Deeksha - CET

Subject	Topic	Mock Test – 01	Date
C + M + P	Complete Syllabus	CET – 12 – CT C1220240103	3rd Jan 2024

Max. Marks: 180 **Duration: 3 Hours**

1. **This paper consists of 180 questions with 3 parts of Chemistry, Mathematics and Physics**

   - **Chemistry:** *(Q. No. 1 to 60) Multiple Choice Questions with one correct answer. A correct answer carries 1 Mark. No Negative marks.*
   - **Mathematics:** *(Q. No. 61 to 120) Multiple Choice Questions with one correct answer. A correct answer carries 1 Mark. No Negative marks.*
   - **Physics:** *(Q. No. 121 to 180) Multiple Choice Questions with one correct answer. A correct answer carries 1 Mark. No Negative marks.*

2. **The OMR sheet for 200 questions is to be used**

3. **Use of calculators and log tables is prohibited**

4. **Darken the appropriate bubble using a pen in the OMR sheet provided to you. Once entered, the answer cannot be changed. Any corrections or modifications will automatically draw a penalty of 1 mark**

5. **No clarification will be entertained during the examination. Doubts in the paper can be reported to the coordinator after the exam**

6. **If the details in the OMR Sheet are not filled, If the OMR sheet is mutilated, torn, white Ink used, the circles filled and scratched, then the OMR sheet will not be graded**

   All the best!!

Useful Data

At. Wt.:

$N = 14;\ O = 16;\ H = 1;\ S = 32;\ Cl = 35.5;\ Mn = 55;\ Na = 23;\ C = 12;\ Ag = 108;\ K = 39;\ Fe = 56;\ Pb = 207$

Physical Constants:

$h = 6.626 \times 10^{-34}\,\text{Js},\ \text{N}_\text{a} = 6.022 \times 10^{23}\,\text{mol}^{-1},\ \text{c} = 2.998 \times 10^{8}\,\text{m s}^{-1},\ \text{m}_\text{e} = 9.1 \times 10^{-31}\,\text{kg},\ R = 8.314\ \text{J mol}^{-1}\ \text{K}^{-1}$

Chemistry

Multiple Choice Questions with one correct answer. A correct answer carries 1 mark. No negative mark. **60 x 1 = 60**

1. Among the following pairs of compounds, the one that illustrates the law of multiple proportions is

   (a) NH_3 and NCl_3 (b) H_2S and SO_2 (c) MnO and Mn_2O_3 (d) CS_2 and $FeSO_4$

2. In the reaction, $3Cl_2 + 6NaOH \longrightarrow NaClO_3 + 5NaCl + 3H_2O$

   The element which loses as well as gains electrons is

   (a) Na (b) Cl (c) O (d) H

3. Which of the following has the highest bond order?

   (a) N_2 (b) O_2 (c) He_2 (d) H_2

4. The uncertainty in the position of an electron moving with a velocity of $3.0\times10^2\,\text{m/s}$ accurate upto 0.011% will be $\left(m = 9.1\times10^{-31}\text{Kg}\right)$

   (a) $80\times10^{-4}\text{m}$ (b) $40\times10^{-3}\text{m}$ (c) $1.75\times10^{-3}\text{m}$ (d) $1.75\times10^{-5}\text{m}$

5. The pair of species having same percentage of carbon is

   (a) C_2H_5OH and CH_3OCH_3 (b) CH_3COOH and $HCOOH$

   (c) $HCOOCH_3$ and C_3H_7OH (d) $C_6H_{12}O_6$ and C_6H_5OH

6. Which of the following properties show gradual decrease with increase in atomic number across a period in the Periodic Table?

   (a) Electron affinity (b) Ionisation potential (c) Electronegativity (d) Size of atom

7. For the reaction $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$. Which of the following is correct?

   (a) $\Delta H = \Delta U$ (b) $\Delta H > \Delta U$ (c) $\Delta H < \Delta U$ (d) $\Delta H = 2\Delta U$

8. Which of the following is NOT a state function?

   (a) Internal energy (b) Enthalpy (c) Work (d) Entropy

9. Given the reaction between two gases represented by A_2 and B_2 to give the compound $AB_{(g)}$

   $A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}$

   At equilibrium, the concentration of $A_2 = 3.0\times10^{-3}M$, of $B_2 = 4.2\times10^{-3}M$, of $AB = 2.8\times10^{-3}M$. If the reaction takes place in a sealed vessel at $527°C$, then the value of K_c will be

   (a) 2.0 (b) 1.9 (c) 0.62 (d) 4.5

10. pH Value of which one of the following is not equal to one?

    (a) 0.1 M CH_3COOH (b) 0.1 M HNO_3

    (c) 0.05 M H_2SO_4 (d) 50 cm^3 0.4 M HCl + 50 cm^3 0.2 M $NaOH$

11. Which of the following aqueous solution will have a pH less than 7.0 ?

    (a) KNO_3 (b) $NaOH$ (c) $FeCl_3$ (d) $NaCN$

12. The oxide of an element whose electronic configuration is $1s^2\,2s^2\,2p^6\,3s^1$ is

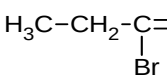
    (a) amphoteric (b) basic (c) acidic (d) neutral

13. The correct order of electronegativities of N, O, F and P is

(a) $F > O > N > P$ (b) $N > O > F > P$ (c) $F > N > P > O$ (d) $F > O > P > N$

14. Number of molecules in one litre of water is close to

(a) $\frac{18}{22.4} \times 10^{23}$ (b) $55.5 \times 6.022 \times 10^{23}$ (c) $\frac{6.022}{23.4} \times 10^{23}$ (d) $18 \times 6.022 \times 10^{22}$

15. IUPAC name of  is

(a) 2-Bromo-1-chlorobut-1-ene (b) 1-chloro-2-bromobut-1-ene

(c) 3-chloro-2-bromobut-1-ene (d) 3-Bromo-4-chlorobut-3-ene

16. 2-butyne is reduced to trans-but-2-ene using

(a) $H_2 | Ni$ (b) $H_2 | Pd - C$ (c) Na in liq. NH_3 (d) Zn in dil. HCl

17. In the reaction

$S + \frac{3}{2} O_2 \longrightarrow SO_3 + 2x$ kJ and $SO_2 + \frac{1}{2} O_2 \longrightarrow SO_3 + y$ kJ

Heat of formation of SO_2 is

(a) $x - y$ (b) $2x + y$ (c) $x + y$ (d) $2x - y$

18. Strongest reducing agent among the following is

(i) $Na^+ + e^- \longrightarrow Na_{(s)} - 2.71\, E^\Theta / V$

(ii) $Al^{3+} + 3e^- \longrightarrow Al_{(s)} - 1.66^\Theta / V$

(iii) $F_{2(g)} + 2e^- \longrightarrow 2F^- + 2.87\, E^\Theta / V$

(iv) $2H_2O + 2e^- \longrightarrow F_{2(g)} + 2OH^-_{(g)} - 0.83\, E^\Theta / V$

(a) iv (b) iii (c) ii (d) i

19. The half life of the first order reaction having rate constant $k = 1.7 \times 10^{-5} s^{-1}$ is

(a) 12.1 h (b) 9.7 h (c) 11.3 h (d) 1.8 h

20. The equation for the rate constant is $k = Ae^{-E_a/RT}$. A chemical reaction will proceed more rapidly if there is a decrease in

