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Ist Floor, Skylark Building,
Newal Kishore Road, Hazratganj, Lucknow.
Call : 7080111582, 7080111595

SAMPLE PAPER - 108

Time : 1 : 15 Hr. **Question : 60**

PHYSICS

01. Two rods P and Q of the same length and same diameter having thermal conductivity in the ratio 2 : 3 are joined end to end. If the temperature at one end of P is 100°C and at one end of Q is 0°C, then the temperature of the interface is
(1) 40°C (2) 50°C
(3) 60°C (4) 70°C

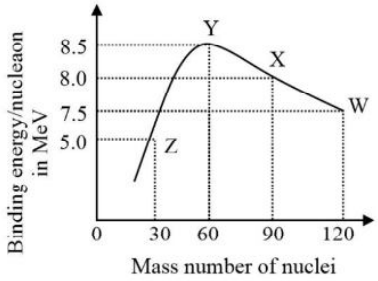
02. Water falls from a height 500 m. The rise in temperature of water at the bottom if the whole of energy remains in the water, will be (specific heat of water is C = 4.2 KJ Kg^{-1})
(1) 0.23 °C (2) 1.16 °C
(3) 0.96 °C (4) 1.02 °C

03. The molecules of a given mass of gas have an rms velocity of 200 ms^{-1} at 27°C and pressure 1 atm. When the temperature is 127°C and pressure is 2 atm, the rms velocity in ms^{-1} will be ?
(1) $\frac{100\sqrt{2}}{3}$ (2) $100\sqrt{2}$
(3) $\frac{400}{\sqrt{3}}$ (4) None of these

04. The de Broglie wavelength of a bullet of mass 0.040 kg, travelling at a speed of 1.0 km s^{-1} is
(1) 1.66×10^{-34} m (2) 1.66×10^{-35} m
(3) 1.66×10^{-32} m (4) 1.66×10^{-33} m

05. Let A_n be the area enclosed by the n^{th} orbit in a hydrogen atom. The graph of $\ln\left(\frac{A_n}{A_1}\right)$ against ln (n)
(1) will pass through the origin
(2) will be a straight line of slope 3
(3) will be a non-linear curve
(4) will be a circle

06. Binding energy per nucleon versus mass number curve for nuclei is shown in the figure. W, X, Y and Z are four nuclei indicated on the curve. The process that would release energy is

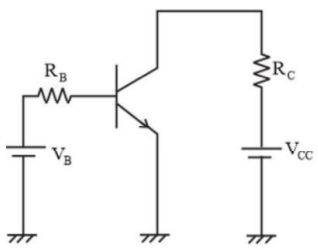


(1) $Y \rightarrow 2Z$ (2) $W \rightarrow X + Z$
(3) $W \rightarrow 2Y$ (4) $X \rightarrow Y + Z$

07. A radioactive sample S_1 having the activity A_1 has twice the number of nuclei as another sample S_2 of activity A_2. If $A_2 = 2A_1$, then the ratio of half-life of S_1 to the half-life of S_2 is
(1) 4 (2) 2 (3) 0.25 (4) 0.75

08. When p-n junction diode is forward biased, then
(1) the depletion region is reduced and barrier height is increased
(2) the depletion region is widened and barrier height is reduced
(3) both the depletion region and barrier height are reduced
(4) both the depletion region and barrier height are increased

09. A common emitter amplifier circuit, built using an NPN transistor, is shown in the figure. Its dc current gain is 250, $R_C = 1\ k\Omega$ and $V_{CC} = 10$ V. The minimum base current for V_{CE} to reach saturation is



(1) 10 μA (2) 40 μA
(3) 7 μA (4) 100 μA

10. The energy associated with electric field is (U_E) and with magnetic field is (U_B) for an electromagnetic wave in free space. Then :

(1) $U_E = \frac{U_B}{2}$ (2) $U_E < U_B$

(3) $U_E = U_B$ (4) $U_E > U_B$

11. An n-p-n transistor conducts when
(1) both collector and emitter are negative with respect to the base potential
(2) both collector and emitter are positive with respect to the base potential
(3) collector is positive and emitter is negative with respect to the base potential
(4) collector is positive and emitter is at same potential as the base potential

12. In a YDSE, if the slits are of unequal widths,
(1) fringes will not be formed
(2) the positions of minimum intensity will not be completely dark
(3) bright fringe will not be formed at the centre of the screen
(4) distance between two consecutive bright fringes will not be equal to the distance between two consecutive dark fringes

13. If the focal length of objective lens in increased then magnifying power of :
(1) microscope will increase but that of telescope decrease
(2) microscope and telescope both will increase
(3) microscope and telescope both will decrease
(4) microscope will decrease but that of telescope will increase.

