{-7} rad

(2) 7.32×10^{-7} rad

(3) 6.00×10^{-7} rad

(4) 3.66×10^{-7} rad

149. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10$ m/s^2)

(1) 340 m

(2) 320 m

(3) 300 m

(4) 360 m

150. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : ($R = 8.3$ J mol^{-1} K^{-1})

(1) 0.2 kg/m^3

(2) 0.1 kg/m^3

(3) 0.02 kg/m^3

(4) 0.5 kg/m^3

151. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{91}_{40}Zr$

(2) $^{101}_{36}Kr$

(3) $^{103}_{36}Kr$

(4) $^{144}_{56}Ba$

152. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) reverse bias only

(2) both forward bias and reverse bias

(3) increase in forward current

(4) forward bias only

153. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) $\frac{3\pi}{2}$ rad

(2) $\frac{\pi}{2}$ rad

(3) zero

(4) π rad

154. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 8.0×10^{-5} T m A^{-1}

(2) $2.4\pi \times 10^{-5}$ T m A^{-1}

(3) $2.4\pi \times 10^{-7}$ T m A^{-1}

(4) $2.4\pi \times 10^{-4}$ T m A^{-1}

155. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

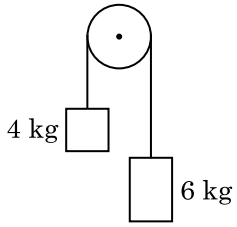
(1) $\frac{9}{4}$

(2) $\frac{3}{2}$

(3) $\frac{5}{3}$

(4) $\frac{27}{8}$

156. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g/2

(2) g/5

(3) g/10

(4) g

157. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

(1) $\frac{1}{\sqrt{2}\ n\pi d^2}$

(2) $\frac{1}{\sqrt{2}\ n^2\pi d^2}$

(3) $\frac{1}{\sqrt{2}\ n^2\pi^2 d^2}$

(4) $\frac{1}{\sqrt{2}\ n\pi d}$

158. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9\ \text{N m}^2/\text{C}^2\right)$

(1) 200 V

(2) 400 V

(3) zero

(4) 50 V

159. Dimensions of stress are :

(1) $[ML^2T^{-2}]$

(2) $[ML^0T^{-2}]$

(3) $[ML^{-1}T^{-2}]$

(4) $[MLT^{-2}]$

160. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 0.6

(2) 0.06

(3) 0.006

(4) 6

161. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

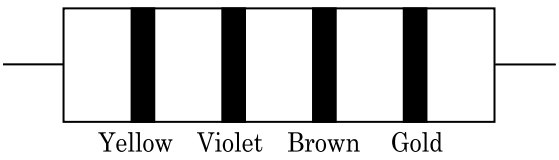
(1) 524 Hz

(2) 536 Hz

(3) 537 Hz

(4) 523 Hz

162. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 47 kΩ, 10%

(2) 4.7 kΩ, 5%

(3) 470 Ω, 5%

(4) 470 kΩ, 5%

163. The Brewsters angle i_b for an interface should be :

(1) $30° < i_b < 45°$

(2) $45° < i_b < 90°$

(3) $i_b = 90°$

(4) $0° < i_b < 30°$

164. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\epsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})

(1) 1.77×10^{-12} C^2 N^{-1} m^{-2}

(2) 0.44×10^{-10} C^2 N^{-1} m^{-2}

(3) 5.00 C^2 N^{-1} m^{-2}

(4) 0.44×10^{-13} C^2 N^{-1} m^{-2}

165. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

(1) $6\hat{j}$ N m

(2) $-6\hat{i}$ N m

(3) $6\hat{k}$ N m

(4) $6\hat{i}$ N m

166. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.0×10^{-1} m

(2) 1.5×10^{-1} m

(3) 1.5×10^{-2} m

(4) 1.0×10^{-2} m

167. For transistor action, which of the following statements is **correct** ?

(1) Base, emitter and collector regions should have same size.

(2) Both emitter junction as well as the collector junction are forward biased.

(3) The base region must be very thin and lightly doped.

(4) Base, emitter and collector regions should have same doping concentrations.

168. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) 1 : 1

(2) 1 : c

(3) 1 : c^2

(4) c : 1

169. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in m^2 V^{-1} s^{-1} of :

(1) 2.5×10^{6}

(2) 2.5×10^{-6}

(3) 2.25×10^{-15}

(4) 2.25×10^{15}

170. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 1.28×10^{5} N/C

(2) 1.28×10^{6} N/C

(3) 1.28×10^{7} N/C

(4) 1.28×10^{4} N/C

171. Taking into account of the significant figures, what is the value of 9.99 m − 0.0099 m ?

(1) 9.98 m

(2) 9.980 m

(3) 9.9 m

(4) 9.9801 m

172. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) half

(2) four times

(3) one-fourth

(4) double

173. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

(1) adiabatic

(2) isochoric

(3) isobaric

(4) isothermal

174. The energy equivalent of 0.5 g of a substance is :

(1) 4.5×10^{13} J

(2) 1.5×10^{13} J

(3) 0.5×10^{13} J

(4) 4.5×10^{16} J

175. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

(1) 5.0 g

(2) 10.0 g

(3) 20.0 g

(4) 2.5 g

176. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

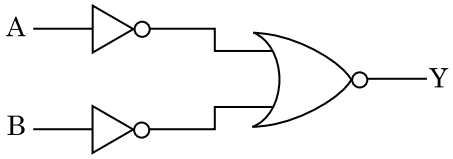
(1) 0.25 mm

(2) 0.5 mm

(3) 1.0 mm

(4) 0.01 mm

177. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(2)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(3)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

178. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)

(1) $\frac{3}{2} k_B T$

(2) $\frac{5}{2} k_B T$

(3) $\frac{7}{2} k_B T$

(4) $\frac{1}{2} k_B T$

179. The solids which have the negative temperature coefficient of resistance are :

(1) insulators only

(2) semiconductors only

(3) insulators and semiconductors

(4) metals

180. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

(1) 50 cm

(2) 67 cm

(3) 80 cm

(4) 33 cm

- o 0 o -

Space For Rough Work

Space For Rough Work

Space For Rough Work

Test Booklet Code

H5

AKANH

No. :

This Booklet contains 24 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **H5.** Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

Centre Superintendent : _____

1. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?
   (1) zero
   (2) doubled
   (3) four times
   (4) one-fourth

2. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :
   ($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})
   (1) 3.14×10^{-5} T
   (2) 6.28×10^{-4} T
   (3) 3.14×10^{-4} T
   (4) 6.28×10^{-5} T

3. For which one of the following, Bohr model is **not** valid ?
   (1) Singly ionised neon atom (Ne^+)
   (2) Hydrogen atom
   (3) Singly ionised helium atom (He^+)
   (4) Deuteron atom

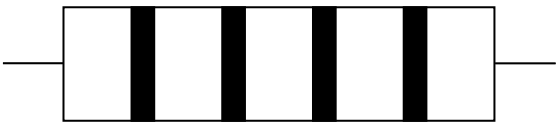
4. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :
   $\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$
   (1) zero
   (2) 50 V
   (3) 200 V
   (4) 400 V

5. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :
   ($\epsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})
   (1) 5.00 C^2 N^{-1} m^{-2}
   (2) 0.44×10^{-13} C^2 N^{-1} m^{-2}
   (3) 1.77×10^{-12} C^2 N^{-1} m^{-2}
   (4) 0.44×10^{-10} C^2 N^{-1} m^{-2}

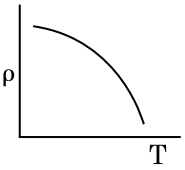
6. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2. The energy received by the surface during time span of 1 minute is :
   (1) 48×10^3 J
   (2) 10×10^3 J
   (3) 12×10^3 J
   (4) 24×10^3 J

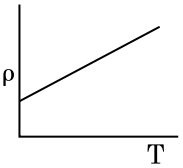
7. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.
   The centre of mass of the system from the 5 kg particle is nearly at a distance of :
   (1) 80 cm
   (2) 33 cm
   (3) 50 cm
   (4) 67 cm

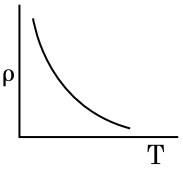
8. The color code of a resistance is given below :

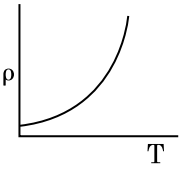


   The values of resistance and tolerance, respectively, are :
   (1) 470 Ω, 5%
   (2) 470 kΩ, 5%
   (3) 47 kΩ, 10%
   (4) 4.7 kΩ, 5%

9. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?
   (1) 

   (2) 

   (3) 

   (4) 

10. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) zero

(2) π rad

(3) $\frac{3\pi}{2}$ rad

(4) $\frac{\pi}{2}$ rad

11. The solids which have the negative temperature coefficient of resistance are :

(1) insulators and semiconductors

(2) metals

(3) insulators only

(4) semiconductors only

12. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

(1) $\frac{5}{3}$

(2) $\frac{27}{8}$

(3) $\frac{9}{4}$

(4) $\frac{3}{2}$

13. For transistor action, which of the following statements is **correct** ?

(1) The base region must be very thin and lightly doped.

(2) Base, emitter and collector regions should have same doping concentrations.

(3) Base, emitter and collector regions should have same size.

(4) Both emitter junction as well as the collector junction are forward biased.

14. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10\ m/s^2$)

(1) 300 m

(2) 360 m

(3) 340 m

(4) 320 m

15. The Brewsters angle i_b for an interface should be :

(1) $i_b = 90°$

(2) $0° < i_b < 30°$

(3) $30° < i_b < 45°$

(4) $45° < i_b < 90°$

16. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)

