

SAMPLE PAPER - 103

Time : 1 : 15 Hr.

Question : 60

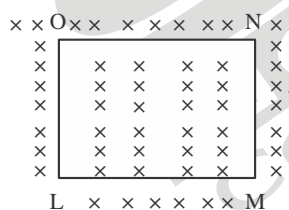
PHYSICS

01. In a hydrogen atom, an electron of mass m and charge e revolves in an orbit of radius r making n revolutions per second. If the mass of hydrogen nucleus is M , the magnetic moment associated with the orbital motion of electron is

- (1) $\frac{\pi n e r^2 m}{M + m}$ (2) $\pi n e r^2$
 (3) $\frac{\pi n e r^2}{m}$ (4) $\frac{\pi n e r^2 m}{M}$

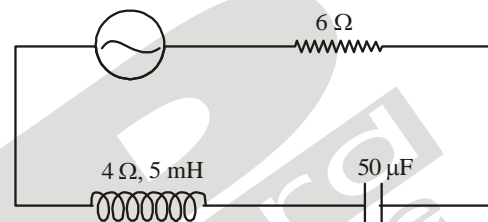
02. Permanent magnets are made of steel because steel has
 (1) low permeability and high coercivity
 (2) high permeability and high coercivity
 (3) low permeability and low coercivity
 (4) high permeability and low coercivity

03. A square loop OLMN of side 5 cm is placed in a magnetic field $B = 3kt^2$ (as shown in figure) where k is a constant, B is in tesla and t is in second. At time $t = 5$ second



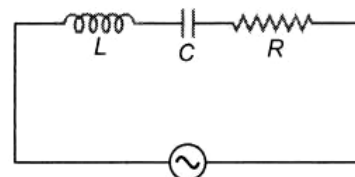
- (1) Induced current flows from O to L
 (2) Induced current flows from L to O
 (3) Induced current flows from is zero
 (4) Induced current flows from may flow in any direction, i.e. either from O to L or from L to O.

04. In the circuit, an ac source has voltage $20 \cos \omega t$ (volt), with $\omega = 2000$ rad/s. The amplitude of current in the circuit is



- (1) 2 A (2) 3.3 A
 (3) $\sqrt{2}$ A (4) $\sqrt{5}$ A

05. A 100 V, AC source of frequency 500 Hz is connected to an LCR circuit with $L = 8.1$ mH, $C = 12.5$ μ F, $R = 10\Omega$ all connected in series as shown in figure. What is the quality factor of circuit?



- (1) 2.02 (2) 2.54
 (3) 50.54 (4) 200.54

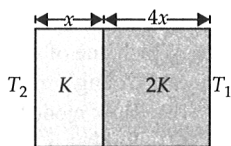
06. Body A of mass $4m$ moving with speed u collides with another body B of mass $2m$, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is:

- (1) $\frac{1}{9}$ (2) $\frac{8}{9}$
 (3) $\frac{4}{9}$ (4) $\frac{5}{9}$

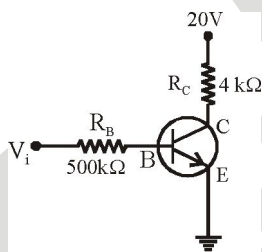
07. How much steam at 100°C will just melt 3200 g of ice at -10°C ? (Specific heat of ice = 0.5 cal/ $g^\circ\text{C}$, specific heat of water = 1 cal/ $g^\circ\text{C}$, latent of fusion of ice = 80 cal/g, and latent heat of vaporisation of water = 540 cal/g)
- (1) 425 g (2) 525 g (3) 625 g (4) 725 g