(a) k (b) A (c) E_a (d) T

21. A solution containing $1.8g$ of a compound (empirical formula CH_2O) in $40\,g$ of water is observed to freeze at $-0.465°C$. The molecular formula of the compound is (K_f of water $= 1.86\, kg$ K mol^{-1})

(a) $C_2H_4O_2$ (b) C_3H_6 (c) $C_4H_8O_4$ (d) $C_6H_{12}O_6$

22. What is the amount of urea dissolved per litre if its aqueous solution is isotonic with 20% cane sugar solution? (mol. wt. of urea $= 60$)

(a) 200 g / L (b) 35.08 g / L (c) 17.54 g / L (d) 16.7 g / L

23. A salt dissolves in water if:

(a) Lattice energy < hydration energy (b) Ionic product < solubility product

(c) Ions may form hydrogen bonds with water (d) All of the above

24. An electric current of $0.5F$ is passed through 1 litre of 1M $CuSO_4$ solution. After the completion of electrolysis the molarity of the resulting solution will be:

(a) 0.75 M (b) 0.60 M (c) 0.50 M (d) 0.90 M

25. The Standard Reduction Potential values of Ag, Cu, Co and Zn electrodes are 0.799, 0.337, $-$ 0.277 and $-$ 0.762 V respectively. Which of the following cells will have maximum cell emf?

(a) $Zn_{(s)} / Zn^{+2}_{(aq)} // Co^{+2}_{(aq)} / Co_{(s)}$ (b) $Zn_{(s)} / Zn^{+2}_{(aq)} // Ag^{+}_{(aq)} / Ag_{(s)}$

(c) $Cu_{(s)} / Cu^{+2}_{(aq)} // Ag^{+}_{(aq)} / Ag_{(s)}$ (d) $Zn_{(s)} / Zn^{+2}_{(aq)} // Cu^{+2}_{(aq)} / Cu_{(s)}$

26. The molar conductance of $0.1M$ solution of a weak acid HA is $1.4\,S\,cm^2\,mol^{-1}$. The molar conductance of HA at infinite dilution is $140\,S\,cm^2 mol^{-1}$. Calculate the pH of $0.1\,M$ solution of HA.

(a) 4 (b) 2 (c) 3 (d) 8

27. For the reaction $A+2B \rightarrow 3C$, the rate of reaction at a given instant can be represented by

(a) $+\frac{d[A]}{dt} = +\frac{1}{2}\frac{d[B]}{dt} = +\frac{1}{3}\frac{d[C]}{dt}$ (b) $\frac{d[A]}{dt} = +\frac{1}{2}\frac{d[B]}{dt} = -\frac{1}{3}\frac{d[C]}{dt}$

(c) $-\frac{d[A]}{dt} = -\frac{1}{2}\frac{d[B]}{dt} = +\frac{1}{3}\frac{d[C]}{dt}$ (d) $-\frac{d[A]}{dt} = +\frac{2d[B]}{dt} + \frac{3d[C]}{dt}$

28. The rate constant of a reaction is $2.1\times10^{-2}\,mol^{-2}L^2\,min^{-1}$. The order of reaction is

(a) Zero (b) 1 (c) 2 (d) 3

29. If the activation energy for the forward reaction is $150\,kJ\,mol^{-1}$ and that of the reverse reaction is $260\,kJ\,mol^{-1}$, what is the enthalpy change for the reaction?

(a) $410\,kJ\,mol^{-1}$ (b) $-110\,kJ\,mol^{-1}$ (c) $110\,kJ\,mol^{-1}$ (d) $-410\,kJ\,mol^{-1}$

30. All form ideal solution except

(a) C_6H_6 and $C_6H_5CH_3$ (b) C_2H_5Br and C_2H_5I

(c) C_6H_5Cl and C_6H_5Br (d) C_2H_5I and C_2H_5OH

31. Which of the following aqueous solution has highest freezing point?

(a) 0.1molal $Al_2(SO_4)_3$ (b) 0.1molal $BaCl_2$

(c) 0.1 molal $AlCl_3$ (d) 0.1 molal NH_4Cl

32. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition elements which shows highest magnetic moment?

(a) $3d^7$ (b) $3d^5$ (c) $3d^8$ (d) $3d^2$

33. Misch metal contains iron to the extent of

(a) 25% (b) 15% (c) 5% (d) 20%

34. Which metal has the highest melting point?

(a) Tungsten (b) Platinum (c) Silver (d) Gold

35. Which is colourless in water?

(a) Ti^{4+} (b) V^{3+} (c) Cr^{3+} (d) Ti^{3+}

36. Which of the following is not a consequence of the Lanthanide contraction?

(a) $5d$ Series elements have a higher IE_1 than $3d$ or $4d$ series

(b) Irregularity in the ionization enthalpy of $3d$ series

(c) Zr and Hf occurs together in the earth crust in their minerals

(d) Zr and Hf have a comparable size

37. Which of the following has the highest molar conductivity in solution?

(a) $\left[Pt(NH_3)_6\right]Cl_4$ (b) $\left[Pt(NH_3)_5Cl\right]Cl_3$ (c) $\left[Pt(NH_3)_4Cl_2\right]Cl_2$ (d) $\left[Pt(NH_3)_3Cl_3\right]Cl$

38. The IUPAC name of $\left[Cr(NH_3)_5Cl\right]SO_4$ is:

(a) pentaaminechloridochromium sulphate

(b) pentaamminechloridochromium(III) sulphate

(c) chloridopentaamminechromium(III) sulphate

(d) pentaaminochloridochromium(II) sulphate

39. Which of the following ligand has lowest Δ_0 value?

(a) en (b) F^- (c) ox (d) CN^-

40. Which of the following is NOT True for S_N1 reaction?

(a) The rate of the reaction does not depend upon the molar concentration of the nucleophile

(b) $1°$ – alkyl halides generally react through S_N1 reaction

(c) Favoured by polar solvents

(d) $3°$ – alkyl halides generally react through S_N1 reaction

41. The arrangement of following compounds

(i) Bromomethane (ii) Bromoform

(iii) Chloromethane (iv) Dibromomethane

In the increasing order of their boiling point is

(a) (i) < (ii) < (iii) < (iv) (b) (ii) < (iii) < (i) < (iv) (c) (iv) < (iii) < (i) < (ii) (d) (iii) < (i) < (iv) < (ii)

