

53

QUESTION PAPER
SERIES CODE
A

Registration No. :

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Centre of Exam. :

Name of Candidate :

Signature of Invigilator

ENTRANCE EXAMINATION, 2018

M.Sc. LIFE SCIENCES

[Field of Study Code : SLISM (225)]

Time Allowed : 3 hours

Maximum Marks : 100

INSTRUCTIONS FOR CANDIDATES

Candidates must read carefully the following instructions before attempting the Question Paper :

- (i) Write your Name and Registration Number in the space provided for the purpose on the top of this Question Paper and in the Answer Sheet.
- (ii) **Please darken the appropriate Circle of Question Paper Series Code on the Answer Sheet.**
- (iii) The Question Paper is divided into two parts : Part—A and Part—B. Both parts have multiple-choice questions. All answers are to be entered in the Answer Sheet provided with the Question Paper for the purpose by darkening the correct choice, i.e., (a) or (b) or (c) or (d) with BALLPOINT PEN only against each question in the corresponding Circle.
- (iv) Part—A consists of 30 questions and all are compulsory.
- (v) Part—B contains 100 questions. **Answer any 70 questions.**
In case any candidate answers more than the required 70 questions, the first 70 questions attempted will be evaluated.
- (vi) Each correct answer carries 1 mark. **There will be negative marking and ½ mark will be deducted for each wrong answer.**
- (vii) Answer written by the candidates inside the Question Paper will not be evaluated.
- (viii) Calculators and Log Tables may be used.
- (ix) Pages at the end have been provided for Rough Work.
- (x) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination. **DO NOT FOLD THE ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS

1. Use only Blue/Black Ballpoint Pen (do not use pencil) to darken the appropriate Circle.
2. Please darken the whole Circle.
3. Darken **ONLY ONE CIRCLE** for each question as shown in example below :

Wrong	Wrong	Wrong	Wrong	Correct
● (b) (c) ●	⊗ (b) (c) (d)	⊗ (b) (c) ⊗	● (b) (c) ●	(a) (b) (c) ●

4. Once marked, no change in the answer is allowed.
5. Please do not make any stray marks on the Answer Sheet.
6. Please do not do any rough work on the Answer Sheet.
7. Mark your answer only in the appropriate space against the number corresponding to the question.
8. **Ensure that you have darkened the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

/53-A



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PART—A

Answer **all** questions

1. Alternation of generation is seen in
 - (a) all plants
 - (b) only angiosperms
 - (c) angiosperms and gymnosperms but not in bryophytes and pteridophytes
 - (d) angiosperms, gymnosperms, pteridophytes but not in bryophytes

2. Movement of substances across a cell membrane from a lower to a region of higher concentration that expends energy is called
 - (a) osmosis
 - (b) diffusion
 - (c) active transport
 - (d) facilitated diffusion

3. Panting in dogs is a process of
 - (a) showing affection
 - (b) thermoregulation
 - (c) blood pressure regulation
 - (d) blood purification

4. The pH of blood would decrease as a result of
 - (a) hyperventilation
 - (b) hypoventilation
 - (c) excessive bicarbonate production
 - (d) excessive vomiting

5. Which one of the following antibacterial drugs **does not** inhibit cell wall synthesis?
 - (a) Ampicillin
 - (b) Cephalosporin
 - (c) Erythromycin
 - (d) Vancomycin



11. Which one of the following is an amphibious plant?
- (a) Polygonum
 - (b) Hydrilla
 - (c) Casuarina
 - (d) Wolffia
12. Darwin's finches are a good example of
- (a) convergent evolution
 - (b) industrial melanism
 - (c) connecting link
 - (d) adaptive radiation
13. What is added to the 3'-end of many eukaryotic mRNAs after transcription?
- (a) Introns
 - (b) A poly A tail
 - (c) A cap structure, consisting of a modified G nucleotide
 - (d) The trinucleotide 5'-CCA
14. Mode of DNA replication in *E. coli* is
- (a) conservative and unidirectional
 - (b) semi-conservative and unidirectional
 - (c) semi-conservative and bidirectional
 - (d) conservative and bidirectional
15. In which phase of the cell cycle does DNA replication occur?
- (a) G_0
 - (b) G_1
 - (c) S
 - (d) G_2