(1) $\frac{7}{2}\ k_B T$

(2) $\frac{1}{2}\ k_B T$

(3) $\frac{3}{2}\ k_B T$

(4) $\frac{5}{2}\ k_B T$

17. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

(1) 5 N/C

(2) zero

(3) 0.5 N/C

(4) 1 N/C

18. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

(1) 24 N

(2) 48 N

(3) 32 N

(4) 30 N

19. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) one-fourth

(2) double

(3) half

(4) four times

20. The energy equivalent of 0.5 g of a substance is :

(1) 0.5×10^{13} J

(2) 4.5×10^{16} J

(3) 4.5×10^{13} J

(4) 1.5×10^{13} J

21. Dimensions of stress are :

(1) $[ML^{-1}T^{-2}]$

(2) $[MLT^{-2}]$

(3) $[ML^{2}T^{-2}]$

(4) $[ML^{0}T^{-2}]$

22. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{MgL}{A(L_1 - L)}$

(2) $\frac{MgL_1}{AL}$

(3) $\frac{Mg(L_1 - L)}{AL}$

(4) $\frac{MgL}{AL_1}$

23. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) -1.0

(2) zero

(3) 0.5

(4) 1.0

24. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 6.00×10^{-7} rad

(2) 3.66×10^{-7} rad

(3) 1.83×10^{-7} rad

(4) 7.32×10^{-7} rad

25. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

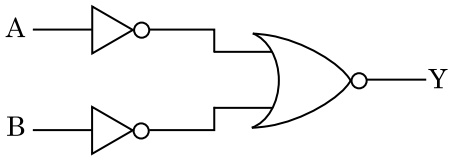
(1) $\frac{1}{\sqrt{2}\, n^2 \pi^2 d^2}$

(2) $\frac{1}{\sqrt{2}\, n\pi d}$

(3) $\frac{1}{\sqrt{2}\, n\pi d^2}$

(4) $\frac{1}{\sqrt{2}\, n^2 \pi d^2}$

26. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(2)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(3)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(4)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

27. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) $1 : c^2$

(2) $c : 1$

(3) $1 : 1$

(4) $1 : c$

28. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

(1) isobaric

(2) isothermal

(3) adiabatic

(4) isochoric

29. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 0.006

(2) 6

(3) 0.6

(4) 0.06

30. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

(1) $6\hat{k}$ N m

(2) $6\hat{i}$ N m

(3) $6\hat{j}$ N m

(4) $-6\hat{i}$ N m

31. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

(1) 1.0 mm

(2) 0.01 mm

(3) 0.25 mm

(4) 0.5 mm

32. Taking into account of the significant figures, what is the value of 9.99 m – 0.0099 m ?

(1) 9.9 m

(2) 9.9801 m

(3) 9.98 m

(4) 9.980 m

33. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0} = 9\times10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 1.28×10^7 N/C

(2) 1.28×10^4 N/C

(3) 1.28×10^5 N/C

(4) 1.28×10^6 N/C

34. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in m^2 V^{-1} s^{-1} of :

(1) 2.25×10^{-15}

(2) 2.25×10^{15}

(3) 2.5×10^6

(4) 2.5×10^{-6}

35. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

(1) 537 Hz

(2) 523 Hz

(3) 524 Hz

(4) 536 Hz

36. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi\times10^{-7}$ T m A^{-1})

(1) $2.4\pi\times10^{-7}$ T m A^{-1}

(2) $2.4\pi\times10^{-4}$ T m A^{-1}

(3) 8.0×10^{-5} T m A^{-1}

(4) $2.4\pi\times10^{-5}$ T m A^{-1}

37. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 25.1 A

(2) 1.7 A

(3) 2.05 A

(4) 2.5 A

38. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10^4 V

(2) 10 V

(3) 10^2 V

(4) 10^3 V

39. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) increase in forward current

(2) forward bias only

(3) reverse bias only

(4) both forward bias and reverse bias

40. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{103}_{36}Kr$

(2) $^{144}_{56}Ba$

(3) $^{91}_{40}Zr$

(4) $^{101}_{36}Kr$

41. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

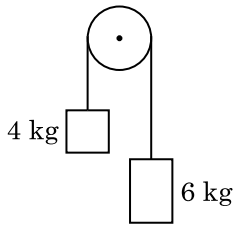
(1) 20.0 g

(2) 2.5 g

(3) 5.0 g

(4) 10.0 g

42. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g/10

(2) g

(3) g/2

(4) g/5

43. A ray is incident at an angle of incidence *i* on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) $\frac{\mu A}{2}$

(2) $\frac{A}{2\mu}$

(3) $\frac{2A}{\mu}$

(4) μA

44. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : ($R = 8.3\ J\ mol^{-1}\ K^{-1}$)

(1) $0.02\ kg/m^3$

(2) $0.5\ kg/m^3$

(3) $0.2\ kg/m^3$

(4) $0.1\ kg/m^3$

45. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.5×10^{-2} m

(2) 1.0×10^{-2} m

(3) 1.0×10^{-1} m

(4) 1.5×10^{-1} m

46. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

(1) Plasmolysis

(2) Transpiration

(3) Root pressure

(4) Imbibition

47. Identify the **wrong** statement with reference to immunity.

(1) Foetus receives some antibodies from mother, it is an example for passive immunity.

(2) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

(3) When ready-made antibodies are directly given, it is called "Passive immunity".

(4) Active immunity is quick and gives full response.