42. Propane nitrile may be prepared by heating:

(a) Ethyl chloride with KCN (b) Propyl alcohol with KCN

(c) Propyl chloride with KCN (d) Propane with KCN

43. Which one of the following alcohols undergoes acid catalysed dehydration to alkene readily?

(a) $(CH_3)_2CHCH_2OH$ (b) $(CH_3)_3COH$

(c) $CH_3CHOHCH_2CH_3$ (d) $CH_3CH_2CH_2CH_2OH$

44. Phenol reacts with bromine in water to give

(a) m – Bromophenol (b) 2, 4, 6 – Tribromophenol

(c) p – Bromophenol (d) Mixture of ortho and para-bromophenol

45. The compound which does not react with Lucas reagent is

(a) n – Butyl alcohol (b) sec – Butyl alcohol

(c) Isobutyl alcohol (d) $tert$ – Butyl alcohol

46. Anisole on treatment with CH_3Cl in presence of anhydrous $AlCl_3$ gives

(a) Toluene (b) o-Chloroanisole

(c) p – Chloroanisole (d) o – and p – methylanisoles

47. One mole of a symmetrical alkene on ozonolysis gives two moles of an acetaldehyde. The alkene is

(a) 2 – Butene (b) Ethene (c) Propene (d) 1 – Butene

48. The final product (Y) in the following sequence of chemical reaction is

$$CH_3OH \xrightarrow[300\,^\circ C]{Cu} X \xrightarrow{NaOH} Y + CH_3OH$$

(a) an alkene (b) a carboxylic acid

(c) an aldehyde (d) sodium salt of carboxylic acid

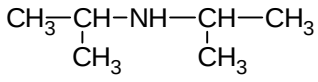
49. In presence of dry HCl gas, CH_3CHO condenses with C_2H_5OH to give

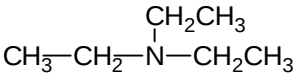
(a) aldol (b) paraldehyde (c) ethyl acetate (d) acetal

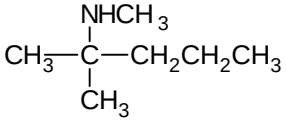
50. Ethanoyl chloride cannot be obtained by treating ethanoic acid with:

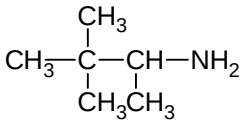
(a) $SOCl_2$ (b) $CHCl_3$ (c) PCl_3 (d) PCl_5

51. The amine that reacts with Hinsberg's reagent to give the product soluble in alkali

(a) 

(b) 

(c) 

(d) 

52. The bad smelling substance formed by the action of alcoholic caustic potash on chloroform and aniline is

(a) Nitrobenzene (b) Phenyl isocyanide (c) Phenyl cyanide (d) Phenyl isocyanate

53. Aniline on heating with conc. H_2SO_4 at $460K$ gives:

(a) Aniline sulphate (b) Benzene sulphonic acid

(c) Sulphanilic acid (d) Sulphonic acid

54. The presence of primary alcoholic group in glucose can be confirmed by

(a) Oxidation of glucose with mild oxidising agent

(b) Acetylation of glucose with acetic anhydride

(c) Oxidation of glucose with nitric acid

(d) Prolonged heating of glucose with HI

55. What type of sugar molecule is present in RNA?

(a) $D-3-$Deoxyribose (b) $D-$Ribose (c) $D-2-$Deoxyribose (d) $D-$Glucopyranose

56. Cheilosis and digestive disorders are due to the deficiency of

(a) Vitamin A (b) Riboflavin (c) Thiamine (d) Ascorbic acid

57. Clemmensen reduction is carried with:

(a) H_2 in the presence of Pd (b) NH_2NH_2 / glycol and KOH

(c) $LiAlH_4$ in ether (d) $Zn-Hg$ and HCl

58. Dimerisation in carboxylic acid is due to

(a) ionic bond (b) covalent bond

(c) coordinate bond (d) inter molecular hydrogen bond

59. How many peptide linkages are present in a tetrapeptide?

(a) 1 (b) 2 (c) 3 (d) 4

60. Which of the following sets of monosaccharides form sucrose?

(a) $\alpha-D-$ galactopyranose and $\alpha-D-$ glucopytanose

(b) $\alpha-D-$ glucopyranose and $\beta-D-$ fructofuranose

(c) $\beta-D-$ glucopyranose and $\alpha-D-$ fructofuranose

(d) $\alpha-D-$ glucopyanose and $\beta-D-$ fructopyranose

Mathematics

Multiple Choice Questions with one correct answer. A correct answer carries 1 mark. No negative mark. 60 x 1 = 60

61. The set $A=\left\{x: x\in R, x^2=16 \text{ and } 2x=6\right\}$ is equal to

(a) ϕ (b) $\{14,3,4\}$ (c) $\{3\}$ (d) $\{4\}$

62. Which of the following is correct?

(a) $A\cap\phi=A$ (b) $A\cap\phi=\phi$ (c) $A\cap\phi=U$ (d) $A\cap\phi=A'$

63. If $A=\{1,3,5,7\}$ and $B=\{1,2,3,4,5,6,7,8\}$ then, the number of one-one function from A into B is

(a) 1340 (b) 1860 (c) 1430 (d) 1680

64. The range of the function $f(x)=x^2+2x+2$ is

(a) $(1,\infty)$ (b) $(2,\infty)$ (c) $(0,\infty)$ (d) $[1,\infty)$

65. If $f(x)=4x^3+3x^2+3x+4$, then $x^3 f\left(\frac{1}{x}\right)$ is equal to

(a) $f(-x)$ (b) $\frac{1}{f(x)}$ (c) $\left[f\left(\frac{1}{x}\right)\right]^2$ (d) $f(x)$

66. For any two real numbers θ and ϕ, we define $\theta R\phi$, if and only if $\sec^2\theta - \tan^2\phi = 1$. The relation R is

(a) reflexive but not transitive

(b) symmetric but not reflexive

(c) both reflexive and symmetric but not transitive

(d) an equivalence relation

67. If $A = \{x, y, z\}$ and $B = \{a, b, c, d\}$. Then, which one of the following is not a relation from A to B?

(a) $\{(x,a), (x,c)\}$ (b) $\{(y,c), (y,d)\}$ (c) $\{(z,a), (z,d)\}$ (d) $\{(z,b), (y,b), (a,d)\}$

68. If $\sin A + \sin B + \sin C = 3$, then $\cos A + \cos B + \cos C$ is equal to

(a) 3 (b) 2 (c) 1 (d) 0

69. If $\frac{\cos A}{3} = \frac{\cos B}{4} = \frac{1}{5}$, $\frac{\pi}{2} < A < 0$ and $-\frac{\pi}{2} < B < 0$, then the value of $2\sin A + 4\sin B$ is

(a) 4 (b) –2 (c) –4 (d) 0

70. The value of $\frac{\sin 55° - \cos 55°}{\sin 10°}$ is

(a) $\frac{1}{\sqrt{2}}$ (b) 2 (c) 1 (d) $\sqrt{2}$

71. Find the value of $\cos(x/2)$, if $\tan x = 5/12$ and x lies in quadrant III

(a) $\frac{5}{\sqrt{13}}$ (b) $\frac{5}{\sqrt{26}}$ (c) $\frac{5}{13}$ (d) $-\sqrt{\frac{1}{26}}$

72. The least value of $3\sin^2\theta + 4\cos^2\theta$ is

(a) 2 (b) 3 (c) 0 (d) 1

73. If $z_1 = \sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$ and $z_z = \sqrt{3}\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$, then $|z_1 z_2|$ is equal to

