

**SAMPLE PAPER - 40**

Time : 1 : 15 Hr.

Question : 60

**PHYSICS**

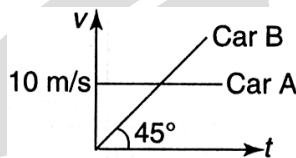
01. A particle starting from rest has a constant acceleration of  $4 \text{ m/s}^2$  for 4 seconds. It then retards uniformly for next 8 seconds and comes to rest. Average acceleration during the motion of the particle is

(1)  $4 \text{ m/s}^2$                       (2) zero  
 (3)  $8 \text{ m/s}^2$                       (4)  $-4 \text{ m/s}^2$

02. A man swims to and fro along the bank of a river with a velocity  $v$  relative to water. If the velocity of flow is  $u$ , the average speed of the man (for to and fro motion) is :

(1) 0            (2)  $\sqrt{uv}$             (3)  $\frac{u+v}{2}$             (4)  $\frac{v^2 - u^2}{v}$

03. Initially car A is 10.5 m ahead of car B. Both start moving at time  $t = 0$  in the same direction along a straight line. The velocity-time graph of two cars is shown in figure. The time when the car B will catch the car A, will be



(1)  $t = 21 \text{ sec}$  (2)  $t = 2\sqrt{5} \text{ sec}$   
 (3) 20 sec                      (4) none

04. A projectile is given an initial velocity of  $\hat{i} + 2\hat{j}$ . The Cartesian equation of its path is : ( $g = 10 \text{ m/s}^2$ )

(1)  $y = 2x - 5x^2$   
 (2)  $y = x - 5x^2$   
 (3)  $4y = 2x - 5x^2$   
 (4)  $y = 2x - 25x^2$

05. A car 'A' moves due north at a speed of 40 km/hr, while another car 'B' moves due east at a speed of 30 km/hr. Find the velocity of car B relative to car A (both in magnitude and direction).

(1) 40 km/hr, at an angle  $\tan^{-1}\left(\frac{3}{5}\right)$  east of south

(2) 50 km/hr, at an angle  $\tan^{-1}\left(\frac{3}{5}\right)$  east of south

(3) 40 km/hr, at an angle  $\tan^{-1}\left(\frac{3}{4}\right)$  east of south

(4) 50 km/hr, at an angle  $\tan^{-1}\left(\frac{3}{4}\right)$  east of south

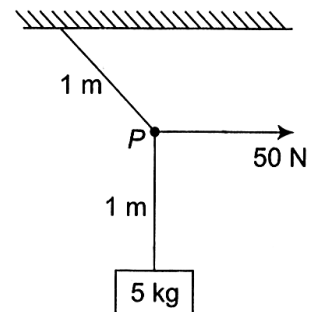
06. A cyclist is riding with a speed of  $27 \text{ km h}^{-1}$ . As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at the constant rate of  $0.50 \text{ m s}^{-1}$  every second. The net acceleration of the cyclist on the circular turn is

(1)  $0.68 \text{ m s}^{-2}$   
 (2)  $0.86 \text{ m s}^{-2}$   
 (3)  $0.56 \text{ m s}^{-2}$   
 (4)  $0.76 \text{ m s}^{-2}$

07. At the uppermost point of a projectile its velocity and acceleration are at an angle of

(1)  $180^\circ$                       (2)  $90^\circ$   
 (3)  $60^\circ$                       (4)  $45^\circ$

08. A block of mass 5 kg is suspended by a massless rope of length 2 m from the ceiling. A force of 50 N is applied in the horizontal direction at the midpoint P of the rope, as shown in the figure. The angle made by the rope with the vertical in equilibrium is (Take  $g = 10 \text{ m s}^{-2}$ )



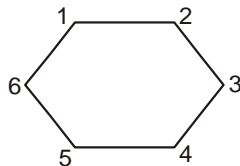
(1)  $30^\circ$                       (2)  $40^\circ$   
 (3)  $60^\circ$                       (4)  $45^\circ$

