

SAMPLE PAPER - 87

Time : 1 : 15 Hr.

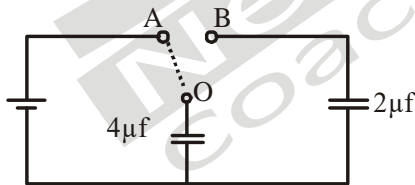
Question : 60

PHYSICS

01. In Young's double-slit experiment, the fringe width is found to be 0.4 mm. If the whole apparatus is immersed in water of refractive index $\frac{4}{3}$, without disturbing the geometrical arrangement, the new fringe width will be
 (1) 0.30 mm (2) 0.40 mm
 (3) 0.53 mm (4) 450 microns

02. In a double-slit experiment, the distance between slits is increased 10 times, whereas their distance from screen is halved, then the fringe width
 (1) Becomes $\frac{1}{20}$ th (2) Becomes $\frac{1}{90}$ th
 (3) Remains same (4) Becomes $\frac{1}{10}$

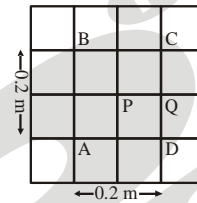
03. In the circuit shown below, O is connected first to A. It charges capacitor $4\mu\text{f}$. Now the connection of O is switched to B. The charge on the $4\mu\text{f}$ capacitor is thereby changed by a factor



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

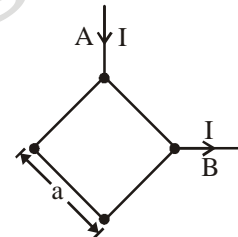
04. A charge of $+2\mu\text{C}$ is situated off-centre of a hollow spherical metallic shell. Then
 (1) $-2\mu\text{C}$ charge gets uniformly distributed on inner surface of shell
 (2) $+2\mu\text{C}$ charge gets non-uniformly distributed on outer surface of shell
 (3) $-2\mu\text{C}$ charge gets non-uniformly distributed on inner surface of shell
 (4) no change appears on outer surface of shell

05. A, B, C, D, P and Q are points in a uniform electric field. The Potentials at these points are $V(A) = 2$ volt, $V(P) = V(B) = V(D) = 5$ volt, $V(C) = 8$ volt. The electric field at P is



- (1) 10 V/m along PQ
 (2) 5 V/m along PC
 (3) $15\sqrt{2}$ V/m along PA
 (4) 5 V/m along PA

06. In a square loop made with a wire of uniform cross-section current I enters from point A and leaves from point B. The magnetic field strength at the centre of the square is-



- (1) zero (2) $\frac{\mu_0 12\sqrt{2}}{4\pi a}$
 (3) $\frac{4\sqrt{2}\mu_0 I}{4\pi a}$ (4) $\frac{2\sqrt{2}\mu_0 I}{4a}$

07. An electron is revolving in a circular path of radius 2.0×10^{-10} m with uniform speed of 3.0×10^6 ms⁻¹. The magnetic induction at the centre of the circular path will be:-

- (1) 0 (2) 1.2×10^{-6} T
 (3) 0.6 T (4) 1.2 T

08. A square coil of side 10 cm consists of 20 turns and carries a current of 12 A. The coil is suspended vertically and the normal to the plane of the coil makes an angle of 30° with the direction of a uniform horizontal magnetic field of magnitude 0.80 T. What is the magnitude of torque experienced by the coil ?

