AIPMT MOCK TEST

Section A: Chemistry

1. How many moles of sodium phosphate can be made from 0.240 mol of sodium hydroxide by the following unbalanced reaction?

$$NaOH(aq) + H_3PO_4(aq) \rightarrow Na_3PO_4(aq) + H_2O$$

(1) 0.05 mol
(2) 0.0800 mol
(3) 0.01 mol
(4) 0.060 mol

2. The van der Waals constants for a gas are: $a = 4\ L^2\ atm\ mol^{-2}$, $b = 0.04\ L\ mol^{-1}$. Its Boyle's temperature is roughly

(1) 100°C
(2) 1220 K
(3) 1220°C
(4) 1600 K

3. The unit cell of a metallic element of atomic mass 108 and density 10.5 g cm^{-3} is a cube with edge length of 409 pm. The structure of the crystal lattice is

(1) fcc.
(2) bcc.
(3) hcp.
(4) none of these.

4. What volume of 0.1 M H_2SO_4 will be required to produce 17.0 g of H_2S by the following reaction?

$$5H_2SO_4 + 10NaI \rightarrow 4Na_2SO_4 + 5I_2 + H_2S + 4H_2O$$

(1) 30.0 L
(2) 50.0 L
(3) 25.0 L
(4) 5.0 L

5. Which of the following colligative properties can help to determine the molar mass of a protein with the greatest precision?

(1) Elevation in boiling point
(2) Depression in freezing point
(3) Osmotic pressure
(4) Relative lowering of vapor pressure

6. The energies E_1 and E_2 of two radiations are 25 eV and 50 eV, respectively. The relation between their wavelengths, that is, λ_1 and λ_2 will be

(1) $\lambda_1 = \frac{1}{2}\lambda_2$
(2) $\lambda_1 = \lambda_2$
(3) $\lambda_1 = 2\lambda_2$
(4) $\lambda_1 = 4\lambda_2$

7. If $n = 6$, the correct sequence of filling of electrons will be

(1) $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n-2)f$

(2) $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$
(3) $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$
(4) $ns \rightarrow (n-2)f \rightarrow np \rightarrow (n-1)d$

8. The number of electrons involved in the reduction of nitrate ion (NO_3^-) to hydrazine (N_2H_4) is
(1) 8
(2) 7
(3) 5
(4) 3

9. What is the composition of toluene in vapor phase of solution at 30°C with a benzene–toluene solution which has a mole fraction of benzene of 0.400? ($p_B^0 = 119$ torr and $p_T^0 = 37.0$ torr)
(1) 1.318
(2) 2.318
(3) 3.318
(4) 0.318

10. When HCl(g) is passed through a saturated solution of common salt, pure NaCl is precipitated because
(1) HCl is highly soluble in water.
(2) The ionic product $[Na^+]$ $[Cl^-]$ exceeds its solubility product (K_{sp}).
(3) The K_{sp} of NaCl is lowered by the presence of Cl^- ions.
(4) HCl causes dissolution.

11. The correct order about of C–O bond length in the following is
(I) CO (II) CO_2 (III) CO_3^{2-}
(1) II < I < III
(2) III < II < I
(3) I < II < III
(4) I < III < II

12. If the enthalpy change for the transition of liquid water to steam is 30 kJ mol^{-1} at 27°C, the entropy change for the process would be (in J mol^{-1} K^{-1})
(1) 100
(2) 10
(3) 1.0
(4) 0.1

13. In a system $A(s) \rightleftharpoons 2B(g) + 3C(g)$. If the concentration of C at equilibrium is increased by a factor of 2, it will cause the equilibrium concentration of B to change to
(1) two times of its original value.
(2) one half of its original value.
(3) $2\sqrt{2}$ times of its original value.
(4) $1/2\sqrt{2}$ times of its original value.

14. The number of *d* electrons in Cu^+ (atomic number = 29) that can have the spin quantum (−1/2) is
(1) 5
(2) 6

(3) 3
(4) 7

15. When NaCl is doped with $MgCl_2$, the nature of defect produced is
(1) Interstitial.
(2) Frenkel.
(3) Schottky.
(4) None of these.

16. Copper crystallizes in a face-centered cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm?
(1) 108
(2) 128
(3) 157
(4) 181

17. The reaction rate increases with rise in temperature due to
(1) increase in activation energy.
(2) increase in effective collisions between molecules.
(3) decrease in activation energy.
(4) decrease in minimum kinetic energy (threshold energy) required for the reaction to occur.

18. The equilibrium constant for the following reaction at 298 K is expressed as $x \times 10^y$.
$2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$, $E^o_{cell} = 0.235\,V$. The value of *y* is ___.
(1) 2
(2) 7
(3) 10
(4) 6

19. Among the elements with the following atomic numbers, which are *d*-block elements?
(I) 29 (II) 81 (III) 46 (IV) 58
(1) (I), (IV)
(2) (IV), (II)
(3) (I), (III)
(4) (II), (III)

20. The BCl_3 is a planar molecule, whereas NCl_3 is pyramidal because
(1) N−Cl bond is more covalent than B–Cl bond.
(2) B−Cl bond is more polar than N–Cl bond.
(3) Nitrogen atom is smaller than boron.
(4) BCl_3 has no lone pair but NCl_3 has one lone pair of electrons.

21. On moving from left to right in a period in transition metals, their atomic size
(1) decreases.
(2) increases.
(3) remains the same.
(4) none of these.

22. Which of the following salts are insoluble for the lanthanoids?
(1) Sulphates

(2) Perchlorates
(3) Fluorides
(4) Nitrates

23. Which of the following compounds consists of a P-P linkage?
(1) hypophosphoric acid
(2) pyrophosphoric acid
(3) orthophosphoric acid
(4) metaphosphoric acid

24. Which of the following is formed when aluminium oxide and carbon are strongly heated in dry chlorine gas?
(1) Aluminium chloride
(2) Hydrated aluminium chloride
(3) Anhydrous aluminium chloride
(4) None of these

25. Which of the following metal ions is expected to be coloured?
(1) Zn^{2+}
(2) Ti^{3+}
(3) Sc^{3+}
(4) Ti^{4+}

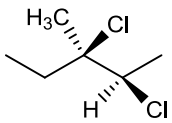
26. In the complex $[Pt(py)_4][PtCl_4]$, the oxidation number of Pt atoms in the former and latter parts of the complex are, respectively,
(1) 0 and 0
(2) +4 and +2
(3) +2 and +2
(4) 0 and +4

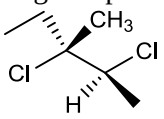
27. According to Werner's theory, the primary valencies of the central metal atom
(1) are satisfied by negative ions.
(2) are satisfied by negative ions or neutral molecule.
(3) decide the geometry of the complex.
(4) are equal to its coordination number.

28. Which of the following complexes obeys the EAN rule?
(1) $[Pt(NH_3)_4]^{2+}$
(2) $[Ni(NH_3)_6]^{2+}$
(3) $[Cr(NH_3)_6]^{3+}$
(4) $[Fe(CN)_6]^{4-}$

29. In the reaction $(CH_3)_2CH - CH = CH_2 \xrightarrow{HCl}$ the product obtained is
(1) $(CH_3)_2CCl - CH_2CH_3$
(2) $(CH_3)_2CH - \underset{\displaystyle Cl}{\underset{|}{CH}} - CH_3$
(3) a mixture of (1) and (2)
(4) none of these.

30. How are the following compounds related?





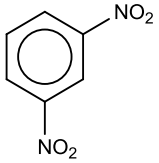
(1) Diastereomers
(2) Enantiomers
(3) Mesomeric compounds
(4) Identical

31. The compound which reacts the fastest with Lucas reagent at room temperature is
(1) butan-1-ol
(2) 2-methyl-propan-2-ol
(3) 2-methyl-1-propan-1-ol
(4) butan-2-ol

32. Identify the compound C in the following reaction sequence:

$$C_6H_6 \xrightarrow[(2)\,NaOH]{(1)\,Oleum} A \xrightarrow[H_2SO_4]{conc.\,HNO_3} B \xrightarrow{Zn\ dust} C$$
$$(3)\,H^+$$

(1)



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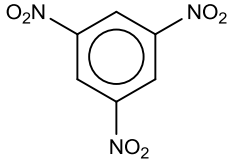

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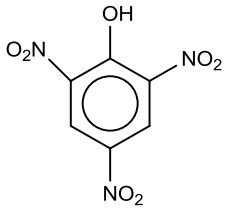

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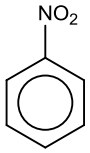


33. An unsaturated hydrocarbon upon ozonolysis gives one mole each of formaldehyde, acetaldehyde and methylglyoxal (CH_3COCHO). The structure of the hydrocarbon is
(1) $CH_2=CH–CH_2–CH=CH_2$.
(2) $CH_2=CH–C(CH_3)=CH–CH_3$.
(3) $(CH_3)_2C=CH–CH_3$.
(4) $CH_3–CH=C(CH_3)–CH_3$.

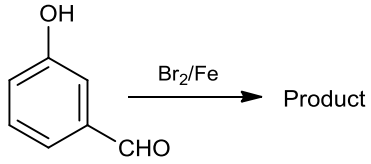
34. In the reaction $CH_3CH_2I \xrightarrow{alc.\,KOH} X \xrightarrow{Br_2} Y \xrightarrow{KCN} Z$, the product Z is
(1) CH_3CH_2CN
(2) CH_2BrCH_2CN
(3) $CNCH_2CH_2CN$
(4) $BrCH=CHCN$

35. Reduction of benzenediazonium chloride with Zn/HCl gives
(1) aniline.

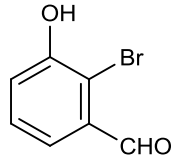
(2) phenylhydrazine.
(3) azobenzene.
(4) hydrazobenzene.

36. The helical structure of protein is stabilized by
(1) dipeptide bonds.
(2) hydrogen bonds.
(3) ether bonds.
(4) peptide bonds.

37. What should be the product in the following reaction?



(1)



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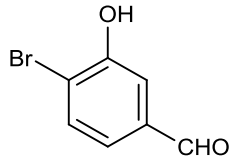

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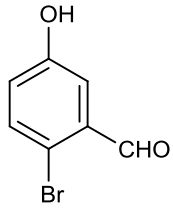

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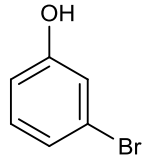


38. Which statement below does not occur during the formation of an addition polymer?
(1) Free radicals initiate the process.
(2) Certain double bonds in monomers are replaced with single bonds.
(3) Propagation involves a reaction between two free radicals.
(4) Termination occurs when the free radicals are used up.

39. The process of eutrophication is due to

(1) increase in concentration of insecticide in water.

(2) increase in concentration of fluoride ion in water.

(3) the reduction in concentration of the dissolved oxygen in water due to phosphate pollution in water.

(4) attack of younger leaves of a plant by peroxyacetyl nitrate.

40. The correct order of increasing thermal stability of K_2CO_3, $MgCO_3$, $CaCO_3$ and $BeCO_3$ is

(1) $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$

(2) $MgCO_3 < BeCO_3 < CaCO_3 < K_2CO_3$

(3) $K_2CO_3 < MgCO_3 < CaCO_3 < BeCO_3$

(4) $BeCO_3 < MgCO_3 < K_2CO_3 < CaCO_3$

41. Which one of the following is employed as a tranquilizer?

(1) Chlorpheniramine

(2) Equanil

(3) Naproxen

(4) Tetracycline.

42. Sulphide ores of metals are usually concentrated by froth flotation process. Which one of the following sulphide ores offer an exception and is concentrated by chemical leaching?

(1) Galena

(2) Copper pyrite

(3) Sphalerite

(4) Argentite

43. The Langmuir adsorption isotherm is deduced using the assumption

(1) the adsorption sites are equivalent in their ability to adsorb the particles.

(2) the heat of adsorption varies with coverage.

(3) the adsorbed molecules interact with each other.

(4) the adsorption takes place in multilayers.

44. Which of the following represents the correct order of the acidity in the given compounds?

(1) $FCH_2COOH > CH_3COOH > BrCH_2COOH > ClCH_2COOH$

(2) $BrCH_2COOH > ClCH_2COOH > FCH_2COOH > CH_3COOH$

(3) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$

(4) $CH_3COOH > BrCH_2COOH > ClCH_2COOH > FCH_2COOH$

45. A buffer solution is prepared in which the concentration of NH_3 is 0.30 M and the concentration of NH_4^+ is 0.20 M. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution?

(1) 8.73

(2) 9.08

(3) 9.43

(4) 11.72

Section-B Biology

46. In the light of recent classification of living organisms into three domains of life (bacteria, archaea and eukarya), which one of the following statements is true about Archea?