09. A body attains a height equal to twice the radius  $R$  of the earth. The velocity of the body with which it was projected is: ( $M_e$  = mass of earth)

(1)  $\sqrt{\frac{GM_e}{R}}$                       (2)  $\sqrt{\frac{2GM_e}{R}}$   
 (3)  $\sqrt{\frac{5 GM_e}{4 R}}$                       (4)  $\sqrt{\frac{4 GM_e}{3 R}}$

10. Mass of the earth has been determined through:  
 (1) use of Kepler's  $T^2/R^3$  constancy law and moon's period.  
 (2) sampling the density of earth's crust and using earth's radius  
 (3) Cavendish determination of  $G$  and using earth radius and  $g$  at its surface  
 (4) use of periods of satellites at different heights above earth's surface and known radius of earth

11. Four point masses each of mass  $m$  are placed at points 1, 2, 3 and 6 of a regular hexagon of side  $a$ . The gravitational field at the centre of hexagon is

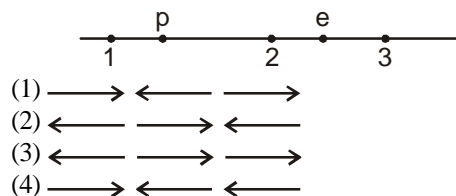


(1)  $\frac{G.m}{a^2}$                       (2)  $\frac{\sqrt{2}G.m}{a^2}$   
 (3)  $\frac{\sqrt{3}G.m}{a^2}$                       (4) Zero

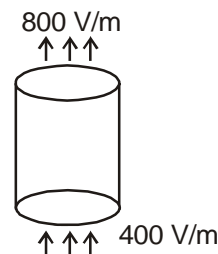
12. An electric dipole consists of two opposite charges each of magnitude  $1\mu\text{C}$  separated by a distance of 2 cm. The dipole is placed in an external field of  $10^5 \text{ N/C}$ . The maximum torque on the dipole is  
 (1)  $2 \times 10^{-4} \text{ Nm}$                       (2)  $2 \times 10^{-3} \text{ Nm}$   
 (3)  $4 \times 10^{-3} \text{ Nm}$                       (4)  $10^{-3} \text{ Nm}$

13. Electric field in a region is uniform and is given by  $\vec{E} = a\hat{i} + b\hat{j} + c\hat{k}$ . Electric flux associated with a surface of area  $\vec{A} = \pi R^2 \hat{i}$  is  
 (1)  $a\pi R^2$                       (2)  $3a\pi R^2$   
 (3)  $2abR$                       (4)  $acR$

14. An electron ( $e$ ) and a proton ( $p$ ) are situated on the straight line as shown. The directions of electric field at points 1, 2 and 3 respectively are shown as



15. A cylinder on whose surfaces there is a vertical electric field of varying magnitude as shown. The electric field is uniform at top surface as well as at bottom surface. Therefore this cylinder encloses

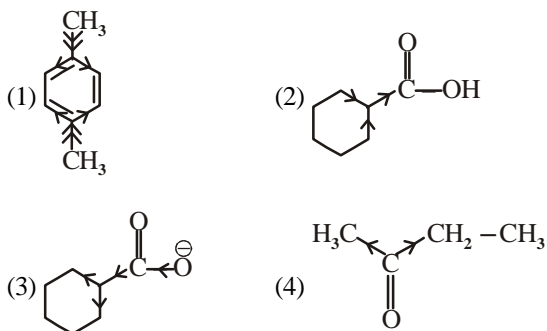


- (1) no net charge  
 (2) net positive charge  
 (3) net negative charge  
 (4) no idea