(a) 6 (b) $\sqrt{2}$ (c) $\sqrt{6}$ (d) $\sqrt{3}$

74. $\tan^{-1}\left(\frac{x}{\sqrt{a^2 - x^2}}\right)$ is equal to

(a) $2\sin^{-1}\left(\frac{x}{a}\right)$ (b) $\sin^{-1}\left(\frac{2x}{a}\right)$ (c) $\sin^{-1}\left(\frac{x}{a}\right)$ (d) $\cos^{-1}\left(\frac{x}{a}\right)$

75. The set $A = \{x : |2x + 3| < 7\}$ is equal to the set

(a) $D = \{x : 0 < x + 5 < 7\}$ (b) $B = \{x : -3 < x < 7\}$

(c) $E = \{x : -7 < x < 7\}$ (d) $C = \{x : -13 < 2x < 4\}$

76. The number of subsets of $\{1, 2, 3, ..., 9\}$ containing at least one odd number, is

(a) 324 (b) 396 (c) 496 (d) 512

77. If the foot of the perpendicular from the origin to a straight line is at the point $(3, -4)$. Then, the equation of the line is

(a) $3x - 4y = 25$ (b) $3x - 4y + 25 = 0$ (c) $4x + 3y - 25 = 0$ (d) $4x - 3y - 25 = 0$

78. The distance between the foci of the conic $7x^2 - 9y^2 = 63$ is equal to

(a) 8 (b) 4 (c) 3 (d) 7

79. $\lim_{x\to\infty}\left(\frac{1^3+2^3+3^3+...+k^3}{k^4}\right)$ is equal to

(a) 0 (b) 2 (c) 1/4 (d) 1/3

80. If $f(5)=7$ and $f'(5)=7$, then $\lim_{x\to\infty}\frac{xf(5)-5f(x)}{x-5}$ is equal to

(a) 35 (b) –35 (c) 28 (d) –28

81. $\lim_{x\to 0}\frac{1-\cos^3 x}{x\sin x\cos x}$ is equal to

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{3}{2}$ (d) $\frac{3}{4}$

82. If $f(x)=e^x\sin x$, then $f''(x)$ is equal to

(a) $e^{6x}\sin 6x$ (b) $2e^x\cos x$ (c) $8e^x\sin x$ (d) $8e^x\cos x$

83. The value of $\frac{d}{dx}\left[\tan^{-1}\left\{\frac{\sqrt{x}(3-x)}{1-3x}\right\}\right]$ is

(a) $\frac{3}{2(1+x)\sqrt{x}}$ (b) $\frac{3}{(1+x)\sqrt{x}}$ (c) $\frac{2}{(1+x)\sqrt{x}}$ (d) $\frac{3}{2(1-x)\sqrt{x}}$

84. Differential coefficient of $\sqrt{\sec\sqrt{x}}$ is

(a) $\frac{1}{4\sqrt{x}}\sec\sqrt{x}\sin\sqrt{x}$ (b) $\frac{1}{4\sqrt{x}}\left(\sec\sqrt{x}\right)^{3/2}\cdot\sin\sqrt{x}$

(c) $\frac{1}{2}\sqrt{x}\sec\sqrt{x}\sin\sqrt{x}$ (d) $\frac{1}{2}\sqrt{x}\left(\sec\sqrt{x}\right)^{3/2}\cdot\sin\sqrt{x}$

85. If $2x^2-3xy+y^2+x+2y-8=0$, then $\frac{dy}{dx}$ is equal to

(a) $\frac{3y-4x-1}{2y-3x+2}$ (b) $\frac{3y+4x-1}{2y+3x+2}$ (c) $\frac{3y-4x+1}{2y-3x-2}$ (d) $\frac{3y-4x+1}{2y+3x+2}$

86. If $f(x)=\begin{cases} cx+1, & x\le 3 \\ cx^2-1, & x>3 \end{cases}$ is continuous at $x=3$, then c is equal to

(a) 1/3 (b) 2/3 (c) 3/2 (d) 3

87. Mean deviation of 6, 8, 12, 15, 10, 9 from mean is

(a) 10 (b) 2.33 (c) 2.5 (d) None of these

88. In a class, there are 10 boys and 8 girls. When 3 students are selected at random, the probability that 2 girls and 1 boy are selected, is

(a) $\frac{35}{102}$ (b) $\frac{15}{102}$ (c) $\frac{55}{102}$ (d) $\frac{25}{102}$

89. If A and B are two events such that $P\left(\overline{A\cup B}\right)=\frac{1}{6}$, $P\left(A\cap B\right)=\frac{1}{4}$ and $P\left(\bar{A}\right)=\frac{1}{4}$, where $\bar{A}$ stands for complement of the event A. Then, events A and B are

(a) mutually exclusive and independent (b) independent but not equally likely

(c) equally likely but not independent (d) equally likely and mutually exclusive

90. If $P\left(A\right)=P\left(B\right)=x$ and $P\left(A\cap B\right)=P\left(A'\cap B'\right)=\frac{1}{3}$, then x is equal to

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

91. If $A=\begin{bmatrix}2-k & 2\\ 1 & 3-k\end{bmatrix}$ is a singular matrix, then the value of $5k-k^2$ is

(a) 4 (b) 6 (c) -6 (d) -4

92. If $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ a & b & -1\end{bmatrix}$, then A^2 is equal to

(a) 0 (b) $-A$ (c) I (d) $2A$

93. If X and Y are 2×2 matrices such that $2X+3Y=O$ and $X+2Y=I$, where O and I denote the 2×2 zero matrix and the 2×2 identity matrix, then X is equal to

(a) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (b) $\begin{bmatrix}2 & 0\\ 0 & 2\end{bmatrix}$ (c) $\begin{bmatrix}-3 & 0\\ 0 & -3\end{bmatrix}$ (d) $\begin{bmatrix}3 & 0\\ 0 & 3\end{bmatrix}$

94. If $\begin{vmatrix}2a & x_1 & y_1\\ 2b & x_2 & y_2\\ 2c & x_3 & y_3\end{vmatrix}=\frac{abc}{2}\neq0$, then the area of the triangle whose vertices are $\left(\frac{x_1}{a},\frac{y_1}{a}\right)$, $\left(\frac{x_2}{b},\frac{y_2}{b}\right)$ and $\left(\frac{x_3}{c},\frac{y_3}{c}\right)$ is

(a) $\frac{1}{4}abc$ (b) $\frac{1}{8}abc$ (c) $\frac{1}{4}$ (d) $\frac{1}{8}$

95. If $\begin{vmatrix}x^2+x & 3x-1 & -x+3\\ 2x+1 & 2+x^2 & x^3-3\\ x-3 & x^2+4 & 3x\end{vmatrix}=a_0+a_1x+a_2x^2+\ldots+a_7x^7$, then the value of a_0 is

(a) 21 (b) 24 (c) 23 (d) 22

96. Three non-zero non-collinear vectors, a,b and c are such that $a+3b$ is collinear with c, $3b+2c$ is collinear with a. Then, $a+3b+2c$ is equal to

