

SAMPLE PAPER - 116

Time : 1 : 15 Hr.

Question : 60

PHYSICS

01. The output of a step-down transformer is measured to be 24 V when connected to a 12 watt light bulb. The value of the peak current is :

(1) $1/\sqrt{2}$ A (2) $\sqrt{2}$ A
 (3) 2 A (4) $2\sqrt{2}$ A

02. In a photoelectric experiment, the wavelength of the light incident on a metal is changed from 300 nm to 400 nm. The decrease in the stopping potential is close to :

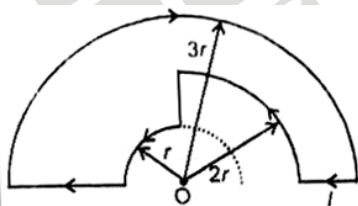
$$\left(\frac{hc}{e} = 1240 \text{ nm} - V \right)$$

(1) 0.5 V (2) 1.0 V
 (3) 2.0 V (4) 1.5 V

03. A capacitor of 20 μF charged upto 500 V is connected in parallel with another capacitor of 10 μF , which is charged upto 200 V. The common potential is (assume same polarity plates are connected)

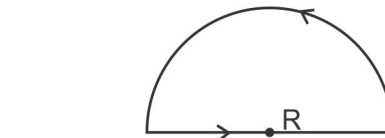
(1) 250 V (2) 300 V
 (3) 400 V (4) 600 V

04. Magnetic field at point O is



(1) $\frac{\mu_0 I}{16R} \odot$ (2) $\frac{5\mu_0 I}{48R} \odot$
 (3) $\frac{\mu I}{12R} \otimes$ (4) $\frac{5\mu_0 I}{48R} \otimes$

05. A charge q is circulating with a constant speed v in a semicircular loop of radius R as shown. The magnetic moment of this loop is



(1) $qvR \left(\frac{\pi}{\pi+2} \right)$ (2) $\frac{1}{2} qvR$

(3) $\frac{1}{2} qvR \left(\frac{\pi}{\pi+2} \right)$ (4) qvR

06. Two conducting plates A and B are placed parallel to each other at a small distance between them. Plate A is given a charge q_1 and plate B is given a charge q_2 . Then
- (1) the outer surfaces of A and B get no charge
 - (2) the inner surfaces of A and B get all the charge
 - (3) the inner surfaces of A and B get equal and opposite

charge of magnitude $\left| \frac{q_1 - q_2}{2} \right|$

- (4) the outer surfaces of A and B get charge of the same

polarity and of the magnitude $\left| \frac{q_1 - q_2}{2} \right|$

07. The work done in increasing the size of a rectangular soap film with dimensions 8 cm \times 3.75 cm to 10 cm \times 6 cm is 2×10^{-4} J. The surface tension of the film (in N/m) is :

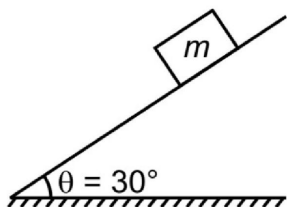
(1) 1.65×10^{-2}
 (2) 3.3×10^{-2}
 (3) 6.6×10^{-2}
 (4) 8.25×10^{-2}

08. Two metal spheres of radii a and b are very far apart but are connected by a thin wire. Their combined charge is Q. Their absolute potential is

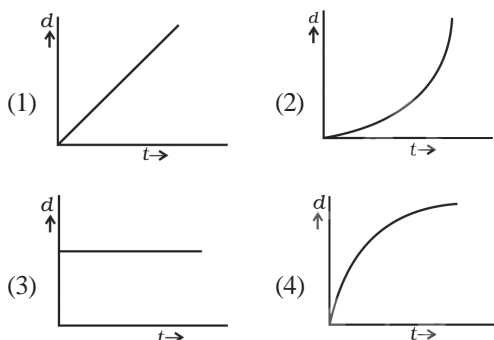
(1) $\frac{Q}{4\pi \epsilon_0 a}$ (2) $\frac{Q}{4\pi \epsilon_0 b}$

