

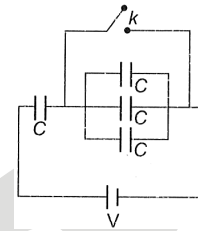

**SAMPLE PAPER - 83**

Time : 1 : 15 Hr.

Question : 60

**PHYSICS**

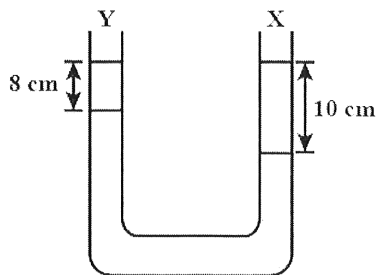
01. A narrow slit of width 1 mm is illuminated by monochromatic light of wavelength 600 nm. The distance between the first minima on either side on a screen at a distance of 2 m is
- (1) 1.2 cm                      (2) 1.2 mm  
 (3) 2.4 cm                      (4) 2.4 mm
02. Unpolarised light of intensity  $32 \text{ W m}^{-2}$  passes through three polarizers such that transmission axes of the first and second polarizer make an angle  $30^\circ$  with each other and the transmission axis of the last polarizer is crossed with that of the first. The intensity of the final emerging light will be
- (1)  $32 \text{ W m}^{-2}$                       (2)  $3 \text{ W m}^{-2}$   
 (3)  $8 \text{ W m}^{-2}$                       (4)  $4 \text{ W m}^{-2}$
03. A charged particle can not move with a constant velocity in a region where in
- (1)  $E = 0, B \neq 0$                       (2)  $E \neq 0, B \neq 0$   
 (3)  $E \neq 0, B = 0$                       (4)  $E = 0, B = 0$
04. For a surface molecule
- (1) the net force on it is zero  
 (2) there is a net downward force  
 (3) the potential energy is less than that of a molecule inside  
 (4) the potential energy is equal to that of a molecule inside
05. A copper and a steel wire of the same diameter are connected end to end. A deforming force  $F$  is applied to this composite wire which causes a total elongation of 1 cm. The two wires will have
- (1) the same stress  
 (2) different stress  
 (3) the same strain  
 (4) same elongation
06. The charge flowing through the cell on closing the key  $k$  is equal to:



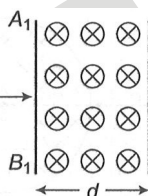
- (1)  $\frac{CV}{4}$                       (2)  $4CV$                       (3)  $\frac{4}{3} CV$                       (d)  $\frac{3}{4} CV$
07. The electric field strength at a distance  $r$  from the centre of a charged sphere of radius  $R$  is  $E$ . If  $r > R$ , how much work will be done in bringing a test charge  $q_0$  from infinity to that point, is
- (1)  $q_0 RE$                       (2)  $\frac{1}{2} q_0 RE$                       (3)  $q_0 r E$                       (4)  $\frac{1}{2} q_0 r E$
08. A particle of charge  $-q$  & mass  $m$  moves in a circle of radius  $r$  around an infinitely long line charge of linear charge density  $+\lambda$ . Then time period will be (Where  $k = \frac{1}{4\pi\epsilon_0}$ ):
- 
- (1)  $T = 2\pi r \sqrt{\frac{m}{2k\lambda q}}$                       (2)  $T^2 = \frac{4\pi^2 m}{2k\lambda q}$   
 (3)  $T = \frac{1}{2\pi r} \sqrt{\frac{4k\lambda q}{m}}$                       (4)  $T = \frac{1}{2\pi r} \sqrt{\frac{m}{4k\lambda q}}$
09. An electric dipole of moment  $p$  is lying along a uniform electric field  $E$ . The work done in rotating the dipole by  $90^\circ$  is
- (1)  $\sqrt{2} p E$                       (2)  $\frac{p E}{2}$   
 (3)  $2 p E$                       (4)  $p E$