(1) Archaea completely differ from prokaryotes.

(2) Archaea resemble eukarya in all respects.
(3) Archaea have some novel features that are absent in other prokaryotes and eukaryotes.
(4) Archaea completely differ from both prokaryotes and eukaryotes.

47. Organisms called methanogens are most abundant in
(1) hot spring
(2) sulphur rock
(3) cattle yard
(4) polluted stream

48. Pigment-containing membranous extensions in some cyanobacteria are
(1) heterocysts
(2) basal bodies
(3) pneumatophores
(4) chromatophores

49. *Cycas* and *Adiantum* resemble each other in having
(1) cambium
(2) vessels
(3) seeds
(4) motile sperms

50. T.O. Diener discovered a
(1) bacteriophage
(2) free infectious DNA
(3) free infectious RNA
(4) infectious protein

51. In which one of the following male and female gametophytes do not have free living independent existence?
(1) *Cedrus*
(2) *Pteris*
(3) *Funaria*
(4) *Polytrichum*

52. *Ascaris* is characterized by
(1) Presence of true coelom and metamerism (metamerization).
(2) Absence of true coelom but presence of metamerism.
(3) Presence of neither true coelom nor metamerism.
(4) Presence of true coelom but absence of metamerism

53. Which one of the following in birds, indicates their reptilian ancestry?
(1) Eggs with a calcareous shell.
(2) Scales on their hind limbs.
(3) Four-chambered heart.
(4) Two special chambers crop and gizzard in their digestive tract.

54. In which one of the following, the genus name, its two characters and its phylum are not correctly matched, whereas the remaining three are correct?

	Genus name	**Two characters**	**Phylum**

(1)	*Sycon*	(i) Pore bearing (ii) Canal system	Porifera
(2)	*Periplanata*	(i) Jointed appendages (ii) Chitinous exoskeleton	Arthropoda
(3)	*Pila*	(i) Body segmented (ii) Mouth with radula	Mollusca
(4)	*Asterias*	(i) Spiny skinned (ii)Water vascular system	Echinodermata

55. Membrane-bound organelles are absent in
(1) *Chlamydomonas*
(2) *Plasmodium*
(3) *Saccharomyces*
(4) *Streptococcus*

56. The fruit is chambered, developed from inferior ovary and has seeds with succulent testa in
(1) cucumber.
(2) pomegranate.
(3) orange.
(4) guava.

57. The scutellum observed in a grain of wheat or maize is comparable to which part of the seed in other monocotyledons?
(1) Plumule
(2) Cotyledon
(3) Endosperm
(4) Aleurone layer

58. Cymose inflorescence is present in
(1) *Trifolium*
(2) *Brassica*
(3) *Solanum*
(4) *Sesbania*

59. About 70% of total global carbon is found in
(1) forests.
(2) grasslands.
(3) agroecosystems.
(4) oceans.

60. Among bitter gourd, mustard, brinjal, pumpkin, china rose, lupin, cucumber, sunnhemp, gram, guava, bean, chilli, plum, *Petunia*, tomato, rose, *Withania*, potato, onion, *Aloe* and tulip how many plants have hypogynous flower?
(1) Six
(2) Ten
(3) Fifteen
(4) Eighteen

61. Heartwood differs from sapwood in
(1) being susceptible to pests and pathogens.

(2) presence of rays and fibers.
(3) absence of vessels and parenchyma.
(4) having dead and non-conducting elements.

62. The length of different internodes in a culm of sugarcane is variable because of
(1) intercalary meristem.
(2) shoot apical meristem.
(3) position of axillary buds.
(4) size of leaf lamina at the node below each internode.

63. If a live earthworm is pricked with a needle on its outer surface without damaging its gut, the fluid that comes out is
(1) slimy mucus
(2) excretory fluid
(3) coelomic fluid
(4) haemolymph

64. Select the correct statement from the ones given below with respect to *Periplaneta americana*.
(1) There are 16 very long Malpighian tubules present at the junctions of midgut and hindgut.
(2) Grinding of food is carried out only by the mouth parts.
(3) Nervous system located dorsally, consists of segmentally arranged ganglia joined by a pair of longitudinal connectives.
(4) Males bear a pair of short thread-like anal styles.

65. The Golgi complex plays a major role
(1) in trapping the light and transforming it into chemical energy.
(2) in digesting proteins and carbohydrates.
(3) as energy transferring organelles.
(4) in post translational modification of proteins and glycosidation of lipids.

66. Select the correct statement from the following regarding cell membrane.
(1) Lipids are arranged in bilayer with polar heads towards the inner part.
(2) Fluid mosaic model of cell membrane was proposed by Singer and Nicolson.
(3) Na^+ and K^+ ions move across cell membrane by passive transport.
(4) Proteins make up 60–70% of the cell membrane.

67. Which one of the following has its own DNA?
(1) Peroxisome
(2) Mitochondria
(3) Dictyosome
(4) Lysosome

68. An example of axile placentation is
(1) Marigold
(2) *Argemone*
(3) *Dianthus*
(4) Lemon

69. Cytoskeleton is made up of
(1) proteinaceous filaments.
(2) calcium carbonate granules.

(3) callose deposits.
(4) cellulose microfibrils.

70. Carbohydrates are commonly found as starch in plant storage organs. Which of the following five properties of starch (a–e) make it useful as a storage material?
(i) Easily translocated (ii) Chemical non-reactive
(iii) Easily digested by animals (iv) Osmotically inactive
(v) Synthesized during photosynthesis
The useful properties are
(1) Both (i) and (v) (2) Both (ii) and (iii)
(3) Both (ii) and (iv) (4) (i), (iii) and (v)

71. The essential chemical components of many coenzymes are
(1) proteins
(2) nucleic acids
(3) carbohydrates
(4) vitamins

72. Meiosis takes place in
(1) Meiocyte
(2) Conidia
(3) Gemmule
(4) Megaspore

73. During mitosis, endoplasmic reticulum and nucleolus begin to disappear at
(1) Late metaphase.
(2) Early prophase.
(3) Late prophase.
(4) Early metaphase.

74. The rupture and fractionation do not usually occur in the water column in vessel/tracheids during the ascent of sap because of
(1) transpiration pull.
(2) lignified thick walls.
(3) cohesion and adhesion.
(4) weak gravitational pull.

75. Which one of the following is the incorrect statement?
(1) Phosphorus is a constituent of cell membranes, certain nucleic acids and all proteins.
(2) *Nitrosomonas* and *Nitrobacter* are chemoautotrophs.
(3) *Anabaena* and *Nostoc* are capable of fixing nitrogen in free-living state also.
(4) Root nodule forming nitrogen fixers live as aerobes under free-living conditions.

76. A process that makes important difference between C_3 and C_4 plants is
(1) photosynthesis.
(2) photorespiration.
(3) transpiration.
(4) glycolysis.

77. CAM helps the plants in
(1) reproduction.

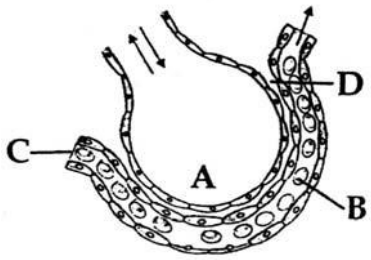
(2) conserving water.
(3) secondary growth.
(4) disease resistance.

78. The energy-releasing metabolic process in which substrate is oxidized without an external electron acceptor is called
(1) photorespiration.
(2) glycolysis.
(3) fermentation.
(4) aerobic respiration.

79. Photoperiodism was first characterized in
(1) cotton.
(2) tobacco.
(3) potato.
(4) tomato.

80. What will happen if the secretion of parietal cells of gastric glands is blocked with an inhibitor?
(1) Enterokinase will not be released from the duodenal mucosa and so trypsinogen is not converted to trypsin.
(2) Gastric juice will be deficient in chymosin.
(3) Gastric juice will be deficient in pepsinogen.
(4) In the absence of HCl secretion, inactive pepsinogen is not converted into the active enzyme pepsin.

81. Figure given below shows a small part of human lung where exchange of gases takes place. In which one of the options given below, the one part **A**, **B**, **C** or **D** is **correctly** identified along with its function?



(1) **B:** Red blood cell- transport of CO_2 mainly.
(2) **C:** Arterial capillary- passes oxygen to tissues.
(3) **A:** alveolar cavity- main site of exchange of respiratory gases.
(4) **D:** Capillary wall- exchange of O_2 and CO_2 takes place here.

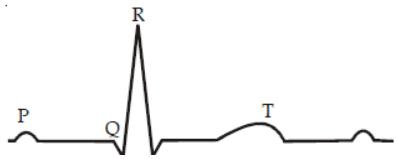
82. Which one of the following is being tried in India as a biofuel substitute for fossil fuels?
(1) *Aegilops*
(2) *Jatropha*
(3) *Azadirachta*
(4) *Musa*

83. The function of leghemoglobin in the root nodules of legumes is
(1) expression of *nif* gene.
(2) inhibition of oxygenase activity.
(3) oxygen removal.

(4) nodule differentiation.

84. Which two of the following changes (i-iv) usually tend to occur in the plain dwellers when they move to high altitudes (3,500 m or more)?
(i) Increase in red blood cell size.
(ii) Increase in red blood cell production.
(iii) Increased breathing rate.
(iv) Increase in thrombocyte count.
Changes occurring are:
(1) (i) and (iv) (2) (i) and (ii) (3) (ii) and (iii) (4) (iii) and (iv)

85. Figure given here is the standard ECG of a normal person. The P-wave represents the



(1) Contraction of both the atria
(2) Initiation of the ventricular contraction
(3) Beginning of the systole
(4) End of systole

86. A certain road accident patient with unknown blood group needs immediate blood transfusion. His one doctor friend at once offers his blood. What was the blood group of the donor?
(1) Blood group O
(2) Blood group A
(3) Blood group B
(4) Blood group AB

87. Which one of the following statement in regard to the excretion by the human kidneys is correct?
(1) Nearly 99% of the glomerular filtrate is reabsorbed by the renal tubules.
(2) Ascending limb of loop of Henle is impermeable to electrolytes.
(3) Descending limb of loop of Henle is impermeable to water.
(4) Distal convoluted tubule is incapable of reabsorbing HCO_3^-.

88. Low Ca^{2+} in the body fluid may be the cause of
(1) angina pectoris.
(2) gout.
(3) tetany.
(4) anaemia.

89. The nerve centers which control the body temperature and the urge for eating are contained in
(1) cerebellum
(2) thalamus
(3) hypothalamus
(4) pons

90. A pregnant female delivers a baby who suffers from stunted growth, mental retardation low intelligence quotient and abnormal skin. This is the result of
(1) Deficiency of iodine in diet.

(2) Low secretion of growth hormone.
(3) Cancer of the thyroid gland.
(4) Over secretion of pars distalis.

91. What is **correct** to say about the hormone action in humans?
(1) In females, FSH first binds with specific receptors on ovarian cell membrane.
(2) FSH stimulates the secretion of oestrogen and progesterone.
(3) Glucagon is secreted by β-cells of islets of Langerhans and stimulates glycogenolysis.
(4) Secretion of thymosin is stimulated with ageing.

92. Match the source gland with its respective hormone as well as the function.

Source gland	**Hormone**	**Function**
(1) Thyroid	Thyroxine	Regulates blood calcium level
(2) Anterior pituitary	Oxytocin	Contraction of uterus muscles during child birth
(3) Posterior pituitary	Vasopressin	Stimulates reabsorption of water in the distal tubules in the nephrons
(4) Corpus luteum	Oestrogen	Maintains pregnancy

93. The "eyes" of the potato tuber are
(1) axillary buds.
(2) root buds.
(3) flower buds.
(4) shoot buds.

94. Signals for parturition originate from
(1) placenta only.
(2) fully developed foetus only.
(3) both placenta as well as fully developed foetus.
(4) oxytocin released from maternal pituitary.

95. Both, autogamy and geitonogamy are prevented in
(1) castor.
(2) maize.
(3) papaya.
(4) cucumber.

96. Which one of the following pairs of plant structures has haploid number of chromosomes?
(1) Egg nucleus and secondary nucleus
(2) Megaspore mother cell and antipodal cells
(3) Egg cell and antipodal cells
(4) Nucellus and antipodal cells

97. What would be the number of chromosomes of the aleurone cells of a plant with 42 chromosomes in its roots tip cells?
(1) 21
(2) 42
(3) 63

(4) 84

98. Wind pollination is common in
(1) orchids.
(2) legumes.
(3) lilies.
(4) grasses.

99. Which one of the following statements about human sperm is correct?
(1) Acrosome serves no particular function.
(2) Acrosome has a conical pointed structure used for piercing and penetrating the egg resulting in fertilization.
(3) The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilization.
(4) Acrosome serves as a sensory structure leading the sperm towards the ovum.