- (1) 0.96 N-m (2) 2.06 N-m
 (3) 0.23 N-m (4) 1.36 N-m

09. A proton of mass m and charge e is moving in $+z$ direction through a region with uniform electric field E in $+x$ direction and a uniform magnetic field B in $+y$ direction, but the proton's trajectory is not affected. Initially the proton is accelerated from rest through a potential difference V and then passes through the region. Then

$$(1) V = \frac{E}{2eB} \quad (2) V = \frac{mE^2}{eB^2}$$

$$(3) V = \frac{mE^2}{2eB^2} \quad (4) \frac{E^2}{B^2}$$

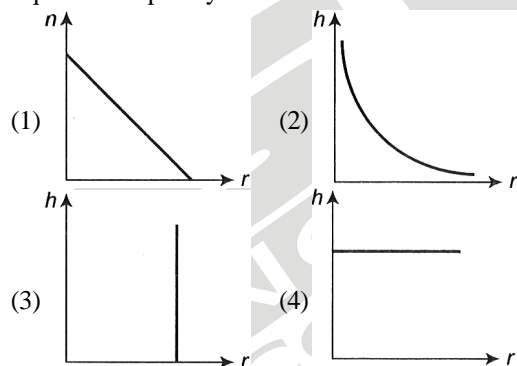
10. Two very long straight parallel wires carry steady currents I and I respectively. The distance between the wires is d . At a certain instant of time, a point charge q is at a point equidistant from the two wires, in the plane of the wires. Its instantaneous velocity v is perpendicular to the plane of wires. The magnitude of force acting on the charge at this instant is

$$(1) \frac{\mu_0 I q v}{2\pi d} \quad (2) \frac{2\mu_0 I q v}{\pi d} \quad (3) \frac{\mu_0 I q v}{\pi d} \quad (4) \text{zero}$$

11. A magnet of magnetic moment $4 \text{ A}\cdot\text{m}^2$ is held in a uniform magnetic field $5 \times 10^{-4} \text{ T}$ with the magnetic moment vector makes an angle 30° with the field. Work done in increasing the angle from 30° to 45° :-

$$(1) 3.2 \times 10^{-4} \text{ J} \quad (2) 1.6 \times 10^{-4} \text{ J} \\ (3) 1.6 \times 10^{-3} \text{ J} \quad (4) 3.2 \times 10^{-3} \text{ J}$$

12. The correct curve between the height or depression h of liquid in a capillary tube and its radius is



13. A stress of 10^6 N/m^2 is required for breaking a material. If the density is $3 \times 10^3 \text{ kg m}^{-3}$ then what should be the maximum length which can be hanged so that it is the point of breaking by its own weight?

$$(1) 34 \text{ m} \quad (2) 340 \text{ m} \quad (3) 3.4 \text{ m} \quad (4) 0.34 \text{ m}$$

14. When a capillary tube is dipped in water, water rises upto 8 cm in the tube. What happens when the tube is pushed down such that its end is only 5 cm above outside water level?

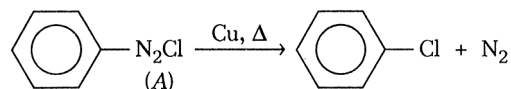
- (1) The radius of the meniscus increases and therefore water does not overflow.
(2) The radius of the water meniscus decreases and therefore does not overflow.

- (3) The water forms a droplet on top of the tube but does not overflow.
(4) The water starts overflowing.

15. One thousand small water drops of equal radii combine to form a big drop. The ratio of final surface energy to the total initial surface energy is
(1) 1000 : 1 (2) 1 : 1000 (3) 10 : 1 (4) 1 : 10

CHEMISTRY

16. For the given reaction



half-life is independent of concentration of A. After 10 min volume of N_2 gas is 25 L and volume is 50 L after complete reaction. Thus rate constant is

$$(1) \frac{\ln 1.25}{10} \quad (2) \frac{\ln 5}{1.25} \quad (3) \frac{\ln 2}{10} \quad (4) \frac{\ln 2}{5}$$

17. The quantum number $+1/2$ and $-1/2$ for the electron spin represent

- (1) Rotation of the electron in clockwise and anticlockwise direction respectively
(2) Rotation of the electron in anticlockwise and clockwise direction respectively
(3) Magnetic moment of the electron pointing up and down respectively
(4) Two quantum mechanical spin states which have no classical analogue