08. The temperature of the two outer surfaces of a composite slab, consisting of two materials having coefficients of thermal conductivity K and $2K$ and thickness x and $4x$ respectively are T_2 and T_1 ($T_2 > T_1$). The rate of heat transfer through the slab, in a steady state is

$$\left(\frac{A(T_2 - T_1)K}{x} \right) f, \text{ with } f, \text{ equal to}$$



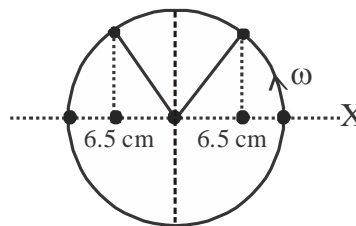
- (1) 1 (2) $\frac{1}{2}$ (3) $\frac{2}{3}$ (4) $\frac{1}{3}$
09. The kinetic energy of an electron with de-Broglie wavelength of 0.3 nanometre is
 (1) 0.168 eV (2) 16.8 eV
 (3) 1.68 eV (4) 2.5 eV
10. The third line of Balmer series of an ion equivalent to hydrogen atom has wavelength of 108.5 nm. The ground state energy of an electron of this ion will be
 (1) 3.4 eV (2) 13.6 eV
 (3) 54.4 eV (4) 122.4 eV
11. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B , I_C and β are given by :-



- (1) $I_B = 40 \mu\text{A}$, $I_C = 10 \text{ mA}$, $\beta = 250$
 (2) $I_B = 25 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 200$
 (3) $I_B = 20 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 250$
 (4) $I_B = 40 \mu\text{A}$, $I_C = 5 \text{ mA}$, $\beta = 125$
12. In the Young's double slit experiment the intensities, at two points P_1 and P_2 on the screen, are respectively I_1 and I_2 . If P_1 is located at the centre of a bright fringe and P_2 is located at a distance equal to a quarter of fringe width from P_1 , then $\frac{I_1}{I_2}$ is :
 (1) 2 : 1 (2) 1 : 2
 (3) 4 : 1 (4) 16 : 1
13. An object is kept at a distance of 16 cm from a thin lens and the image formed is real. If the object is kept at a distance of 6 cm from the same lens the image formed is virtual. If the size of the image formed are equal, the focal length of the lens will be:

- (1) 15 cm (2) 17 cm
 (3) 21 cm (4) 11 cm.

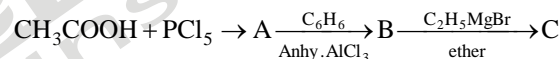
14. A body of mass 36 g moves with SHM of amplitude $A = 13 \text{ cm}$ and period $T = 12 \text{ s}$. At $t = 0$, the displacement x is $+13 \text{ cm}$. The shortest time of passage from $x = +6.5 \text{ cm}$ to $x = -6.5 \text{ cm}$ is (the circle of reference is shown in figure)



- (1) 2 s (2) 3 s
 (3) 6 s (4) 4 s
15. In a stationary wave
 (1) all the medium particles vibrate in the same phase
 (2) all the particles between two consecutive nodes vibrate in the same phase
 (3) any two consecutive nodes vibrate in the same phase
 (4) all the particles between two consecutive antinodes vibrate in the same phase

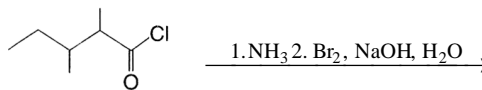
CHEMISTRY

16. In a set of the given reactions, acetic acid yielded a product C.



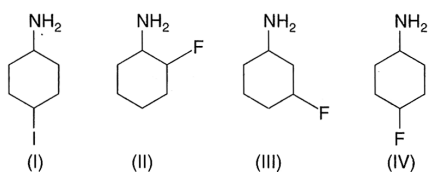
Product C would be

- (1) $\text{CH}_3\text{CH}(\text{OH})\text{C}_2\text{H}_5$
 (2) $\text{CH}_3\text{COC}_6\text{H}_5$
 (3) $\text{CH}_3\text{CH}(\text{OH})\text{C}_6\text{H}_5$
 (4) $\text{CH}_3 - \overset{\text{C}_2\text{H}_5}{\underset{|}{\text{C}}} - (\text{OH})\text{C}_6\text{H}_5$
17. What is the product of the following reaction?