100. In humans, at the end of the first meiotic division, the male germ cells differentiate into the
(1) spermatozonia.
(2) primary spermatocytes.
(3) secondary spermatocytes.
(4) spermatids.

101. Which one of the following conditions in humans is correctly matched with its chromosomal abnormality/linkage?
(1) Down syndrome—44 autosomes + XO
(2) Klinefelter's syndrome—44 autosomes + XXY
(3) Color blindness—Y-linked
(4) Erythroblastosis foetalis—X-linked

102. Which one of the following statements is incorrect about menstruation?
(1) The beginning of the cycle of menstruation is called menarche.
(2) During normal menstruation about 40 ml blood is lost.
(3) The menstrual fluid can easily clot.
(4) At menopause in the female, there is especially abrupt increase in gonadotropic hormones.

103. Medical Termination of Pregnancy (MTP) is considered safe up to how many weeks of pregnancy?
(1) Six weeks
(2) Eight weeks
(3) Twelve weeks
(4) Eighteen weeks

104. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group : 'AB' blood group : 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of
(1) codominance
(2) incomplete dominance
(3) partial dominance
(4) complete dominance

105. Which of the following endoparasites of humans does show viviparity?

(1) *Ancylostoma duodenale*

(2) *Enterobius vermicularis*

(3) *Trichinella spiralis*

(4) *Ascaris lumbricoide*

106. Which one of the following conditions correctly describes the manner of determining the sex in the given example?
(1) Homozygous sex chromosomes (XX) produce make in Drosophila.
(2) Homozygous sex chromosomes (ZZ) determine female sex in birds.
(3) XO type of sex chromosomes determines male sex in grasshopper.
(4) XO condition in humans as found in Turner's syndrome, determines female sex.

107. The permissible use of the technique amniocentesis is for
(1) detecting any genetic abnormality.
(2) detecting sex of the unborn foetus.
(3) artificial insemination.
(4) transfer of embryo into the uterus of a surrogate mother.

108. Which one of the following in not a property of cancerous cells whereas the remaining three are?
(1) They divide in an uncontrolled manner.
(2) They show contact inhibition.
(3) They compete with normal cells for vital nutrients.
(4) They do not remain confined in the area of formation.

109. Removal of introns and joining of exons in a defined order during transcription is called
(1) slicing
(2) splicing
(3) looping
(4) inducing

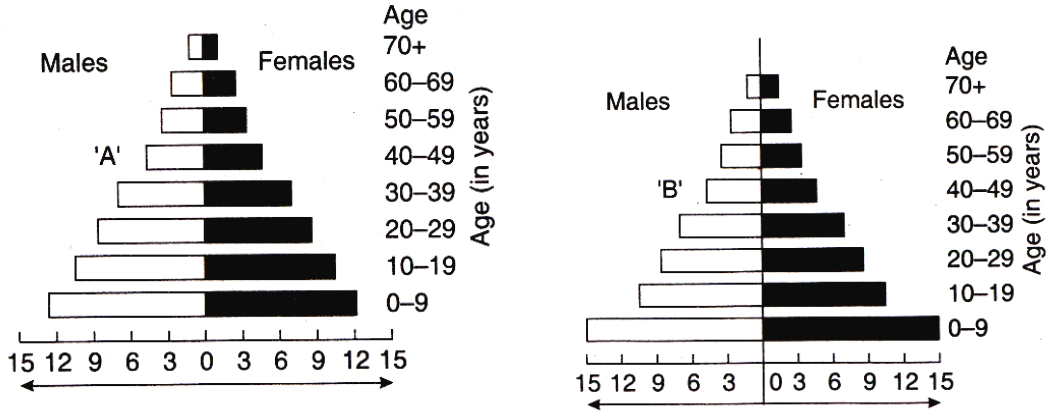
110. If one strand of DNA has the nitrogenous base sequence as ATCTG, what would be the complementary RNA stand sequence?
(1) AACTG
(2) ATCGU
(3) TTAGU
(4) UAGAC

111. Select the two correct statements out of the four (a–d) given below about lac operon.
(i) Glucose or galactose may bind with the repressor and inactivate it.
(ii) In the absence of lactose the repressor binds with the operator region.
(iii) The z-gene codes for permease.
(iv) This was elucidated by Francois Jacob and Jacque Monod.
The correct statements are
(1) (i) and (ii)
(2) (ii) and (iii)
(3) (i) and (iii)
(4) (ii) and (v)

112. Darwin's finches are a good example of

(1) convergent evolution.
(2) industrial melanism.
(3) connecting link.
(4) adaptive radiation.

113. A country with a high rate of population growth took measures to reduce it. Figure shows age-sex pyramids of populations A and B twenty years apart. Select the correct interpretation about them .



(1) "A" is the earlier pyramid and no change has occurred in the growth rate.
(2) "A" is more recent shows slight reduction in the growth rate.
(3) "B" is earlier pyramid and shows stabilized growth rate.
(4) "B" is more recent showing that population is very young.

114. At which stage of HIV infection does one usually show symptoms of AIDS?
(1) Within 15 days of sexual contact with an infected person.
(2) When the infecting retrovirus enters host cells.
(3) When viral DNA is produced by reverse transcriptase.
(4) When HIV replicates rapidly in helper T lymphocytes and damages large number of these.

115. Which one of the following is the correct statement regarding the particular psychotropic drug specified?
(1) Barbiturates cause relaxation and temporary euphoria.
(2) Hashish causes after thought perceptions and hallucinations.
(3) Opium stimulates nervous system and causes hallucinations.
(4) Morphine leads to delusions and disturbed emotions.

116. To which type of barriers under innate immunity, do the saliva in the mouth and the tears from the eyes belong?
(1) Physical barriers
(2) Cytokine barriers
(3) Cellular barriers
(4) Physiological barriers

117. Which one of the following is an example of carrying out biological control of pests/diseases using microbes?
(1) Bt-cotton to increase cotton yield.
(2) Lady bird beetle against aphids in mustard.
(3) *Trichoderma* species against certain plant pathogens.
(4) Nucleopolyhedrovirus against white rust in *Brassica*.

118. What was the most significant trend in the evolution of modern man {Homo sapiens) from his ancestors?
(1) Increasing cranial capacity
(2) Upright posture
(3) Shortening of jaws
(4) Binocular vision.

119. Which part would be most suitable for raising virus free plants for micropropagation?
(1) Meristem
(2) Node
(3) Bark
(4) Vascular tissue

120. "Himgiri" developed by hybridization and selection for disease resistance against rust pathogens is a variety of
(1) wheat.
(2) chilli.
(3) maize.
(4) sugarcane.

121. Which one of the following microbes forms symbiotic association with plants and helps them in their nutrition?
(1) *Glomus*
(2) *Trichoderma*
(3) *Azotobacter*
(4) *Aspergillus*

122. Select the correct statement from the following:
(1) Biogas commonly called gobar gas is pure methane.
(2) Activated sludge-sediment in settlement tanks of sewage treatment plant is a rich source of aerobic bacteria.
(3) Biogas is produced by the activity of aerobic bacteria on animal waste.
(4) Methanobacterium is an aerobic bacterium found in rumen of cattle.

123. The genetic defect adenosine deaminase (ADA) deficiency may be cured permanently by
(1) enzyme replacement therapy.
(2) periodic infusion of genetically engineered lymphocytes having functional ADA cDNA.
(3) administering adenosine deaminase activators.
(4) introducing bone marrow cells producing ADA into cells at early embryonic stages.

124. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?
(1) 5′ _____ CACGTA _____ 3′
3′ _____ CTCAGT _____ 5′
(2) 5′ _____ CGTTCG _____ 3′
3′′ _____ ATGGTA _____ 5′
(3) 5′ _____ GATATG _____ 3′
3′ _____ CTACTA _____ 5′
(4) 5′ _____ GAATTC _____ 3′
3′ _____ CTTAAG _____ 5′

125. In plant breeding programs, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called
(1) selection of superior recombinants.
(2) cross-hybridization among the selected parents.
(3) evaluation and selection of parents.
(4) germplasm collection.

126. Maximum number of existing transgenic animals is of
(1) pig
(2) fish
(3) mice
(4) cow

127. Agarose extracted from sea weeds finds use in
(1) gel electrophoresis
(2) spectrophotometry
(3) tissue culture
(4) PCR

128. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of
(1) non-recombinant bacteria containing beta-galactosidase.
(2) insertional inactivation of alpha-galactosidase in non-recombinant bacteria.
(3) insertional inactivation of alpha-galactosidase in recombinant bacteria.
(4) inactivation of glycosidase enzyme in recombinant bacteria.

129. Consider the following four statements (i - iv) about certain desert animals such as kangaroo rat.
(i) They have dark color and high rate of reproduction and excrete solid urine.
(ii) They do not drink water, breathe at a slow rate to conserve water and have their body covered with thick hairs.
(iii) They feed on dry seeds and do not require drinking water.
(iv) They excrete very concentrated urine and do not use water to regulate body temperature.
Which two of the above statements for such animals are true?
(1) (i) and (ii)
(2) (iii) and (iv)
(3) (ii) and (iii)
(4) (iii) and (i)

130. Which one of the following statements is correct for secondary succession?
(1) It is similar to primary succession except that it has a relatively fast pace.
(2) It begins on a bare rock.
(3) It occurs on a deforested site.
(4) It follows primary succession.

131. The upright pyramid of number is absent in
(1) lake
(2) grassland
(3) pond
(4) forest

132. Which one of the following shows maximum genetic diversity in India?
(1) Mango
(2) Groundnut
(3) Rice
(4) Maize

133. Which one of the following is not used for *ex situ* plant conservation?
(1) Field gene banks
(2) Seed banks
(3) Shifting cultivation
(4) Botanical Gardens

134. The two gases making highest relative contribution to the greenhouse gases are
(1) CFCs and N_2O
(2) CO_2 and N_2O
(3) CO_2 and CH_4
(4) CH_4 and N_2O

135. Eutrophication is often seen in
(1) mountains.
(2) deserts.
(3) fresh water lakes.
(4) oceans.

Section C: Physics

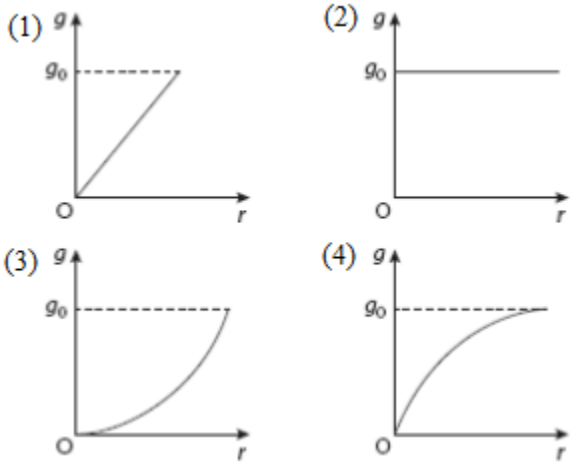
136. The equation of state of some gases can be expressed as $(P + a/V^2)(V - b) = RT$, where P is the pressure, V is the volume, T is the absolute temperature, and a, b, and R are constants. The dimensions of a are
(1) $[ML^5T^{-2}]$
(2) $[ML^{-1}T^{-2}]$
(3) $[L^3]$
(4) $[L^6]$

137. The motion of a particle is described by the equation $x = a + bt^2$ where $a = 15$ cm and $b = 3$ cm/s^2. Its instantaneous velocity at time 3 s will be
(1) 36 cm/s
(2) 18 cm/s
(3) 16 cm/s
(4) 32 cm/s

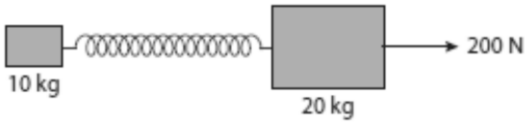
138. A 1 kg stone at the end of 1 m long string is whirled in a vertical circle at constant speed of 4 m/s. The tension in the string is 6 N, when the stone is at ($g = 10$ m/s^2)
(1) top of the circle.
(2) bottom of the circle.
(3) half way down.
(4) none of the above.

139. A wooden block is floating in water contained in a beaker. During the free fall of the beaker, the upthrust on the block will be
(1) equal to the weight of the block
(2) slightly more than the weight of one block
(3) slightly less than the weight of the block
(4) zero

140. Which of the graph shown in the below figure represents the variation of g with distance (r) from the center O of the Earth? The value of g at the surface of the Earth is g_o.