14. What is the ratio of moment of inertia of a thin rod about an axis through midpoint and perpendicular to its length and that about an axis through one end and perpendicular to its length?
(1) 1/4 (2) 1/3 (3) 1/2 (4) 1.

15. Two satellites of the same mass are orbiting around the earth at heights R and 4R above the earth's surface. If R is the radius of earth, the ratio of their kinetic energies is:
(1) 4 : 1 (2) 3 : 2 (3) 4 : 3 (4) 5 : 2

CHEMISTRY

16. The pH of 0.1 M CH_3COOH is 2.873. What is pH of 0.1 M NH_4OH? $K_a(CH_3COOH) = 1.8 \times 10^{-5}$ and $K_b(NH_4OH) = 1.8 \times 10^{-5}$.
(1) 11.127 (2) 2.873
(3) 7 (4) 9.53

17. The number of moles of $Cr_2O_7^{2-}$ needed to oxidise 0.60 equivalents of $N_2H_5^+$ by the reaction
$N_2H_5^+ + Cr_2O_7^{2-} \longrightarrow N_2 + Cr^{3+} + H_2O$ is
(1) 0.136 (2) 0.10 (3) 0.816 (4) 0.0227

18. 3 mol of $FeSO_4$ are oxidised by 'a' mole of $KMnO_4$ in acid medium, whereas 3 mol of FeC_2O_4 are oxidised by 'b' moles of $KMnO_4$ in acid medium. The ratio of a and b is:
(1) 1/3 (2) 1/2 (3) 1/4 (4) 1/5

19. The number of unit cells in 58.5 g of NaCl is nearly:
(1) 6×10^{20} (2) 3×10^{22}
(3) 1.5×10^{23} (4) 0.5×10^{24}

20. If NaCl is doped with 10^{-8} mol% $SrCl_2$, then the concentration of cation vacancies will be
(1) 1×10^{-3} mol% (2) 1×10^{-8} mol%
(3) 3×10^{-3} mol% (4) 4×10^{-3} mol%

21. For a cell reaction involving a two electron changes, the standard EMF, of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction at 25°C will be
(1) 1×10^{-10} (2) 29.5×10^{-2}
(3) 10 (4) 1×10^{10}

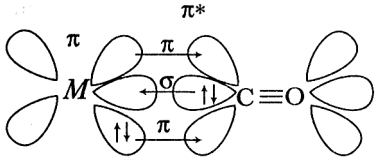
22. For the formation of NH_3 in the following reaction it is given that
$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$; E_a = activation energy
$\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \rightleftharpoons NH_{3(g)}$; E_{a_1} = activation energy
(1) $E_a > E_{a_1}$ (2) $E_a < E_{a_1}$
(3) $E_{a_1} = \frac{1}{2}E_a$ (4) $E_a = E_{a_1}$

23. The heat of physisorption lie in the range of
(1) 1 – 10 kJ mol^{-1} (2) 20–40 kJ mol^{-1}
(3) 40–200 kJ mol^{-1} (4) 200–400 kJ mol^{-1}

24. All colloids
(1) are suspensions of one phase in another
(2) are two-phase systems
(3) contain only water-soluble particles
(4) are ture solutions

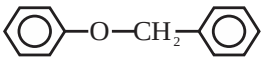
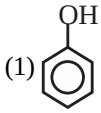
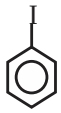
25. Zone refining is a method to obtain:
(1) very high temperature
(2) ultra pure Al
(3) ultra pure metals (4) ultra pure oxides

26. Consider the following figure.



Which type of bond formed between metals and ligand?
(1) synergic bond (2) σ-bond
(3) π-bond (4) None of these

27. The percentage composition of an organic compound is as C= 40%, N = 46.66%, H = 13.3%. The empirical formula of the compoud is
(1) C_2NH_5 (2) CHN
(3) C_2NH_2 (4) CNH_4

28. The ether  when made to react with HI, produces
(1)  (2)  (3)  (4) 

29. Monomer of teflon is
(1) $CF_2 = CF_2$ (2) $CH_2 = CH_2$
(3) $Ph–CH = CH_2$ (4) $CH_2 = CH – Cl$

30. Which of the following is a basic amino acid?
(1) Serine (2) Alanine
(3) Tyrosine (4) Lysine

BOTANY

31. Mitochondria are called powerhouses of the cell. Which of the following observations support this statement ?
(1) Mitochondria synthesise`ATP
(2) Mitochondria have a double membrane
(3) The enzymes of the Krebs' cycle and the cytochromes are found in mitochondria.
(4) Mitochondria are found in almost all plants and animal cells.

