Set No. 1                                    Question Booklet No.    01401

# 17P/290/23(i)

## INSTRUCTIONS TO CANDIDATES

*(Use only **blue/black ball-point pen** in the space above and on both sides of the Answer Sheet)*

1. Within 30 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.

2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope.*

3. *A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*

4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.

5. *On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.*

6. *No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Question Booklet.*

7. *Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.*

8. *Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.*

9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.

10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*

11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.

12. Deposit only OMR Answer Sheet at the end of the Test.

13. You are not permitted to leave the Examination Hall until the end of the Test.

14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

**Total No. of Printed Pages : 48**          [उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण पृष्ठ पर दिये गए हैं]

ROUGH WORK

रफ़ कार्य

# 17P/290/23(i)

**Time : 2 Hours**
**Full Marks : 360**

**Note :** (1) Attempt as many questions as you can. Each question carries **3** **(Three)** marks. *One mark will be deducted for each incorrect* *answer.* **Zero** mark will be awarded for each unattempted question.

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

(3) This Question Booklet comprises two Sections viz. Section-A and Section-B:

**Section-A :** This is compulsory. This contains two sub-sections having questions of **two** disciplines viz.

(i) **Basic Environmental Science**

(ii) **Chemistry**

A candidate is required to attempt above both all sub-sections are compulsory.

**Section-B :** This contains three Sub-sections having questions of **three** disciplines viz.,

(i) **Life Science**

(ii) **Physics**

(iii) **Geology**

A candidate is required to attempt only **one** from above three Sub-sections.

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P.T.O.

# SECTION - A
## (i) BASIC ENVIRONMENTAL SCIENCES
## (Compulsory for all)

01. Among the following ecosystems which have the least net primary productivity :
    (1) Swamp and marsh
    (2) Tropical rain Forest
    (3) Savanna
    (4) Cultivated land

02. Which of the following statement is incorrect ?
    (1) R-selected population have small size of individuals
    (2) K-selected population have long life span
    (3) R-selected population have short seed life span
    (4) Development time of k-selected population are slow

03. Largest biogeographical zone in India is :
    (1) Himalayan
    (2) Desert
    (3) Gangetic Plain
    (4) Deccan Peninsula

04. Which of the following is not correct ? An ecological niche may be said to be :
    (1) How an organism lives
    (2) Where an organism lives
    (3) An n-dimensional hyper-volume
    (4) A summary of an organism's tolerances and requirements

**05.** The formula for exponential population growth is :

(1) $dN/dT = rN$

(2) $dT/dN = rN$

(3) $dN/rN = dT$

(4) $rN/dN = dT$

**06.** In a population unrestricted reproductive capacity is called as :

(1) Carrying capacity

(2) Biotic potential

(3) Birth rate

(4) Fertility are

**07.** Human population growth curve is :

(1) S-shaped curve

(2) Parabola curve

(3) J-shaped curve

(4) Zigzag curve

**08.** In a food chain of grassland ecosystem the top consumers are :

(1) Herbivorous

(2) Carnivorous

(3) Bacteria

(4) Either carnivorous or herbivorous

**09.** Ecotype is a type of species in which environmentally induced variations are :

(1) Temporally

(2) Genetically fixed

(3) Genetically not related

(4) None of the above

**P.T.O.**

10. Energy flow in a ecosystem is :
    (1) Unidirectional
    (2) Bidirectional
    (3) Multidirectional
    (4) None of the above

11. The realized niche of an organism is :
    (1) the area a species can occupy in the face of exploitive competition
    (2) the habitat of a species within a community resulting from clumping
    (3) the habitat that exists in nature as opposed to the ideal
    (4) the life pattern that the organism actually assumes

12. A barnacle grows on a whale, doing it no harm. This is an example of :
    (1) Vitalism
    (2) Mutualism
    (3) Parasitism
    (4) Commensalism

13. Which of the following is **not** an example of symbiosis ?
    (1) Monarch butterflies
    (2) Lichens
    (3) Mycorrhizae
    (4) Tapeworms and humans

14. Which of the following statement is **true** ?

    (1) Oligotrophic lakes contain more nutrients than eutrophic lakes

    (2) Xerarch succession is primary succession that occurs in salt-water environments

    (3) Most ecologists believe that most communities achieve a stable, unchanging climax vegetation

    (4) A mature ecosystem has greater species richness, greater biomass and less net productivity than a younger stage of succession

15. Which of the following pairs mismatched ?

    (1) Tundra-permafrost

    (2) Coniferous forest-evergreen trees

    (3) Savanna-acacia tree

    (4) Prairie-epiphytes

16. Which of the following are important biotic factors that can affect the structure and organization of biological communities ?

    (1) nutrient availability, soil pH, light intensity

    (2) precipitation, wind, temperature

    (3) predation, competition, disease

    (4) 1 and 2 only

P.T.O.