18. Which of the following pair will diffuse at the same rate?

- (1) CO_2 and N_2O (2) CO_2 and NO
(3) CO_2 and CO (4) N_2O and NO

19. The correct order of atomic / Ionic radii is :

- (1) $\text{Sc} > \text{Ti} > \text{V} > \text{Cr}$ (2) $\text{Co} > \text{Ni} > \text{Cu} > \text{Zn}$
(3) $\text{S}^{2-} > \text{Cl}^- > \text{O}^{2-} > \text{N}^{3-}$ (4) None of these

20. The correct values of ionization energies (in KJ mole^{-1}) of Si, P, Cl and S are respectively:

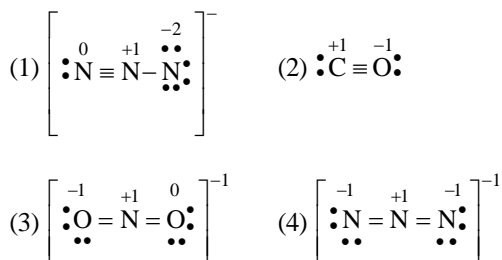
- (1) 786, 1012, 999, 1256 (2) 1012, 786, 999, 1256
(3) 786, 1012, 1256, 999
(4) 786, 999, 1012, 1256

21. Match of the species given in Columns I with the shape given in column II and mark the correct option:

	Column -I		Column-II
A.	SF_4	1.	Tetrahedral
B.	BrF_3	2.	Pyramidal
C.	BrO_3^-	3.	Sea-saw shaped
D.	NH_4^+	4.	Bent T-shaped

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

22. In which of the following lewis dot structure is written with incorrect formal charge?



23. Fac and mer isomerism is associated with which of the following general formula ?



24. $[\text{Ni}(\text{H}_2\text{O})_6]^{2+} \xrightarrow{+\text{en}} \text{A} \xrightarrow{+\text{en}} \text{B} \xrightarrow{+\text{en}} \text{C}$

A is Pale blue, C is violet, Then possible colour of B is:

- (1) Red (2) Green
 (3) Yellow (4) Blue

25. Radioactive elements emit α, β and γ -rays and are characterised by their half-lives. The radioactive isotope of hydrogen is:

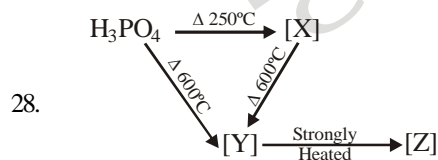
- (1) Protium (2) Deuterium
 (3) Tritium (4) Hydronium

26. The thermal stability of $\text{BaCO}_3, \text{CaCO}_3, \text{SrCO}_3$ and MgCO_3 decreases in the order:

- (1) $\text{BaCO}_3 > \text{SrCO}_3 > \text{MgCO}_3 > \text{CaCO}_3$
 (2) $\text{CaCO}_3 > \text{SrCO}_3 > \text{MgCO}_3 > \text{BaCO}_3$
 (3) $\text{MgCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$
 (4) $\text{BaCO}_3 > \text{SrCO}_3 > \text{CaCO}_3 > \text{MgCO}_3$

27. A chemical A is used for the preparation of washing soda to recover ammonia. When CO_2 is bubbled through an aqueous solution A, the solution turns milky. It is used in white washing due to disinfectant nature. What is the chemical formula of A?