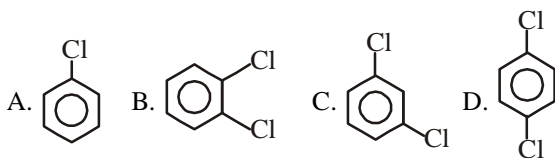
## CHEMISTRY

16. Insulin contains 3.4% sulphur. What will be the minimum molecular weight of insulin?  
 (1) 94.117    (2) 1884    (3) 941.176    (4) 976
17. Under S.T.P. 1 mol of  $\text{N}_2$  and 3 mol of  $\text{H}_2$  will form on complete reaction  
 (1) 4 moles L of  $\text{NH}_3$     (2) 89.6 L of  $\text{NH}_3$   
 (3) 22.4 L of  $\text{NH}_3$     (4) 44.8 L of  $\text{NH}_3$
18. In the combustion of 5.00 g of a metal, 9.44 g of metal oxide are formed. Hence, equivalent mass of the metal is  
 (1) 4.44 g    (2) 9.00 g    (3) 5.00 g    (4) 2.22 g
19. 500 mL of a gaseous hydrocarbon when burnt in excess of  $\text{O}_2$  gave 2.5 L of  $\text{CO}_2$  and 3.0 L of water vapours under same conditions. Molecular formula of the hydrocarbon is:  
 (1)  $\text{C}_4\text{H}_8$     (2)  $\text{C}_4\text{H}_{10}$     (3)  $\text{C}_5\text{H}_{10}$     (4)  $\text{C}_3\text{H}_{12}$
20. The volume strength of 1M  $\text{H}_2\text{O}_2$  is : (Molar mass of  $\text{H}_2\text{O}_2 = 34 \text{ g mol}^{-1}$ )  
 (1) 16.8    (2) 11.2    (3) 22.4    (4) 5.6
21. The correct decreasing order of acidic strength is  
 I.  $\text{FCH}_2\text{CH}_2\text{COOH}$   
 II.  $\text{FCH}_2\text{COOH}$   
 III.  $\begin{array}{c} \text{Cl} - \text{CH} - \text{CH}_2\text{COOH} \\ | \\ \text{Cl} \end{array}$   
 IV.  $\text{Br}-\text{CH}_2-\text{CH}_2\text{COOH}$   
 (1) I > II > III > IV    (2) III > II > I > IV  
 (3) II > III > I > IV    (4) II > I > IV > III
22. The number of cyclic structural isomers are possible for molecular formula  $\text{C}_5\text{H}_{10}$   
 (1) 5    (2) 6    (3) 4    (4) 7

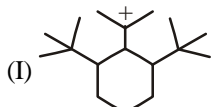
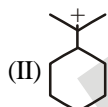
23. In which of the following species, incorrect direction of inductive effect is shown ?



24. Which of the following substituted benzene derivatives would furnish three isomers when more substituent is introduced.



Select the correct answer using the code

- (1) A, B and C                      (2) A alone  
 (3) B and D                         (4) A and C
25. Which statement is correct ?
- (I) 
- (II) 
- (1) I is more stable than II  
 (2) II is more stable than I  
 (3) both are equally stable  
 (4) none of these
26. How many corners of the outer shell cube will be occupied by electrons in case of  $\text{Na}^+$  or  $\text{Mg}^{++}$  or  $\text{Cl}^-$   
 (1) 2                      (2) 7                      (3) 6                      (4) 8
27. The electronic configuration of element which is just above the element with atomic number 43 in same group.  
 (1)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$   
 (2)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^5 5s^2$   
 (3)  $[\text{Xe}] 4f^{14} 5d^5 6s^2$   
 (4) None
28. The elements with atomic numbers 34, 52, 84, are all .....  
 (1) Noble gas                      (2) Halogen  
 (3) Chalcogen                      (4) Metals

29. Which of the following elements will gain one electron more readily in comparison to other elements of their group  
 (1) S                                      (2) B  
 (3) Bi                                      (4) All