17. Which of the following is the formula for determining the rate of growth of a population ?
    (1) (birth rate-death rate) + immigration rate + emigration rate
    (2) (immigration rate + emigration rate) - (death rate + birth rate)
    (3) birth rate + death rate + immigration rate + emigration rate
    (4) (birth rate + immigration rate)- (death rate + emigration rate)

18. Most people have pesticides and other environmental contaminants in their body. This is an example of :
    (1) healthy eating
    (2) bioamplification
    (3) biomagnification
    (4) bioaccumulation

19. After a forest fire, the first signs of ecological recovery occur with the appearance of :
    (1) large herbivores
    (2) grasses and small shrubs
    (3) predators
    (4) trees

20. Food webs differ from food chains in that they :
    (1) show the actual movement of energy within the ecosystem
    (2) show more of the available feeding relationships in an ecosystem
    (3) show the distribution of biomass within an ecosystem
    (4) identify the keystone speies within an ecosystem

21. In the nitrogen cycle, the term "denitrification" refers to :
    (1) The conversion of ammonia into nitrogen
    (2) The conversion of nitrogen into ammonia
    (3) The conversion of nitrates into nitrogen gas
    (4) The conversion of nitrogen gas into nitrates

22. The amount of energy that is passed from one organism to the next in a food chain is :
    (1) 5%                 (2) 10%
    (3) 15%                (4) 20%

23. Which among the following is the most abundant Green-House-Gas (GHG) in the earth's atmosphere ?
    (1) Carbon dioxide
    (2) Water vapour
    (3) Sulphur dioxide
    (4) Tropospheric Ozone

24. The 'thickness' of stratospheric Ozone layer is measured in/on :
    (1) Sieverts
    (2) Dobson units
    (3) Melson units
    (4) Beaufort Scale

25. Which of the following is an example of secondary succession ?
    (1) reforestation of the cedar forest of the northwest
    (2) landscaping at a golf course
    (3) sedimentation of the bottom of drained lake
    (4) scrub grasses growing on a newly exposed dune

P.T.O.

26. In a terrestrial ecosystem, the trophic level that would contain the largest biomass would be the :

    (1) Producers.

    (2) Primary consumers

    (3) Secondary consumers

    (4) Highest order consumers

27. Chloroluorocarbons (CFCs) in the atmosphere

    (1) Cause ozone to be broken down

    (2) Change oxygen into ozone

    (3) Convert sunlight into ozone

    (4) Convert ozone into methane

28. As a population reaches its carrying capacity, there may be an increase in competition for :

    (1) Food

    (2) Mates

    (3) Shelter

    (4) All of the above

29. Largest share of soil type in India is :

    (1) Black soil

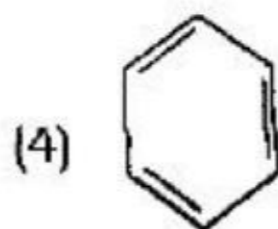    (2) Laterite

    (3) Alluvial

    (4) Red Soil

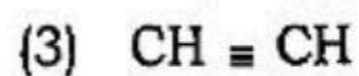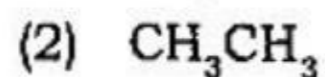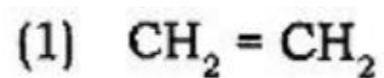**30.** What does the population change of lichen indicate ?

    (1)   Air pollution

    (2)   Soil pollution
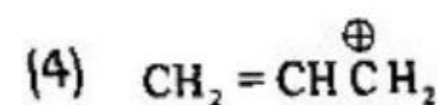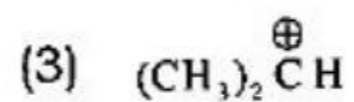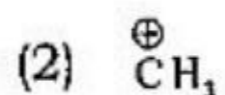
    (3)   Water pollution

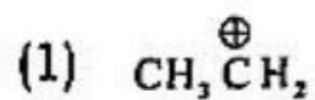    (4)   None of the above

**P.T.O.**

## (ii) CHEMISTRY
## (Compulsory for all)

31. Which of the following hydrocarbons has the shortest C-C bond length ?

   (1) $CH_2 = CH_2$

   (2) $CH_3CH_3$

   (3) $CH \equiv CH$

   (4) 
   
   

32. Which of the following carbonium ions will be most stable ?

   (1) $CH_3 \overset{\oplus}{C}H_2$

   (2) $\overset{\oplus}{C}H_3$

   (3) $(CH_3)_2 \overset{\oplus}{C}H$

   (4) $CH_2 = CH \overset{\oplus}{C}H_2$

33. The combustion of Pentane produces :

   (1) Pentene

   (2) $HCl + H_2O$

   (3) Pentyne

   (4) $CO_2 + H_2O$
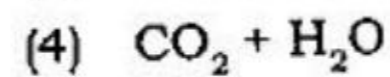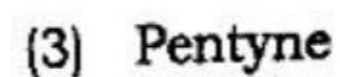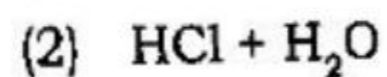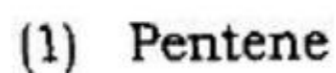
**34.** The monomer for Neoprene is :

    (1)  Acrylonitrile

    (2)  1, 3 - Butadiene

    (3)  Isoprene

    (4)  Chloroprene

**35.** 1, 3 - Butadiene reacts with bromine to mainly give :

    (1)  3, 4 - Dibromo - 1 - butene

    (2)  4 - Bromo - 1 - butene

    (3)  1, 4 - Dibroma - 2 - butene

    (4)  1 - Bromo - 2 - butene

**36.** Ozonolysis of 2- butyne gives :

    (1)  Formic acid

    (2)  Propanoic acid

    (3)  Acetic acid

    (4)  Butanoic acid

**37.** When glycerol is heated with potassium hydrogen sulfate ($KHSO_4$), it forms :

    (1)  Acrolein

    (2)  Acetic acid

    (3)  Allyl alcohol

    (4)  Propionic acid

P.T.O.