- (1) $\text{Ca}(\text{HCO}_3)_2$ (2) CaO
 (2) $\text{Ca}(\text{OH})_2$ (4) CaCO_3



[X], [Y] and [Z] are:

- (1) $\text{H}_4\text{P}_2\text{O}_7, \text{HPO}_3$ and P_4O_{10}
 (2) $\text{HPO}_3, \text{H}_4\text{P}_2\text{O}_7$ and P_4O_{10}
 (3) $\text{H}_4\text{P}_2\text{O}_6, \text{H}_3\text{PO}_3$ and P_4O_6
 (4) $\text{H}_4\text{P}_2\text{O}_6, \text{HPO}_3$ and P_4O_6

29. Select interhalogen compound which is/are not exist?

- (i) IF_3 (ii) ClF_7 (iii) ClF_3 (iv) BrF_4
 (1) (i) and (iii) (2) (ii) and (iv)

- (3) (ii) only (4) (ii) and (iii)

30. There are 14 elements in actinoid series. Which of the following elements does not belong to this series?

- (1) U (2) Np (3) Tm (4) Fm

BOTANY

31. Read the given statements

- (i) Centromere is present in the middle of the chromosome and forms two equal arms
 (ii) Chromosome has a terminal centromere
 (iii) Centromere lies close to the end of the chromosome forming one extremely short and one very long arm
 (iv) Centromere lies slightly away from the middle of the chromosome resulting into one shorter arm and one longer arm

Select the correct option as per the codes given above

	Metacentric	Submetacentric	Acrocentric	Telocentric
(1)	(i)	(iv)	(iii)	(ii)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(iv)	(i)	(iii)	(ii)
(4)	(iv)	(ii)	(iii)	(i)

32. Centrioles arise from

- (1) pre-existing centrioles
 (2) de novo
 (3) nuclear envelope (4) sphaerosome

33. Which of the following is correct regarding the structure of a section of cilia / flagella ?

	Peripheral microtubules (doublets)	Central microtubules (singlets)	Radial spokes	Central sheath
(1)	9 + 0	2	8	1
(2)	9 + 2	9 + 0	9	1
(3)	9	2	9	1
(4)	3	6	9	1

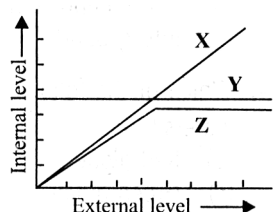
34. Best material to study meiosis is

- (1) root tip (2) ovary
 (3) young anther (4) pollen grain

35. Which one is correct about bivalent ?

- (i) Bivalents are tetrads
 (ii) A bivalent means 4 chromatids and 2 centromeres
 (iii) One bivalent consists of 2 homologous chromosomes
 (iv) Bivalents form in zygotene
 (1) (i), (ii), (iii) and (iv)
 (2) (iii) only
 (3) (iii) and (iv)
 (4) (iv) only