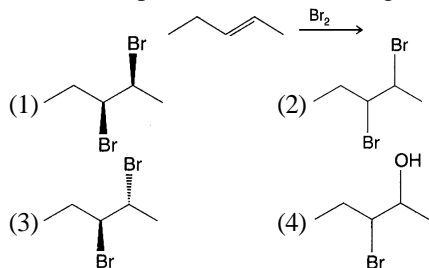
- (1) (2)
 (3) (4)

18. Arrange the amines in order of increasing boiling point (lowest first).



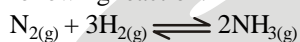
- (1) I, III, II, IV
(2) II, IV, I, III
(3) IV, II, III, I
(4) II, III, IV, I

19. What is the product of the following reaction?

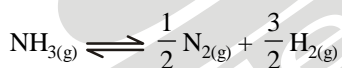


20. The incorrect statement among the following is
(1) S.B.M.-U. primarily aims at making urban India free from open defecation
(2) S.B.M.-G. aims to bring about an improvement in the general quality of life in rural areas.
(3) S.B.M-U. primarily aims at making U.S.A. free from open defecation
(4) Green chemistry is a production process that would bring about minimum pollution.

21. One mole of $N_{2(g)}$ is mixed with 2 mol of $H_{2(g)}$ in a 4 L vessel, if 50% of $N_{2(g)}$ is converted to $NH_{3(g)}$ by the following reaction:



What will be the value of K_c for the following equilibrium?



- (1) 256
(2) 16
(3) $\frac{1}{16}$
(4) None of these

22. A buffer solution is made up of acetic acid ($pK_a = M$) having concentration 1.5 M and sodium acetate having concentration 0.15 M. What is the number of OH^- ions present in 1 L solution?

- (1) $10^{-10} N_A$
(2) $10^{-4} N_A$
(3) $10^{-3} N_A$
(4) $10^{-6} N_A$

23. 25.4 g of iodine and 14.2 g of chlorine are made to react completely to yield a mixture of ICl and ICl_3 . Calculate the ratio of moles of ICl and ICl_3 . Calculate the ratio of moles of ICl and ICl_3 .

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

24. When heated above $916^\circ C$, iron changes its bcc crystalline form of fcc with out the change in the radius of atom. The ratio of density of the crystal before heating and after heating is

- (1) 1.069
(2) 0.918
(3) 0.725
(4) 1.231

25. A solution of x moles of sucrose in 100 g of water freezes at $-0.2^\circ C$. As ice separates the freezing point goes down to $0.25^\circ C$. How many grams of ice would have separated?

- (1) 18 g
(2) 20 g
(3) 25 g
(4) 23 g

26. A narrow spectrum antibiotic is active against _____

- (1) gram positive or gram negative bacteria.
(2) gram negative bacteria only.
(3) single organism or one disease.
(4) both gram positive and gram negative bacteria

27. A known mass m gram of an organic compound is heated with fuming HNO_3 and $AgNO_3$ in Carius tube. If the molar mass of AgX is M and weight of AgX collected is m_1 the percentage of X (Cl, Br, I) is:

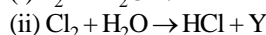
(1) $\frac{\text{At. wt. of X}}{M} \times \frac{m_1}{m} \times 100$

(2) $\frac{\text{At. wt. of X}}{M} \times \frac{m}{m_1} \times 100$

(3) $\frac{M}{\text{At. wt. of X}} \times \frac{m}{m_1} \times 100$

(4) $\frac{M}{\text{At. wt. of X}} \times \frac{m_1}{m} \times 100$

28. (i) $F_2 + 2H_2O \rightarrow 4HF + X$



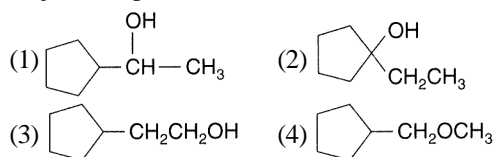
What is X and Y in above reaction.