32. Ethylene is used for :
(1) Retarding ripening of tomatoes
(2) Hastening of ripening of fruits
(3) Slowing down ripening of apples
(4) Both (2) and (3)

33. Monocarpic plants are those which :
(1) Bear flowers with one ovary
(2) Flower once and die
(3) Bear only one flower
(4) All of these

34. Cells of this tissue are living and show angular wall thickening. They also provide mechanical support. The tissue is:
(1) Xylem (2) Sclerenchyma
(3) Collenchyma (4) Epidermis

35. Who amongst the following scientists had no contribution in the development of the double helix model for the structure of DNA?
(1) Rosalind Franklin (2) Maurice Wilkins
(3) Erwin Chargaff (4) Meselson and Stahl

36. Match the followings and choose the correct option from below.

(A) Meristem	(i) Photosynthesis, storage
(B) Parenchyma	(ii) Mechanical support
(C) Collenchyma	(iii) Actively dividing cells
(D) Sclerenchyma	(iv) Stomata
(E) Epidermal tissue	(v) Sclereids

(1) A-(i), B-(iii), C-(v), D-(ii), E-(iv)
(2) A-(iii), B-(i), C-(ii), D-(v), E-(iv)
(3) A-(ii), B-(iv), C-(v), D-(i), E-(iii)
(4) A-(v), B-(iv), C-(iii), D-(ii), E-(i)

37. A cross between two tall plants resulted in offspring having few dwarf plants. What would be the genotypes of both the parents?
(1) TT and Tt (2) Tt and Tt
(3) TT and TT (4) Tt and tt

38. Two genes 'A' and 'B' are linked. In a dihybrid cross involving these two genes, the F_1 heterozygote is crossed with homozygous recessive parental type (aa bb). What would be the ratio of offspring in the next generation?
(1) 1 : 1 : 1 : 1 (2) 9 : 3 : 3 : 1
(3) 3 : 1 (4) 1 : 1

39. With regard to mature mRNA in eukaryotes :
(1) Exons and introns do not appear in the mature RNA
(2) Exons appear but introns do not appear in the mature RNA
(3) Introns appear but exons do not appear in the mature RNA
(4) Both exons and introns appear in the mature RNA

40. Which was the last human chromosome to be completely sequenced ?
(1) Chromosome 1 (2) Chromosome 11
(3) Chromosome 21 (4) Chromosome X

41. A prothallus is:
(1) A structure in pteridophytes formed before the thallus develops
(2) A sporophytic free-living structure formed in pteridophytes
(3) A gametophyte free-living structure formed in pteridophytes
(4) A primitive structure formed after fertilization in pteridophytes

42. Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is:
(1) Monocots (2) Dicots
(3) Pteridophytes (4) Gymnosperms

43. Protonema is:
(1) Haploid and is found in mosses
(2) Diploid and is found in liverworts
(3) Diploid and is found in pteridophytes
(4) Haploid and is found in pteridophytes

44. Which of the following 'suffixes' used for the units of classification in plants indicates a taxonomic category of 'family'?
(1) –Ales (2) –Onae (3) –Aceae (4) –Ae

45. Refrigeration prevents food from spoilage by
(1) Fungus (2) Bacteria
(3) Both (1) and (2) (4) Viruses

ZOOLOGY

46. During ventricular systole
(1) Oxygenated blood is pumped into the pulmonary artery and Deoxygenated blood is pumped into the aorta
(2) Oxygenated blood is pumped into the aorta and Deoxygenated blood is pumped into the pulmonary vein
(3) Oxygenated blood is pumped into the pulmonary vein and Deoxygenated blood is pumped into the pulmonary artery
(4) Oxygenated blood is pumped into the aorta and Deoxygenated blood is pumped into the pulmonary artery

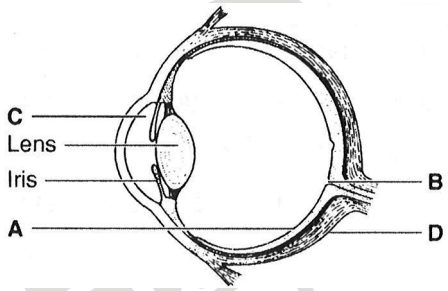
47. Which of the following sequences is truly a systemic circulation pathway?
(1) Left ventricle →Aorta →Arteries →Tissues →Veins →Right atrium
(2) Right ventricle → Pulmonary Aorta →Tissues →Pulmonary Veins →Left atrium
(3) Right auricle → Left ventricle →Aorta →Tissues →Veins →Left auricle
(4) Left auricle → Left ventricle →Pulmonary Aorta →Tissues → Right auricle