16. Which one of the following cell compartments is associated with a protein skeleton composed of lamins?
- (a) Basement membrane
 - (b) Mitochondrion
 - (c) Nucleus
 - (d) Peroxisome
17. Adjuvants
- (a) act as carrier proteins
 - (b) cause slow release of antigen
 - (c) induce short-lived immune response
 - (d) induce only primary immune response
18. When the experimentally isolated parts of the embryo develop less structures than expected from their fate map it is referred to as
- (a) mosaic development
 - (b) regulative development
 - (c) clonal development
 - (d) syncytial development
19. Which one of the following sequences correctly orders portions of the electromagnetic spectrum in terms of increasing photon energy?
- (a) Radiowaves, infrared, visible light, UV, X-rays
 - (b) UV, X-rays, microwaves, infrared, radiowaves
 - (c) Visible light, UV, X-rays, radiowaves, infrared
 - (d) Radiowaves, UV, X-rays, visible light, infrared
20. Individuals diagnosed with xeroderma pigmentosum are more likely to develop skin cancer as they are deficient in
- (a) nucleotide excision repair
 - (b) methyl-guanine transferase
 - (c) mismatch repair
 - (d) base excision repair



21. What are the values of the image distance (d) and image height (h) for an object of 5 cm height if placed 90 cm from a double convex lens with a focal length of 30 cm?
- (a) $d = 45$ cm and $h = -2.5$ cm
(b) $d = 35$ cm and $h = -2.5$ cm
(c) $d = 55$ cm and $h = -1.5$ cm
(d) $d = 65$ cm and $h = -5$ cm
22. What will be the frequency of X-rays produced by 30 kV electrons? (Planck's constant $h = 6.63 \times 10^{-34}$ joules second, charge of electron is 1.6×10^{-19} coulombs)
- (a) 7.2×10^{18} Hz
(b) 4×10^9 Hz
(c) 7.5×10^{15} Hz
(d) 8×10^{12} Hz
23. A radioactive substance has a half-life of t . What is the time taken for 3/4th of original atoms to disintegrate?
- (a) $2t$
(b) $3t$
(c) $4t$
(d) $0.5t$
24. If 200 ml of a 5 M HCl solution is first diluted to 1 litre and then 20 ml of this diluted solution is further diluted to 1 litre, the pH of the final solution would be
- (a) 1.3
(b) 1.5
(c) 1.7
(d) 1.9
25. An acid-base neutralization is an example of which one of the following reactions?
- (a) Double displacement
(b) Single displacement
(c) Combination
(d) Decomposition



26. Enantiomers are
- (a) functional isomers
 - (b) non-superimposable stereoisomers
 - (c) structural isomers that spontaneously convert from one form to the other
 - (d) positional isomers
27. Differentiation of $\sin(x^2 + 1)$ with respect to x is
- (a) $2x\cos(x^2 + 1)$
 - (b) $3x\cos(2x)$
 - (c) $x\cos(x^2 + 1)$
 - (d) $4x\cos(x^2 + 1)$
28. What is the value of standard deviation for the following set of data?
10, 11, 12, 8, 14
- (a) 3
 - (b) 2
 - (c) 4
 - (d) 2.5
29. Which are the two numbers whose sum is 26 and whose product is as large as possible?
- (a) 10, 16
 - (b) 11, 15
 - (c) 12, 14
 - (d) 13, 13
30. Nobel prize in Physiology or Medicine for 2017 was awarded for research on
- (a) a drug for malaria
 - (b) circadian rhythm
 - (c) understanding cell cycle regulation
 - (d) autophagy

PART—B

Answer *any seventy* questions

31. The Casparian strip
- (a) limits the pathway available to water and solutes, forcing them to enter the symplast
 - (b) surrounds the root vascular tissue
 - (c) allows water to move down a water potential gradient
 - (d) is made of suberin
32. Which one of the following is *not* a characteristic of plant hormone?
- (a) They are active in small concentrations
 - (b) They are pleiotropic in their effects
 - (c) They are synthesized in specific glands and tissues
 - (d) Their responses are tissue- and time-specific
33. In vascular plants, most cytokinins are produced in which of the following plant parts?
- (a) Roots
 - (b) Shoots
 - (c) Leaves
 - (d) Lateral branches
34. The pigment that plays a key role in photomorphogenesis is
- (a) chlorophyll
 - (b) phytochrome
 - (c) cytochrome
 - (d) anthocyanin
35. The genome of cauliflower mosaic virus is a
- (a) positive-stranded RNA
 - (b) single-stranded DNA
 - (c) double-stranded DNA
 - (d) double-stranded RNA