36. Which of the following statements, support the view that elaborate sexual reproductive process appeared much later in the organic evolution?
 (i) Lower groups of organisms have simpler body design
 (ii) Asexual reproduction is common in lower groups
 (iii) Asexual reproduction is common in higher groups of organisms
 (iv) The high incidence of sexual reproduction in angiosperms and vertebrates
 Choose the correct answer from the options given below
 (1) (i), (ii) and (iii) (2) (i), (iii) and (iv)
 (3) (i), (ii) and (iv) (4) (ii), (iii) and (iv)
37. Refer the given characteristics of some flowers
 (i) Light and non-sticky pollen grains
 (ii) Exserted stigmas and anthers
 (iii) Large, often feathery stigmas
 (iv) Flowers colourless, odourless and nectarless
 (v) Common in grasses
 Above features are the characteristics of
 (1) anemophily (2) hydrophily
 (3) entomophily (4) zoophily.
38. The three cells found in a pollen grain when it is shed at 3-celled stage are
 (1) 1 vegetative cell, 1 generative cell, 1 male gamete
 (2) 1 vegetative cell, 2 male gametes
 (3) 1 vegetative cell, 2 male gametes
 (4) either (1) or (2)
39. Given below are the events that are observed in an artificial hybridization programme. Arrange them in the correct sequential order and select the correct option
 1. Re-bagging
 2. Selection of parents
 3. Bagging
 4. Dusting the pollen on stigma
 5. Emasculation
 6. Collection of pollen from male parent
 (1) 2 → 3 → 5 → 6 → 4 → 1
 (2) 2 → 5 → 3 → 6 → 4 → 1
 (3) 5 → 2 → 3 → 6 → 1 → 4
 (4) 2 → 3 → 6 → 4 → 5 → 1
40. In a fertilised embryo sac, the haploid, diploid and triploid structures are
 (1) synergid, zygote and primary endosperm nucleus
 (2) synergid, antipodal and polar nuclei
 (3) antipodal, synergid and primary endosperm nucleus
 (4) synergid, polar nuclei and zygote
41. Select the option showing the correct sequential steps to produce a new genetic variety of a crop
 (1) Selection of parents → Hybridization of selected parents → Germplasm collection → Selection of superior recombinants → Testing and release of new varieties
 (2) Germplasm collection → Selection of parents → Hybridization of selected parents → Selection of superior recombinants → Testing and release of new varieties
 (3) Selection of superior recombinants → Germplasm collection → Hybridization of selected parents → Selection of parents → Testing and release of new varieties
 (4) Germplasm collection → Selection of parents → Hybridization of selected parents → Testing and release of new varieties → Selection of superior recombinants
42. Select the correct option to fill up the blanks
 (i)are used in detergent formulations and are helpful in removing oily stains from the laundry
 (ii) are ripened by growing *Penicillium roqueforti* on them
 (iii) are produced without distillation whereas,are produced by distillation of the fermented broth
 (iv) antibiotic was used to treat American soldiers wounded in world war II
 (v) is also called as kusht rog
 (1) (i) Lipase (ii) Camembert cheese (iii) Whisky and rum, wine and beer (iv) Penicillin (v) Leprosy
 (2) (i) Lipase (ii) Roquefort cheese (iii) Wine and beer, whisky and rum (iv) Penicillin (v) Leprosy
 (3) (i) Streptokinase (ii) Roquefort cheese (iii) Wine and beer, whisky and rum (iv) Streptomycin (v) Whooping cough
 (4) (i) Amylase (ii) Swiss cheese (iii) Whisky and rum, wine and beer (iv) Penicillin (v) Diphtheria
43. Match column-I with column-II and select the correct answer from the codes given below
- | Column-I | Column-II |
|--|--|
| A. The stage in which physical treatment of sewage is done | (i) Anaerobic digestion of activated sludge and production of biogas |
| B. The stage in which biological treatment of sewage is done | (ii) Activated sludge |
| C. Name of the sediment in primary treatment | (iii) Aeration tanks |
| D. It is carried to aeration tanks from primary settling | (iv) Primary effluent |
| E. Name of the sediment in secondary treatment | (v) Primary sludge |
| F. Site of flocs growth | (vi) Secondary treatment |
| G. Function of sludge digester | (vii) Primary treatment |
- (1) A-(vii), B-(vi), C-(v), D-(iv), E-(ii), F-(iii), G-(i)
 (2) A-(i), B-(iii), C-(v), D-(vii), E-(ii), F-(iv), G-(vi)
 (3) A-(i), B-(ii), C-(iii), D-(iv), E-(v), F-(vi), G-(vii)
 (4) A-(vii), B-(vi), C-(i), D-(ii), E-(iii), F-(iv), G-(v)
44. The given graph represents how three different living organisms (X, Y and Z) cope with the external environmental conditions. Study the graph and select the correct option regarding X, Y and Z



- (1) X could be a mammal
- (2) Y could be a bird
- (3) Z could be a mammal
- (4) X could be a bird

45. Species interaction with negative influence on both is referred to as
- (1) amensalism
 - (2) mutualism
 - (3) commensalism
 - (4) competition