10. The pressure of the medium is changed from  $1.01 \times 10^5$  Pa to  $1.165 \times 10^5$  Pa and change in volume is 10% keeping temperature constant. The bulk modulus of the medium is
- $204.8 \times 10^5$  Pa
  - $102.4 \times 10^5$  Pa
  - $51.2 \times 10^5$  Pa
  - $1.55 \times 10^5$  Pa

11. A liquid X of density  $3.36 \text{ g/cm}^3$  is poured in a U-tube in right arm with height 10 cm, which contains Hg. Another liquid Y is poured in left arm with height 8 cm. Upper levels of X and Y are same. What is density of Y? ( $\rho_{\text{Hg}} = 13.6 \text{ g/cm}^3$ )



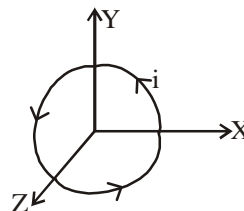
- 0.8 g/cc
  - 1.2 g/cc
  - 1.4 g/cc
  - 1.6 g/cc
12. A particle of charge  $Q$  moving with kinetic energy  $K$  enters a zone of uniform magnetic field  $B$  along normal to  $A_1B_1$  as shown satisfying the condition  $d > \frac{2K}{QvB}$  where  $v$  is the velocity of the particle. What will be the magnitude of change in velocity when particle exits magnetic field



- $v/4$
  - $v$
  - $v/3$
  - $2v$
13. A wire of length  $L$  metre carrying a current of  $I$  ampere is bent in the form of square of  $N$  turns. Its magnitude of magnetic moment will be
- $\frac{IL}{N}$
  - $\frac{IL^2}{16N}$
  - $\frac{I^2L^2}{32N}$
  - $\frac{I^2L}{4N}$

14. A screw gauge having  $n$  divisions per cm in its main scale, and has total  $n^2$  division in circular scale. Find least count of screw gauge
- $\frac{1}{n^2}$  cm
  - $\frac{1}{n^3}$  cm
  - $\frac{1}{n}$  cm
  - $n$  cm

15. A wire is bent into three segments each of radius  $r$ . Each segment is a quadrant of a circle. The first segment lies in  $X$ - $Y$  plane, the second in the  $Y$ - $Z$  plane and third in  $XZ$  plane. If a current  $I$  flows in the wire then net magnetic field at origin is



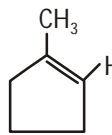
- $\frac{\mu_0 I}{8r} (\hat{i} + \hat{j})$
- $\frac{\mu_0 I}{2r} (\hat{i} + \hat{j} + \hat{k})$
- $\frac{\mu_0 I}{8r} (\hat{i} + \hat{j} + \hat{k})$
- $\frac{\mu_0 I}{4r} (\hat{i} + \hat{j} + \hat{k})$

## CHEMISTRY

16. The main product of the following reactions is

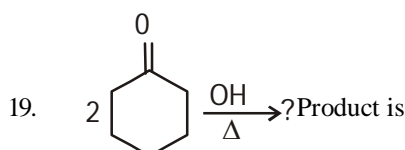


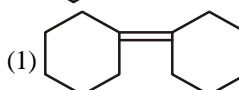

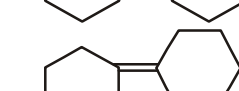
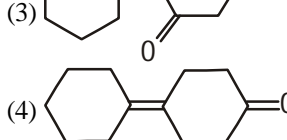
- $$\begin{array}{c} \text{C}_6\text{H}_5\text{CH}_2 \quad \text{CH}_3 \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{CH}(\text{CH}_3)_2 \end{array}$$
- $$\begin{array}{c} \text{H}_5\text{C}_6 \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{CH}(\text{CH}_3)_2 \end{array}$$
- $$\begin{array}{c} \text{C}_5\text{H}_6 \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{CH}(\text{CH}_3)_2 \end{array}$$
- $$\begin{array}{c} \text{H}_5\text{C}_6\text{CH}_2\text{CH}_2 \\ \diagdown \\ \text{C}=\text{CH}_2 \\ \diagup \\ \text{H}_3\text{C} \end{array}$$