36. Infectious single-stranded RNAs in plants that are not associated with any protein are called
- (a) viruses
 - (b) viroids
 - (c) prions
 - (d) satellite viruses
37. What best describes plant stem cells?
- (a) A group of compact undifferentiated cells without cell wall
 - (b) A group of compact undifferentiated cells with cell wall
 - (c) A group of differentiated cells with dense cytoplasm but without cell wall
 - (d) A group of differentiated cells with dense cytoplasm and cell wall
38. In hydroponics, two spinach plants were starved for nitrogen (N) for about 7 days, after which one plant was transferred to NH_4^+ containing medium (medium A) and the other plant was transferred to NO_3^- (medium B). Initial pH of both the media was same. What changes in medium pH is likely to take place?
- (a) pH of the medium A will reduce and medium B will increase
 - (b) pH will remain unchanged in both the media
 - (c) pH will similarly change in both the media
 - (d) pH of the medium A will only change but not of medium B
39. Choose the correct answer based on the given three statements :
- (i) Ethylene negatively regulates root elongation.
 - (ii) ACC is a substrate for ethylene biosynthesis.
 - (iii) Mutation in *ein2* gene abolish ethylene signalling.
- (a) ACC application will enhance root length in normal plants but not in *ein2* mutant
 - (b) ACC application will shorten root length in *ein2* mutant but not in normal plants
 - (c) ACC application will shorten root length in normal plants but not in *ein2* mutant
 - (d) ACC application will enhance root length both in *ein2* mutant and normal plants
40. Marker enzyme for plant mitochondria is
- (a) succinate dehydrogenase
 - (b) RuBisCO
 - (c) alcohol dehydrogenase
 - (d) PEP carboxylase



41. The physiologists define the term 'homeostasis' as
- (a) a condition of an equilibrium
 - (b) maintenance of nearly constant conditions in the internal environment
 - (c) a machinery for transporting ions through the cell membrane to maintain the ionic concentration differences between the extracellular and intracellular fluids
 - (d) cross-talk between the cells for ionic concentration differences between the extracellular and intracellular fluids
42. The kidneys perform their function by first filtering large quantities of
- (a) blood through the glomeruli into the macula densa
 - (b) serum through the glomeruli into the macula densa
 - (c) plasma through the glomeruli into the tubules
 - (d) extracellular fluids to the loop of Henle
43. In human eyes, light exposure to the retinal photoreceptors
- (a) causes its depolarization
 - (b) causes its hyperpolarization
 - (c) opens Na^+ channels
 - (d) opens K^+ channels
44. Which one of the following cellular arrangements from inner to outer side of the retinal layer is correct?
- (a) Ganglionic cells — Bipolar cells — Photoreceptors — Choroids
 - (b) Photoreceptors — Bipolar cells — Ganglionic cells — Choroids
 - (c) Photoreceptors — Ganglionic cells — Bipolar cells — Choroids
 - (d) Photoreceptors — Bipolar cells — Amacrine cells — Choroids
45. Blood is supplied to the vasa recta in the kidney by the
- (a) afferent arterioles
 - (b) arcuate arteries
 - (c) efferent arterioles
 - (d) interlobular arteries

46. Glomerular filtration
- (a) is increased by increased afferent arteriole diameter
 - (b) is always increased when cardiac output is decreased
 - (c) is increased by parasympathetic nerve activity
 - (d) produces an ultrafiltrate which is identical in composition to plasma
47. Which one of the following is correct concerning the structure and function of the heart?
- (a) The right atrium receives blood from the pulmonary circulation
 - (b) The chordae tendineae attach the semilunar valves to the walls of the ventricles
 - (c) The left ventricle ejects blood into the pulmonary circulation
 - (d) The bicuspid and mitral valves prevent blood from flowing into the atria from the ventricles
48. The intracellular potential is negative with reference to extracellular potential for
- (a) only neurons
 - (b) only liver cells
 - (c) all living cells
 - (d) only cancerous cells
49. Gamma-aminobutyric acid (GABA), a neurotransmitter is synthesized from which one of the following?
- (a) L-arginine
 - (b) L-serine
 - (c) L-glutamate
 - (d) L-tryptophan
50. Under sub-zero temperature conditions, when lakes and ponds are frozen, fish
- (a) dies as ice dissipates all the heat
 - (b) goes into hibernation in ice
 - (c) survives as it is a warm-blooded animal
 - (d) survives as water under the ice layer does not freeze