38. Acetaldehyde on treatment with Fehling's solution gives a precipitate of :

    (1) Cu

    (2) Ag

    (3) CuO

    (4) $Cu_2O$

39. Calcium acetate on strong heating gives :

    (1) Methane + $CaCO_3$

    (2) Ethane + $CaCO_3$

    (3) Acetone + $CaCO_3$

    (4) Ethane + CaO

40. Which of the following is a thermosetting polymer ?

    (1) Nylon 6.10

    (2) Polypropene

    (3) Teflon

    (4) Bakelite

41. Ethyl acetoacetate reacts with phenylhydrazine to give :

    (1) Antipyrine

    (2) 4- Methyl uracil

    (3) Barbituric acid

    (4) Hydantoin

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42. Phenol on distillation with Zinc dust gives :

    (1) Phenylzine

    (2) Benzene

    (3) Cyclohexanone

    (4) Benzoic acid

43. Hydrolysis of benzal chloride gives :

    (1) Phenol

    (2) Benzyl alcohol

    (3) Benzaldehyde

    (4) Benzoyl chloride

44. Benzamide reacts with $Br_2$ and KOH to give :

    (1) Benzene

    (2) Benzylamine

    (3) Benzonitrite

    (4) Aniline

45. Phenylmagnesium bromide reacts with $CO_2$ followed by acid - hydrolysis to form :

    (1) Phenol

    (2) Benzoic acid

    (3) Bromobenzene

    (4) Acetophenone

P.T.O.

46. Which of the following compounds is most acidic ?

    (1) Ethanol

    (2) Phenol

    (3) Acetic acid

    (4) Formic acid

47. Which of the following carbohydrates is **not** a reducing sugar ?

    (1) Glucose

    (2) Sucrose

    (3) Fructose

    (4) Lactose

48. When aniline is heated with glycerol in the presence of sulfuric acid and nitrobenzene, it gives quinoline. This reaction is called :

    (1) Fischer Synthesis

    (2) Corey-House Synthesis

    (3) Diazotization

    (4) Skraup Synthesis

49. Benzene reacts with propene in the presence of $H_2SO_4$ catalyst to give :

    (1) n-Propylbenzene

    (2) Benzophenone

    (3) Cumene

    (4) Acetophenone

50. Octane number of gasoline is a measure of its :

   (1) Knocking tendency
   (2) Ignition delay
   (3) Ignition temperature .
   (4) Smoke point

51. For an isothermal free expansion of an ideal gas into vacuum, which of the following represents the correct set of values ?

   (1) $\Delta U = 0, q > 0, w < 0$
   (2) $\Delta U > 0, q > 0, w = 0$
   (3) $\Delta U = 0, q = 0, w = 0$
   (4) $\Delta U < 0, q = 0, w < 0$

52. If a sol. is saturated with silver acetate ($K_{sp} = 1.9 \times 10^{-3}$), which of the following reagent will increase the solubility of silver acetate :

   (1) sodium acetate
   (2) ammonia
   (3) silver nitrate
   (4) sodium chloride

53. The equilibrium constant of a gaseous reversible reaction is expressed in terms of $K_p$, $K_a$ and $K_x$ respectively if the concentration of species involved are expressed in terms of partial pressure, activity and mole fraction. Which one of these equilibrum constants will vary with the change in total pressure of the reaction mixture ?

   (1) $K_p$
   (2) $K_a$
   (3) $K_x$
   (4) all the three

54. The maximum external work that can be obtained from a system is represented by :

(1) $-\Delta U$

(2) $-\Delta H$

(3) $-\Delta S$

(4) $-\Delta G$

55. An aqueous solution of gold (III) nitrate, $Au(NO_3)_3$ is electrolysed with a current of 0.025 A until 1.2g of Au (atomic weight 197) has been deposited at the cathode. The quantity of electricity passed is :

(1) $2.76 \times 10^3$ C

(2) $1.76 \times 10^3$ C

(3) $2.58 \times 10^3$ C

(4) $0.58 \times 10^3$ C

56. The kinetics of a reaction $2X \rightarrow 4Y + Z$ was measured independently for three different initial concentrations of X : 0.10, 0.08 and 0.06 mol $L^{-1}$. The half-life of the reaction was found to be 120 minutes for all these concentrations. The order of the reaction is :

(1) 0  (2) 1  (3) 2  (4) 3

57. For a solution showing negative deviation from Roult's law, the *false* statement is :

(1) $\Delta H_{mixing} < 0$

(2) $\Delta V_{mixing} < 0$

(3) $P_{total} > x_A P_A^0 + x_B P_B^0$

(4) $\Delta S_{mixing} > 0$

**58.** The extent to which a real gas departs from ideal behaviour may be depicted in terms of a function called compressibility factor (z), which is defined as :