- (1) OF_2 and O_2
(2) O_2F_2 and HCl
(3) O_2F_2 and Cl_2
(4) O_2 and $HClO$

29. Which of the following gases can be used as an anaesthetic?

- (1) N_2O
(2) NO
(3) NCl_3
(4) NO_2

30. A Grignard reagent is prepared by reacting cyclo-pentanol with first thionyl chloride and then magnesium in ether. The Grignard reagent is then reacted with acetaldehyde (ethanal) and the reaction mixture acidified. What is the major final product of this series of reactions?



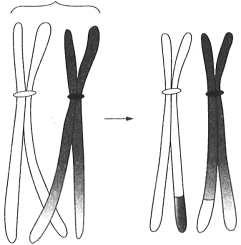
31. Which of the following dyes is not used for staining chromosomes?
 (1) Basic Fuchsin
 (2) Safranin
 (3) Methylene green
 (4) Carmine

32. The sequence of events by which a cell duplicates its genome, synthesizes the other constituent of cells and eventually divides into two daughter cells is termed as _____.
 (1) Cytology (2) Cell division
 (3) Cell cycle (4) Cell biology

33. The G_1 phase is not characterized by
 (1) Continuous growth
 (2) Active metabolism
 (3) DNA replication
 (4) Non-replication of DNA

34. At metaphase, chromosomes are attached to the spindle fibres by their
 (1) Satellites
 (2) Secondary constrictions
 (3) Kinetochores
 (4) Centromeres

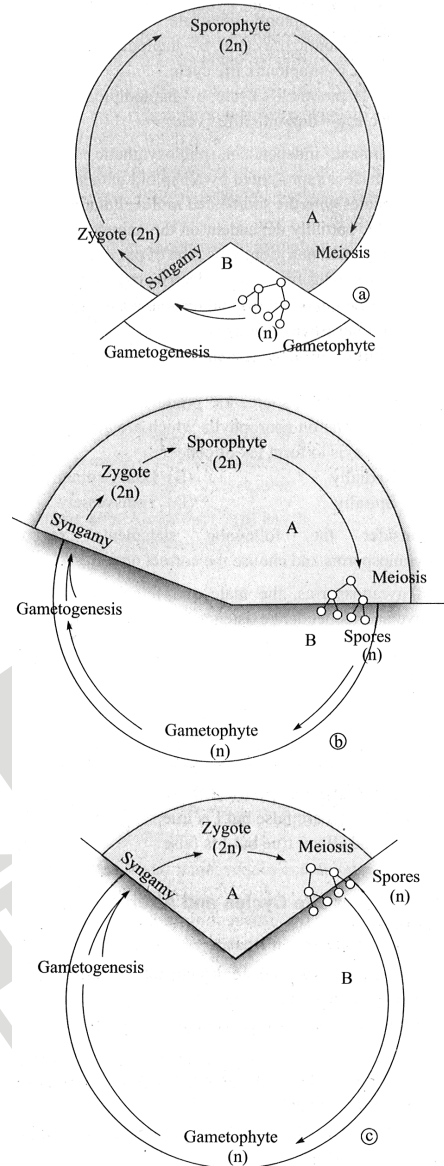
35. Given below is the representation of a certain event at a particular stage of a type of cell division. Which is this stage?



- (1) Prophase I during meiosis
 (2) Prophase II during meiosis
 (3) Prophase of Mitosis
 (4) Both prophase and metaphase of mitosis

36. Pyrenoid consists of
 (1) Protein besides starch
 (2) Protein around starch
 (3) Starch around protein
 (4) Both (1) and (3)

37. Recognise the figure and find out the correct matching:



- (1) a–Haplontic life cycle, b–diplontic life cycle, c–haplodiplontic life cycle
 (2) a–Haplodiplontic life cycle, b–diplontic life cycle, c–haplontic life cycle
 (3) a–Diplontic life cycle, b–haplodiplontic life cycle, c–haplontic life cycle
 (4) a–Haplontic life cycle, b–haplodiplontic life cycle, c–diplontic life cycle

38. The activity of cambium is under the control of
 (1) Environmental factors (2) Physiological factors
 (3) Both (1) and (2) (4) None of the above