48. Ray florets have :

(1) Half inferior ovary

(2) Inferior ovary

(3) Superior ovary

(4) Hypogynous ovary

49. Match the following with respect to meiosis :

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iv)	(iii)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(i)	(ii)	(iv)	(iii)

50. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(c)	Bulbo-urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(iv)	(i)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(i)	(iv)	(ii)	(iii)
(4)	(iii)	(ii)	(iv)	(i)

51. Match the following concerning essential elements and their functions in plants :

(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iii)	(iv)	(ii)	(i)

52. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	6 - 15 pairs of gill slits	(i)	*Trygon*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iv)	(iii)	(ii)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(ii)	(iii)	(i)

53. Match the trophic levels with their **correct** species examples in grassland ecosystem.

(a)	Fourth trophic level	(i)	Crow
(b)	Second trophic level	(ii)	Vulture
(c)	First trophic level	(iii)	Rabbit
(d)	Third trophic level	(iv)	Grass

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(iv)	(iii)	(ii)	(i)

54. Snow-blindness in Antarctic region is due to :

(1) Damage to retina caused by infra-red rays

(2) Freezing of fluids in the eye by low temperature

(3) Inflammation of cornea due to high dose of UV-B radiation

(4) High reflection of light from snow

55. Which of the following statements about inclusion bodies is **incorrect** ?

(1) These represent reserve material in cytoplasm.

(2) They are not bound by any membrane.

(3) These are involved in ingestion of food particles.

(4) They lie free in the cytoplasm.

56. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

(1) There is no relationship between Gross primary productivity and Net primary productivity.

(2) Gross primary productivity is always less than net primary productivity.

(3) Gross primary productivity is always more than net primary productivity.

(4) Gross primary productivity and Net primary productivity are one and same.

57. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Eosinophils	(i)	Immune response
(b)	Basophils	(ii)	Phagocytosis
(c)	Neutrophils	(iii)	Release histaminase, destructive enzymes
(d)	Lymphocytes	(iv)	Release granules containing histamine

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iii)	(iv)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(i)	(ii)	(iv)	(iii)

58. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

(1) Nuclear Division takes place.

(2) DNA synthesis or replication takes place.

(3) Reorganisation of all cell components takes place.

(4) Cell is metabolically active, grows but does not replicate its DNA.

59. The transverse section of a plant shows following anatomical features :

(a) Large number of scattered vascular bundles surrounded by bundle sheath.

(b) Large conspicuous parenchymatous ground tissue.

(c) Vascular bundles conjoint and closed.

(d) Phloem parenchyma absent.

Identify the category of plant and its part :

(1) Dicotyledonous root

(2) Monocotyledonous stem

(3) Monocotyledonous root

(4) Dicotyledonous stem

60. The infectious stage of *Plasmodium* that enters the human body is :

(1) Male gametocytes

(2) Trophozoites

(3) Sporozoites

(4) Female gametocytes

61. Identify the **wrong** statement with reference to transport of oxygen.

(1) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

(2) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

(3) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

(4) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

62. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(ii)	(iv)	(iii)	(i)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(iii)	(ii)	(iv)	(i)

63. Flippers of Penguins and Dolphins are examples of :

(1) Natural selection

(2) Adaptive radiation

(3) Convergent evolution

(4) Industrial melanism

64. Bilaterally symmetrical and acoelomate animals are exemplified by :

(1) Annelida

(2) Ctenophora

(3) Platyhelminthes

(4) Aschelminthes

65. Select the **correct** events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter-costal muscles

(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

(1) only (d)

(2) (a) and (b)

(3) (c) and (d)

(4) (a), (b) and (d)

66. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

(1) Polysomes

(2) Endoplasmic reticulum

(3) Peroxisomes

(4) Golgi bodies

67. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

(1) Inbreeding

(2) Out crossing

(3) Mutational breeding

(4) Cross breeding

68. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

(1) G_2 phase

(2) M phase

(3) G_1 phase

(4) S phase

69. Which of the following regions of the globe exhibits highest species diversity ?

(1) Amazon forests

(2) Western Ghats of India

(3) Madagascar

(4) Himalayas

70. Identify the basic amino acid from the following.

(1) Valine

(2) Tyrosine

(3) Glutamic Acid

(4) Lysine

71. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iv)	(iii)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(iii)	(i)	(iv)	(ii)

72. Which of the following statements are **true** for the phylum-Chordata ?

(a) In Urochordata notochord extends from head to tail and it is present throughout their life.

(b) In Vertebrata notochord is present during the embryonic period only.

(c) Central nervous system is dorsal and hollow.

(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

(1) (b) and (c)

(2) (d) and (c)

(3) (c) and (a)

(4) (a) and (b)

73. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

(1) Effect on reproduction

(2) Nutritive value

(3) Growth response

(4) Defence action

74. Strobili or cones are found in :

(1) *Equisetum*

(2) *Salvinia*

(3) *Pteris*

(4) *Marchantia*

75. Which of the following pairs is of unicellular algae ?

(1) *Chlorella* and *Spirulina*

(2) *Laminaria* and *Sargassum*

(3) *Gelidium* and *Gracilaria*

(4) *Anabaena* and *Volvox*

76. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

(1) Activated sludge

(2) Primary sludge

(3) Floating debris

(4) Effluents of primary treatment

77. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(i)	(ii)	(iv)	(iii)

78. Which of the following is **correct** about viroids ?

(1) They have free DNA without protein coat.

(2) They have RNA with protein coat.

(3) They have free RNA without protein coat.

(4) They have DNA with protein coat.