(1) RT/M  (2) pV/nRT  (3) V/RT  (4) RV/PT

**59.** At 25°C the solubility product of $CaF_2$ in water is $3.2 \times 10^{-11}$. The solubility (in mole $kg^{-1}$ of water) of the salt at the same temperature is :

(1) $4.0 \times 10^{-6}$  (2) $3.2 \times 10^{-4}$

(3) $2.5 \times 10^{-4}$  (4) $2.0 \times 10^{-4}$

**60.** Which of the following thermodynamic equation is NOT correct ?

(1) $\left(\dfrac{\partial G}{\partial P}\right)_T = V$

(2) $\left(\dfrac{\partial G}{\partial T}\right)_P = -S$

(3) $\left(\dfrac{\partial A}{\partial T}\right)_V = S$

(4) $\left(\dfrac{\partial A}{\partial V}\right)_T = -P$

**61.** What will be the E value at the equivalence point of titration of $Fe^{2+}$ against $KMnO_4$ ? ($E^0{}_{Fe^{2+}/Fe^{3+}} = 0.77V$ and $E^0{}_{MnO4/Mn^{2+}} = 1.52$ V)

(1) Much less than 0.77 V

(2) Between 0.77 V and 1.52 V

(3) 0.77 V

(4) 1.52 V

**P.T.O.**

62. According to Nernst distribution law for the distribution of benzoic acid between water and benzene, the correct form for $K_D$ is
   [$C_w$ is concentration in aqueous layer & $C_b$ is the concentration in benzene layer respectively] .

   (1)  $K_D = C_b/C_w$

   (2)  $K_D = C_w/n\sqrt{C_b}$

   (3)  $K_D = C_w^2/C_b$

   (4)  $K_D = n\sqrt{C_w}/C_b$

63. What is the pH of a buffer solution containing 0.01 M acetic acid (pka = 4.74) and 0.1 M sodium acetate ?

   (1)  2.74         (2)  3.74         (3)  4.74         (4)  5.74

64. At 300 K one mole of an ideal gas expands reversibly and isothermally from 1 litre to 10 litres. What is the entropy change for the process ?

   (1)  9.2 calK$^{-1}$ mol$^{-1}$

   (2)  6.9 calK$^{-1}$ mol$^{-1}$

   (3)  4.6 calK$^{-1}$ mol$^{-1}$

   (4)  2.3 calK$^{-1}$ mol$^{-1}$

65. Which one of the following does not express the condition for a spontaneous process ?

   (1)  $(\Delta U)_{S,V} \leq 0$

   (2)  $(\Delta S)_{U,V} \leq 0$

   (3)  $(\Delta A)_{T,V} \leq 0$

   (4)  $(\Delta G)_{T,P} \leq 0$
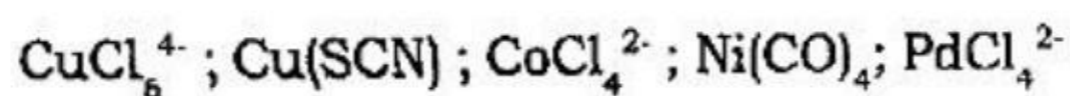
71. If hydrogen sulphide gas is passed through an acidified solution containing a mixture of the sulphates of cadmium, nickel and zinc which sulphides will be precipitated ?

    (1) CdS and NiS

    (2) NiS and ZnS

    (3) NiS

    (4) CdS

72. Which among the following compounds/ions are diamagnetic ?

    $CuCl_6^{4-}$ ; $Cu(SCN)$ ; $CoCl_4^{2-}$ ; $Ni(CO)_4$; $PdCl_4^{2-}$

    (1) $CoCl_4^{2-}$ and $PdCl_4^{2-}$

    (2) $CuCl_6^{4-}$ , $Cu(SCN)$ and $Ni(CO)_4$

    (3) $Cu(SCN)$ and $Ni(CO)_4$

    (4) $Cu(SCN)$ , $Ni(CO)_4$ and $PdCl_4^{2-}$

73. Complete the following sentence : A teraheron has six .................

    (1) vertices and edges

    (2) edges

    (3) faces

    (4) faces and vertices

74. Identify the missing product in the following nuclear reaction :

    $^{14}_7N + \alpha \rightarrow ? + {}^1_1H$

    (1) $^{17}_8O$                    (2) $\beta^-$

    (3) $\beta^+$                      (4) $^{16}_8O$

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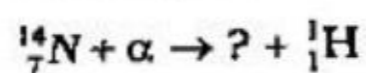
**75.** Which of the following is a disproportionation reaction ?

(1) $2H_2O_2 \rightarrow 2H_2O + O_2$

(2) $CO_3^{2-} + 2H^+ \rightarrow H_2O + CO_2$

(3) $Cr_2O_7^{2-} + H_2O \rightarrow 2CrO_4^{2-} + 2H^+$

(4) $2Cu^{2+} + 4I^- \rightarrow 2CuI + I_2$

**76.** How many isomers are possible for the octahedral complex, $CrCl_2Br(OH_2)_3$ ?

(1) 2      (2) 3      (3) 4      (4) 5

**77.** What is the oxidation state of Mn in $Mn(oxalate)_3^{3-}$ ?

(1) -3      (2) 2      (3) 3      (4) 4

**78.** What happens when sodium hydroxide solution is added to a precipitiate containing a mixture of aluminium hydroxide and copper hydroxide ?