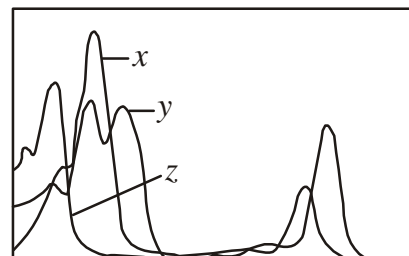
30. The correct order among the following is  
 (1)  $\text{HIO}_4 > \text{HBrO}_4 > \text{HClO}_4 > \cdot$  dec. acidic strength  
 (2)  $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Te} > \cdot$  dec. acidic strength  
 (3)  $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$  dec. acidic strength  
 (4)  $\text{Na}_2\text{O} > \text{K}_2\text{O} > \text{Rb}_2\text{O} > \text{Cs}_2\text{O}$  dec. basic strength

## BOTANY

31. Which of the following element is present in plant tissues in excess of 10 mmole  $\text{kg}^{-1}$  of dry matter ?  
 (1) Magnesium                      (2) Manganese  
 (3) Molybdenum                      (4) Both (1) and (2)
32. Find out correctly matched pair.

	Nutrients	Functions
(a)	Zinc	Helps to maintain ribosome structure
(b)	Magnesium	Needed during formation of mitotic spindle
(c)	Potassium	Plays a role in opening and closing of stomata
(d)	Magnesium	Needed in splitting of water to liberate oxygen during photosynthesis

33. In plants flowering is delayd due to the deficiency of  
 (1) Mo, S and N                      (2) Mo, S, N and K  
 (3) Ca, Mg, Cu and K                      (4) Mg, Zn, Mn and K
34. Conversion of ammonia to nitrite is affected by  
 (1) Nitrosomonas                      (2) Nitrobacter  
 (3) Nitrococcus                      (4) Both (1) and (3)
35. Osmosis can be demonstrated by  
 (1) Potato osmometer  
 (2) Thistle funnel experiment  
 (3) Cobalt-chloride paper method  
 (4) Both (1) and (2)
36. The following hypothesis, "Plants restore to the air whatever breathing animals and burning candles remove" was given by  
 (1) Joseph Priestley                      (2) Jan Ingenhousz  
 (3) T.W. Engelmann                      (4) C. van Niel
37. Recognise the figure and find out the correct matching



- (1) z - chlorophyll a, x - chlorophyll b, y - carotenoids

- (2) z - chlorophyll a, y - chlorophyll b, x - carotenoids  
 (3) y - chlorophyll a, z - chlorophyll b, x - carotenoids  
 (4) y - chlorophyll a, x - chlorophyll b, z - carotenoids

38. What is true about genetic material of a prokaryotic cell?

- (1) Lacks histones  
 (2) Not enveloped by nuclear membrane  
 (3) Composed of a single circular DNA molecule  
 (4) All of these

39. Smooth endoplasmic reticulum is well developed in the cells which synthesize

- (1) steroids (2) proteins  
 (3) carbohydrates (4) all of these

40. The best material for the study of structure of cell membrane is

- (1) RBC of human (2) liver cell  
 (3) kidney cell (4) muscle cell

41. Yeast cell divides once in approximately every

- (1) 90 minutes (2) 9 minutes  
 (3) 24 hours (4) 24 days

42. \_\_\_\_\_ is the best stage to count the number and study the morphology of chromosomes.

- (1) Prophase (2) Metaphase  
 (3) Anaphase (4) Telophase

43. If a tissue has at a given time 1024 cells, how many cycles of mitosis had the original parental single cell undergone?

- (1) 512 (2) 10  
 (3) 1024 (4) 256

44. At which of the following stages, the chromosomes appear single, thin and thread like?

- (1) Leptotene (2) Zygotene  
 (3) Pachytene (4) Diplotene

45. At which stage, the homologous chromosomes separate due to repulsion, but are yet held by chiasmata?

- (1) Zygotene (2) Pachytene  
 (3) Diplotene (4) Diakinesis

## ZOOLOGY

46. Antigen binding site is present in antibody between

- (1) two heavy chains  
 (2) two light chains  
 (3) one heavy and one light chain  
 (4) None of the above

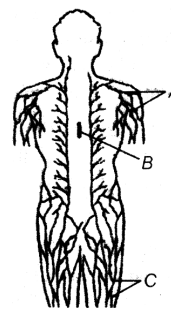
47. Immunity gained after an infection is called

- (1) active immunity (2) innate immunity  
 (3) Passive immunity (4) None of these

48. Common examples of allergens are

- (1) mites in dust (2) pollen grains  
 (3) animal dander (4) All of these

49. Given below the digrammatic representation of lymph nodes.



Label A, B and C.