79. Match the following :

(a)	Inhibitor of catalytic activity	(i)	Ricin
(b)	Possess peptide bonds	(ii)	Malonate
(c)	Cell wall material in fungi	(iii)	Chitin
(d)	Secondary metabolite	(iv)	Collagen

Choose the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(i)	(iv)
(2)	(ii)	(iv)	(iii)	(i)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iii)	(iv)	(i)	(ii)

80. Goblet cells of alimentary canal are modified from :

(1) Compound epithelial cells

(2) Squamous epithelial cells

(3) Columnar epithelial cells

(4) Chondrocytes

81. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Renal calculi and Hyperglycaemia

(2) Uremia and Ketonuria

(3) Uremia and Renal Calculi

(4) Ketonuria and Glycosuria

82. Which of the following would help in prevention of diuresis ?

(1) Decrease in secretion of renin by JG cells

(2) More water reabsorption due to undersecretion of ADH

(3) Reabsorption of Na^+ and water from renal tubules due to aldosterone

(4) Atrial natriuretic factor causes vasoconstriction

83. Which of the following statements is **not correct** ?

(1) Genetically engineered insulin is produced in *E-Coli*.

(2) In man insulin is synthesised as a proinsulin.

(3) The proinsulin has an extra peptide called C-peptide.

(4) The functional insulin has A and B chains linked together by hydrogen bonds.

84. Montreal protocol was signed in 1987 for control of :

(1) Disposal of e-wastes

(2) Transport of Genetically modified organisms from one country to another

(3) Emission of ozone depleting substances

(4) Release of Green House gases

85. The sequence that controls the copy number of the linked DNA in the vector, is termed :

(1) Recognition site

(2) Selectable marker

(3) Ori site

(4) Palindromic sequence

86. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

(1) 1 molecule of 4-C compound and 1 molecule of 2-C compound

(2) 2 molecules of 3-C compound

(3) 1 molecule of 3-C compound

(4) 1 molecule of 6-C compound

87. The body of the ovule is fused within the funicle at :

(1) Chalaza

(2) Hilum

(3) Micropyle

(4) Nucellus

88. Which of the following statements is **correct** ?

(1) Adenine does not pair with thymine.

(2) Adenine pairs with thymine through two H-bonds.

(3) Adenine pairs with thymine through one H-bond.

(4) Adenine pairs with thymine through three H-bonds.

89. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Gregarious, polyphagous pest	(i)	*Asterias*
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	*Ctenoplana*
(d)	Bioluminescence	(iv)	*Locusta*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iii)	(iv)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(iii)	(ii)	(i)	(iv)

90. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

(1) Low concentration of FSH

(2) High concentration of Estrogen

(3) High concentration of Progesterone

(4) Low concentration of LH

91. Which one of the following is the most abundant protein in the animals ?

(1) Insulin

(2) Haemoglobin

(3) Collagen

(4) Lectin

92. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

(1) GIFT and ICSI

(2) ZIFT and IUT

(3) GIFT and ZIFT

(4) ICSI and ZIFT

93. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

(1) Insect predators

(2) Insect pests

(3) Fungal diseases

(4) Plant nematodes

94. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

(1) Allele 'i' does not produce any sugar.

(2) The gene (I) has three alleles.

(3) A person will have only two of the three alleles.

(4) When I^A and I^B are present together, they express same type of sugar.

95. The ovary is half inferior in :

(1) Plum

(2) Brinjal

(3) Mustard

(4) Sunflower

96. According to Robert May, the global species diversity is about :

(1) 7 million

(2) 1.5 million

(3) 20 million

(4) 50 million

97. Meiotic division of the secondary oocyte is completed :

(1) At the time of fusion of a sperm with an ovum

(2) Prior to ovulation

(3) At the time of copulation

(4) After zygote formation

98. Name the enzyme that facilitates opening of DNA helix during transcription.

(1) RNA polymerase

(2) DNA ligase

(3) DNA helicase

(4) DNA polymerase

99. In light reaction, plastoquinone facilitates the transfer of electrons from :

(1) PS-I to ATP synthase

(2) PS-II to $Cytb_6f$ complex

(3) $Cytb_6f$ complex to PS-I

(4) PS-I to $NADP^+$

100. The enzyme enterokinase helps in conversion of :

(1) pepsinogen into pepsin

(2) protein into polypeptides

(3) trypsinogen into trypsin

(4) caseinogen into casein

101. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

(1) Inulin, insulin

(2) Chitin, cholesterol

(3) Glycerol, trypsin

(4) Cellulose, lecithin

102. Identify the **wrong** statement with regard to Restriction Enzymes.

(1) Sticky ends can be joined by using DNA ligases.

(2) Each restriction enzyme functions by inspecting the length of a DNA sequence.

(3) They cut the strand of DNA at palindromic sites.

(4) They are useful in genetic engineering.

103. The QRS complex in a standard ECG represents :

(1) Repolarisation of ventricles

(2) Repolarisation of auricles

(3) Depolarisation of auricles

(4) Depolarisation of ventricles

104. Dissolution of the synaptonemal complex occurs during :

(1) Leptotene

(2) Pachytene

(3) Zygotene

(4) Diplotene

105. Identify the **correct** statement with reference to human digestive system.

(1) Vermiform appendix arises from duodenum.

(2) Ileum opens into small intestine.

(3) Serosa is the innermost layer of the alimentary canal.

(4) Ileum is a highly coiled part.