(a) 0 (b) $2a$ (c) $3b$ (d) $4c$

97. If a,b and c are pth, qth and rth terms of a GP, then the vectors $\log a\hat{i}+\log b\hat{j}+\log c\hat{k}$ and $(q-r)\hat{i}+(r-p)\hat{j}+(p-q)\hat{k}$ are

(a) equal (b) parallel (c) perpendicular (d) None of these

98. If $a=\hat{i}+2\hat{j}+2\hat{k}, |b|=5$ and the angle between a and b is $\pi/6$, then the area of the triangle formed by these two vectors as two sides is

(a) $\frac{15}{4}$ (b) $\frac{15}{2}$ (c) 15 (d) $\frac{15\sqrt{3}}{2}$

99. The maximum value of $z=4x+2y$ subject to constraints $2x+3y\le 18,\ x+y\ge 10$ and $x, y\ge 0$ is

(a) 20 (b) 36 (c) 40 (d) None of these

100. $\int \frac{1}{\sqrt{7-x^2}}dx$ is equal to

(a) $\frac{1}{2\sqrt{7}}\log\left|\frac{\sqrt{7+x}}{\sqrt{7-x}}\right|+C$ (b) $\sin^{-1}\left(\frac{x}{\sqrt{7}}\right)+C$ (c) $\log\left|x+\sqrt{x^2-7}\right|+C$ (d) $\frac{1}{2\sqrt{7}}\log\left|\frac{x-\sqrt{7}}{x+\sqrt{7}}\right|+C$

101. $\int \frac{x^4+x^2+1}{x^2-x+1}dx$ is equal to

(a) $\frac{x^3}{3}-\frac{x^2}{2}+x+C$ (b) $\frac{x^3}{3}+\frac{x^2}{2}+x+C$ (c) $\frac{x^3}{3}-\frac{x^2}{2}-x+C$ (d) $\frac{x^3}{3}+\frac{x^2}{2}-x+C$

102. $\int e^{-\log x}dx$ is equal to

(a) $e^{-\log x}+C$ (b) $-xe^{-\log x}+C$ (c) $e^{\log x}+C$ (d) $\log|x|+C$

103. $\int \frac{(1+x)^{e^x}}{\sin^2\left(xe^x\right)}dx$ is equal to

(a) $-\cot\left(xe^x\right)+C$ (b) $\tan\left(xe^x\right)+C$ (c) $\tan\left(e^x\right)+C$ (d) $\cot\left(xe^x\right)+C$

104. Which of the following is correct?

(a) $\int_0^1 e^x dx=e$ (b) $\int_0^1 2^x dx=\log 2$ (c) $\int_0^1 \sqrt{x}dx=\frac{2}{3}$ (d) $\int_0^1 xdx=\frac{1}{3}$

105. If $\int_a^b x^3dx=0$ and $\int_a^b x^2dx=\frac{2}{3}$, then the values of a and b are respectively

(a) 1,1 (b) $-1,-1$ (c) $1,-1$ (d) $-1,1$

106. $\int_0^{2\pi}\left(\sin x+|\sin x|\right)dx$ is equal to

(a) 0 (b) 4 (c) 8 (d) 1

107. The degree of the differential equation $\frac{d^2y}{dx^2}+3\left(\frac{dy}{dx}\right)^2=x^2\log\left(\frac{d^2y}{dx^2}\right)$ is

(a) 1 (b) 2 (c) 3 (d) none of these

108. Solution of the differential equation $\frac{dy}{dx}+\frac{y}{x}=\sin x$ is

(a) $x\left(y+\cos x\right)=\sin x+c$ (b) $x\left(y-\cos x\right)=\sin x+c$

(c) $x\left(y\cos x\right)=\sin x+c$ (d) $x\left(y+\cos x\right)=\cos x+c$

109. The general solution of a differential equation of the type $\frac{dx}{dy}+P_1x=Q_1$ is

(a) $y\cdot e^{\int P_1\,dy}=\int\left(Q_1e^{\int P_1\,dy}\right)dy+c$ (b) $y\cdot e^{\int P_1\,dx}=\int\left(Q_1e^{\int P_1\,dy}\right)dx+c$

(c) $x\cdot e^{\int P_1\,dy}=\int\left(Q_1e^{\int P_1\,dy}\right)dy+c$ (d) $x\cdot e^{\int P_1\,dx}=\int\left(Q_1e^{\int P_1\,dx}\right)dx+c$

110. Solution of the differential equation $\tan y\sec^2 x\,dx+\tan x\sec^2 y\,dy=0$ is

(a) $\tan x+\tan y=k$ (b) $\tan x-\tan y=k$ (c) $\frac{\tan x}{\tan y}=k$ (d) $\tan x\cdot\tan y=k$

111. The area bounded by $y=\sin x$ and $x-$axis from $x=0$ to $x=\pi$ is

(a) 2 (b) π (c) π^2 (d) none of these

112. The area bounded by the curve $y=\sqrt{16-x^2}$ is

(a) 8π sq. units (b) 20π sq. units (c) 16π sq. units (d) 256π sq. units

113. The S.D. of scores 1, 2, 3, 4, 5 is

(a) $\sqrt{2}$ (b) $\sqrt{3}$ (c) $\frac{2}{5}$ (d) $\frac{3}{5}$

114. A bag contains 3 black and 4 white balls. Two balls are drawn one by one at random without replacement. The probability that second drawn ball is white is

(a) $\frac{4}{7}$ (b) $\frac{1}{7}$ (c) $\frac{4}{49}$ (d) $\frac{12}{49}$

115. The function $f(x)=\cot^{-1}x+x$ increases in the interval

(a) $(1,\infty)$ (b) $(-1,\infty)$ (c) $(-\infty,\infty)$ (d) $(0,\infty)$

116. The minimum value of $(x-\alpha)(x-\beta)$ is

(a) 0 (b) $\alpha\beta$ (c) $\frac{1}{4}(\alpha-\beta)^2$ (d) $-\frac{1}{4}(\alpha-\beta)^2$

117. The acute angle between the lines whose direction cosines are proportional to $3,-1,2$ and $2,1,-3$ is

(a) $\cos^{-1}\frac{2}{\sqrt{14}}$ (b) $\cos^{-1}\frac{1}{\sqrt{14}}$ (c) $\cos^{-1}\frac{\sqrt{3}}{\sqrt{14}}$ (d) $\cos^{-1}\frac{3}{\sqrt{14}}$

118. If the lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ are at right angles, then $k=$

(a) $-\frac{10}{7}$ (b) $\frac{10}{7}$ (c) $\frac{7}{10}$ (d) $-\frac{7}{10}$

119. The shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$

(a) $\frac{1}{\sqrt{6}}$ (b) $\frac{1}{6}$ (c) $\frac{1}{3}$ (d) $\frac{1}{\sqrt{3}}$

120. The number of terms in the expansion of $\left(x^2+y^2\right)^{25}-\left(x^2-y^2\right)^{25}$ after simplification is