39. Long distance transport of substances within a plant cannot be done by diffusion alone. Diffusion is a slow process. The movement of a molecule across a typical plant cell about 50 μm takes approximately
 (1) 2.5 minutes (2) 2.5 hours
 (3) 2.5 seconds (4) 5.0 minutes

40. The C_4 plants are different from the C_3 plants with reference to the
- (1) The substance that accepts CO_2 in carbon assimilation
 - (2) Types of end product of photosynthesis
 - (3) The number of NADPH that are consumed in preparing sugar
 - (4) Types of pigments involved in photosynthesis

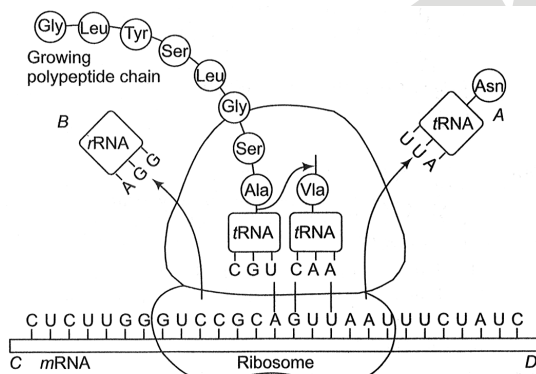
41. Match column I with column II, and choose the correct combination from the options given below.

	Column-I		Column-II
a.	Differentiation	1.	Formation of interfascicular cambium
b.	De-differentiation	2.	Secondary xylem
c.	Re-differentiation	3.	Tracheary element

- (1) a-3; b-2; c-1 (2) a-2; b-3; c-1
 (3) a-1; b-2; c-3 (4) a-3; b-1; c-2

42. Letter symbol refers to the dominant factors give a ...A... or upper case letter of the alphabet. A corresponding ...B... or lower case letter is used for recessive factor. Here A and B refers to
- (1) A-capital; B-small (2) A-small; B-capital
 - (3) A-capital; B-capital (4) A-small; B-small

43. Choose the correct options for A, B, C and D.

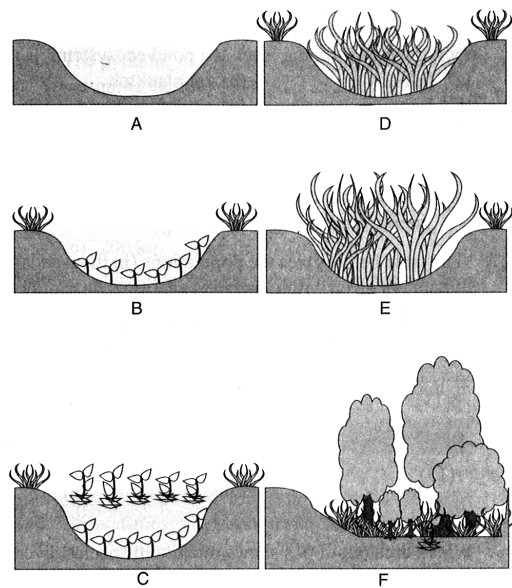


- (1) A–Uncharged tRNA, B–Charged tRNA, C–5' end, D–3' end
- (2) A–Charged tRNA, B–Uncharged tRNA C–3' end, D–5' end
- (3) A–Charged tRNA, B–Uncharged tRNA C–5' end, D–3' end
- (4) A–Charged tRNA, B–Charged tRNA C–5' end, D–3' end

44. Cuscuta is an example of:

- (1) Brood parasitism
- (2) Predation
- (3) Endoparasitism
- (4) Ectoparasitism

45. Select the correct match for the below given stages of succession.

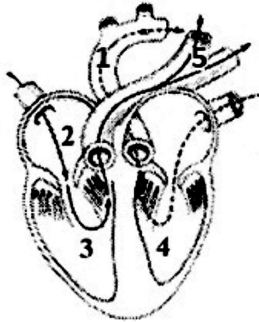


- (1) A: Phytoplankton, B: Submerged plant, C: Submerged free floating plant stage, D: Reed swamp stage, E: Marsh-meadow stage, F: Scrub stages
- (2) A: Marsh-meadow stage, B: Submerged free floating plant stage, C: Scrub stages, D: Phytoplankton, E: Submerged plant, F: Submerged free floating plant stage
- (3) A: Scrub stages, B: Marsh-meadow stage, C: Phytoplankton, D: Reed swamp stage, E: Submerged plant, F: Submerged free floating plant stage
- (4) A: Scrub stages, B: Phytoplankton, C: Reed swamp stage, D: Marsh-meadow stage, E: Submerged free floating plant stage, F: Submerged plant