141. Two masses of 10 kg and 20 kg are connected by a massless spring as shown in the below figure. A force of 200 N acts on the 20 kg mass. At the instant shown, the 10 kg mass has an acceleration 10 m/s^2, what is the acceleration of the 20 kg mass?



(1) 4 m/s^2
(2) 10 m/s^2
(3) 12 m/s^2
(4) zero

142. A body of mass 1 kg is projected with a velocity of 10 m/s at an angle 60° with respect to horizontal ground. The maximum value of gravitational potential energy in its motion is
(1) 50 J
(2) 25 J
(3) 35 J
(4) 37.5 J

143. A thin circular ring of mass M and radius R is rotating in a horizontal plane about an axis vertical to its plane with a constant angular velocity ω. If objects each of mass m be attached gently to the opposite ends of a diameter of the ring, the ring will then rotate with an angular velocity

(1) $\frac{\omega M}{M+2m}$

(2) $\frac{\omega(M+2m)}{M}$

(3) $\frac{\omega M}{M+m}$

(4) $\frac{\omega(M-2m)}{M+2m}$.

144. 3 rods of mass *M* and length *L* are joined to form equilateral triangle. Find the moment of inertia of the triangle about axis passing through centroid perpendicular to lamina.

(1) $\frac{ML^2}{2}$

(2) $\frac{ML^2}{4}$

(3) $\frac{ML^2}{6}$

(4) $\frac{ML^2}{3}$

145. The velocities of three particles of masses 20 g, 30 g and 50 g are $10\vec{i}$, $10\vec{j}$ and $10\vec{k}$ respectively. The velocity of the centre of mass of the three particles is

(1) $2\vec{i}+3\vec{j}+5\vec{k}$

(2) $10(\vec{i}+\vec{j}+\vec{k})$

(3) $20\vec{i}+30\vec{j}+5\vec{k}$

(4) $2\vec{i}+30\vec{j}+50\vec{k}$

146. Ratio between maximum range and square of time of flight in projectile motion is
(1) 10:4
(2) 49:10
(3) 98:10
(4) 10:98

147. The ratio of lateral strain to the longitudinal strain of a wire is called
(1) compressibility
(2) modulus of rigidity
(3) tensile strength
(4) none of the above

148. The surface tension of a liquid is found to be influenced by
(1) its increase with an increase of temperature.
(2) the nature of the liquid in contact.
(3) the presence of soap that increases it.
(4) its variation with the concentration of the liquid.

149. A body of mass 5 m initially at rest explodes into three fragments with mass ratio 3:1:1. Two of fragments each of mass *m* are found to move with a speed 60 m/s in mutually perpendicular directions. The velocity of third fragment is

(1) $60\sqrt{2}$
(2) $20\sqrt{3}$
(3) $10\sqrt{2}$
(4) $20\sqrt{2}$

150. A wind-powered generator converts wind energy into electric energy. Assume that the generator converts a fixed fraction of wind energy intercepted by its blades into electrical energy. For wind speed v, the electrical power output will be proportional to
(1) v
(2) v^2
(3) v^3
(4) v^4

151. A body cools from 50°C to 49.9°C in 5 s. How long will it take to cool from 40°C to 39.9°C? Assume the temperature of the surroundings to be 30°C and Newton's law of cooling to be valid.
(1) 20 s
(2) 15 s
(3) 10 s
(4) 5 s

152. A balloon is filled with cold air and placed in a warm room. It is NOT in thermal equilibrium with the air of the room until
(1) it rises to the ceiling.
(2) it sinks to the floor.
(3) it stops expanding.
(4) it starts to contract.

153. During an adiabatic compression, 830 J of work is done on 2 moles of a diatomic ideal gas to reduce its volume by 50%. The change in its temperature is nearly: ($R = 8.3\ J\ K^{-1}\ mol^{-1}$)
(1) 40 K
(2) 33 K
(3) 20 K
(4) 14 K

154. The equation of state for 5 g of oxygen at a pressure P and temperature T, when occupying a volume V, will be
(1) $PV = 5RT/32$
(2) $PV = 5RT/16$
(3) $PV = 5RT/2$
(4) $PV = 5\ RT$

155. Two equations of two SHM are $y = a \sin(\omega t - \alpha)$ and $y = b \cos(\omega t - \alpha)$. The phase difference between the two is
(1) 0°
(2) α°
(3) 90°
(4) 180°

156. In case of a vibrating string, the frequency of the first overtone is equal to frequency of the

(1) fundamental note.
(2) first harmonic.
(3) second harmonic.
(4) none of the above.

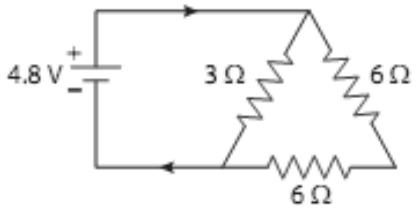
157. A 1.00×10^{-20} kg particle is vibrating with simple harmonic motion with a period of 1.00×10^{-5} s and a maximum speed of 1.00×10^{3} m/s. The maximum displacement of the particle is
(1) 1.59 mm
(2) 1.00 m
(3) 10 m
(4) None of these

158. Which one of the following statements is true?
(1) Both light and sound waves in air are longitudinal
(2) Both light and sound waves can travel in vacuum
(3) Both light and sound waves in air are transverse
(4) The sound waves in air are longitudinal, whereas the light waves are transverse

159. The point charges Q and $-2Q$ are placed at some distance apart. If the electric field at the location of Q is E, then the electric field at the location of $-2Q$ will be
(1) $-\frac{E}{2}$
(2) $-\frac{3E}{2}$
(3) $-E$
(4) $-2E$

160. A half ring of radius R has a charge of l per unit length. The potential at the center of the half ring is
(1) $k\frac{\lambda}{R}$
(2) $k\frac{\lambda}{\pi R}$
(3) $k\frac{\pi\lambda}{R}$
(4) $k\pi\lambda$

161. The current in the circuit shown in the below figure is
(1) 8.31 A
(2) 6.82 A
(3) 4.92 A
(4) 2.0 A



162. An electric bulb rated 220 V, 100 W is connected to a source of 220(0.8) V, then the actual power will be
(1) 100(0.8) W
(2) $100(0.8)^2$ W
(3) $>100(0.8)$ W but <100 W
(4) $>100(0.8)^2$ W but $<100(0.8)$ W

163. In a Leclanche cell, the depolarizer is
(a) ammonium chloride
(b) sulfuric acid
(c) copper sulfate solution
(d) manganese oxide

164. What is the power of the lens, if the far point of a short-sighted eye is 200 cm?
(1) –0.5 D
(2) 2 D
(3) 1 D
(4) –1.5 D

165. The critical angle for a ray of light suffering total internal reflection will be smallest for light traveling from
(1) water to air.
(2) glass to air.
(3) glass to water.
(4) water to glass.

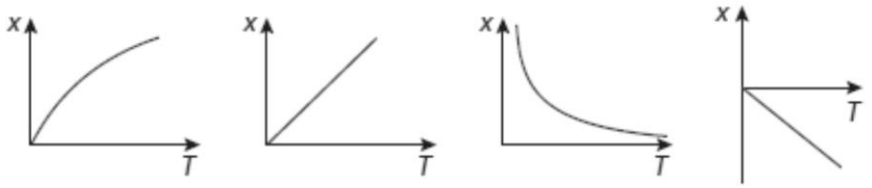
166. A Young's double-slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is
(1) hyperbola.
(2) circle.
(3) straight line.
(4) parabola.

167. The intensity ratio of the two interfering beams of light is β. What is the value of $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$?
(1) $2\sqrt{\beta}$
(2) $\frac{2\sqrt{\beta}}{1+\beta}$
(3) $\frac{2}{1+\beta}$
(4) $\frac{1+\beta}{2\sqrt{\beta}}$

168. A current-carrying loop is placed in a uniform magnetic field. The torque acting on it does not depend upon
(1) Shape of the loop.
(2) Area of the loop.

(3) Value of the current.
(4) Magnetic field.

169. Which among the four χ versus *T* graphs shown in the following figure is the correct one for a paramagnetic substance will look like?



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

170. A *LCR* series ac circuit is tuned to resonance. The impedance of the circuit is
(1) R

(2) $\left[R^2+\left(\frac{1}{\omega C}-\omega L\right)^2\right]^{1/2}$

(3) $\left[R^2+(\omega L)^2+\left(\frac{1}{\omega C}\right)^2\right]^{1/2}$

(4) $\left[R^2+\left(\omega L-\frac{1}{\omega C}\right)^2\right]^{1/2}$

171. According to Lenz's law of electromagnetic induction
(1) The induced emf is not in the direction opposing the change in magnetic flux.
(2) The relative motion between the coil and magnet produces change in magnetic flux.
(3) Only the magnet should be moved toward coil.
(4) Only the coil should be moved toward magnet.

172. In a transformer, the number of turns of primary coil and secondary coil are 5 and 4, respectively. If 220 V is applied on the primary coil, then the ratio of primary current to the secondary current is
(1) 4 : 5
(2) 5 : 4
(3) 5 : 9
(4) 9 : 5

173. The frequency 10^{57} MHz of radiation arising from two close energy levels in hydrogen belongs to
(1) radio waves
(2) infrared waves
(3) microwaves
(4) γ-rays

174. A photoelectron has a frequency ν_e. It was ejected by a photon having frequency ν_p from a metal of work function ϕ. Then which of the following is correct assuming all of the energy of photon is utilized?

(1) $\phi = \nu_p - \nu_e$

(2) $\nu_p > \nu_e$

(3) $\nu_p = \nu_e$

(4) $\nu_p = h\phi + \nu_e$

175. Photoelectric effect supports quantum nature of light because
(a) There is a minimum frequency of light below which no photoelectrons are emitted.
(b) The maximum kinetic energy of photoelectrons depends only on the frequency of light and not on its intensity.
(c) Even when the metal surface is faintly illuminated the photoelectrons leave the surface immediately.
(d) Electric charge of the photoelectrons is quantized.

176. Which of the following is true?
(1) Lyman series is a continuous spectrum.
(2) Paschen series is a line spectrum in the infrared.
(3) Balmer series is a line spectrum in the ultraviolet.
(4) The spectral series formula can be derived from the Rutherford model of the hydrogen atom.

177. The de Broglie wavelength of an electron in the first orbit of Bohr's hydrogen atom is
(1) πr
(2) $\pi r/2$
(3) $2\pi r$
(4) $2\pi r/3$

178. What is missing particle in the following reaction? ${}_6C^{12} + {}_1H^3 \rightarrow {}_7N^{14} + \ldots\ldots$?
(1) ${}_0n^1$
(2) ${}_{-1}e^0$
(3) ${}_0\gamma^0$
(4) ${}_1H^1$

179. In the reverse-biased *p-n* junction, the current is the order of
(1) Ampere.
(2) Milliampere.
(3) Microampere.
(4) Nanoampere.

180. The output of OR gates is 1
(1) if either input is zero.
(2) only if both inputs are 1.
(3) if both inputs are zero.
(4) if either or both inputs are 1.

ANSWER KEY

Section A: Chemistry

1. (2)	2. (2)	3. (1)	4. (3)	5. (3)
6. (3)	7. (2)	8. (2)	9. (4)	10. (2)
11. (3)	12. (1)	13. (4)	14. (1).	15. (3)
16. (2)	17. (2)	18. (2)	19. (3)	20. (4).
21. (1)	22. (3)	23. (1)	24. (3)	25. (2)
26. (3)	27. (1)	28. (4)	29. (3)	30. (1)
31. (2)	32. (2)	33. (2)	34. (3)	35. (1)
36. (2)	37. (2)	38. (3)	39. (3)	40. (1)
41. (2)	42. (4)	43. (1)	44. (3)	45. (3)

Section-B Biology

46. (3)	47. (3)	48. (4)	49. (4)	50. (3)
51. (1)	52. (3)	53. (2)	54. (3)	55. (4)
56. (2)	57. (2)	58. (3)	59. (4)	60. (3)
61. (4)	62. (1)	63. (3)	64. (4)	65. (4)
66. (2)	67. (2)	68. (4)	69. (1)	70. (3)
71. (4)	72. (1)	73. (2)	74. (3)	75. (1)
76. (2)	77. (2)	78. (3)	79. (2)	80. (4)
81. (3)	82. (2)	83. (3)	84. (3)	85. (1)
86. (1)	87. (1)	88. (3)	89. (3)	90. (1)
91. (3)	92. (3)	93. (1)	94. (3)	95. (3)
96. (3)	97. (3)	98. (4)	99. (3)	100. (3)
101. (2)	102. (3)	103. (3)	104. (1)	105. (3)
106. (3)	107. (1)	108. (2)	109. (2)	110. (4)
111. (4)	112. (4)	113. (2)	114. (4)	115. (2)
116. (4)	117. (3)	118. (1)	119. (1)	120. (1)
121. (1)	122. (2)	123. (4)	124. (4)	125. (3)
126. (3)	127. (1)	128. (1)	129. (2)	130. (1)
131. (4).	132. (3)	133. (3)	134. (1)	135. (3)

Section C: Physics

136. (1)	137. (2)	138. (1)	139. (4)	140. (1)
141. (1)	142. (4)	143. (1)	144. (1)	145. (1)
146. (1)	147. (4)	148. (4)	149. (4)	150. (3)
151.(2)	152. (3)	153. (3)	154. (1)	155. (1)
156. (3)	157. (1)	158. (4)	159. (1)	160. (4)
161. (4)	162. (2)	163. (4)	164. (1)	165. (2)
166. (1)	167. (2)	168. (1)	169. (3)	170. (2)
171. (2)	172. (1)	173. (1)	174. (2)	175. (1)
176. (2)	177. (3)	178. (1)	179. (3)	180. (4)

SOLUTIONS

Section A: Chemistry

1.
We write the question in equation form as
0.240 mol NaOH $\Leftrightarrow$? mol Na_3PO_4
And convert 0.240 mol NaOH to the numbers of moles of Na_3PO_4 equivalent to it in the reaction as follows.

$$0.240 \text{ mol NaOH} \times \frac{1 \text{mol } Na_3PO_4}{3 \text{ mol NaOH}} = 0.0800 \text{ mol } Na_3PO_4$$

Thus we can make 0.0800 mol Na_3PO_4 from 0.240 mol NaOH.
Hence, the correct option is (2).