(a) 0 (b) 13 (c) 26 (d) 50

Physics

Multiple Choice Questions with one correct answer. A correct answer carries 1 mark. No negative mark. 60 x 1 = 60

121. A satellite has kinetic energy K, potential energy V and total energy E. Which of the following statements is true?

(a) $K=-\frac{V}{2}$ (b) $K=\frac{V}{2}$ (c) $E=\frac{K}{2}$ (d) $E=-\frac{K}{2}$

122. A wire fixed at the upper end stretches by length l by applying a force F. The work done in stretching is

(a) $2Fl$ (b) Fl (c) $\frac{F}{2l}$ (d) $\frac{Fl}{2}$

123. A wheel has angular acceleration of $3.0\,\text{rad}\,\text{s}^{-2}$ and an initial angular speed of $2.00\,\text{rad}\,\text{s}^{-1}$. In a time of $2\,\text{s}$ it has rotated through an angle (in radian) of

(a) 10 (b) 12 (c) 4 (d) 6

124. Spheres of iron and lead having same mass are completely immersed in water. Density of lead is more than that of iron. Apparent loss of weight is W_1 for iron sphere and W_2 for lead sphere. Then $\frac{W_1}{W_2}$ is

(a) 1 (b) Between 0 and 1 (c) 0 (d) >1

125. The ratio of radiant energies radiated per unit surface area by two bodies is $16:1$, the temperature of hotter body is $1000\,\text{K}$, then the temperature of colder body will be

(a) $250\,\text{K}$ (b) $500\,\text{K}$ (c) $1000\,\text{K}$ (d) $62.5\,\text{K}$

126. According to kinetic theory of gas, molecules of a gas behave like

(a) Inelastic rigid sphere
(b) Perfectly elastic non-rigid sphere
(c) Perfectly elastic rigid sphere
(d) Inelastic non-rigid sphere

127. In an adiabatic process, the pressure is increased by $\left(\frac{2}{3}\right)\%$. If $\gamma=\frac{3}{2}$, then the volume decreases by nearly

(a) $\frac{4}{9}\%$ (b) $\frac{2}{3}\%$ (c) 1% (d) $\frac{9}{4}\%$

128. The displacement of particle from the mean position in SHM is given by $x=a\cos\omega t+b\sin\omega t$. If $a=3, b=4$ and $\omega=4$, the amplitude and maximum velocity respectively will be

(a) 3,4 (b) 4,16 (c) 7,14 (d) 5,20

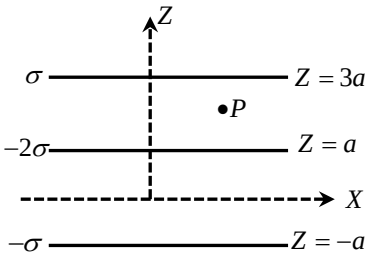
129. The number of beats produced per second by two vibrations, $x_1=x_0\sin 646\pi t$ and $x_2=x_0\sin 652\pi t$ is of

(a) 2 (b) 3 (c) 4 (d) 6

130. Three point charges Q_1, Q_2, Q_3 are placed equally spaced along a straight line. Q_2 and Q_3 are equal in magnitude but opposite in sign. If the net force on Q_3 is zero, the value of Q_1 is

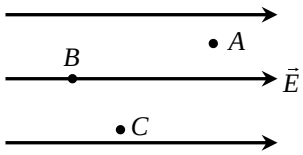
(a) $Q_1=4(Q_3)$ (b) $Q_1=2(Q_3)$ (c) $Q_1=\sqrt{2}(Q_3)$ (d) $Q_1=(Q_3)$

131. Three infinitely long charge sheets are placed as shown in figure. The electric field at point P is



(a) $\frac{2\sigma}{\varepsilon_0}\hat{k}$ (b) $\frac{4\sigma}{\varepsilon_0}\hat{k}$ (c) $-\frac{2\sigma}{\varepsilon_0}\hat{k}$ (d) $-\frac{4\sigma}{\varepsilon_0}\hat{k}$

132. A, B and C are three points in a uniform electric field. The electric potential is



(a) maximum at B (b) maximum at C

(c) same at all the three points A, B and C (d) maximum at A

133. A pendulum bob of mass m carrying a charge q is at rest with its string making an angle θ with the vertical in a uniform horizontal electric field E. The tension in the string is

(a) $\frac{mg}{\sin\theta}$ and $\frac{qE}{\cos\theta}$ (b) $\frac{mg}{\cos\theta}$ and $\frac{qE}{\sin\theta}$ (c) $\frac{qE}{mg}$ (d) $\frac{mg}{qE}$

134. A dielectric slab is inserted between the plates of an isolated charged capacitor. Which of the following quantities remain unchanged?

(a) The charge on the capacitor (b) The stored energy in the capacitor

(c) The potential difference between the plates (d) The electric field in the capacitor

135. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system

(a) Decreases by a factor of 2 (b) Remains the same

(c) Increases by a factor of 2 (d) Increases by a factor of 4

136. Two spheres A and B of radius $4\,\text{cm}$ and $6\,\text{cm}$ are given charges of $80\,\mu\text{C}$ and $40\,\mu\text{C}$ respectively. If they are connected by a fine wire, the amount of charge flowing from one to the other is

(a) $20\,\mu\text{C}$ from A to B (b) $16\,\mu\text{C}$ from A to B

(c) $32\,\mu\text{C}$ from B to A (d) $32\,\mu\text{C}$ from A to B

137. There is an electric field E in $x-$direction. If the work done on moving a charge of $0.2\,\text{C}$ through a distance of $2\,\text{m}$ along a line making an angle $60°$ with $x-$axis is $4\,\text{J}$, then what is the value of E?

(a) $3\,\text{N C}^{-1}$ (b) $4\,\text{N C}^{-1}$ (c) $5\,\text{N C}^{-1}$ (d) $20\,\text{N C}^{-1}$

138. A primary cell has an emf of 1.5 volt, when short-circuited it gives a current of 3 ampere. The internal resistance of the cell is

(a) 4.5 ohm (b) 2 ohm (c) 0.5 ohm (d) $\frac{1}{4.5}$ ohm

139. An electric current passes through a circuit containing two wires of the same material connected in parallel. If the lengths of the wires are in the ratio of $\frac{4}{3}$ and radius of the wires are in the ratio of $\frac{2}{3}$, then the ratio of the currents passing through the wires will be

(a) 3 (b) $\frac{1}{3}$ (c) $\frac{3}{9}$ (d) None of these

140. The powers of two electric bulbs are 100 watt and 200 watt. Both of them are joined with 220 volt. The ratio of resistance of their filament will be

(a) 4:1 (b) 1:4 (c) 1:2 (d) 2:1

141. A charged particle is moving in an electric field of $3\times10^{-10}\,\text{V m}^{-1}$ with mobility $2.5\times10^{6}\ \text{m}^2/\text{V/s}$, its drift velocity is

(a) $1.2\times10^{-4}\ \text{ms}^{-1}$ (b) $7.5\times10^{-4}\text{ms}^{-1}$ (c) $8.33\times10^{-4}\text{ms}^{-1}$ (d) $2.5\times10^{4}\text{ms}^{-1}$