51. Which one of the following dyes is used for endospore staining?
- (a) Basic fuchsin
 - (b) Malachite green
 - (c) Methylene blue
 - (d) India ink
52. In Gram staining, iodine is used as a
- (a) mordant
 - (b) counterstain
 - (c) chelator
 - (d) decolorizer
53. Teichoic acid and lipoteichoic acid are present in cell wall of
- (a) Gram negative bacteria
 - (b) Gram positive bacteria
 - (c) fungi
 - (d) archaeobacteria
54. Which one of the following statements is **not true** about MacConkey (MAC) agar?
- (a) It functions as selective and differential media
 - (b) It contains bile salt and crystal violet
 - (c) It contains lactose as a carbon and energy source
 - (d) Colonies of Gram negative bacteria have a green metallic sheen on this plate
55. Which one of the following is true for the mechanism of action of antibacterial drug, fluoroquinolones?
- (a) Inhibits DNA gyrase and topoisomerase II, thereby blocks DNA replication
 - (b) Inhibits bacterial DNA-dependent RNA polymerase
 - (c) Binds to plasma membrane and disrupts its structure
 - (d) Blocks folic acid synthesis by inhibiting tetrahydrofolate reductase

56. Which one of the following is used as an antimalarial drug?
- (a) Acyclovir
 - (b) Metronidazole
 - (c) Artemisinin
 - (d) Nalidixic acid
57. Which one of the following viruses is transmitted through 'fecal-oral' route?
- (a) Hepatitis A
 - (b) Hepatitis B
 - (c) Hepatitis C
 - (d) Hepatitis D
58. Which one of the following statements **does not** apply to the gut microbiome?
- (a) It can change with diet
 - (b) It can provide our bodies with certain necessary vitamins
 - (c) It helps crowd out incoming pathogens
 - (d) It is primarily composed of pathogenic agents
59. Which one of the following bacteria lacks a cell wall and is therefore resistant to penicillin?
- (a) Cyanobacteria
 - (b) Mycoplasmas
 - (c) Bdellovibrios
 - (d) Spirochetes
60. Which one of these terms is a name for a form of leishmaniasis?
- (a) Delhi Belly
 - (b) Kala Azar
 - (c) Baghdad Boil
 - (d) Dum Dum



61. Which one of the following statements is **not true** about vitamin D?
- (a) It is converted into a hormone
 - (b) Its deficiency causes rickets in children
 - (c) Raw milk is a good source of vitamin D
 - (d) 7-Dehydrocholesterol in human skin is converted to cholecalciferol by UV radiation
62. For a reaction X, $\Delta G = -10$ kcal/mole, while for reaction Y, $\Delta G = -5$ kcal/mole. Choose the correct statement about their reaction rates :
- (a) Rate of reaction X will exceed the rate of Y
 - (b) Rate of reaction Y will exceed the rate of X
 - (c) If the activation energy of reaction Y is less than the activation energy of reaction X, then the rate of reaction Y will exceed the rate of X
 - (d) No valid comparison of reaction rates can be made from the above information
63. Which one of the following statements is **not true** for heparin?
- (a) It is sulfated acidic mucopolysaccharide
 - (b) It is commonly administered as an anticoagulant
 - (c) Repeating unit of heparin consists of glucouronic acid and N-acetyl-galactosamine-4-sulfate
 - (d) Repeating unit of heparin consists of glucouronic acid 2-sulfate and glucosamine-6-sulfate-2-N-sulfate
64. Which one of the following statements is **not true** for estrogens?
- (a) It has 18 carbon atoms
 - (b) This class of steroid has an aromatic ring
 - (c) It has a single methyl group attached to steroid nucleus
 - (d) It has an OH at carbon 11
65. For the oxidation of myristic acid (14 carbons) to CO_2 and H_2O , how many net moles of ATP are produced?
- (a) 113
 - (b) 84
 - (c) 114
 - (d) 110