17.   $\xrightarrow[\text{(ii) H}_2\text{O}_2 \cdot \text{OH}^-]{\text{(i) BH}_3 \cdot \text{THF}}$  (A); Product 'A' of the

- reaction is
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{C}_1\text{H} \\ | \\ \text{C}_2\text{H} \\ | \\ \text{C}_3\text{H} \\ | \\ \text{C}_4\text{OH} \\ | \\ \text{C}_5\text{H} \end{array}$$
  - $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{C}_1\text{H} \\ | \\ \text{C}_2\text{OH} \\ | \\ \text{C}_3\text{H} \\ | \\ \text{C}_4\text{H} \\ | \\ \text{C}_5\text{H} \end{array}$$
  - $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{C}_1\text{H} \\ | \\ \text{C}_2\text{OH} \\ | \\ \text{C}_3\text{H} \\ | \\ \text{C}_4\text{H} \\ | \\ \text{C}_5\text{H} \end{array}$$
  - $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{C}_1\text{H} \\ | \\ \text{C}_2\text{H} \\ | \\ \text{C}_3\text{H} \\ | \\ \text{C}_4\text{H} \\ | \\ \text{C}_5\text{CH}_3 \end{array}$$

18. The reaction of  $C_6H_5O^-Na^+$  and  $CO_2$  at 6 atm 400 K, followed by addition of aq. acid is called
- (1) Reimer-Tiemann reaction
  - (2) Kolbe reaction
  - (3) Wurtz reaction
  - (4) Cannizzaro reaction

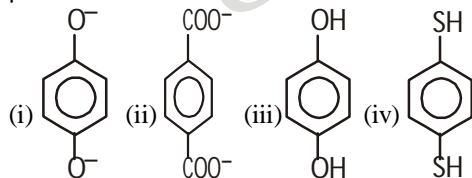


- (1) 
- (2) 
- (3) 
- (4) 

20. In this reaction  $CH_3CHO + HCN \rightarrow CH_3CH(OH)CN$   
 $\xrightarrow{HOH} CH_3CH(OH)COOH$  a symmetric centre is generated. The acid obtained would be
- (1) D-isomer
  - (2) L-isomer
  - (3) 50% D + 50% L-isomer
  - (4) 20% D + 80% L-isomer

21. When electric arc is produced using electrodes of graphite in inert atmosphere of He or Ar, clustering of even number of carbon atoms 60 to 350 are obtained as special allotropes of carbon. These allotropes are called:
- (1) super graphites
  - (2) super diamonds
  - (3) Fullerenes
  - (4) Bucky balls

22. For which of the following molecule significant  $\mu \neq 0$ ?



- (1) (i) and (ii)
- (2) Only (iii)
- (3) (iii) and (iv)
- (4) Only (i)

23. Select the correct order of electronegativity of elements of 14<sup>th</sup> group.

- (1)  $C > Si > Ge > Sn > Pb$
- (2)  $C > Si > Ge > Sn < Pb$
- (3)  $C > Si = Ge = Sn < Pb$
- (4)  $C \gg Si = Ge = Sn \gg Pb$

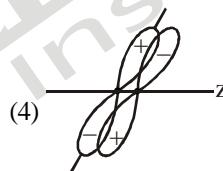
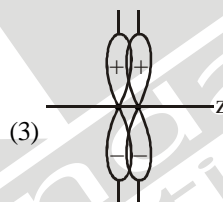
24. How many are Pink or Purple ?  
 $MnO_2, Na_2CrO_4, Na_2Cr_2O_7, KMnO_4, K_2MnO_4, Ti^{3+}(aq), Mn^{2+}(aq), V^{3+}(aq), Fe^{2+}(aq), Ni^{2+}(aq), Zn^{2+}(aq), Sc^{2+}, Ti^{2+}$
- (1) 7
  - (2) 5
  - (3) 1
  - (4) 3