48. Foramen of Monro connects
(1) I ventricle to III ventricle
(2) III ventricle to IV ventricle
(3) II ventricle to III ventricle
(4) Lateral ventricles to III ventricle

49. Which of the following statements are correct and incorrect?
A. Synaptic cleft of neurons secrete adrenaline
B. Myelinated nerve fibres are enveloped with Schwann cells, which form a myelin sheath around the axon
C. Non-myelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath
D. Spinal nerve and cranial nerves are made of non-myelinated nerve fibres
Of the four statements
(1) A, B are correct but C and D are incorrect
(2) A, B and C are correct but D is incorrect
(3) C and D are correct while A and B are incorrect
(4) B and C are correct while A and D are incorrect

50. Utriculus is the part of internal ear or membranous labyrinth which forms
(1) Lower chamber and is concerned with maintenance of equilibrium
(2) Lower chamber and is concerned with transmission of sound
(3) Upper chamber and is concerned with maintenance of equilibrium
(4) Upper chamber and is concerned with transmission of sound

51. Parts A, B, C and D of the human eye are shown in the diagram. Select the option which gives correct identification along with its functions/characteristics



(1) B-Blind spot – Has only a few rods and cones
(2) C-Aqueous chamber – Reflects the light which does not pass through the lens
(3) D-Choroid –Its anterior part forms ciliary body
(4) A-Retina – Contains photoreceptors, rods and cones

52. Which of the following hormones is secreted during for the emotional state such as fear, anger, pain and causes rise to blood pressure and rate of heartbeat?
(1) Insulin
(2) Adrenaline
(3) Progesterone
(4) Thyroxine

53. Match List I with List II and select the correct answer using the codes given on below the lists

List - I	**List - II**
A. Tyrosine	1. Vitamin D
B. Cyclic AMP	2. Thyroxine
C. Ionic calcium	3. Calcitonin
D. Hypocalcemia	4. Hormone action

(1) A-2, B-4, C-1, D-3 (2) A-4, B-1, C-3, D-2
(3) A-1, B-2, C-3, D-4 (4) A-3, B-1, C-4, D-2

54. A colour blind man marries a woman who is normal but carries this trait, the progeny would be
(1) All normal females but carrier of the trait
(2) All males and 50% females colour blinds
(3) All females and 50% males colour blind
(4) 50% males and 50% females colour blind

55. Albinism is known to be due to an autosomal recessive mutation. The first child of a couple with normal skin pigments was albino. What is the probability of their second child will also be an albino?
(1) 25% (2) 50%
(3) 75% (4) 100%

56. Match the disease in Column I with the appropriate items (pathogen/prevention/treatment) in Column II

Column-I	**Column-II**
A. Amoebiasis	1. *Treponema pallidum*
B. Diphtheria	2. Use only sterilized food and water
C. Cholera	3. DPT vaccine
D. Syphilis	4. Use oral rehydration therapy

(1) A-2, B-3, C-4, D-1 (2) A-1, B-2, C-3, D-4
(3) A-2, B-4, C-1, D-3 (4) A-2, B-1, C-3, D-4

57. Cancer is generally caused due to activation of ..... to ..... and/ or inactivation of .....
(1) oncogene, tumour suppressor gene, protooncogene
(2) tumour suppressor gene, oncogene, protooncogene
(3) oncogene, protooncogene, tumour suppressor gene
(4) protooncogene, oncogene, tumour suppressor gene

58. Match the following columns.

	Column–I		**Column–II**
(A)	Physalia	(1)	Brain coral
(B)	Adamsia	(2)	Sea fan
(C)	Pennatula	(3)	Sea pen
(D)	Gorgonia	(4)	Sea anemone
(E)	Meandrina	(5)	Portuguese Man o'War
(F)	Aurelia	(6)	Jellyfish

(1) A–5, B–4, C–2, D–3, E–1, F–6
(2) A–5, B–4, C–3, D–2, E–1, F–6
(3) A–5, B–4, C–2, D–1, E–2, F–6
(4) A–5, B–3, C–4, D–2, E–1, F–6

59. The head of cockroach is formed by fusion of how many segments?
(1) 4 (2) 5 (3) 6 (4) 8

60. A nucleotide is formed of
(1) Purine, pyrimidine and phosphate
(2) Purine, sugar and phosphate
(3) Nitrogen base, sugar and phosphate
(4) Pyrimidine, sugar and phosphate