142. In an atom electrons revolve around the nucleus along a path of radius 0.72 Å making 9.4×10^{18} revolutions per second. The equivalent current is $-\left[\text{given } e=1.6\times10^{-19}\,C\right]$

(a) 1.8 A (b) 1.2 A (c) 1.5 A (d) 1.4 A

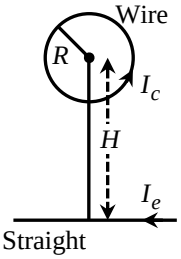
143. A steady current flows in a metallic conductor of non-uniform cross-section. The quantity/quantities remain constant along the length of the conductor is/are

(a) Current, electric field and drift speed (b) Drift speed only
(c) Current and drift speed (d) Current only

144. A conducting wire of length l is turned in the form of a circular coil and a current i is passed through it. For torque due to magnetic field produced at its centre, to be maximum, the minimum number of turns in the coil will be

(a) 1 (b) 2 (c) 5 (d) of any value

145. Circular loop of a wire and a long straight wire carry currents I_c and I_e, respectively as shown in figure. Assuming that these are placed in the same plane. The magnetic fields will be zero at the centre of the loop when the separation H is



(a) $\frac{I_eR}{I_c\pi}$ (b) $\frac{I_cR}{I_e\pi}$ (c) $\frac{\pi I_c}{I_eR}$ (d) $\frac{I_e\pi}{I_cR}$

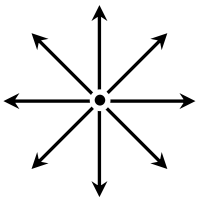
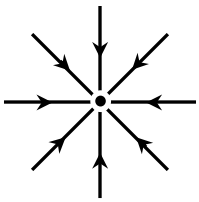
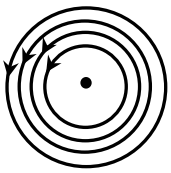
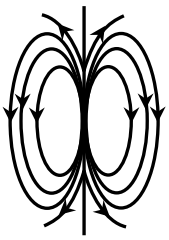
146. A wire of length l m carrying a current I A is bent into a circle. The magnitude of the magnetic moment is

(a) $\frac{lI^2}{2\pi}$ (b) $\frac{lI^2}{4\pi}$ (c) $\frac{l^2I}{2\pi}$ (d) $\frac{l^2I}{4\pi}$

147. To convert a $800\,\text{mV}$ range milli voltmeter of resistance $40\,\Omega$ into a galvanometer of $100\,\text{mA}$ range, the resistance to be connected as shunt is

(a) $10\,\Omega$ (b) $20\,\Omega$ (c) $30\,\Omega$ (d) $40\,\Omega$

148. Which of the field pattern given below is valid for electric field as well as for magnetic field?

(a)  (b)  (c)  (d) 

149. The distance between the wires of electric mains is $12\,\text{cm}$. These wires experience $4\,\text{mg wt}$ per unit length. The value of current flowing in each wire will be

(a) $4.85\,\text{A}$ (b) 0 (c) $4.85\times10^{-2}\,\text{A}$ (d) $4.85\times10^{-4}\,\text{A}$

150. Which of the following properties is 'False' for a bar magnet?

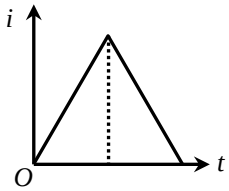
(a) It doesn't produce magnetic field

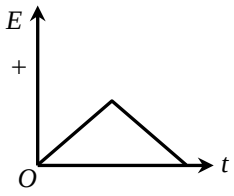
(b) It points in North-South direction when suspended

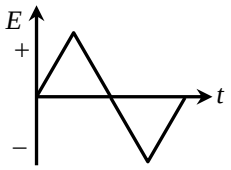
(c) Its poles cannot be separated

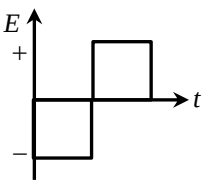
(d) Its like poles repel and unlike poles attract

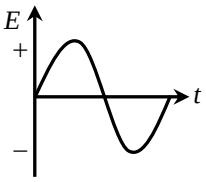
151. The current i in an inductance coil varies with time t according to the graph shown in figure. Which one of the following plots shows the variation of voltage in the coil with time?



(a) 

(b) 

(c) 

(d) 

152. Two coaxial solenoids are made by winding thin insulated wire over a pipe of cross-sectional area $A=10\,\text{cm}^2$ and length $=20\,\text{cm}$. If one of the solenoid has 300 turns and the other 400 turns, their mutual inductance is $\left(\mu_0=4\pi\times10^{-7}\,\text{Tm A}^{-1}\right)$

(a) $2.4\pi\times10^{-5}\,\text{H}$ (b) $4.8\pi\times10^{-4}\,\text{H}$ (c) $4.8\pi\times10^{-5}\,\text{H}$ (d) $2.4\pi\times10^{-4}\,\text{H}$

153. If instantaneous current is given by $i = 4\cos(\omega t + \phi)$ amperes, then the rms value of current is

(a) 4 amperes (b) $2\sqrt{2}$ amperes (c) $4\sqrt{2}$ amperes (d) zero amperes

154. In a series LCR circuit $R = 300\Omega$, $L = 0.9\text{H}$, $C = 2.0\ \mu\text{F}$ and $\omega = 1000\ \text{rad s}^{-1}$, then impedance of the circuit is

(a) 400Ω (b) 1300Ω (c) 900Ω (d) 500Ω

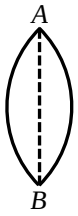
155. An inductance of $\left(\frac{200}{\pi}\right)\text{mH}$, a capacitance of $\left(\frac{10^{-3}}{\pi}\right)\text{F}$ and a resistance of 10Ω are connected in series with an a.c. source $220\,\text{V}\ 50\,\text{Hz}$. The phase angle of the circuit is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$

156. An electromagnetic wave travels along $z-$axis. Which of the following pairs of space and time varying fields would generate such a wave?

(a) E_x, B_y (b) E_y, B_x (c) E_z, B_x (d) E_y, B_z

157. The equi-convex lens, shown in figure, has a focal length f. What will be the focal length of each half if the lens is cut along AB?



(a) $\frac{f}{2}$ (b) f (c) $\frac{3f}{2}$ (d) $2f$

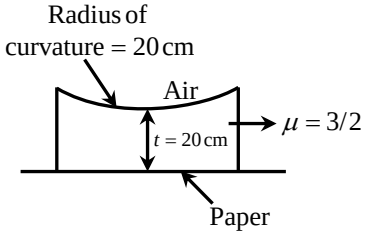
158. An astronomical telescope has a magnifying power 10, the focal length of the eyepiece is $20\,\text{cm}$. The focal length of the objective is

(a) $\frac{1}{200}\text{cm}$ (b) $\frac{1}{2}\text{cm}$ (c) $200\,\text{cm}$ (d) $2\,\text{cm}$

159. A convex mirror of focal length f forms an image which is $\frac{1}{n}$ times the object. The distance of the object from the mirror is

(a) $(n-1)f$ (b) $\left(\frac{n-1}{n}\right)f$ (c) $\left(\frac{n+1}{n}\right)f$ (d) $(n+1)f$

160. A plano-concave lens is placed on a paper on which a flower is drawn. How far above its actual position does this flower appear to be?