106. Select the **correct** match.

(1)	Thalassemia	-	X linked
(2)	Haemophilia	-	Y linked
(3)	Phenylketonuria	-	Autosomal dominant trait
(4)	Sickle cell anaemia	-	Autosomal recessive trait, chromosome-11

107. Which of the following is **not** an attribute of a population ?

(1) Species interaction

(2) Sex ratio

(3) Natality

(4) Mortality

108. The process of growth is maximum during :

(1) Dormancy

(2) Log phase

(3) Lag phase

(4) Senescence

109. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	*Bacillus thuringiensis*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(ii)	(iii)	(iv)	(i)

110. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Morgan

(2) Mendel

(3) Sutton

(4) Boveri

111. If the head of cockroach is removed, it may live for few days because :

(1) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.

(2) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

(3) the cockroach does not have nervous system.

(4) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

112. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

(1) 2.7 meters

(2) 2.0 meters

(3) 2.5 meters

(4) 2.2 meters

113. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

(a) Darwin's Finches of Galapagos islands.

(b) Herbicide resistant weeds.

(c) Drug resistant eukaryotes.

(d) Man-created breeds of domesticated animals like dogs.

(1) only (d)

(2) only (a)

(3) (a) and (c)

(4) (b), (c) and (d)

114. Identify the **incorrect** statement.

(1) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.

(2) Heart wood does not conduct water but gives mechanical support.

(3) Sapwood is involved in conduction of water and minerals from root to leaf.

(4) Sapwood is the innermost secondary xylem and is lighter in colour.

115. The roots that originate from the base of the stem are :

(1) Lateral roots

(2) Fibrous roots

(3) Primary roots

(4) Prop roots

116. The specific palindromic sequence which is recognized by EcoRI is :

(1) 5' - GGATCC - 3'
3' - CCTAGG - 5'

(2) 5' - GAATTC - 3'
3' - CTTAAG - 5'

(3) 5' - GGAACC - 3'
3' - CCTTGG - 5'

(4) 5' - CTTAAG - 3'
3' - GAATTC - 5'

117. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

(1) Abscisic acid

(2) Cytokinin

(3) Gibberellin

(4) Ethylene

118. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

(1) Ethidium bromide in infrared radiation

(2) Acetocarmine in bright blue light

(3) Ethidium bromide in UV radiation

(4) Acetocarmine in UV radiation

119. Select the option including all sexually transmitted diseases.

(1) Cancer, AIDS, Syphilis

(2) Gonorrhoea, Syphilis, Genital herpes

(3) Gonorrhoea, Malaria, Genital herpes

(4) AIDS, Malaria, Filaria

120. Floridean starch has structure similar to :

(1) Laminarin and cellulose

(2) Starch and cellulose

(3) Amylopectin and glycogen

(4) Mannitol and algin

121. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

(1) Ammonia and hydrogen

(2) Ammonia alone

(3) Nitrate alone

(4) Ammonia and oxygen

122. Match the following diseases with the causative organism and select the **correct** option.

	Column - I		**Column - II**
(a)	Typhoid	(i)	*Wuchereria*
(b)	Pneumonia	(ii)	*Plasmodium*
(c)	Filariasis	(iii)	*Salmonella*
(d)	Malaria	(iv)	*Haemophilus*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(ii)	(i)	(iii)	(iv)

123. The number of substrate level phosphorylations in one turn of citric acid cycle is :

(1) Three

(2) Zero

(3) One

(4) Two

124. The plant parts which consist of two generations - one within the other :

(a) Pollen grains inside the anther

(b) Germinated pollen grain with two male gametes

(c) Seed inside the fruit

(d) Embryo sac inside the ovule

(1) (a) and (d)

(2) (a) only

(3) (a), (b) and (c)

(4) (c) and (d)

125. Which of the following is **not** an inhibitory substance governing seed dormancy ?

(1) Para-ascorbic acid

(2) Gibberellic acid

(3) Abscisic acid

(4) Phenolic acid

126. Cuboidal epithelium with brush border of microvilli is found in :

(1) eustachian tube

(2) lining of intestine

(3) ducts of salivary glands

(4) proximal convoluted tubule of nephron

127. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

(1) CH_3, H_2, NH_3 and water vapor at 600°C

(2) CH_4, H_2, NH_3 and water vapor at 800°C

(3) CH_3, H_2, NH_4 and water vapor at 800°C

(4) CH_4, H_2, NH_3 and water vapor at 600°C

128. Select the **correct** statement.

(1) Insulin is associated with hyperglycemia.

(2) Glucocorticoids stimulate gluconeogenesis.

(3) Glucagon is associated with hypoglycemia.

(4) Insulin acts on pancreatic cells and adipocytes.

129. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

(1) 8

(2) 4

(3) 2

(4) 14

130. In water hyacinth and water lily, pollination takes place by :

(1) insects and water

(2) insects or wind

(3) water currents only

(4) wind and water

131. Embryological support for evolution was disapproved by :

(1) Oparin

(2) Karl Ernst von Baer

(3) Alfred Wallace

(4) Charles Darwin

132. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iv)	(iii)
(2)	(ii)	(iii)	(i)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iv)	(ii)	(i)	(iii)

133. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iii)	(ii)	(iv)	(i)

134. Choose the **correct** pair from the following :

(1)	Exonucleases	-	Make cuts at specific positions within DNA
(2)	Ligases	-	Join the two DNA molecules
(3)	Polymerases	-	Break the DNA into fragments
(4)	Nucleases	-	Separate the two strands of DNA