66. How many malonate units are consumed in the cytoplasmic synthesis of palmitic acid (16 carbons)?
- (a) 5
 - (b) 6
 - (c) 7
 - (d) 8
67. Where are the two nitrogen atoms of urea derived from in the urea cycle?
- (a) γ -Amino group of ornithine and α -amino group of ornithine
 - (b) α -Amino group of ornithine and carbamoyl phosphate nitrogen
 - (c) Carbamoyl phosphate nitrogen and aspartate nitrogen
 - (d) Aspartate nitrogen and γ -amino group of ornithine
68. In which order are the three components of purine nucleotides produced or attached during synthesis?
- (a) Pyrimidine ring, imidazole ring, then ribose 5-P
 - (b) Ribose 5-P, pyrimidine ring, then imidazole ring
 - (c) Imidazole ring, ribose 5-P, then pyrimidine ring
 - (d) Ribose 5-P, imidazole ring, then pyrimidine ring
69. Oxidation of fatty acids in mitochondria generates which one of the following end products?
- (a) Acyl-CoA
 - (b) Acetyl-CoA
 - (c) Glycerol
 - (d) Triglyceride
70. If you have to prepare one millimolar (mM) solution of sodium chloride in one litre of water, how much quantity of sodium chloride you would dissolve in the water?
- (a) 58.44 g
 - (b) 5.844 g
 - (c) 58.44 mg
 - (d) 5.844 mg

71. A female left-handed coiled snail with genotype (Ss) mates with a male right-handed coiled snail with genotype (ss). The probability of a progeny having right-handed coiled shell is
- (a) 0
 - (b) 0.25
 - (c) 0.5
 - (d) 1
72. In a plant, R (round seed) is dominant over r (wrinkled seed) and Y (green leaf) is dominant over y (yellow leaf). A plant with a genotype Rryy is crossed with a plant RrYy. The fraction of progeny possessing wrinkled seed and yellow leaf will be
- (a) 1/16
 - (b) 1/8
 - (c) 1/4
 - (d) 1/2
73. The coat colour in cattle is an example of incomplete dominance. A red cow (RR) is mated with a Roan bull (Rr). The fraction of progeny possessing red coat will be
- (a) 0
 - (b) 0.25
 - (c) 0.5
 - (d) 1
74. In bacteria, conjugation occurs between which of the following cell types?
- (a) F and F'
 - (b) F and F
 - (c) F' and F'
 - (d) Hfr and F'
75. Which one of the following is the correct order of the basic processes involved in Ecological succession?
- (a) Invasion — Nudation — Competition and coaction — Reaction — Stabilization
 - (b) Invasion — Stabilization — Competition and coaction — Reaction — Nudation
 - (c) Nudation — Invasion — Competition and coaction — Reaction — Stabilization
 - (d) Nudation — Stabilization — Competition and coaction — Invasion — Reaction

76. The term alpha diversity refers to
- (a) genetic diversity
 - (b) community and ecosystem diversity
 - (c) species diversity
 - (d) diversity among the plants
77. Of the following four, which one is *not in situ* conservation?
- (a) National park
 - (b) Wildlife Sanctuary
 - (c) Biological resources repository
 - (d) Biosphere reserve
78. Sympatric speciation occurs *not* as a result of reproductive isolation due to
- (a) geographic isolation
 - (b) barrier of mating
 - (c) barrier of gene flow
 - (d) genetic change (mutation)
79. The first life on the earth was
- (a) cyanobacterium
 - (b) photoautotroph
 - (c) chemoheterotroph
 - (d) fungus
80. Evolutionary process occurring in a species where accumulation of gradual changes becomes distinct to form a different species is
- (a) Cladogenesis
 - (b) Anagenesis
 - (c) Phylogenesis
 - (d) Heterogenesis