(a) 10 cm (b) 15 cm (c) 50 cm (d) None of these

161. A ray of light traveling inside a rectangular glass block of refractive index $\sqrt{2}$ is incident on the glass-air surface at an angle of incident of $45°$. The refractive index of air is one. Under these conditions the ray will

(a) Emerge into the air without any deviation

(b) Be reflected back into the glass

(c) Be absorbed

(d) Emerge into the air with an angle of refraction equal to $90°$

162. A polarized light of intensity I_0 is passed through another polarizer whose pass axis makes an angle of $60°$ with the pass axis of the former. What is the intensity of emergent polarized light from second polarizer?

(a) $\frac{I_0}{4}$ (b) $I=\frac{I_0}{5}$ (c) $I=\frac{I_0}{6}$ (d) $I=I_0$

163. If in a photoelectric cell, the wavelength of incident light is changed from $4000\,\text{Å}$ to $3000\,\text{Å}$ then change in stopping potential will be

(a) $0.66\,\text{V}$ (b) $1.03\,\text{V}$ (c) $0.33\,\text{V}$ (d) $0.49\,\text{V}$

164. If the momentum of electron is changed by P, then the de Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be

(a) $200\,P$ (b) $400\,P$ (c) $\frac{P}{200}$ (d) $100\,P$

165. Out of the following which one is not a possible energy for a photon to be emitted by hydrogen atom according to Bohr's atomic model?

(a) $1.9\,\text{eV}$ (b) $11.1\,\text{eV}$ (c) $13.6\,\text{eV}$ (d) $0.65\,\text{eV}$

166. An alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then the distance of closest approach for the alpha nucleus will be proportional to

(a) $\frac{1}{Ze}$ (b) v^2 (c) $\frac{1}{m}$ (d) $\frac{1}{v^4}$

167. A nuclear reactor delivers a power of $10^9\,\text{W}$, the amount of fuel consumed by the reactor in one hour is

(a) $0.96\,g$ (b) $0.04\,g$ (c) $0.08\,g$ (d) $0.72\,g$

168. The binding energy per nucleon for ${}_1^2H$ and ${}_2^4He$ respectively are 1.1MeV and 7.1MeV. The energy released in MeV when two ${}_1^2H$ nuclei fuse to form ${}_2^4He$ is

(a) 4.4 (b) 8.2 (c) 24 (d) 28.4

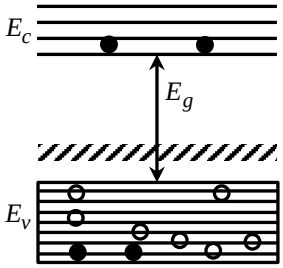
169. A nucleus disintegrates into two nuclear parts which have their velocities in the ratio $2:1$. Ratio of their nuclear sizes will be

(a) $2^{1/3}:1$ (b) $1:3^{1/2}$ (c) $3^{1/2}:1$ (d) $1:2^{1/3}$

170. In Rutherford experiment, for head-on collision of $\alpha-$particles with a gold nucleus, the impact parameter is

(a) zero
(b) of the order of $10^{-14}\,\text{m}$
(c) of the order of $10^{-10}\,\text{m}$
(d) of the order of $10^{-6}\,\text{m}$

171. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is



(a) An insulator
(b) A metal
(c) An $n-$type semiconductor
(d) A $p-$type semiconductor

172. The conductivity of semiconductor increases with increase in temperature because.

(a) number density of charge carriers increases
(b) relaxation time increases
(c) both number density of charge carriers and relaxation time increase
(d) number density of current carriers increases, relaxation time decreases but effect of decrease in relaxation time is much less than increase in number density

173. When a $p-n$ junction diode is reverse biased the flow of current across the junction is mainly due to

(a) Diffusion of charges
(b) Drift of charges
(c) Depends on the nature of material
(d) Both drift and diffusion of charges

174. A $10\,\text{eV}$ electron is circulating in a plane at right angles to a uniform field of magnetic field $10^{-4}\,\text{Wb}\,\text{m}^{-2}$ $(=1.0$ gauss). The orbital radius of the electron is

(a) $12\,\text{cm}$ (b) $16\,\text{cm}$ (c) $11\,\text{cm}$ (d) $18\,\text{cm}$

175. If the units of mass, length and time are doubled, unit of angular momentum will be

(a) Doubled
(b) Tripled
(c) Quadrupled
(d) 8 times the original value

176. The displacement $'x'$ (in metre) of particle of mass $'m'$ (in kg) moving in one dimension under the action of a force, is related to time $'t'$ (in sec.) by, $t=\sqrt{x}+3$. The displacement of the particle when its velocity is zero, will be

(a) $2\,\text{m}$ (b) $4\,\text{m}$ (c) $0\,\text{m}$ (d) $6\,\text{m}$

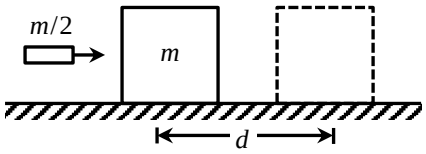
177. A cricketer hits a ball with a velocity $25\,\text{m}\,\text{s}^{-1}$ at $60°$ above the horizontal. How far above the ground it passes over a fielder $50\,\text{m}$ from the bat (assume the ball is truck very close to the ground)

(a) $8.2\,\text{m}$ (b) $9.0\,\text{m}$ (c) $11.6\,\text{m}$ (d) $12.7\,\text{m}$

178. A person with his hands in his pockets is skating on ice at the velocity of $10\,\text{m}\,\text{s}^{-1}$ and describes a circle of radius $50\,\text{m}$. What is his inclination with vertical? $\left(g = 10\,\text{m}\,\text{s}^{-2}\right)$

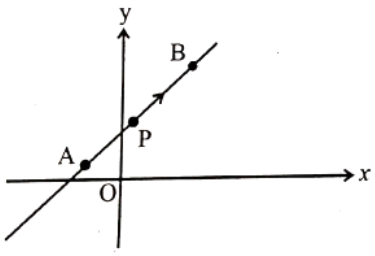
(a) $\tan^{-1}\left(\frac{1}{10}\right)$ (b) $\tan^{-1}\left(\frac{3}{5}\right)$ (c) $\tan^{-1}(1)$ (d) $\tan^{-1}\left(\frac{1}{5}\right)$

179. A block of mass m rests on a rough horizontal surface (coefficient of friction is μ). When a bullet of mass $m/2$ strikes horizontally, and get embedded in it, the block moves a distance d before coming to rest. The initial velocity of the bullet is $k\sqrt{2\mu g d}$, then the value of k is



(a) 2 (b) 3 (c) 4 (d) 5

180. A particle is moving uniformly along a straight line as shown in the figure. During the motion of the particle from A to B, the angular momentum of the particle about 'O'



(a) increases (b) decreases

(c) remains constant (d) first increases then decreases