135. The first phase of translation is :

(1) Recognition of an anti-codon

(2) Binding of mRNA to ribosome

(3) Recognition of DNA molecule

(4) Aminoacylation of tRNA

136. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

(1) $-8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(4 \times 10^{13})$

(2) $-8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(2 \times 10^{13})$

(3) $8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(2 \times 10^{13})$

(4) $8.314\ \text{J mol}^{-1}\text{K}^{-1} \times 300\ \text{K} \times \ln(3 \times 10^{13})$

137. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction

(b) Follows Zaitsev rule

(c) Dehydrohalogenation reaction

(d) Dehydration reaction

(1) (a), (b), (d)

(2) (a), (b), (c)

(3) (a), (c), (d)

(4) (b), (c), (d)

138. Identify the **correct** statement from the following :

(1) Pig iron can be moulded into a variety of shapes.

(2) Wrought iron is impure iron with 4% carbon.

(3) Blister copper has blistered appearance due to evolution of CO_2.

(4) Vapour phase refining is carried out for Nickel by Van Arkel method.

139. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 4

(2) 1

(3) 2

(4) 3

140. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 2.84 BM

(2) 3.87 BM

(3) 4.90 BM

(4) 5.92 BM

141. Sucrose on hydrolysis gives :

(1) α-D-Fructose + β-D-Fructose

(2) β-D-Glucose + α-D-Fructose

(3) α-D-Glucose + β-D-Glucose

(4) α-D-Glucose + β-D-Fructose

142. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?

(1) NaCl, $MgCl_2$ and $CaCl_2$

(2) Both $MgCl_2$ and $CaCl_2$

(3) Only NaCl

(4) Only $MgCl_2$

143. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

(1) $H_2S_2O_7$, pyrosulphuric acid

(2) H_2SO_3, sulphurous acid

(3) H_2SO_4, sulphuric acid

(4) $H_2S_2O_8$, peroxodisulphuric acid

144. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q > 0$, $\Delta T > 0$ and $w > 0$

(2) $q = 0$, $\Delta T = 0$ and $w = 0$

(3) $q = 0$, $\Delta T < 0$ and $w > 0$

(4) $q < 0$, $\Delta T = 0$ and $w = 0$

145. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 1×10^{8} M

(2) 2×10^{-13} M

(3) 2×10^{-8} M

(4) 1×10^{-13} M

146. An increase in the concentration of the reactants of a reaction leads to change in :

(1) collision frequency

(2) activation energy

(3) heat of reaction

(4) threshold energy

147. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

(1) $CuCO_3 \cdot Cu(OH)_2$

(2) $CuSO_4$

(3) $[Cu(NH_3)_4]^{2+}$

(4) $Cu(OH)_2$

148. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(i)	(ii)	(iv)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(iii)	(iv)	(ii)	(i)

149. Which of the following is a cationic detergent ?

(1) Sodium dodecylbenzene sulphonate

(2) Sodium lauryl sulphate

(3) Sodium stearate

(4) Cetyltrimethyl ammonium bromide

150. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(iii)	(iv)	(i)	(ii)

151. Which of the following is a basic amino acid ?

(1) Lysine

(2) Serine

(3) Alanine

(4) Tyrosine

152. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

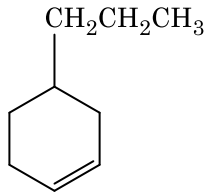
(1) 175, 104 and 71

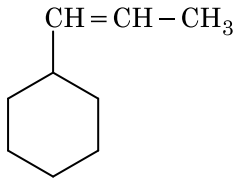
(2) 71, 104 and 71

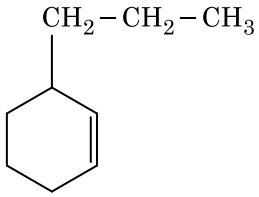
(3) 104, 71 and 71

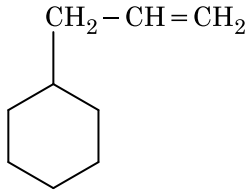
(4) 71, 71 and 104

153. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

(1) 

(2) 

(3) 

(4) 

154. Identify the **incorrect** match.

	Name		**IUPAC Official Name**
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Ununnunnium	(iv)	Darmstadtium

(1) (d), (iv)

(2) (a), (i)

(3) (b), (ii)

(4) (c), (iii)

155. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

(1) Potassium

(2) Iron

(3) Copper

(4) Calcium

156. Paper chromatography is an example of :
(1) Column chromatography
(2) Adsorption chromatography
(3) Partition chromatography
(4) Thin layer chromatography

157. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :
(1) SO_2 gas
(2) Hydrogen gas
(3) Oxygen gas
(4) H_2S gas

158. Which of the following alkane cannot be made in good yield by Wurtz reaction ?
(1) n-Butane
(2) n-Hexane
(3) 2,3-Dimethylbutane
(4) n-Heptane

159. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?
(1) $CN^- < C_2O_4^{2-} < SCN^- < F^-$
(2) $SCN^- < F^- < C_2O_4^{2-} < CN^-$
(3) $SCN^- < F^- < CN^- < C_2O_4^{2-}$
(4) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