(1) the precipitate completely dissolves

(2) part of the precipitate dissolves leaving a blue residue

(3) part of the precipitate dissolves leaving a white residue

(4) the preciptiate is unchanged

**79.** A solution containing $1.00 \times 10^{-3}$ mole of copper sulphate is treated with excess potassium iodide. The resulting solution is titrated against 0.100 M sodium thiosulphate. What will be the titre value at the end point ?

(1) 5.0 ml           (2) 10.0 ml

(3) 20.0 ml         (4) 40.0 ml

P.T.O.

**80.** What is the coordination number of a metal ion situated at the centre of a trigonal prism formed by the ligand atoms ?

(1)  3        (2)  4        (3)  6        (4)  8

**81.** When 27 g of $N_2O_5$ was reacted with 10g of water, 27 g of nitric acid was obtained. What is the percentage yield of nitric acid ?

(1)  32%        (2)  67%        (3)  87%        (4)  100%

**82.** How many unpaired electorns are there in the HOMO of the dioxygen molecule ?

(1)  0        (2)  1        (3)  2        (4)  3

**83.** What is the range for bond energy $(k\, cal\, mol^{-1})$ of a typical hydrogen bond ?

(1)  1 - 4        (2)  5 - 40

(3)  100 - 200        (4)  200- 250

**84.** Which one, among the given atoms, has the highest number of unpaired electrons in its ground state ?

(1)  C        (2)  N        (3)  O        (4)  F

**85.** How many moles of $P_4O_{10}$ will react with one mole of water ?

(1)  2 moles        (2)  6 moles

(3)  1/3 moles        (4)  1/6 moles

86. Which one among the given arrangements of one molecule of HCl and one molecule of HBr will have the lowest energy ?

(1) H – Cl
    Br – H

(2) H – Cl
    H – Br

(3) H - Cl  Br - H

(4) H - Br  H - Cl

87. The formation of $I_3^-$ ion may be visualized as a reaction between iodine molecule and iodide ion. How may one classify the two reactants ?

(1) Iodine (Lewis base) ; Iodide (Lewis acid)

(2) Iodine (oxidizing agent); Iodide (reducing agent)

(3) Iodine (reducing agent); Iodide (oxidizing agent)

(4) Iodine (Lewis acid); Iodide (Lewis base)

88. How many electrons are there in the $e_g$ level of a low spin Fe(III) complex ?

(1) 0      (2) 1      (3) 2      (4) 3

P.T.O.

# SECTION - B
## (i) LIFE SCIENCE
### (Optional)

91. Which one of the following is the smallest cellular structure ?

    (1) Mitochondria       (2) Plant vacuole

    (3) Chloroplast granum      (4) Ribosome

92. Which of the following organelles digests the old organelles that are no longer required to the cells ?

    (1) Lysosomes

    (2) Mitochondria

    (3) Ribosomes

    (4) Chromatin

93. During cell division there are three types of check points; one of them (M checkpoint) is to ensure :

    (1) Chromosomes are attached to the spindle

    (2) Complete DNA replication

    (3) DNA not damaged or broken

    (4) All of the above

94. Which of the following descriptions of chromosomes is **not** correctly matched ?

    (1) Metacentric-chromosome arms are almost equal in size

    (2) Submetacentric-chromosome arms are slightly different in size

    (3) Acrocentric-chromosome arms are identical in size

    (4) Telocentric-there is only one chromosome arm

P.T.O

**95.** Mutations that arise in the absence of known mutagen are known :

(1) Induced mutations

(2) Fused mutations

(3) Spontaneous mutations

(4) None of the above

**96.** A heritable feature is a ....................and may have two or more variants called ........................

(1) Trait/characteristics

(2) Character/traits

(3) Character/factors

(4) Trait/factors

**97.** If the genotype consists of only one type of allele, it is called :

(1) Uniallelic

(2) Heterozygous

(3) Momoallelic

(4) Homozygous

**98.** The physical expression or appearance of a character is called as :

(1) Morphology

(2) Genotype

(3) Phenotype

(4) Ecotype

**99.** Who is regarded as the father of genetics ?

(1) Watson      (2) De vries

(3) Mendel      (4) Morgan

**100.** Characteristics that are passed to off springs from parents are called :

(1) Phenotype      (2) Traits

(3) Chromatin design      (4) Genotype

**101.** Lamp brush chromosomes are seen in :

(1) Prophase

(2) Meiotic prophase

(3) Mitotic metaphase

(4) Mitosis

**102.** Prokaryotic genetic system has :

(1) Both DNA and histones

(2) DNA but no histones

(3) Neither DNA nor histones

(4) Either DNA or histones

**103.** A chromosome aberration leads to change in the order of genes in a genetic map but does not alter its linkage group. This is due to :

(1) Inversion

(2) Transposition

(3) Recombination

(4) Translocation

P.T.O.