(3) $\frac{Q}{4\pi \epsilon_0 (a+b)}$ (4) $\frac{Q(a+b)}{4\pi \epsilon_0 ab}$

09. The dimension of $\frac{e^2}{4\pi\epsilon_0 hc}$, where e , ϵ_0 , h and c are electric charge, electric permittivity, Plank's constant and velocity of light in vacuum respectively
 (1) $[M^0L^0T^0]$ (2) $[ML^0T^0]$
 (3) $[M^0LT^0]$ (4) $[M^0L^0T]$
10. A projectile is projected from the ground by making an angle of 60° with the horizontal. After 1s projectile makes an angle of 30° with the horizontal. The maximum height attained by the projectile is (Take $g = 10 \text{ ms}^{-2}$)
 (1) $\frac{45}{2} \text{ m}$ (2) $\frac{45}{4} \text{ m}$ (3) $\frac{43}{2} \text{ m}$ (4) $\frac{43}{4} \text{ m}$
11. Plane having inclination 30° . The coefficient of friction between the block and the inclined plane is 0.75. The contact force on the block is-



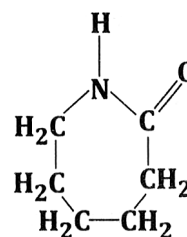
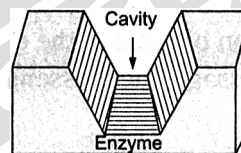
- (1) $\frac{3}{4}mg$ (2) $2mg$ (3) $\frac{5}{4}mg$ (4) mg
12. A particle of mass m is moving in a straight line with momentum p . Starting at time $t = 0$, a force $F = kt$ acts in the same direction on the moving particle during time interval T so that its momentum changes from p to $3p$. Here k is a constant. The value of T is:
 (1) $2\sqrt{\frac{p}{k}}$ (2) $\sqrt{\frac{2p}{k}}$
 (3) $\sqrt{\frac{2k}{p}}$ (4) $2\sqrt{\frac{k}{p}}$
13. A body is moving unidirectionally under the influence of a source of constant power supplying energy. Which of the diagrams shown in Fig. correctly shows the displacement-time curve for its motion?



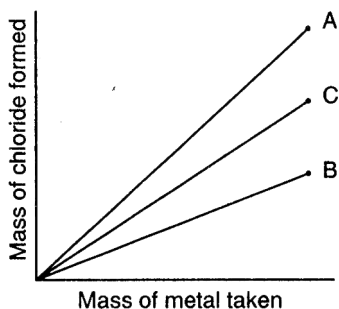
14. A thin uniform rod of length l and mass m is swinging freely, about a horizontal axis passing through its end. Its maximum angular speed is ω . The maximum height, to which its centre of mass rises, is
 (1) $\frac{1}{3} \frac{l^2 \omega^2}{g}$ (2) $\frac{1}{6} \frac{l\omega}{g}$ (3) $\frac{1}{2} \frac{l^2 \omega^2}{g}$ (4) $\frac{1}{6} \frac{l^2 \omega^2}{g}$
15. A screen is placed 90 cm from an object. The image of an object on the screen is formed by a convex lens at two different locations separated by 20 cm. The focal length of the lens is:
 (1) 18 cm (2) 21.4 cm
 (3) 60 cm (4) 85.6 cm

CHEMISTRY

16. Which are given below is non-reducing sugar?
 (1) Maltose (2) Glucose
 (3) Sucrose (4) Lactose
17. The visible box represents an enzyme. What is the cavity shown technically known as?
 (1) Active cavity (2) Active site
 (3) Holding site (4) All of these
18. Which of the following polymer can be formed by using the following monomer unit?



- (1) Nylon-6, 6 (2) Nylon 2-nylon 6
 (3) Melamine polymer (4) Nylon-6
19. Three alkali metals A, B, C separately on reacting with fixed volume of chlorine gas forms chlorides. The masses of chlorides formed are plotted against the masses of metal taken are shown in figure.