ZOOLOGY

46. Enzymes that catalyse the removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds is known as
- (1) Oxidoreductase (2) Transferase
 - (3) Hydrolase (4) Lyase
47. The nitrogenous organic base purine occurring in RNA is
- (1) Cytosine (2) Thymine
 - (3) Guanine (4) Uracil
48. How many layers do filtration membrane consist of?
- (1) 1 (2) 2 (3) 3 (4) 4
49. Counter-current mechanism is present in which of the following?
- (1) HL (2) Vasa recta
 - (3) Both (1) and (2) (4) DCT

50. Total number of bones in the hind limb of man is
 (1) 14 (2) 30 (3) 24 (4) 21
51. In the given figure of the heart, which of the marked structures (1, 2, 3, 4 and 5) carry oxygenated blood?



- (1) 1, 2, 3 and 4 (2) 1 and 5
 (3) 1 and 4 (4) 3 and 5

52. In bird exceptionally (A) gland is present at the (B).
 (1) A = Oil B = Base of fore limb
 (2) A = Oil B = Base of tail
 (3) A = preen B = Base of beak
 (4) A = Uropygeal B = Base of beak

53. Reissner's membrane is found in :
 (1) Cochlea of mammal
 (2) Eye of mammal
 (3) Heart of mammal
 (4) Nasal duct of mammal

54. Which one is the function of parasympathetic nervous system in mammals ?
 (1) Acceleration of heart beat
 (2) Constriction of pupil
 (3) Stimulation of sweat glands
 (4) Contraction of arrector pilli muscles

55. All the following statements about cannabinoids are true, except
 (1) Cannabinoids are known for their effects on cardiovascular system
 (2) Cannabinoids are obtained from leaves and flowers of hemp plant
 (3) Cannabinoids interact with cannabinoid receptors present principally in brain
 (4) Cock or Crack is a very commonly abused cannabinoid

56. Study the figure I and II carefully and identify the structures A, B and C respectively which are related with specialized connective tissues :

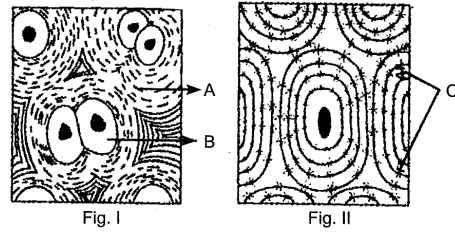


	Fig.I	Fig.II	A	B	C
(1)	Bone	Cartilage	Collagen fibres	Osteoblast	Lamella
(2)	Cartilage	Bone	Microtubule	Chondroclast	Lamella
(3)	Cartilage	Bone	Collagen fibres	Chondrocytes	Lamella
(4)	Cartilage	Bone	Collagen	Chondroclast	Lamella

57. Select the incorrect statement:
 (1) Male fruit fly is heterogametic.
 (2) In male grasshoppers, 50% of sperms have no sex-chromosome.
 (3) In domesticated fowls sex of progeny depends on the type of sperm rather than egg.
 (4) Human males have one of their sex-chromosome much shorter than the other.
58. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to
 (1) Co-667 (2) Lerma Rojo
 (3) Sharbati Sonora (4) Basmati
59. Bacteria protects themselves from viral attack by producing
 (1) Exonuclease (2) Endonuclease
 (3) DNA ligase (4) Gyrase
60. Each testis has how many testicular tubules?
 (1) 200 (2) 250
 (3) 300 (4) 150