2.
Boyle's temperature,

$$T_B = \frac{a}{Rb} = \frac{4 \text{ L}^2 \text{ atm. mol}^{-2}}{0.082 \text{ L atm. K}^{-2} \times 0.04 \text{ L}^2 \text{ mol}^{-1}} = 1219.5 \text{ K} = 1220 \text{ K}$$

Hence, the correct option is (2).

3.
The density is given by

$$d = \frac{z \times M}{N_A \times a^3} .$$

Here, $M = 108, N_A = 6.023 \times 10^{23}$, a = 409 pm = 4.09×10^{-8} cm, d= 10.5 g cm^{-2}
Substituting the values, we get
Number of atoms per unit cell. (z) = 4
So, the structure of the crystal lattice is fcc.
Hence, the correct option is (1).

4.

$$\text{Moles of } H_2S = \frac{17}{M_{H_2S}} = \frac{17}{34} = \frac{1}{2} \text{mol}$$

Also, 1 mol $H_2S \equiv 5$ mol of H_2SO_4 (from stoichiometry of reaction)

or $\frac{1}{2}$ mol of $H_2S \equiv \frac{5}{2}$ mol of $H_2SO_4 = M \times V_L \Rightarrow V_L = \frac{2.5}{0.1} = 25.0$ L

Hence, the correct option is (3).

5.
Osmotic pressure is used for molar mass determination of protein; it is given by

$$\Pi = \frac{wRT}{M \times V}$$

where w is weight of protein, R is the gas constant, T is the temperature, M is the molecular mass of protein and V is the volume.
Hence, the correct option is (3).

6.

Solution

The energies for the two radiations are given by

$$E_1 = \frac{hC}{\lambda_1} \quad \text{and} \quad E_2 = \frac{hC}{\lambda_2}$$

Therefore, the ratio of E_1:E_2 is given by

$$\frac{E_1}{E_2} = \frac{\lambda_2}{\lambda_1} \Rightarrow \frac{25}{50} = \frac{\lambda_2}{\lambda_1}$$

Hence, the ratio of their wavelengths is

$$\frac{\lambda_2}{\lambda_1} = \frac{1}{2} \Rightarrow \lambda_1 = 2\lambda_2$$

Hence, the correct option is (3).

7.

According to Aufbau principle, the correct sequence for filling up orbitals when n = 6 is 6*s*, 4*f*, 5*d*, 6*p*.

Hence, the correct option is (2).

8.

The reaction is

$$2NO_3^- + 7e^- + 10H^+ \rightarrow N_2H_4 + 3H_2O$$

Hence, the correct option is (2).

9.

Total pressure is given by (Raoult's law)

$$p_{\text{total}} = x_B p_B^0 + x_T p_T^0 = 0.4 \times 119 + 0.6 \times 37 = 47.6 + 22.2 = 69.8 \text{ torr}$$

Applying Dalton's law for mole fraction in vapor phase, we get

$$y_B = \frac{p_B}{p_{\text{total}}} = \frac{p_B^0 x_B}{p_T^0 x_T + p_B^0 x_B} = \frac{0.4 \times 119}{69.8} = 0.682$$

$$y_T = 1 - 0.682 = 0.318$$

Hence, the correct option is (4).

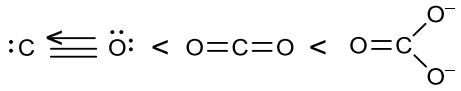
10.

The precipitate formation will take place only when the value of ionic product of compound exceeds its solubility product.

Hence, the correct option is (2).

11.

The order is as follows:



Hence, the correct option is (3).

12.

$$H_2O(l) \rightleftharpoons H_2O(g)$$

Given that ΔH = 30 kJ mol^{-1} and T = 300 K, therefore,

$$\Delta S = \frac{\Delta_{\text{trans}} H}{T} = \frac{30 \times 10^3}{300} = 100 \text{ J mol}^{-1}\text{K}^{-1}$$

Hence, the correct option is (1).

13.

$$\underset{1-x}{\text{A(s)}} \rightleftharpoons \underset{2x}{2\text{B(g)}} + \underset{3x}{3\text{C(g)}}$$

$$K_c = 4x^2 \times 27x^3 = 108x^5$$

$$\text{A(s)} \rightleftharpoons \underset{2x \times c}{2\text{B(g)}} + \underset{6x}{3\text{C(g)}}$$

$$108x^5 = 4x^2 \times c^2 \times 216x^3 \Rightarrow 108 = c^2 \times 216 \times 4$$

$$c^2 = \frac{108}{4 \times 216} \Rightarrow c = \frac{1}{2\sqrt{2}}$$

Hence, the correct option is (4).

14.

$$\text{Cu}^+ = [\text{Ar}]3d^{10}4s^0$$

Five *d*-electrons have $+\frac{1}{2}$ spin

Five *d*-electrons have $-\frac{1}{2}$ spin

Hence, the correct option is (1).

15.

When NaCl is doped with $MgCl_2$, two Na^+ are replaced by one Mg^{2+} ion to maintain electrical neutrality. Thus, a hole is created for every Mg^{2+} ion introduced. Thus, the defect produced will be Schottky defect.

Hence, the correct option is (3).

16.

Solution

In fcc, face diagonal = 4*r*. Therefore,

$$\sqrt{2}a = 4r \Rightarrow r = \frac{\sqrt{2} \times 361 \text{ pm}}{4} = 127.632 \text{ pm}\,; \quad 128 \text{ pm}$$

Hence, the correct option is (2).

17.

A modest increase in temperature does not affect the activation energy and the minimum kinetic energy of the molecules required for the reaction to take place. Instead, on increasing the temperature the effective collisions increase, that is, the fraction of the total collisions for which the energy is equal to or more than activation energy increases.

Hence, the correct option is (2).

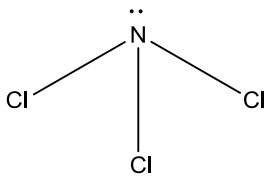
18.

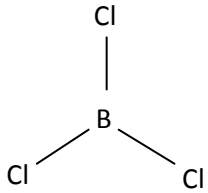
$$E^{\circ}_{\text{cell}} = \frac{0.059}{2} \log K_C \Rightarrow \log K_C = \left(\frac{2 \times 0.235}{0.059} \right) = 7.96 \Rightarrow K = x \times 10^7$$

Hence, the correct option is (2).

19.
For I: The atomic number is 29 and the electronic configuration: [Ar]$3d^{10}4s^1$ is that of a *d*-block element (Cu).
For II: The atomic number is 81 and the electronic configuration: [Xe] $4f^{14}5d^{10}6s^26p^1$ is that of *p*-block element (Tl).
For III: The atomic number is 46 and the electronic configuration: [Kr] $4d^85s^2$ is that of a *d*-block element (Pd).
For IV: The atomic number is 58 and the electronic configuration: [Xe] $4f^15d^16s^2$ is that of a *f*-block element (Ce).
Hence, the correct option is (3).

20.
BCl_3 has no lone pair as B has only three valance electrons thus its shape is trigonal planar ; while NCl_3 has one lone pair of electron as N has 5 valence electrons , so its shape is pyramidal.



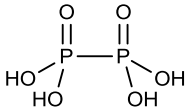


Hence, the correct option is (4).

21.
Generally, the atomic size of transition elements in a series decrease on moving from left to right in a period, but the decrease in atomic size is small after midway.
Hence, the correct option is (1).

22.
Fluorides of lanthanoids are insoluble, while with heavier lanthanoids they become sparingly soluble due to the formation of complex.
Hence, the correct option is (3).

23.
Hypophosphoric acid contains P-P linkage.



Pyrophosphoric acid ($H_4P_2O_7$) contains four P–OH, two P= O and one P–O–P bonds.
Orthophosphoric acid (H_3PO_4) contains three P–OH and one P= O bonds.
Metaphosphoric acid $(HPO_3)_n$ contains three P–OH, three P= O and three P–O–P bonds.
Hence, the correct option is (1).

24.
When aluminium oxide and carbon are strongly heated in dry chlorine gas anhydrous aluminium chloride is formed. The reaction involved is

$$\underset{\text{Aluminium oxide}}{Al_2O_3} + 3C + 3Cl_2 \xrightarrow{100^\circ C} \underset{\text{Anhydrous aluminium chloride}}{2AlCl_3} + 3CO$$

Hence, the correct option is (3).

25.
Substances with unpaired electrons generally formed coloured ions. Of the given options:
Zn^{2+}:[Ar]$3d^{10}$ is colourless
Ti^{3+} :[Ar]$3d^{1}$ is coloured (purple)
Sc^{3+}: [Ar] is colourless
Ti^{4+}: [Ar] is colourless
Hence, the correct option is (2).

26.
In both the complexes the oxidation number of Pt atom
$[Pt(py)_4]^{2+}[PtCl_4]^{2-}$ is +2.
Hence, the correct option is (3).

27.
Primary valencies are ionizable. If the complex ion exhibits positive charge, then primary valence corresponds to the number of charges present and is balanced by the same number of negative ions. Hence, primary valency can also be defined by the number of anions neutralizing the charge on the complex.
Hence, the correct option is (1).

28.
Oxidation state of Fe in $\left[Fe(CN)_6\right]^{4-}$ = + 2

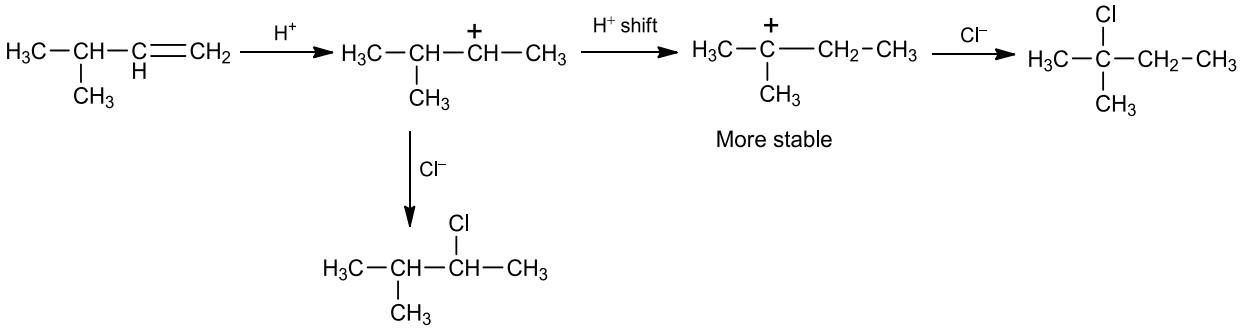
Number of electrons in Fe (II) of the complex = 26 – 2 = 24
Number of electrons donated by six CN^- ligands = 6 × 2 = 12

So, EAN of Fe(II) in $\left[Fe(CN)_6\right]^{4-}$ = 24 + 12 = 36

Since 36 is equal to the nearest noble gas (Kr), the $\left[Fe(CN)_6\right]^{4-}$ follows the EAN rule.

Hence, the correct option is (4).