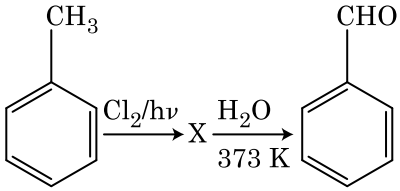
160. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :
(1) $\Delta_r H < 0$ and $\Delta_r S < 0$
(2) $\Delta_r H > 0$ and $\Delta_r S > 0$
(3) $\Delta_r H > 0$ and $\Delta_r S < 0$
(4) $\Delta_r H < 0$ and $\Delta_r S > 0$

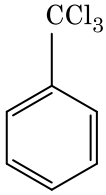
161. The rate constant for a first order reaction is $4.606 \times 10^{-3}\ s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :
(1) 1000 s
(2) 100 s
(3) 200 s
(4) 500 s

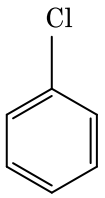
162. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :
(1) Cross Aldol condensation
(2) Aldol condensation
(3) Cannizzaro's reaction
(4) Cross Cannizzaro's reaction

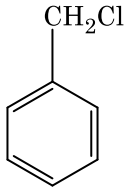
163. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :
(1) $\frac{4}{\sqrt{2}} \times 288$ pm
(2) $\frac{\sqrt{3}}{4} \times 288$ pm
(3) $\frac{\sqrt{2}}{4} \times 288$ pm
(4) $\frac{4}{\sqrt{3}} \times 288$ pm

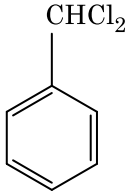
164. Identify compound X in the following sequence of reactions :



(1) 

(2) 

(3) 

(4) 

165. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

(1) 0.60 K

(2) 0.20 K

(3) 0.80 K

(4) 0.40 K

166. Identify the **incorrect** statement.

(1) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

(2) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

(3) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(4) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

167. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Size of the colloidal particles

(2) Viscosity

(3) Solubility

(4) Stability of the colloidal particles

168. Identify a molecule which does **not** exist.

(1) O_2

(2) He_2

(3) Li_2

(4) C_2

169. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (c) and (d) only

(2) (a), (b) and (c) only

(3) (a) and (c) only

(4) (b) and (c) only

170. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 18 bar

(2) 9 bar

(3) 12 bar

(4) 15 bar

171. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

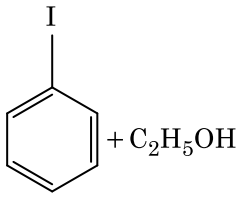
(1) Isobutyl alcohol

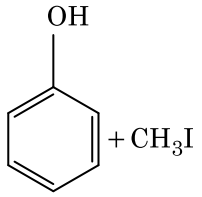
(2) Isopropyl alcohol

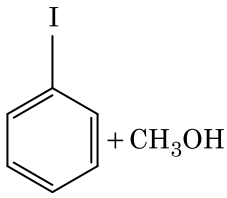
(3) Sec. butyl alcohol

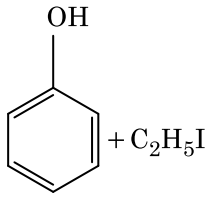
(4) Tert. butyl alcohol

172. Anisole on cleavage with HI gives :

(1)  $+ C_2H_5OH$

(2)  $+ CH_3I$

(3)  $+ CH_3OH$

(4)  $+ C_2H_5I$

173. Which of the following is a natural polymer ?

(1) poly (Butadiene-acrylonitrile)

(2) *cis*-1,4-polyisoprene

(3) poly (Butadiene-styrene)

(4) polybutadiene

174. Which of the following is **not** correct about carbon monoxide ?

(1) It is produced due to incomplete combustion.

(2) It forms carboxyhaemoglobin.

(3) It reduces oxygen carrying ability of blood.

(4) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

175. Which one of the followings has maximum number of atoms ?

(1) 1 g of Li(s) [Atomic mass of Li = 7]

(2) 1 g of Ag(s) [Atomic mass of Ag = 108]

(3) 1 g of Mg(s) [Atomic mass of Mg = 24]

(4) 1 g of O_2(g) [Atomic mass of O = 16]

176. Which of the following set of molecules will have zero dipole moment ?

(1) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

(2) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

(3) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

(4) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

177. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

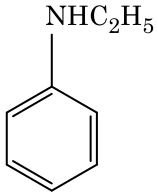
(1) Hyperconjugation

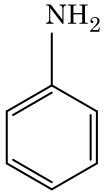
(2) $-$I effect of $-CH_3$ groups

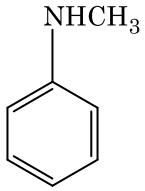
(3) $+$R effect of $-CH_3$ groups

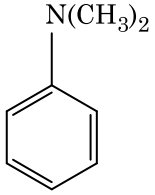
(4) $-$R effect of $-CH_3$ groups

178. Which of the following amine will give the carbylamine test ?

(1) 

(2) 

(3) 

(4) 

179. The mixture which shows positive deviation from Raoult's law is :

(1) Chloroethane + Bromoethane

(2) Ethanol + Acetone

(3) Benzene + Toluene

(4) Acetone + Chloroform

180. What is the change in oxidation number of carbon in the following reaction ?

$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$

(1) 0 to -4

(2) $+4$ to $+4$

(3) 0 to $+4$

(4) -4 to $+4$

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Space For Rough Work

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