The atomic masses of metals are in the order:

- (1) $A > B > C$ (2) $A < B < C$
 (3) $A < C < B$ (4) $A > C > B$

20. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following:

- (1) $q = 0, \Delta T \neq 0, w = 0$ (2) $q \neq 0, \Delta T = 0, w = 0$
 (3) $q = 0, \Delta T = 0, w = 0$ (4) $q = 0, \Delta T < 0, w \neq 0$

21. At 30°C the solubility of Ag_2CO_3 ($K_{sp} = 8 \times 10^{-12}$) would be greatest in one litre of:

- (1) 0.05 M Na_2CO_3 (2) 0.05 M AgNO_3
 (3) pure water (4) 0.05 M K_2CO_3

22. The oxidation number of sulphur in $\text{S}_8, \text{S}_2\text{F}_2, \text{H}_2\text{S}$ respectively are:

- (1) 0, +1 and -2 (2) +2, +1 and -2
 (3) 0, +1 and +2 (4) -2, +1 and -2

23. A student made the following observations in the laboratory:

- (i) Clean copper metal did not react with 1 molar $\text{Pb}(\text{NO}_3)_2$ solution
 (ii) Clean lead metal dissolved in a 1 molar AgNO_3 solution and crystals of Ag metal appeared
 (iii) Clean silver metal did not react with 1 molar $\text{Cu}(\text{NO}_3)_2$ solution. The order of decreasing reducing character of the three metals is:

- (1) Cu, Pb, Ag (2) Cu, Ag, Pb
 (3) Pb, Cu, Ag (4) Pb, Ag, Cu

24. Z-axis is taken as internuclear axis. Which of the following will form σ bond?

- (1) $P_x - P_x$ (2) $P_y - P_y$
 (3) $P_z - P_z$ (4) None of these

25. For the storage of a small quantity of hydrogen, the tank is made from the alloy

- (1) NaNi_5 (2) $\text{Ti} - \text{TiH}_2$
 (3) $\text{Mg} - \text{MgH}_2$ (4) All of these

26. Magnitude of torsional strain depends upon the angle of rotation about the C-C bond. This angle is called:

- (1) dihedral angle (2) torsional angle
 (3) rotational angle (4) both (1) and (2)

27. Match the facts of Column-I and Column-II and select the correct option:

	Column-I (Element)		Column-II (Electronic configuration)
(p)	Zn ($Z = 30$)	(i)	$6d^4 7s^2$
(q)	Pd ($Z = 46$)	(ii)	$5d^{10} 6s^1$
(r)	Au ($Z = 79$)	(iii)	$3d^{10} 4s^2$
(s)	Sg ($Z = 106$)	(iv)	$4d^{10} 5s^0$

- (1) p-(iii); q-(ii); r-(iv); s-(i)
 (2) p-(i); q-(ii); r-(iv); s-(iii)
 (3) p-(iii); q-(iv); r-(ii); s-(i)
 (4) p-(iii); q-(i); r-(ii); s-(iv)

28. Match the complex ions given Column-I with the hybridisation and number of unpaired electrons given in Column-II and assign the correct code:

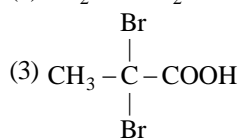
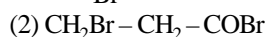
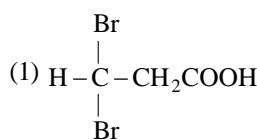
	Column-I (Complex ion)		Column-II (Hybridisation, number of unpaired electrons)
(i)	$[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$	(A)	$dsp^2, 1$
(ii)	$[\text{Co}(\text{CN})_4]^{2-}$	(B)	$sp^3 d^2, 5$
(iii)	$[\text{Ni}(\text{NH}_3)_6]^{2+}$	(C)	$d^2 sp^3, 3$
(iv)	$[\text{MnF}_6]^{4-}$	(D)	$sp^3, 4$
		(E)	$sp^3 d^2, 2$

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

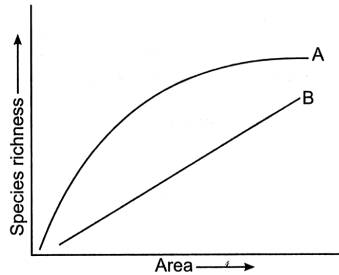
29. Which of the following was earlier used as antiseptic but due to objectionable smell it has now been replaced by some other chemicals?