25. Match the species in Column-I with the geometry/shape in Column-II.

Column I		Column II	
i.	$H_3O^+$	(a)	Linear
ii.	$HC \equiv CH$	(b)	Angular
iii.	$ClO_2^-$	(c)	Tetrahedral
iv.	$NH_4^+$	(d)	Trigonal bipyramidal
		(e)	Pyramidal

- (1) i-e, ii-a, iii-b, iv-c
- (2) i-a, ii-b, iii-c, iv-d
- (3) i-a, ii-c, iii-d, iv-e
- (4) i-b, ii-c, iii-d, iv-a

26. Which of the following does not show positive or in phase overlap?



27. The covalent nature in ionic bond is greater if:
- (1) size of cation is small
  - (2) size of anion is large
  - (3) charge on cation and anion, both, is large
  - (4) all of the above

28. Electrophiles are electron seeking species. Which of the following groups contain only electrophiles?

- (1)  $BF_3, NH_3, H_2O$
- (2)  $AlCl_3, SO_3, NO_2^+$
- (3)  $NO_2^+, CH_3^-, CH_3-C=O^+$
- (4)  $C_2H_5^{\ominus}, \cdot C_2H_5, C_2H_5^{\oplus}$

29. The addition of HCl to an alkene proceeds in two steps.

The first step is the attack of  $H^{\oplus}$  ion to  $\text{>C=C<}$  portion which can be shown as:

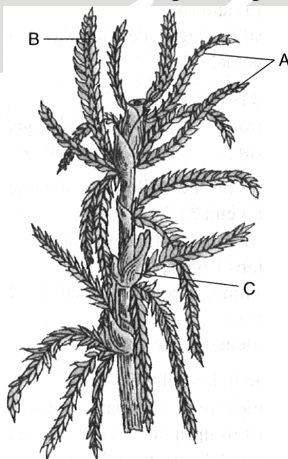


(4) All of these are possible

30. An organic compound contains C, H and O. Its elemental analysis gave 38.71% C and 9.67% H. The empirical formula of the compound would be:  
 (1)  $CH_4O$  (2)  $CH_3O$  (3)  $CH_2O$  (4)  $CHO$

## BOTANY

31. The biflagellate pear-shaped zoospores are characteristics of  
 (1) Red algae (2) Green algae  
 (3) Brown algae (4) All of these
32. Complex post-fertilization events are seen in  
 (1) Chlorella and Spirulina  
 (2) Gracilaria and porphyra  
 (3) Volvox and Ulothrix  
 (4) All of these
33. The dominant stage of gametophyte of mosses consists of  
 (1) Protonema which develops from the lateral bud  
 (2) A leafy stage developing from a spore  
 (3) Both (1) and (2)  
 (4) A leafy stage developing from secondary protonema
34. 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

35. The zygote of pteridophyte  
 (1) Undergoes reduction division just after formation  
 (2) Produces multicellular gametophyte  
 (3) Produces multicellular sporophyte  
 (4) Remains dormant
36. Select the correct sequence of true and false statements from the following.  
 (a) Epidermis is usually single-layered.  
 (b) Epidermal cells are parenchymatous cells with abundant cytoplasm.  
 (c) Vessel members of xylem are interconnected through perforation in their common walls.  
 (d) Sclerenchyma provides mechanical support to organs.  
 (1) TTTT (2) TFFT (3) TFFT (4) FFTT
37. The following features belong to which option?  
 (I) Epidermis may bear trichoma and few stomata.  
 (II) Cortex is divided into three sub-zones.  
 (III) Hypodermis is made up of collenchyma.  
 (IV) Starch sheath  
 (V) Pericycle is above phloem in the form of semilunar patches of sclerenchyma.  
 (1) Dicot root (2) Dicot stem  
 (3) Monocot root (4) Monocot stem
38. Which of the following is correct about imbibition?  
 (1) It requires  $\Psi_w$  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
39. The continuity of water column in xylem is maintained due to  
 (1) Presence of air bubbles  
 (2) Cohesive property of water  
 (3) Evaporation power of water  
 (4) None of these
40. Which of the following element generally activates carboxylase enzyme?  
 (1) Mo (2) Mn (3) Mg (4) Zn
41. Calvin cycle is termed as dark reaction because it  
 (1) It is not dependent on light for  $CO_2$  fixation in stroma  
 (2) Occurs in dark  
 (3) Is by convention only  
 (4) Requires light
42. In Z-scheme, Z shape is formed when  
 (1) Carriers are placed uphill  
 (2) Carriers are placed downhill  
 (3) Carriers are placed in sequence on a redox potential scale  
 (4) None of the above