81. Which one of the following enzymes is carried by retroviruses?
- (a) RNA-dependent RNA polymerase
 - (b) DNA-dependent DNA polymerase
 - (c) RNA-dependent DNA polymerase
 - (d) RNA replicase
82. A tautomeric shift causing the substitution of one purine for another purine is called
- (a) transversion
 - (b) transition
 - (c) inversion
 - (d) translocation
83. In *E. coli*, the inability of the *lac* repressor to bind an inducer would result in
- (a) no substantial synthesis of galactosidase
 - (b) constitutive synthesis of galactosidase
 - (c) inducible synthesis of galactosidase
 - (d) synthesis of galactosidase only in the absence of lactose
84. If the molar amount of G in a DNA sample is 20%, what is the molar amount of T in the sample?
- (a) 20%
 - (b) 30%
 - (c) 40%
 - (d) 60%
85. Which one of the following enzymes is involved in RNA editing in mammals?
- (a) RNA polymerase I
 - (b) RNA methyl transferase
 - (c) Cytidine deaminase
 - (d) Apolipoproteinase



86. Chemical reactivity of RNA is due to
- (a) uracil
 - (b) single strandedness
 - (c) 2'-OH
 - (d) ethidium bromide
87. Which scientists first gave experimental evidence that DNA is the genetic material?
- (a) Avery, MacLeod and McCarty who repeated the transformation experiments of Griffith and chemically characterized the transforming principle
 - (b) Garrod, who postulated that alcaptonuria or black urine disease was due to a defective enzyme
 - (c) Beadle and Tatum, who used a mutational and biochemical analysis of the bread mold *Neurospora* to establish a direct link between genes and enzymes
 - (d) Meselson and Stahl who showed that DNA is replicated semi-conservatively
88. In your opinion what would happen to a muscle, if Troponin and Tropomyosin complexes are removed from the Actin?
- (a) Actin will strongly bind with Myosin
 - (b) Actin-Myosin interaction will be inhibited
 - (c) Actin will convert into G-Actin
 - (d) ATP hydrolyzing sites at Myosin heads gets deactivated
89. Northern blot hybridization for measurement of a cellular mRNA from higher eukaryotic cells depicts
- (a) synthesis of mRNA
 - (b) half-life of mRNA
 - (c) steady-state level of mRNA
 - (d) sequence of mRNA
90. Which one of the following microscopes would you use to visualize a given protein in a living cell?
- (a) Fluorescence
 - (b) Stereozoom
 - (c) Electron
 - (d) Scanning

91. Which one of the following phases of meiosis is suitable to study homologous recombination of chromosomes?
- (a) Meiotic S phase
 - (b) Meiosis I
 - (c) Meiosis II
 - (d) Metaphase
92. Which domain of a cell surface receptor is primarily involved in signalling property?
- (a) Extracellular
 - (b) Transmembrane
 - (c) Intracellular
 - (d) Dimerizing
93. Which one of the following second messengers is generated by the G-protein coupled receptor present in the human eye?
- (a) Diacyl glycerol (DAG)
 - (b) cGMP
 - (c) cAMP
 - (d) Inositol 3,4,5-phosphate (IP3)
94. Which one of the following cellular processes in mammalian cells is involved with lysosome?
- (a) Apoptosis
 - (b) Autophagy
 - (c) Senescence
 - (d) G_1 -arrest
95. Inflammation *does not*
- (a) destroy and remove pathogens
 - (b) distribute the pathogen evenly throughout the system
 - (c) confine the pathogen and its products
 - (d) repair the damaged tissue



- 96.** Cells that express antigen-specific receptors are
- (a) dendritic cells
 - (b) mast cells
 - (c) neutrophils
 - (d) lymphocytes
- 97.** Innate immunity
- (a) is the first to engage upon initial encounter with antigen
 - (b) is the most pathogen-specific
 - (c) responds more effectively during a subsequent exposure
 - (d) is the target of vaccination
- 98.** Epimorphosis is regeneration through
- (a) repatterning of existing cells, as occurs in Hydra
 - (b) reinitiation of division in existing cells, followed by patterning, as occurs in Hydra
 - (c) reinitiation of division in existing cells, followed by patterning, as occurs in amphibians such as newts
 - (d) repatterning of existing cells, as occurs in amphibians
- 99.** Which one of the following types of stem cells can be derived from a differentiated diseased human cell?
- (a) Embryonic
 - (b) Bone marrow
 - (c) Inducible pluripotent
 - (d) Neuronal
- 100.** In order to generate a knock-out mouse for a specific single copy gene, which of the following approaches can be adopted?
- (a) DNA fingerprinting
 - (b) Chromatin remodelling
 - (c) PCR amplification
 - (d) Homologous recombination
- 101.** An atom or molecule that has an unpaired electron in its outer shell is referred to as
- (a) heavy ion
 - (b) recoil proton
 - (c) free radical
 - (d) spallation product