- (1) CHCl_3
 (2) CHBr_3
 (3) CHI_3
 (4) CH_2Cl_2

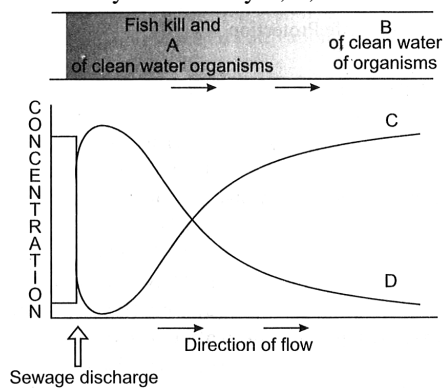
30. Propanoic acid with Br_2/P yields a dibromo product. Its structure is



31. The given figure showing species area relationship of species richness, which option correct for A and B?



- (1) A-Species richness for large area, B-Species richness for large area
 (2) A-Species richness for small area, B-Species richness for small area
 (3) A-Species richness for large area, B-Species richness for small area
 (4) A-Species richness for small area, B-Species richness for large area
32. Given below is a flow chart showing the effect of sewage discharge on some important characteristics of a river. Read carefully and identify A, B, C and D.



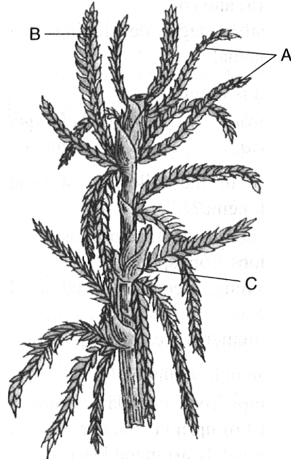
- (1) A-Reappear, B-Disappear, C-BOD, D-Dissolved oxygen
 (2) A-Dissolved oxygen, B-BOD, C-Disappear, D-Reappear
 (3) A-Disappear, B-Reappear, C-BOD, D-Dissolved oxygen
 (4) A-Disappear, B-Reappear, C-Dissolved oxygen, D-BOD
33. In biological names *Mangifera indica* Linn, what is meaning of Linn?
 (1) Name of the place (2) Name of the country
 (3) Name of the author (4) All of these
34. Based on their shape bacteria are grouped under:
 (1) Two categories (2) Three categories
 (3) Four categories (4) Five categories
35. Dikaryon condition is found in:
 (1) Ascomycetes (2) Basidiomycetes
 (3) Both (1) and (2) (4) Phycomycetes

36. Bisexual and zygomorphic flower imbricate aestivation, vexillary aestivation of corolla, diadelphous androecium and superior ovary is a characteristic of:
 (1) Solanaceae (2) Malvaceae
 (3) Fabaceae (4) Liliaceae
37. Endosperm seed is characteristics of:
 (1) Dicotyledonous plant
 (2) Monocotyledonous plant
 (3) Gymnospermic plant
 (4) Both (1) and (2)
38. Match the entities in Column I with their character in Column II:

	Column-I		Column-II
A.	Passive transport	(i)	Connect the cytoplasm of neighbouring cells
B.	Active transport	(ii)	Diffusion along the concentration gradient
C.	Plasmodesmata	(iii)	Na ⁺ /K ⁺ pump
D.	Osmosis	(iv)	Carrier
E.	Facilitated diffusion	(v)	Movement of water by diffusion

- (1) A-(ii), B-(iii), C-(i), D-(iv), E-(v)
 (2) A-(v), B-(i), C-(iv), D-(ii), E-(iii)
 (3) A-(v), B-(iii), C-(i), D-(ii), E-(iv)
 (4) A-(ii), B-(iii), C-(i), D-(v), E-(iv)
39. Crossing over takes place between:
 (1) 2 sister chromatids
 (2) 2 non-sister chromatids
 (3) 3 homologous chromosomes
 (4) 4 non-homologous chromosomes
40. Meiosis results in:
 (1) Production of gametes
 (2) Reduction in the number of chromosomes
 (3) Introduction of variation
 (4) All of the above
41. Complex post-fertilization events are seen in
 (1) *Chlorella* and *Spirulina*
 (2) *Gracilaria* and *porphyra*
 (3) *Volvox* and *Ulothrix*
 (4) All of these
42. Which of the following is correct about imbibition?
 (1) It requires Ψ_w gradient between the absorbent and the liquid imbibed.
 (2) It requires affinity between the absorbent and the liquid.
 (3) Imbibition pressure that is produced by the swelling of wood and in turn used by prehistoric man to split rocks and boulders.
 (4) All the above