104. Which one of the following is **not** required in PCR ?

    (1) *Taq* polymerase

    (2) Restriction enzymes

    (3) Oligonucleotide primers

    (4) Deoxynucleoside triphosphates

105. Gene transfer in plants can be mediated through :

    (1) *Bacillus sp.*
    (2) *E. Coli*

    (3) *Thermus aquaticus*
    (4) *Agrobacterium tumefaciens*

106. Which of the following group of organisms does not have bilateral symmetry ?

    (1) Platyhelminthes
    (2) Mollusca

    (3) Cnideria
    (4) Echinodermata larvae

107. In coelomates, the body cavity is lined by :

    (1) ectoderm
    (2) mesoderm

    (3) endoderm
    (4) coelom

108. Which of the following is not an example of egg laying mammal ?

    (1) Marsupialia

    (2) Monotremata

    (3) Prototheria

    (4) *Echidna*

109. The dorsal-most vegetal cells of amphibian blastula, capable of inducing the organizer, is called as :

  (1) Dorsal lip
  (2) Nieuwkoop centre
  (3) Dorsal marginal zone
  (4) Primary organizer

110. Acrosomal vesicle in a mature sperm is derived from :

  (1) endoplasmic reticulum
  (2) Golgi complex
  (3) lysosomes
  (4) mitochondria

111. NADH is oxidised by the electron transport system with subsequent production of :

  (1) 1 ATP
  (2) 2 ATP
  (3) 3 ATP
  (4) 4 ATP

112. Hexokinase, which catalyzes reaction between glucose and ATP forming glucose-6-phosphate is an example of :

  (1) ligase
  (2) lyase
  (3) oxydoreductase
  (4) transferase

113. If a sample of DNA is found to have the base composition (mole ratios) of adenine, 40; thymine, 22; guanune, 21; and cytosine 17, which of the following conclusions will be most appropriate ?

  (1) The given DNA is a double stranded circular molecule
  (2) It is a linear double stranded molecule
  (3) It is a single stranded molecule
  (4) It has high melting point

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114. The fuels for Krebs cycle occurring in mitochondria are :
    (1) pyruvate and lactate
    (2) fatty acid and palmitic acid . .
    (3) pyruvate and fatty acids
    (4) succinate and NADH

115. Deficiency of which of the following hormone causes wate retention and characteristic puffiness of skin ?
    (1) Thyroid hormone
    (2) Anti-direutic hormone
    (3) Calcitonin
    (4) parathormone

116. Cutting of Pituitary stalk causes all of the following except :
    (1) Dilute urine formation
    (2) Increased urine formation
    (3) Diabetes insipdus
    (4) Diabetes mellitus

117. Steroid hormones exert their effect on target cells :
    (1) by directly binding with the target gene
    (2) by binding with the specific cell surface receptor
    (3) through trimeric G-proteins
    (4) by binding with the cytoplasmic receptor

118. All of the following are functions of mammalian kidney except :
    (1) detoxification of harmful compounds
    (2) regulation of salt balance in the blood
    (3) regulation of water balance in the blood
    (4) filtration of blood

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119.Most of the glucose that is filtered through the glomerulus undergoes reabsorption in :

(1) proximal tubule

(2) descending loop of Henle

(3) ascending loop of Henle

(4) collecting duct

120.The blood group of a couple is as follows : Husband 'O' Rh-ve, wife 'A' Rh - ve. Their new born baby got mixed in the hospital. Among the four new born babies present in the hospital, which one would you think was their baby ?

(1) The baby with blood group 'A' Rh-ve

(2) The baby with blood group 'A' Rh+ve

(3) The baby with blood group 'O' Rh+ve

(4) The baby with blood group 'AB' Rh-ve

P.T.O.

## SECTION - B
### (ii) PHYSICS
### (Optional)

121. If a big drop of water is broken into smaller drops the surface energy :
   (1) increase
   (2) decreases
   (3) remain unchanged
   (4) can increase as well as decrease

122. How much energy is released in nuclear fission of $U^{235}$ ?
   (1) 20 MeV
   (2) 200 MeV
   (3) 2000 MeV
   (4) 20000 MeV

123. Yong modulus 'Y', modulus of rigidity 'η' and Poission's ratio 'σ' are related as :
   (1) $Y = 2\eta(H\sigma)$
   (2) $\sigma = \dfrac{2Y}{(1+\eta)}$
   (3) $\dfrac{Y}{\sigma} = 2(1+\eta)$
   (4) $\eta = \dfrac{2Y}{(1+\sigma)}$

124. Young's double slit experiment is based on the principle of :
   (1) division of amplitude
   (2) devision of ware front
   (3) addition of amplitude
   (4) addition of ware front

125. In which of the following configuration of a transistor the voltage gain is highest :
  (1) Common Collector (CC)
  (2) Common Base (CB)
  (3) Common Emitter (CE)
  (4) Same in all

126. The most important characteristics of Laser light is :
  (1) Polarization        (2) Coherence
  (3) High intensity      (4) Directionality

127. The base of transistor is doped :
  (1) heavily             (2) lightly
  (3) moderate            (4) do not doped

128. The phenomenon which produces colours in a srap bubble is due to :
  (1) Diffraction         (2) Dispersion
  (3) Interference        (4) Polarization

129. Fission of nucleus is possible only when its mass number 'A' satisfies the condition :
  (1) A > 15              (2) A < 15
  (3) A > 85              (4) A < 85

130. Bernoulli's principle is based on the law of conservation of :
  (1) mass                (2) energy
  (3) linear momentum     (4) Angular momentum

P.T.O.