- 102.** The type of radiation-induced DNA damage, that mostly cause cell killing on exposure to ionizing radiation is
- (a) DNA double-strand break
 - (b) DNA single-strand break
 - (c) DNA-DNA inter-strand cross link
 - (d) DNA-protein cross link
- 103.** The organ which is most commonly damaged by ultraviolet rays is
- (a) skin
 - (b) lung
 - (c) heart
 - (d) liver
- 104.** Which one of the following assays is specific to detection of cells undergoing apoptosis?
- (a) Trypan Blue staining
 - (b) Annexin V labelling
 - (c) Staining with pimonidazole
 - (d) DAPI
- 105.** Which one of the following expressions best describes generation of cancer?
- (a) Mutation and recombination
 - (b) Proliferation and differentiation
 - (c) Mitosis and meiosis
 - (d) Genomic instability and heterogeneity
- 106.** Which one of the following statements regarding nocodazole is correct?
- (a) Binds and stabilizes actin filament
 - (b) Binds actin subunits and prevents their polymerization
 - (c) Binds and stabilizes microtubules
 - (d) Binds microtubule subunits and prevent their polymerization

107. What is the correct expression for the surface energy E of a drop of water of diameter D and the surface tension σ ?
- (a) $E = \sigma\pi D^2$
 - (b) $E = \sigma\pi^2 D^2$
 - (c) $E = \sigma\pi^2 D$
 - (d) $E = \sigma/(\pi D^2)$
108. From which layer of the atmosphere the radiowaves are reflected back?
- (a) Troposphere
 - (b) Stratosphere
 - (c) Ionosphere
 - (d) Mesosphere
109. A water drop of 10 mg and having a charge of 0.98×10^{-6} C stays suspended in a room. What is the electric field in the room, if it is acting upwards?
- (a) 20 N/C
 - (b) 50 N/C
 - (c) 100 N/C
 - (d) 200 N/C
110. A battery of e.m.f. 6 V and internal resistance 1.0 ohm is connected to a resistor. If the current in the circuit is 0.5 amp, what is the resistance of the resistor?
- (a) 2 ohms
 - (b) 5 ohms
 - (c) 11 ohms
 - (d) 23 ohms
111. A proton travelling in a vacuum with the velocity V_1 at right angles to a uniform magnetic field experiences twice the force that an alpha particle experiences when it is travelling along the same path with velocity V_2 . The ratio of V_1/V_2 is
- (a) 1:2
 - (b) 1:1
 - (c) 4:1
 - (d) 2:1



112. An iron ball of 7 kg is dropped from a height 5 m. What is the value of the kinetic energy of the iron ball when it reaches the ground?
- (a) 234 J
(b) 645 J
(c) 343 J
(d) 219 J
113. What is the momentum of a photon of energy 2 MeV, when velocity of photon is equal to the light?
- (a) 1.07×10^{-21} kg m/s
(b) 6×10^{-8} kg m/s
(c) 2 kg m/s
(d) 6×10^8 kg m/s
114. Hofmann rearrangement reaction involving acetamide and alkaline hypobromite ($\text{Br}_2 + \text{NaOH}$) results in the formation of
- (a) acetic acid
(b) acetic anhydride
(c) methanol
(d) methyl amine
115. The predominant species in a reaction between aniline and $\text{Ar}-\text{N}=\text{N}^+$ is a
- (a) N-aryl amino product
(b) diazo product
(c) diazo-amino product
(d) deaminated product
116. Which one of the following statements is *incorrect*?
- (a) If the reaction has zero activation energy then it is independent of temperature
(b) The thermodynamic parameter, equilibrium constant (K_{eq}) of any reaction is dependent on the temperature of the reaction (T)
(c) A chemical reaction is considered spontaneous if the value of change in free energy parameter (ΔG) is negative
(d) Free energy change (ΔG) of a reaction is lowered when it is catalyzed by an enzyme