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



- (1) A–Branches, B–Antheridial branch, C–Archegonial branch
 (2) A–Antheridial branch, B–Branches, C–Archegonial branch
 (3) A–Branches, B–Archegonial branch, C–Antheridial branch
 (4) A–Archegonial branch, B–Archegonial branch, C–Branches

44. Oxidative phosphorylation occurs in the

- (1) Outer membrane of mitochondria
 (2) Inner membrane of mitochondria
 (3) Stroma of chloroplast
 (4) Grana of chloroplast

45. When are winter varieties planted?

- (1) Spring (2) Winter
 (3) Autumn (4) All of these

ZOOLOGY

46. The sequence or positional information of amino acid is given by

- (1) 2° structure (2) 1° structure
 (3) Tertiary structure (4) Quaternary structure

47. How many nitrogen atoms are present in adenine?

- (1) 3 (2) 4 (3) 5 (4) 6

48. What is vital capacity of our lungs?

- (1) Inspiratory reserve volume plus expiratory reserve volume
 (2) Total lung capacity minus residual volume
 (3) Inspiratory reserve volume plus tidal volume
 (4) Total lung capacity minus expiratory reserve volume

49. Brush border is a characteristic of

- (1) Neck of nephron
 (2) Collecting tube
 (3) Proximal convoluted tubule
 (4) All of these

50. Phalangeal formula of the hand of a man is

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

51. Foramen magnum and occipital condyles are found in

- (1) Parietal bone (2) Ethmoid bone
 (3) Sphenoid bone (4) Occipital bone

52. What is the right sequence of bones in the ear ossicles of a mammal starting from the tympanum inwards?

- (1) Malleus, incus and stapes
 (2) Malleus, stapes and incus
 (3) Incus, malleus and stapes
 (4) Stapes, incus and malleus

53. Match the following columns.

	Column-I		Column-II
A.	Wallace	1.	Essay on population
B.	Malthus	2.	Biston betularia
C.	Hardy - Weinberg's law	3.	$p^2 + q^2 + 2pq = 1$
D.	Industrial melanism	4.	Co-proposer of natural selection

- (1) A–3; B–4; C–2; D–1 (2) A–2; B–1; C–4; D–3
 (3) A–4; B–1; C–2; D–3 (4) A–4; B–1; C–3; D–2

54. In a population in Hardy – Weinberg equilibrium, if the dominant allele frequency is 0.50, then the frequency of heterozygous is

- (1) 0.01 (2) 0.25 (3) 0.75 (4) 0.50

55. Larynx is present in between

- (1) epiglottis and glottis (2) trachea and bronchiole
 (3) epiglottis and trachea (4) bronchus and epiglottis

56. Vaccine is included in

- (1) Natural active acquired immunity
 (2) Natural passive acquired immunity
 (3) Artificial active acquired immunity
 (4) Artificial passive acquired immunity

57. Read the following statements carefully and choose the option which have all the wrong ones.

A. Colon is a blind sac which hosts some symbiotic micro-organisms.

B. The sigmoid part of colon opens into the rectum.

C. The oesophagus is a thick and short tube which extends anteriorly passing through the neck.

D. The tongue is a freely movable muscular organ attached to the floor of the oral cavity by frenulum.

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

58. How many of the following belongs to subphylum urochordate?

Ascidia, Salpa, Doliolum, Branchiostoma, Petromyzon, Myxine

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

59. The association area in cerebral cortex is responsible for
- (1) Intersensory association
 - (2) Memory
 - (3) Communication
 - (4) All of these
60. Which of the following layers are present in adrenal cortex from inner to outer?
- (1) Zona reticularis, zona fasciculata and zona glomerulosa
 - (2) Zona fasciculata, zona glomerulosa and zona reticularis
 - (3) Zona glomerulosa, zona reticularis and zona fasciculata
 - (4) Zona glomerulosa, zona fasciculata and zona reticularis.

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