**131.** The equation $\bar{\nabla} \times \bar{B} = \mu_0 \vec{J}$ represents :

    (1)  Faraday's law         (2)  Ampere's law

    (3)  Gausses law          (4)  Ohm's law

**132.** The Planck's radiation formula reduces to Rayleigh Jeans law for :

    (1)  Shorter wavelength

    (2)  longer wavelenght

    (3)  for both shorter & longer wavelenth

    (4)  neither of above

**133.** The direction of propagation of electromagnetic wave is given by :

    (1)  Vector $\bar{E}$           (2)  Vector $\bar{B}$

    (3)  Poynting Vector     (4)  Vector $\bar{H}$

**134.** The Gibb's potential 'G' is defined as :

    (1)  $G = U - PV + TS$     (2)  $G = U + PV + TS$

    (3)  $G = U - PV - TS$     (4)  $G = U + PV - TS$

**135.** Out of isothermal, isobaric and adiabatic for the same volume change, the work done is maximum in the following :

    (1)  Isothermal Process     (2)  Isobaric Process

    (3)  Adiabatic Process     (4)  Same for all

**136.** Suppose a magnetic monopole exists; which of the following Maxwell's equation (in free space) will be modified :

    (1)  $\bar{\nabla}.\bar{E} = \delta / \epsilon_0$     (2)  $\bar{\nabla} \times \bar{E} = -\partial \bar{B} / \partial t$

    (3)  $\nabla.\bar{B} = 0$     (4)  $\bar{\nabla} \times \bar{B} = \mu_0 \bar{J} + \mu_0 \epsilon_0 \, \partial \bar{E} / \partial t$

137. The terminal velocity of a spherical ball of radius 'r' falling through a viscous liquid is proportional to :

(1) $r$

(2) $r^2$

(3) $r^3$

(4) $r^4$

138. A ring, disc, a solid sphere and a spherical shell have the same mass and radius respectively. The body which has the hightest moment of inertia about the central axis is :

(1) disc

(2) ring

(3) Solid sphere

(4) spherical shell

139. Zener diodes can be used as :

(1) Rectifier

(2) Oscillator

(3) Voltage regulator

(4) Transmitter

140. Two lenses of power -1.5 and + 2.5 diopters are placed in contact. The focal length of the combination is :

(1) 100 cm

(2) 90 cm

(3) 80 cm

(4) 70 cm

141. In manufactor of electronic devices Silicon is preferred to Germanium because :

(1) Silicon is cheaper than Germenium

(2) Silicon is more compact than Germenium

(3) the leakage current in Silicon is less than Germenium

(4) Silicon has better appearance than Germenium

P.T.O.

142. The wavelength of microwave is of the order of :

    (1)  meter            (2)  millimeter

    (3)  micrometer       (4)  Angstrom

143. Zeroth law of thermodynamics shows the existance of :

    (1)  Internal energy      (2)  Pressure

    (3)  Temperature       (4)  Entropy

144. With rise of temperature the resistivity of a semi-conductor :

    (1)  remains unchanged

    (2)  increases

    (3)  decreases

    (4)  first increases then decreases

145. Which wave phenomine is not common to both light and sound wave ?

    (1)  reflection        (2)  refraction

    (3)  Polarization      (4)  Deffraction

146. Which of the following is invariant under a Galilian transformation ?

    (1)  Displacement     (2)  Velocity

    (3)  Force          (4)  Momentum

147. Triple point of water is :

    (1)  273.16 F        (2)  373.16 K

    (3)  273.16 K        (4)  273.16 R

148. The phenomenon of rotating the plane of vibration of a polarised light is known as :

(1) Polerization

(2) Optical activity

(3) double refraction

(4) Kerr effcet

149. The photo-electric effect can be understood by :

(1) the electromagnetic theory of light

(2) the special theory of relativity

(3) the quantum theory of light

(4) the wave theory of light

150. The most energetic electromagnetic radiations are :

(1) microwaves

(2) Ultraviolet waves

(3) X - ray

(4) $\gamma$ rays

**P.T.O.**

# (iii) GEOLOGY
## (Optional)

151. Which of the following is **not** part of a fold ?

    (1) Hinge

    (2) Inflexion

    (3) Net slip

    (4) Axial plane

152. Which of the following is most suitable statement for a fault ?

    (1) It is a contact between igneous and sedimentary rocks

    (2) It is a fracture in the rock which has displacement of two blocks along it

    (3) It is a phenomenon due to which the rock arches upward

    (4) It indicates redeposition of the rock sequences after a time gap

153. Which of the following is **true** for angular unconformity ?

    (1) The older sequence is sedimentary but the younger sequence is volcanic

    (2) The older and younger sequences both are sedimentary and mutually parallel

    (3) The older sequence is folded but the younger sequence is not

    (4) The older sequence is sedimentary and the younger igneous rocks intrude it

154. A joint has its strike perpendicular to dip direction of the bedding plane. It is :

(1) Strike joint

(2) Dip joint

(3) Extension joint

(4) Radial joint

155. The diameter of the Earth is approximately :

(1) 6371 km

(2) 8410 km

(3) 10570 km

(4) 12800 km

156. Himalayan mountain originated due to :

(1) Subduction of Indian plate under Tibetan Plateau

(2) Collision of Indian Plate with Eurasian plate

(3) Fragmentation of Pangaea Supercontinent

(4) Huge sedimentation in the Tethys Ocean

157. The actual place of origin of an earthquake is the :

(1) Focus

(2) Epicenter

(3) Place where disaster is maximum

(4) Subduction zone

158. Karst topography is found in areas where dominantly present rock is :

(1) Shale

(2) Limestone

(3) Granite

(4) Basalt

P.T.O.