29.
The reaction involved is

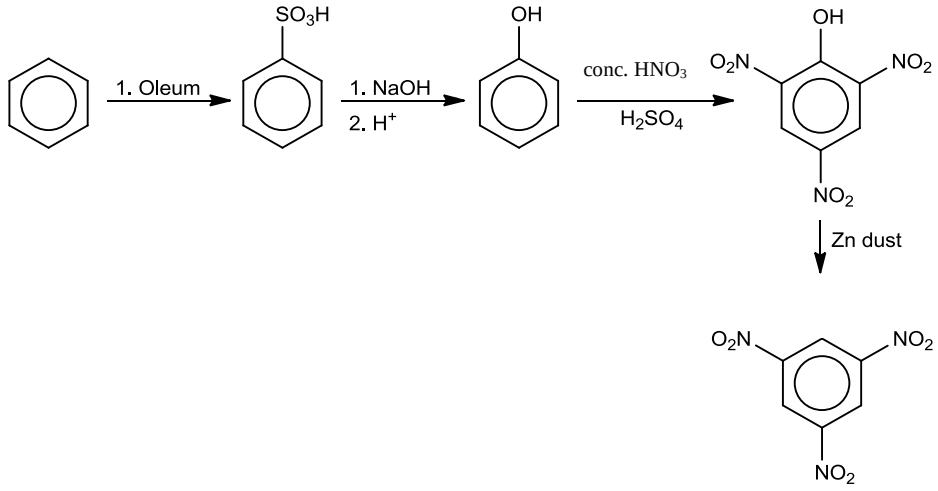


Hence, the correct option is (3).

30.
The stereoisomers that are optically active isomers but not mirror images are called diastereoisomers or diastereomers.
Hence, the correct option is (1).

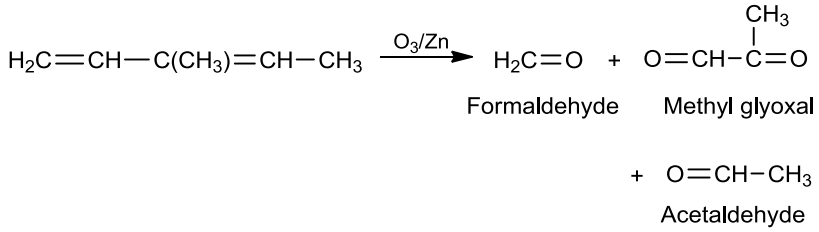
31.
For Lucas test the reactivity order of alcohols is 3° > 2° > 1° Tertiary $(CH_3)_3C–OH$ will give a white turbidity at room temperature.
Hence, the correct option is (2).

32.
In the first step, the electrophilic substitution of benzene with oleum forms benzenesulphonate which on fusion with alkali yields sodium phenoxide. This on acidification forms phenol.
In the second step, the nitration of phenol with concentrated nitric acid leads to formation of picric acid in poor yield. So phenol is first converted to 2,4- disulphonated product and then treated with conc. nitric acid.
In step 3, the –OH group is removed by passing over zinc dust to obtain tri-nitrobenzene.



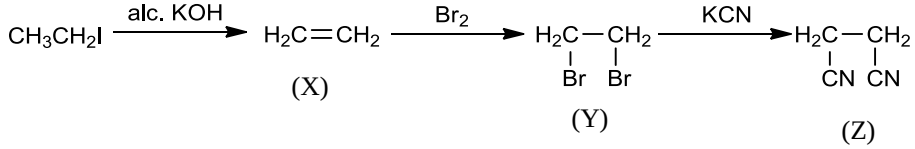
Hence, the correct option is (2).

33.



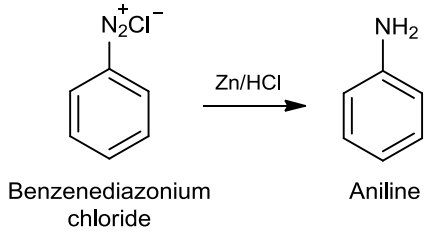
Hence, the correct option is (2).

34.
The reaction is as follows



Hence, the correct option is (3).

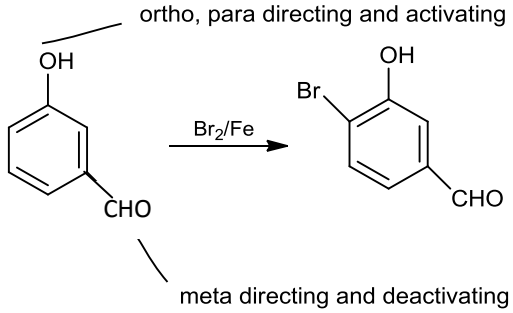
35.
Reduction of benzenediazonium chloride with Zn/HCl gives aniline as the main product because Zn/HCl is a strong reducing agent. The reaction is



Hence, the correct option is (1).

36.
Helical structure of protein is stabilized by hydrogen bonds between amino group and carboxylic group.
Hence, the correct option is (2).

37.
Electrophile will attack at ortho position with respect to activating group (–OH). The reaction is



Hence, the correct option is (2).

38.
In the chain propagation step, a free radical attacks another monomer to produce yet another free radical and the process continues. The reaction between two free radicals leads to termination of reaction.
Hence, the correct option is (3).

39.
The process by which the aquatic life gets deprived of oxygen due to the presence of addition of nitrates or phosphates through fertilizers or sewage in the water bodies is known as eutrophication.
Hence, the correct option is (3).

40.
As the basicity of metal hydroxides increases down the group from Be to Ba, the thermal stability of their carbonates also increases in the same order. Further, Group 1 compounds are more stable thermally than Group 2 because their hydroxides are much more basic than Group 2 hydroxides; therefore, the order of thermal stability is $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$.
Hence, the correct option is (1).

41.
Equanil is a carbamate derivative used as tranquilizer.

Hence, the correct option is (2).

42.
Leaching is the selective discharge of the desired mineral leaving behind the impurities in a suitable dissolving agent, for example, argentite or silver glance, Ag_2S is an ore of silver. Silver is extracted from argentite by the MacArthur Forest process (leaching process).
Hence, the correct option is (4).

43.
Langmuir adsorption isotherm is based on the assumption that every adsorption site is equivalent and the ability of a particle to bind there is independent of whether or not nearby sites are occupied.
Hence, the correct option is (1).

44.
Electron withdrawing substituent increases the acidity by increasing the ionic character of O–H by inductive effect. Electronegativity decreases in the order F > Cl > Br and hence –I effect also decreases in the same order, therefore, the correct option is FCH_2COOH > $ClCH_2COOH$ >$BrCH_2COOH$ > CH_3COOH.
Hence, the correct option is (3).

45.
The pOH can be found by the following expression:

$$\text{pOH} = \text{p}K_\text{b} + \log\frac{[\text{NH}_4^+]}{[\text{NH}_3]} = -\log(1.8\times10^{-5}) + \log\frac{0.2}{0.3}$$

$$= 5 - \left[\log(1.8) - \log\left(\frac{0.2}{0.3}\right)\right] = 5 - \log\left(\frac{1.8\times0.3}{0.2}\right)$$

$$= 5 - \log(2.7) = 5 - 0.43 = 4.57$$

Therefore, pH can be obtained as

$$\text{pH} = 14 - \text{pOH} = 14 - 4.57 = 9.43$$

Hence, the correct option is (3).

Section-B Biology

46.
Archaea have primitive forms with histones, no organized nucleus membrane bound organelles are absent and proteinaceous and non-cellulosic carbohydrate nature of cell wall.
Hence, the correct option is (3).

47.
Methanogens are strict anaerobes. They occur in marshy areas, cattle yards where they convert formic acid and carbon dioxide into methane with the help of hydrogen.
Hence, the correct option is (3).

48.
Some of the cyanobacteria and photosynthetic bacteria contain internal membrane systems known as chromatophores. They contain pigments used to capture light energy for the synthesis of sugars.
Hence, the correct option is (4).

49.

In both *Cycas* (gymnosperm) and *Adiantum* (a fern), male gametes are motile.
Hence, the correct option is (4).

50.
T.O. Diener discovered a free infectious RNA particle, now known as viroid.
Hence, the correct option is (3).

51.
Cedrus is gymnosperm having reduced dependent gametophytes on the sporophyte.
Hence, the correct option is (1).

52.
Ascaris is pseudocoelomate and metamerism is absent in *Ascaris*.
Hence, the correct option is (3).

53.
The hind limbs of the birds are covered by the scales as found in the reptiles.
Hence, the correct option is (2).

54.
Body is unsegmented in *Pila*.
Hence, the correct option is (3).

55.
Streptococcus is a prokaryote. Membrane bound organelles found in eukaryotes are absent in prokaryotes.
Hence, the correct option is (4).

56.
Pomegranate is a Balausta (as it develops from inferior, multicarpellary, syncarpous ovary) in which the pericarp is leathery, endocarp is papery. The succulent seed coat forms the edible part.
Hence, the correct option is (2).

57.
The single cotyledon of maize grain is called scutellum.
Hence, the correct option is (2).

58.
In *Solanum*, the inflorescence present is rhipidium which is a modification of cymose inflorescence.
Hence, the correct option is (3).

59.
For the carbon, cycling pool consists of 6×10^{14} kg (29%) of free CO_2 in the atmosphere and 1.45×10^{15} kg (71%) dissolved CO_2 in hydrosphere.
Hence, the correct option is (4).

60.
In a hypogynous flower, gynoecium or ovary is superior as it develops at the top of thalamus while the other floral organs are borne at the bottom. For example, mustard, brinjal, China rose, lupin, sunnhemp, gram, bean, chilli, *Petunia*, tomato, *Withania*, potato, onion, *Aloe* and tulip.
Hence, the correct option is (3).

61.
The tracheary elements in heartwood are blocked by neighboring parenchymatous cells or by tyloses. Also, living cells are absent in heartwood.
Hence, the correct option is (4).

62.
Intercalary meristems are present in the internodes.
Hence, the correct option is (1).

63.
Body cavity of earthworm is a true coelom which is filled with an alkaline colorless coelomic fluid.
Hence, the correct option is (3).

64.
Pair of small, unsegmented anal style is present in the ninth segment of the male cockroach only.
Hence, the correct option is (4).

65.
Proteins, carbohydrates, phospholipids, and other molecules formed in the endoplasmic reticulum are transported to the Golgi apparatus to be biochemically modified during their transition from the *cis* to the *trans* poles of the complex. Enzymes present in the Golgi lumen modify the carbohydrate (or sugar) portion of glycoproteins by adding or subtracting individual sugar monomers.
Hence, the correct option is (4).

66.
The fluid mosaic model of cell membrane was proposed by S. Jonathan Singer and Garth Nicolson (1972) and is the most acceptable one describing the membrane architecture.
Hence, the correct option is (2).

67.
Mitochondria have their own DNA, RNA and ribosomes and so can undergo self-replication.
Hence, the correct option is (2).

68.
In axile placentation, the gynoecium is made up of two or more carpels, the ventral sutures of which meet at the center of the ovary making it multilocular. The ovules are borne on the placenta of the central axis. For example, lemon, tomato, china rose, etc.
Hence, the correct option is (4).

69.
Cytoskeleton is a network of filaments composed of polymers of specific protein molecules, which form the framework of a cell. Its components are microtubules, microfilaments and intermediate filaments.
Hence, the correct option is (1).

70.
Starch is non-reducing and water insoluble so is preferred as storage material.
Hence, the correct option is (3).

71.
Essential chemical components of many coenzymes are vitamins, example, NAD and NADP contains vitamin niacin.

Hence, the correct option is (4).

72.
The cells in which meiosis take place are called meiocytes.
Hence, the correct option is (1).

73.
During mitosis, endoplasmic reticulum and nucleolus begin to disappear at early prophase and these are not observed in late prophase.
Hence, the correct option is (2).

74.
The water column present in tracheary elements is continuous and does not fall down under the force of gravity because the force of gravity is balanced by forces of cohesion and adhesion.
Hence, the correct option is (3).

75.
Phosphorus is a constituent of nucleotides, ATP, nucleic acids, phospholipids (cell membrane), NAD^+, $NADP^+$ and some other coenzymes, but not a constituent of proteins.
Hence, the correct option is (1).

76.
C_4 plants have a high rate of photosynthesis due to negligible photorespiration as concentration of carbon dioxide is high and photolysis of water does not occur in bundle sheath cells.
Hence, the correct option is (2).

77.
In CAM plants, stomata open at night and remain closed during the day, thus CO_2 absorption also takes place at night. This reduces the evaporative water loss during the day time and helps conserve water.
Hence, the correct option is (2).