117. Sedimentation coefficient is the rate
- at which a molecule sediments
 - of change of centrifugal velocity of a sedimenting particle
 - of change of angular velocity as a function of the centrifugal force experienced by the particle
 - of sedimentation per unit centrifugal acceleration
118. The standard enthalpy of formation of gaseous H_2O at 298 K is $-241.82 \text{ kJ mol}^{-1}$. Assuming that the heat capacities are independent of temperature, what would be the standard enthalpy at 100 °C given the following values of the molar heat capacities at constant pressure?
- $\text{H}_2\text{O(g)}: 33.58 \text{ JK}^{-1} \text{ mol}^{-1}$; $\text{H}_2(\text{g}): 28.84 \text{ JK}^{-1} \text{ mol}^{-1}$; $\text{O}_2(\text{g}): 29.37 \text{ JK}^{-1} \text{ mol}^{-1}$
- $242.6 \text{ kJ mol}^{-1}$
 - $342.3 \text{ kJ mol}^{-1}$
 - $442.7 \text{ kJ mol}^{-1}$
 - $652.8 \text{ kJ mol}^{-1}$
119. The formation of ethyl acetate from ethanol and acetic acid at 25 °C has an equilibrium constant (K_{eq}) of approximately 1.0. This implies that when ethanol
- and acetic acid are mixed together, then 50% of this would be converted to product
 - acetic acid, ethyl acetate and water are mixed together then they would be in equilibrium with one another
 - and acetic acid are mixed together in molar ratio, then 50% of this would be converted to product
 - acetic acid, ethyl acetate and water are mixed together in molar ratio, then they would be in equilibrium with one another
120. The Raman effect is a result of
- elastic scattering of light by atoms or molecules
 - inelastic scattering of light by atoms or molecules
 - diffraction of light by atoms or molecules
 - dispersion of light by atoms or molecules



121. Solving the integral

$$\int \frac{x+3}{(x^2+6x)^4} dx$$

would result in

- (a) $\frac{1}{6} [1/(x^2+6x)^3]$
(b) $\frac{1}{3} [1/(x^2+6x)]$
(c) $\frac{1}{6} [1/(x+4x)^3]$
(d) $\frac{1}{3} [1/(x^2+2x)^6]$
122. If $a * b = a^2 + b^2$, then the value of $(2 * 3) * 4$ is
(a) $(2^2 + 3^2) + 4^2$
(b) $(2+3)^2 + 4^2$
(c) $13^2 + 4^2$
(d) $(2+3+4)^2$
123. The absolute maximum of the function $f(x) = 3x^2 - 2x$ at the interval $[-1, 0]$ will occur at what value of x ?
(a) $x = -1$
(b) $x = -1/3$
(c) $x = 1/3$
(d) $x = 0$
124. The values of the bases and heights of a cylinder are same as that of a cone. Given the volume of the cylinder is 27 cm^3 , what is the value of the volume of the cone?
(a) 7.3 cm^3
(b) 9.0 cm^3
(c) 12.5 cm^3
(d) 18 cm^3
125. The linear equations of the two graphs are $ax + by = c$ and $bx - ay = c$ and the values of a , b and c are all not equal to zero. Which of the following is correct for these linear graphs?
(a) They are parallel
(b) They intersect at one point
(c) They intersect at two points
(d) They are perpendicular



126. What are the values for a and b , given that $y = ax + b$ is a tangent line to the curve, $y = x^2 + 3x + 2$ at $x = 3$?
- (a) $a = 8, b = -7$
 - (b) $a = -7, b = -9$
 - (c) $a = -9, b = 7$
 - (d) $a = 9, b = -7$
127. A car travels up a hill at a constant speed of 40 km/hour and the same car travels down the hill at a constant speed of 70 km/hour. What is the value of average speed for the whole trip?
- (a) 42.2 km/hour
 - (b) 55.0 km/hour
 - (c) 60.3 km/hour
 - (d) 50.9 km/hour
128. The chief constituent of gobar gas is
- (a) ethane
 - (b) methane
 - (c) hydrogen
 - (d) carbon
129. Which one of the following memories is an optical memory?
- (a) Floppy disk
 - (b) Bubble memory
 - (c) CD-ROM
 - (d) Core memory
130. Web pages are written using
- (a) FTP
 - (b) HTML
 - (c) HTTP
 - (d) URL