159. 'Ring of Fire' refers to :

(1) Circular outline of a volcanic mountain from where lava comes out

(2) A circular region in Africa where volcanic activity is continuously going on

(3) The narrow climatic belt near equator which remain hot throughout the year

(4) The chain of volcanoes present around Pacific Ocean

160. Which of the following statement is **not** true for dip ?

(1) It is inclination of ground with respect to horizontal

(2) Its maximum amount is called as true dip

(3) The apparent dip is always less than the true dip

(4) Its amount is always zero along the strike of a bedding plane

161. Which of the following groups the mineral hornblende belongs to ?

(1) Pyroxene  (2) Amphibole

(3) Feldspar  (4) Zeolite

162. Which of the following is optically isotropic ?

(1) Calcite  (2) Olivine

(3) Almandine  (4) Staurolite

163. Which of the following crystallizes in isometric system ?

(1) Albite  (2) Oligoclase

(3) Halite  (4) Quartz

164. The mineral showing two hardness values is :

    (1)  Rutile           (2)  Apatite

    (3)  Quartz          (4)  Kyanite

165. Which of the following is a plagioclase mineral ?

    (1)  Enstatite        (2)  labradorite

    (3)  Orthoclase      (4)  Chalcedony

166. Which of the following mineral's crystal is used in making a petrological microscope ?

    (1)  Barite           (2)  Dolomite

    (3)  Canada Balsam    (4)  Iceland spar

167. Which of the following minerals **does not** have chemical composition $Al_2SiO_5$ ?

    (1)  Corundum       (2)  Sillimanite

    (3)  Kyanite         (4)  Andalusite

168. Flowering plants first appeared during :

    (1)  Jurassic         (2)  Carboniferous

    (3)  Cretaceous      (4)  Eocene

169. Which of the following would become a trace fossil ?

    (1)  Bone in coarse sediments

    (2)  Calcareous shells in limestone

    (3)  Plant leaves in shale

    (4)  Burrowing in alluvium

P.T.O.

170. Which among the following is considered as a living fossil ?

    (1) *Nautilus*                (2) *Nummulites*

    (3) *Ammonites*              (4) *Trilobites*

171. The fossil having short geological time span but wide geographical distribution is called :

    (1) Living fossil            (2) Index fossil

    (3) Marker fossil            (4) Trace fossils

172. The volcanic equivalent of granite is :

    (1) Basalt                   (2) Andesite

    (3) Dolerite                 (4) Rhyolite

173. Which of the following mineral assemblages generally **does not** occur in **nature** ?

    (1) Nepheline-quartz         (2) Leucite-albite

    (3) labradorite - augite     (4) Olivine-anorthite

174. Which of the following minerals is an ore of iron ?

    (1) Hematite                 (2) Psilomelane

    (3) Biotite                  (4) Pyrite

175. The first oil discovery in India was made at :

    (1) Bombay Hi                (2) Cambay

    (3) Digboi                   (4) Lakhpat

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**176.** The Mn-ore deposit are found in :

    (1)  Bomby Hi           (2)  Saucer Group

    (3)  Mahakoshal Group    (4)  Semri Group

**177.** The Indo-Gangetic plain is separated from the Siwalik by :

    (1)  Great Boundary Fault

    (2)  Main boundary Fault

    (3)  Himalayan Frontal Thrust

    (4)  Main Himalayan Thrust

**178.** Which among the following shows the highest grade of metamorphism ?

    (1)  Granulite           (2)  Gneiss

    (3)  Schist              (4)  Phyllite

**179.** Which among the following is **not** a clastic sedimentary rock ?

    (1)  Greywacke          (2)  Arkose

    (3)  Shale              (4)  Limestone

**180.** An igneous rock will be considered 'under saturated' if it has :

    (1)  Quartz

    (2)  Nepheline

    (3)  Orthoclase feldspar

    (4)  Plagioclase feldspar

**ROUGH WORK**
रफ़ कार्य

ROUGH WORK
रफ कार्य

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P.T.O.

# अभ्यर्थियों के लिए निर्देश

*(इस पुस्तिका के प्रथम आवरण पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली-काली बाल-प्वाइंट पेन से ही लिखें)*

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त*, लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. *उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।*

4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।

5. *उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।*

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।

8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिए आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।

9. प्रत्येक प्रश्न के उत्तर के लिए केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. *ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।*

11. रफ कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त केवल ओ एम आर उत्तर-पत्र परीक्षा भवन में जमा कर दें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।