78.
NADH produced during glycolysis is used for reduction of pyruvate in fermentation.
Hence, the correct option is (3).

79.
Photoperiodism was first studied by Garner and Allard in Tobacco plant.
Hence, the correct option is (2).

80.
The function of parietal cells is to secrete HCl and Castle's intrinsic factor in stomach. Pepsinogen is changed by HCl into an active enzyme pepsin.
Hence, the correct option is (4).

81.
Alveolar ducts are the both sites of gas exchange. The alveolar exchange serves as gas-exchange surface.
Hence, the correct option is (3).

82.
Jatropha is a petroplant and the source of fuel is latex.
Hence, the correct option is (2).

83.
It acts as an oxygen scavenger and protects nitrogen fixing enzyme nitrogenase from oxygen.
Hence, the correct option is (3).

84.
To compensate altitudinal sickness, plain dwellers have higher red blood cell count or total haemoglobin, decreasing binding capacity of haemoglobin and increased breath rate.
Hence, the correct option is (3).

85.
In ECG, P wave represents the depolarization of atria which leads to the contraction of both atria.
Hence, the correct option is (1).

86.
Blood group O is a universal donor. It does not have either A or B antigens on the surface of RBCs.
Hence, the correct option is (1).

87.
A comparison of volume of filtrate formed per day (180 liters) with urine released (1.5 liters) suggests that nearly 99% of the filtrate is reabsorbed by renal tubules.
Hence, the correct option is (1).

88.
Tetany is wild involuntary contraction of muscles which is caused due to low amount of calcium in the body fluids.
Hence, the correct option is (3).

89.
The hypothalamus regulates food intake. It contains a feeding center, which promotes eating, and a satiety center, which causes a sensation of fullness and cessation of eating. It also contains a thirst center. It also functions as the body's thermostat.
Hence, the correct option is (3).

90.
Hypothyroidism during pregnancy causes defective development and maturation of the growing foetus leading to stunted growth
Hence, the correct option is (1).

91.
In females, FSH first binds with specific receptors on ovarian cell membrane to initiates the development of several ovarian follicles, and stimulates them to secrete oestrogen. LH secretes oestrogen and progesterone. Glucagon stimulates conversion of glycogen into glucose (glycogenolysis). Secretion of thymosin is reduced with ageing.
Hence, the correct option is (3).

92.
Posterior pituitary gland secretes the hormone vasopressin (or ADH) which stimulates the water retention raises blood pressure by constricting arterioles.
Hence, the correct option is (3).

93.
Axillary buds develop at nodes and eyes.
Hence, the correct option is (1).

94.
The signals for parturition originate from the foetus and placenta, leading to mild uterine contractions called as foetal rejection reflex.
Hence, the correct option is (3).

95.
Because papaya is dioecious.
Hence, the correct option is (3).

96.
Egg cell and antipodal cells are part of the female gametophyte, which is haploid. The egg cell is present at the micropylar end, while the antipodal cells (3 in number) are present at the opposite end.
Hence, the correct option is (3).

97.
Root tip is diploid (2n). Hence, the number of chromosomes in gametes (n) = 21. Aleurone cells are triploid, so the number of chromosomes in aleurone cells = 3n = 63.
Hence, the correct option is (3).

98.
It is common in grasses and gymnosperms, and in trees of cool temperate regions.
Hence, the correct option is (4).

99.
Acrosome is a cap-like structure present in sperm head. It contains several enzymes (sperm lysins) that dissolve the egg envelope and help the sperm to penetrate the cells of the corona radiata and come in contact with the zona pellucida.
Hence, the correct option is (3).

100.
The two cells formed from a primary spermatocyte by meiosis I are called secondary spermatocytes.
Hence, the correct option is (3).

101.
Klinefelter's syndrome is an aneuploid trisomic disease. Hence, the total number of chromosomes present in the affected individual = 44 autosomes + XXY.
Hence, the correct option is (2).

102.
During menstruation, bleeding occurs due to disintegration of endometrium. The menstrual blood does not clot easily because of the presence of anticoagulants.
Hence, the correct option is (3).

103.
MTPs are considered safe up to twelve weeks of pregnancy.
Hence, the correct option is (3).

104.
This is an example of codominance as the alleles are able to express themselves independently when present together.
Hence, the correct option is (1).

105.
Viviparity means development of the embryo inside the body of the mother, eventually leading to live birth, as opposed to laying eggs is shown by *Trichinella spiralis* parasite which causes systemic trichinosis, a gastrointestinal disease spread by the consumption of raw meat, specifically pork *Trichinella spiralis* is the smallest nematode pathogenic to humans.
Hence, the correct option is (3).

106.
In grasshoppers, female has two chromosomes XX and is homogametic. The male has one chromosome only (X) and is heterogametic. It produces two types of sperms—one with X chromosome and one without (nullo-X). Fertilization of an egg by X bearing sperm yields female offspring and by nullo-X sperm yields male offspring.
Hence, the correct option is (3).

107.
Amniocentesis is prenatal diagnostic technique for detecting any genetic disorder. The misuse of amniocentesis is to detect the sex of the foetus.
Hence, the correct option is (1).

108.
Cancerous cells do not show contact inhibition where as normal cell shows.
Hence, the correct option is (2).

109.
Splicing is the removal of intervening sequences or introns and the joining of expressing sequences or exons in a specific order during transcription.
Hence, the correct option is (2).

110.
The RNA transcript will be complementary to the template strand. The RNA sequence will be UAGAC.
Hence, the correct option is (4).

111.
Lactose binds repressor protein and exerts negative control.
Hence, the correct option is (4).

112.
Darwin's finches are good example of adaptive radiation. The main Darwin finch was in South America, some of these birds flew and reach these islands, became best suited for these habitats were selected to reproduce. So, the evolution of these species started from a point and radiated towards different areas of the region.
Hence, the correct option is (4).

113.

The age-sex pyramid of population "A" showed less number of individual mainly females in pre-reproductive and reproductive age groups as compared to the population, indicating less population growth than "B". Hence, "A" is more recent shows slight reduction in the growth rate.
Hence, the correct option is (2).

114.
Symptoms of AIDS appear when there is depletion of helper T cells.
Hence, the correct option is (4).

115.
Morphine is both sedative as well as analgesic drug. Barbiturates are sedative and hypnotic drugs. Opium is also a narcotic drug which has a depressing effect on CNS.
Hence, the correct option is (2).

116.
Tears and saliva contains enzyme lysozyme which cleaves the covalent linkage between the sugars in peptidoglycan; hence Gram-positive bacteria are particularly susceptible to killing by this enzyme.
Hence, the correct option is (4).

117.
Free-living fungus *Trichoderma* found in root ecosystem, exerts biocontrol over several plant pathogens.
Hence, the correct option is (3).

118.
The increase in brain capacity is the most significant trend in the evolution of man from its ancestors.
Hence, the correct option is (1).

119.
Meristem is the most suitable for raising virus free plants for micropropagation because meristems are generally free from viruses.
Hence, the correct option is (1).

120.
"Himgiri" is a variety of wheat which is resistant to leaf and stipe rust, hill bunt.
Hence, the correct option is (1).

121.
The soil fungi Glomus has symbiotic association with the roots of plants.
Hence, the correct option is (1).

122.
Methanobacteria are anaerobic.
Hence, the correct option is (2).

123.
The individual suffering from genetic defect adenosine deaminase (ADA) deficiency can be cured by transplantation of bone marrow cells. The first step involves the extraction of lymphocyte from the patient's bone marrow. Then, a functional gene for ADA is introduced into lymphocytes with the help of retrovirus. These treated lymphocytes containing ADA gene are then introduced into the patient's bone marrow. Thus, the gene gets activated producing functional T-lymphocytes and activating the patient's immune system.

Hence, the correct option is (4).

124.
Palindromic nucleotide sequence in the DNA molecule is the sequence of base pairs that read same when orientation of reading is same.
Hence, the correct option is (4).

125.
Germplasm is the sum total of all the alleles of the genes present in a crop and its related species. The entire collection having all the diverse alleles for all genes in a given crop is called germplasm collection. A good germplasm collection is essential for a successful breeding program.
Hence, the correct option is (3).

126.
95% of the existing transgenic animals are mice.
Hence, the correct option is (3).

127.
The most commonly used matrix in gel electrophoresis is agarose which is a polysaccharide extracted from sea weeds.
Hence, the correct option is (1).

128.
The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of inactivation of beta-galactosidase enzyme in recombinant bacteria.
Hence, the correct option is (1).

129.
Kangaroo rat seldom drinks water. 90% of its water needs are met from metabolic water, that is, water produced by respiratory breakdown and remaining 10% is fulfilled from food. Kangaroo rat feeds on dry castor seeds. Loss of water is minimized by producing nearly solid urine and faeces.
Hence, the correct option is (2).

130.
Secondary succession begins in areas where natural biotic communities have been destroyed such as in abandoned farm lands, burned or cut forests, lands that have been flooded. Since some soil or sediment is present, secondary succession is faster than primary succession.
Hence, the correct option is (1).

131.
In a forest ecosystem, single large-sized tree is attacked by numerous minute plant-eating insects preyed upon by fewer spiders and carnivorous insects which are further preyed upon by a lesser number of small-sized birds which are finally preyed upon by only a few large sized birds of prey, the pyramid of number is spindle-shaped
Hence, the correct option is (4).

132.
Rice possesses 50,000 species followed by mango that boasts of 1000 species.
Hence, the correct option is (3).

133.

Shifting cultivation results into deforestation
Hence, the correct option is (3).

134.
Global warming is due to presence of excess amount of greenhouse gases in the atmosphere. They do not allow the long wave radiations to escape from the Earth. There are four major greenhouse gases: carbon dioxide, methane, chlorofluorocarbons and nitrous oxide. Their contribution of global warming is 60%, 20%, 14% and 6%, respectively.
Hence, the correct option is (1).

135.
Eutrophication is excessive growth of algae, plants and animals in water bodies due to the nutrient enrichment particularly with nitrogen and phosphorus.
Hence, the correct option is (3).

Section C: Physics

136.
The given equation of state is
$\left(P+\frac{a}{V^2}\right)(V-b)=RT.$
Since pressure can be added only to pressure, a/V^2 represents pressure P. That is,
$\frac{a}{V^2}=P$
Or, $a=PV^2$.
We know that
$P=\mathrm{ML^{-1}T^{-2}}$
$V=\mathrm{L^3}$
So
$a=\mathrm{ML^{-1}T^{-2}(L^3)^2}$
$=\mathrm{M^1L^5T^{-2}}$
Hence, the correct option is (1).

137.
The velocity of the particle at time t is evaluated as
$v(f)=\frac{dx}{dt}=2bt.$
Hence, the instantaneous velocity is calculated as
$v_{t=3}$ = 2 × 3 × 3 cm/s = 18 cm/s.
Hence, the correct option is (2).

138.
Mass (m) = 1 kg, velocity (v) = 4 m/s, radius (r) = 1 m. The tension at the top is
$T=\frac{mv^2}{r}-mg=\frac{1\times4^2}{1}-1\times10=16-10=6\,\mathrm{N}.$
Hence, the correct option is (1).

139.

When a wooden block is floating in water contained in beaker. During the free fall of the beaker, the upthrust on the block is equal to zero; because for a floating body, the net weight is equal to zero, as the upthrust balances the actual weight of the body, when the free fall of the beaker occur than the up thrust becomes zero.

Hence, the correct option is (4).

140.

We know that the value of *g* is directly proportional to the value of (r). If we raise the value of (g) then the value of (r) will also increase but at some stage the value of (g) becomes the value of *g* at the surface of earth is (g_0)

Hence the correct option is (1).

141.

We have the two masses $m_1 = 10\,\text{kg}$ and $m_2 = 20\,\text{kg}$. The acceleration on both the masses is calculated as

$$F = (m_1 + m_2)a$$

$$\Rightarrow a = \frac{200}{30} = 6.66\,\text{m/s}^2.$$

The acceleration on 10 kg mass is $10\,\text{m/s}^2$. Then, the acceleration on 20 kg mass is

$$10\,\text{m/s}^2 - 6.66\,\text{m/s}^2 = 3.34\,\text{m/s}^2 \approx 4\,\text{m/s}^2.$$

Hence, the correct option is (1).

142.

Maximum height attained.

$$h = \frac{u^2 \sin^2\theta}{2g} \quad \Rightarrow \quad \frac{10^2 \times \sin^2 60°}{2 \times 10}$$

$$h = \frac{10}{2} \times \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = 30/8$$

$$h = 3.75 \text{ m.}$$

$$U = mgh = 1 \times 10 \times 3.75 = 37.5 \text{ J}$$

Hence the correct option is (4).

143.