43. Oxidative phosphorylation occurs in the  
 (1) Outer membrane of mitochondria  
 (2) Inner membrane of mitochondria  
 (3) Stroma of chloroplast  
 (4) Grana of chloroplast
44. Respiratory pathway is best defined as  
 (1) Catabolic pathway (2) Anabolic pathway  
 (3) Amphibolic pathway (4) None of these
45. Leaves of which of the following plant shows environmental heterophylly?  
 (1) Cotton (2) Coriander  
 (3) Larkspur (4) Buttercup

## ZOOLOGY

46. Production of human protein in bacteria by genetic engineering is possible because  
 (1) the human chromosome can replicate in bacterial cell  
 (2) the mechanism of gene regulation is identical in human and bacteria  
 (3) bacterial cell can carry out the RNA splicing reactions  
 (4) the genetic code is universal
47. Which of the following enzymes are used to join bits of DNA?  
 (1) ligase (2) primase  
 (3) DNA polymerase (4) endonuclease
48. Which one of the following groups of animals is bilaterally symmetrical and triploblastic?  
 (1) Aschelminthes (Roundworms)  
 (2) Ctenophores  
 (3) Sponges  
 (4) Coelenterates (Cnidarians)
49. Function wise, just as there are nephridia in an earth-worm, so are  
 (1) parotid glands in toad  
 (2) statocysts in prawn  
 (3) flame cells in liver fluke  
 (4) myotomes in fish
50. The size of cockroach ranges from  
 (1)  $\frac{1}{4}$ " to 3" (2) 1 to 3"  
 (3) 2 to 3" (4)  $\frac{1}{4}$ " to  $\frac{3}{4}$ "
51. The sequence or positional information of amino acid is given by  
 (1) 2° structure (2) 1° structure  
 (3) Tertiary structure (4) Quaternary structure
52. How many nitrogen atoms are present in adenine?  
 (1) 3 (2) 4 (3) 5 (4) 6
53. Which of the following secondary metabolites are used as drugs?  
 (1) Abrin + Ricin  
 (2) Vinblastine + Curcumin  
 (3) Anthocyanin  
 (4) Monoterpenes
54. 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
55. The exchange of gases in the alveoli of the lungs takes place by  
 (1) Simple diffusion (2) Osmosis  
 (3) Active transport (4) Passive transport
56. Ammonia produced by metabolism is converted into A in the liver of mammals and released into B which is filtered and C out by kidney.  
 (1) A–Uric acid, B–Blood, C–Excreted  
 (2) A–Urea, B–Blood, C–Excreted  
 (3) A–Amino acid, B–Blood, C–Excreted  
 (4) A–Sugar, B–Blood, C–Excreted
57. Brush border is a characteristic of  
 (1) Neck of nephron  
 (2) Collecting tube  
 (3) Proximal convoluted tubule  
 (4) All of these
58. 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
59. Foramen magnum and occipital condyles are found in  
 (1) Parietal bone (2) Ethmoid bone  
 (3) Sphenoid bone (4) Occipital bone
60. 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