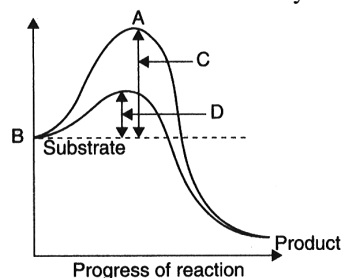
ZOOLOGY

46. Which of the following has been recently used for increasing productivity of super milk cows?
- (1) Artificial insemination by a pedigreed bull only
 - (2) Super ovulation of a high production cow only
 - (3) Embryo transplantation only
 - (4) A combination of super ovulation, artificial insemination and embryo transplantation into a 'carrier cow' (surrogate mother)
47. Inbreeding is carried out in animal husbandary because it
- (1) Increases vigour
 - (2) Improves the breed
 - (3) Increases heterozygosity
 - (4) Increases homozygosity
48. Intercostal muscles occur in
- (1) Abdomen
 - (2) Thigh
 - (3) Ribs
 - (4) Diaphragm
49. Which is part of pectoral girdle ?
- (1) Glenoid cavity
 - (2) Sternum
 - (3) Ilium
 - (4) Acetabulum
50. What is sarcomere ?
- (1) Part between two H-lines
 - (2) Part between two A-lines
 - (3) Part between two I-bands
 - (4) Part between two Z-lines
51. Uric acid is the chief nitrogenous component of the excretory products of
- (1) earth worm
 - (2) cockroach
 - (3) Frog
 - (4) man
52. The quantity 1200 ml in the respiratory volumes of a normal human adult refers to
- (1) Maximum air that can be breathed in and breathed out

- (2) Residual volume
- (3) Expiratory reserve volume
- (4) Total lung capacity

53. Oxygen dissociation curve of haemoglobin is
- (1) Sigmoid
 - (2) Hyperbolic
 - (3) Linear
 - (4) Hypobolic

54. The figure given below shows the conversion of a substrate into product by an enzyme. In which one of the four options (a-d) the components of reaction labelled as A, B, C and D are identified correctly?



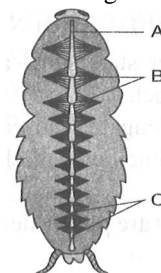
- (1) A: Potential energy, B: Transition state, C: Activation energy with enzyme, D: Activation energy without enzyme.
- (2) A: Transition state, B: Potential energy, C: Activation energy without enzyme, D: Activation energy with enzyme.
- (3) A: Potential energy, B: Transition state, C: Activation energy with enzyme, D: Activation energy without enzyme
- (4) A: Activation energy with enzyme, B: Transition state, C: Activation energy without enzyme D: Potential energy.

55. The most abundant chemical in living organisms could be
- (1) Protein
 - (2) Water
 - (3) Sugar
 - (4) Nucleic acid

56. Enzymes enhance the rate of reaction by
- (1) Forming a reactant-product complex
 - (2) Changing the equilibrium point of the reaction
 - (3) Combining with the product as soon as it is formed
 - (4) Lowering the activation energy of the reaction

57. Male and female cockroaches can be distinguished externally through
- (1) Anal styles in male
 - (2) Anal cerci in female
 - (3) Anal style and antennae in female
 - (4) Both (2) and (3)

58. Identify A, B and C in the given figure.



- (1) A : Chambers of hart, B : Anterior aorta, C : Alary

muscles

(2) A : Alary muscles, B : Chamber of heart, C : Anterior aorta

(3) A : Anterior aorta, B : Chamber of heart, C : Alary muscles

(4) A : Anterior aorta, B : Alary muscles, C : Chambers of heart

59. Malpighian tubules are

(1) Excretory organs of insects.

(2) Excretory organs of annelids.

(3) respiratory organs of insects.

(4) Respiratory organs of annelids.

60. Which of the following pairs are correctly matched?

	Animals	Morphological features
(i)	Crocodile	Four-chambered heart
(ii)	Sea urchin	Parapodia
(iii)	Obelia	Metagenesis
(iv)	Lemur	Thecodont

(1) (ii), (iii) and (iv)

(2) only (i) and (iv)

(3) only (i) and (ii)

(4) (i), (iii) and (iv)

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