The initial angular momentum

$$L = I\omega^2 = MR^2\omega$$

After attaching the mass *m*

$$L' = (MR^2 + 2mR^2)\omega'$$

The angular momentum is a conserved quantity

$$L = L'$$

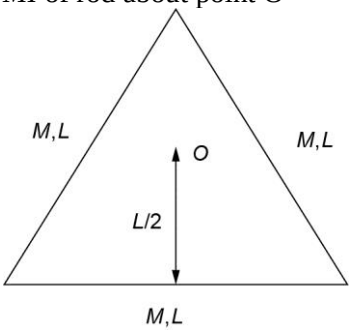
$$MR^2\omega = (MR^2 + 2mR^2)\omega'$$

$$\omega' = \frac{MR^2\omega}{(MR^2 + 2mR^2)} = \frac{M}{M + 2m}\omega$$

Hence the correct option is (1).

144.

MI of rod about point O



$$= (MI)_{\text{com}} + M\left(\frac{L}{2\sqrt{3}}\right)^2$$

$$= \frac{ML^2}{6}$$

Now *MI* of 3 Rods about COM = $\frac{ML^2 \times 3}{6} = \frac{ML^2}{2}$

Hence the correct option is (1).

145.

Velocity of centre of mass

$$v_{cm} = \frac{m_1 v_1 + m_2 v_2 + m_3 v_3}{m_1 + m_2 + m_3} = \frac{20 \times 10\hat{i} + 30 \times 10\,\hat{j} + 50 \times 10\hat{k}}{100} = 2\hat{i} + 3\hat{j} + 5\hat{k}\,.$$

Hence the correct option is (1).

146.

The maximum horizontal range is

$$R = \frac{v^2}{g}$$

and the time of flight is

$$T = \frac{2v}{g}$$

The required ratio is

$$\frac{R}{T^2} = \frac{v^2 / g}{(2v/g)^2} = \frac{v^2}{g} \times \frac{g^2}{4v^2}$$

$$\Rightarrow \frac{g}{4} = \frac{10}{4}.$$

Hence, the correct ratio is (1).

147.

We know that Poisson's ratio is defined as the ratio of the lateral strain to the longitudinal strain.

$$\text{Lateral strain} = -\frac{\Delta R}{R}$$

$$\text{Longitudinal strain} = \frac{\Delta l}{l}$$

Poisson's ratio $(\sigma) = \dfrac{\text{Lateral strain}}{\text{Longitudinal strain}}$

Hence, the correct option is (4).

148.

The surface tension of a liquid is found to be influenced by its variation with the concentration of the liquid. Surface tension decreases with concentration of liquid. In many cases, it is more convenient to express the surface tension changes using other solute concentration scales.

Hence, the correct option is (4).

149.

The velocity of third fragment is obtained as follows: Applying the principle of conservation of linear momentum, we get

$$3m \times v = \sqrt{(m \times 60)^2 + (m \times 60)^2}$$

$$3m \times v = m \times 60\sqrt{2}$$

$$v = 20\sqrt{2}\ \text{m/s}.$$

Hence, the correct option is (4).

150.

Power output is proportional to the number of molecules striking the blades per unit time (which depends on the velocity, v, of the wind) and also proportional to the energy of striking molecules or proportional to the square of velocity, v^2. therefore, the power output is expressed as

$$P \propto v^3$$

Hence, the correct option is (3).

151.

A body cools from 50°C to 49.9°C in 5 s, then we have to find the time of body when it cools from half the temperature. According to Newton's law of cooling, the ratio of cooling is directly proportional to the temperature difference. When the temperature difference is halved, the rate of cooling is also halved. So, the time taken is 10 s.

Hence, the correct option is (2).

152.

When the temperature inside and outside the balloon becomes same, that is, the air inside and outside the balloon are in thermal equilibrium, then the balloon stops expanding.

Hence, the correct option is (3).

153.

$W = -\Delta U$ (In adiabatic process)

Since, $\Delta U = nC_V \Delta T$

$$\Rightarrow \Delta T = \frac{-W}{nC_V} = \frac{-(-830)}{2 \times (5/2) \times R}$$

$$\Rightarrow \Delta T = \frac{830}{5 \times 8.314} = 20\,\text{K}$$

Hence, the correct option is (3).

154.

Molecular weight of oxygen = 32 g

Number of moles in $5\text{g} \Rightarrow n = \frac{5}{32}$

Therefore, equation of state in $PV = nRT$

$$PV = \frac{5}{32}RT$$

Hence, the correct option is (1).

155.

The equations of the two given SHM are

$y_1 = a\sin(\omega t - a)$

$y_2 = b\cos(\omega t - a)$

Phase difference is

$$(\omega t - a) - (\omega t - a) = \omega t - a - \omega t + a$$
$$= 0°$$

Hence, the correct option is (1).

156.

In case of a vibrating string, the frequency of the first overtone is equal to the frequency of the second harmonic; a vibration in a string is a wave. Usually, a vibrating string produces a sound whose frequency in most cases is constant. Therefore, as frequency characterizes the pitch, the sound produced is a constant. Vibrating string is the basic of any string instrument such as guitar, hullo, and piano.

Hence, the correct option is (3).

157.

We know that

$$V_{\max} = r\omega$$

$$= r\frac{2\pi}{T}$$

where $\omega = \frac{2\pi}{T}$

Or

$$r = \frac{V_{\max}T}{2\pi}$$

$$r = \frac{10^3 \times 10^{-5}}{2 \times 22/7}$$

$$r = 1.59 \times 10^{-3}\,\text{m}$$

$$r = 1.59\,\text{mm}$$

Hence the correct option is (1).

158.

Sound waves in air are longitudinal because particles of the medium through which the sound is transported vibrate parallel to the direction in which the sound wave moves. Light waves in air are transverse, in which the electromagnetic vibrations are at 90° to the direction of travel. The speed of wave can be calculated using its frequency and wavelength. Casers produce intense narrow beams of light.

Hence, the correct option is (4).

159.
We have
$$Q|\vec{E}'| = |2Q||\vec{E}'| \Rightarrow |\vec{E}'| = \frac{E}{2}$$
Therefore,
$$E' = -\frac{E}{2}.$$
Hence, the correct option is (1).

160.
The charge is given by
$q = \lambda(\pi R) = \pi R\lambda$.

Therefore, the potential at the center of the half ring is
$$V_{\text{center}} = k\frac{q}{R} = k\pi\lambda.$$
Hence, the correct option is (4).

161.
The two equal resistances (6Ω) are in series, making 12 Ω. This 12 Ω resistor and 3 Ω resistor are in parallel. Therefore, the resultant resistance is
$$R_{\text{eff}} = \frac{12\times 3}{12+3} = \frac{36}{15} = 2.4.$$
According to the Ohms law, we have
$$I = \frac{V}{R_{\text{eff}}} = \frac{4.8}{2.4} = 2 \text{ A}.$$
Hence, the correct option is (4).

162.
Resistance of the filament is calculated as
$$R = \frac{V^2}{P} = \frac{220\times 220}{100} = 484\Omega.$$
Therefore, the power delivered is
$$P = \frac{V^2}{R} = \frac{[220(0.8)]^2}{484} = 100(0.8)^2 \text{ W}.$$
Hence, the correct option is (2).

163.
In a Leclanche cell, the depolarizer is manganese oxide.
Hence, the correct option is (4).

164.
In the given situation, $f = -200\,\text{cm}$. Hence, the power of the lens is

$$P = \frac{1}{f} = \frac{-1}{200}\,\text{cm}^{-1}$$
$$= -0.005(10^{-2}\,\text{m})^{-1}$$
$$= -0.5\,\text{m}^{-1}$$
$$= -0.5\,\text{D}.$$

Hence, the correct option is (1).

165.

Refractive index of air is $n_a = 1$; refractive index of water is $n_w = 1.3$; refractive index of glass is $n_g = 1.5$. The critical angle is given as

$$\theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$$

and n_2 / n_1 is minimum when

$$\frac{n_2}{n_1} = \frac{n_a}{n_g}.$$

Therefore, when light travels from glass to air, the critical angle is minimum.

Hence, the correct option is (2).

166.

Fringes form a hyperbolic form in Young's double-slit experiment.

Hence, the correct option is (1).

167.

We have

$$I_{max} = \beta + 1 + 2\sqrt{\beta};$$
$$I_{min} = \beta + 1 - 2\sqrt{\beta}.$$

Therefore,

$$\frac{I_{max} - I_{min}}{I_{max} + I_{min}} = \frac{4\sqrt{\beta}}{2(\beta+1)} = \frac{2\sqrt{\beta}}{\beta+1}.$$

Hence, the correct option is (2).

168.

If the current-carrying coil has n turns, then torque is given by

$$\tau = nIBA\cos\theta$$

By this relation, we see that torque does not depend upon the shape of the loop.

Hence, the correct option is (1).

169.

For paramagnetic substance, the susceptibility is inversely proportional to the temperature of the paramagnetic substance, that is,

$$\chi \propto \frac{1}{\text{T}}.$$

Paramagnetic substance loses their magnetic character with the rise in temperature. So, for paramagnetic substance, graph (3) is the best among the four graphs.

Hence, the correct option is (3).

170.
At resonance, the impedance of a *LCR* circuit is purely resistive (*R*).
Hence, the correct option is (2).

171.
The relative motion between the coil and magnet produces change in magnetic flux. The polarity of the induced emf is such that it opposes the change in magnetic flux responsible for its production. When the north pole of the bar magnet is being pushed toward the coil, the amount of magnetic flux linked with the coil increases. Current is induced in the coil in such a direction that it opposes the increase in flux. This is possible only when current is induced in the coil is in anticlockwise direction with respect to an observer on the side of the bar magnet. The magnetic moment associated with this induced current has north polarity toward the north pole of the approaching bar magnet.
Hence, the correct option is (2).

172.
Number of turns of primary coil, $N_P = 5$; number of turns of secondary coil, $N_S = 4$. Let the primary current be I_P andthe secondary current be I_S. The ratio of primary current to the secondary current is obtained as follows:

$$I_S = I_P \frac{N_P}{N_S} \Rightarrow \frac{I_P}{I_S} = \frac{N_S}{N_P} = \frac{4}{5}.$$

Hence, the correct option is (1).

173.
The frequency 10^{57} MHz of radiation arising from two close energy levels in hydrogen belongs to radio waves.
Hence, the correct option is (1).

174.
From Einstein's photoelectric equation, we have kinetic energy (K.E.) of an emitted photoelectron as $E = qV = h\nu - \phi$ where K.E.= E is the kinetic energy of emitted electron, h is the Planck's constant, ϕ is threshold energy, V is stopping potential and ν is frequency of incident photon.
Ejected photoelectron has lesser energy as compared to the incident photon as a part of its energy is consumed in overcoming the work function:

$$h\nu_e = h\nu_p - \phi$$

Hence, the correct option is (2).

175.
Photoelectric effect supports quantum nature of light as the existence of minimum frequency barrier means that emission depends on energy of individual photon (which depends on frequency of light). Thus, the kinetic energy of emitted photoelectron depends only on photon frequency and not on the amount or duration of incidence of light.
Hence, the correct option is (1).

176.
According to Bohr, Paschen series is obtained when an electron jumps to third orbit from any outer orbit.
Bohr calculated the wave numbers of spectral lines of Paschen series from the relation:

$$\bar{\nu} = R\left[\frac{1}{3^2} - \frac{1}{n^2}\right], \text{ where } n = 4,5,6....$$

The values of $\bar{\nu}$ lie in the infrared region of the spectrum. .

Hence, the correct option is (2).

177.

The de Broglie wavelength of an electron is given by

$$2\pi r_n = n\lambda$$

For first orbit, hence $n = 1$ thus, $2\pi r = \lambda$

Hence, the correct option is (3).

178.

The given equation is ${}_6C^{12} + {}_1H^3 \rightarrow {}_7N^{14} +$

Now if we equate the atomic number on both sides then the atomic number of missing particle should be 1. On equating the atomic mass on both sides we get the atomic mass of missing particle as 0. The missing particle is the neutron, that is, ${}_0n^1$. So the required equation is

${}^{12}_6C + {}^{3}_1H \rightarrow {}^{14}_7N + {}^{1}_0n$

Hence the correct option is (1).

179.

In the reverse biasing of *p-n* junction diode, the reverse current is very small which is equal to microampere or μA and is voltage independent up to certain reverse bias voltage, known as breakdown voltage. It is called reverse saturation current.

Hence, the correct option is (3).

180.

The output of OR gate is 1 if either or both inputs are 1. We can see this through the truth table of OR gate:

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

The Boolean expression for OR gate is

$A + B = Y$

In truth table, in both *A* and *B* have value 1, then *Y* is also 1, if also either *A* or *B* has value 1, then the *Y* is also 1, but if *A* and *B* both have zero, then the *Y* is also zero.

Hence, the correct option is (4).