- (1) A-Lymph nodes, B-Thymus, C-Lymphatic vessels  
 (2) A-Lymphatic vessels, B-Thyroid, C-Lymph nodes  
 (3) A-Tonsils, B-Peyer's patches, C-Lymphatic vessels  
 (4) A-Tonsils, B-Thymus, C-Peyer's patches

50. Which organ receives only oxygenated blood in human?

- (1) Heart (2) Spleen  
 (3) Lung (4) Liver

51. Which of the following about human circulatory system is correct?

- (1) Double circuit and open  
 (2) Single circuit and closed  
 (3) Single circuit and open  
 (4) Double circuit and closed

52. Which of the following is secondary lymphoid organs

- (1) MALT  
 (2) Lymph nodes and Tonsils  
 (3) Appendix  
 (4) All of the above

53. Different types of excretory structures and animals are given below. Match them appropriately and mark the correct answer from among those given below:

	Excretory structure/organ		Animals
(A)	Protonephridia	(i)	Prawn
(B)	Nephridia	(ii)	Cockroach
(C)	Malpighian tubules	(iii)	Earthworm
(D)	Green gland or Antennal gland	(iv)	Flatworms

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

55. Juxta glomerular apparatus contain all the following cells, except :

- (1) Macula densa  
 (2) Juxta glomerular cells  
 (3) Podocyte cells  
 (4) Lacis cells

54. Match the terms given in Column I with their physiological processes given in Column II and choose the correct answer

	Column I		Column II
(A)	Proximal convoluted tubule	(i)	Formation of concentrated urine
(B)	Distal convoluted tubule	(ii)	Filtration of blood
(C)	Henle's loop	(iii)	Reabsorption of 70-80% of electrolytes
(D)	Counter-current mechanism	(iv)	Ionic balance
(E)	Renal corpuscle	(v)	Maintenance of concentration gradient in medulla

- (1) (A)-(iii), (B)-(v), (C)-(iii), (D)-(ii), (E)-(i)  
 (2) (A)-(iii), (B)-(iv), (C)-(i), (D)-(v), (E)-(ii)  
 (3) (A)-(i), (B)-(iii), (C)-(ii), (D)-(v), (E)-(iv)  
 (4) (A)-(iii), (B)-(i), (C)-(iv), (D)-(v), (E)-(ii)
56. Excretion of  $\text{Na}^+$  in urine is elevated by:  
 (1) ANF (2) ADH  
 (3) ACTH (4) Aldosterone

57. Value of GFR is 125 ml/min. What does it mean ?  
 (1) 125 ml is the amount of urine formed in 1 minute  
 (2) 125 ml is the amount of nephric filtrate formed per minute by 1 nephron  
 (3) 125 ml is the amount of nephric filtrate formed per minute by 1 kidney  
 (4) 125 ml is the amount of nephric filtrate formed per minute by both kidneys
58. Human kidneys are located between the levels of following vertebra :  
 (1)  $T_{10} - L_1$  (2)  $T_{12} - L_3$   
 (3)  $L_2 - L_5$  (4)  $L_4 - S_1$
59. Ultimate correction of acute renal failure is :  
 (1) Haemodialysis (2) Peritoneal dialysis  
 (3) Renal transplant (4) Blood transfusion
60. Vasa recta is :  
 (1) Part of nephron  
 (2) Artery  
 (3) Capillary  
 (4) Vein