Deeksha

ABHYAS KCET 2024

FREE TEST SERIES

MOCK TEST 8

PDF

QUESTION PAPER

Deeksha - CET

Subject	Topic	
C + M + P	Complete Syllabus	

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. Deficiency of vitamin E causes

   (a) rickets (b) scurvy (c) muscular weakness (d) beri beri

2. Methyl bromide reacts with AgF to give methyl fluoride and silver bromide. This reaction is called

   (a) Fitting reaction (b) Swarts reaction (c) Wurtz reaction (d) Finkelstein reaction

3. The first ionisation of carbon, nitrogen and oxygen respectively are (in eV)

   (a) 11.3,13.6,14.5 (b) 13.6,11.3,14.5 (c) 14.5,13.6,11.3 (d) 11.3,14.5,13.6

4. The correct order of increasing bond angles in the following triatomic species is

   (a) $NO_2^+ < NO_2 < NO_2^-$ (b) $NO_2^+ < NO_2^- < NO_2$ (c) $NO_2^- < NO_2^+ < NO_2$ (d) $NO_2^- < NO_2 < NO_2^+$

5. Highest oxidation state of manganese in fluoride is $+4(MnF_4)$ but highest oxidation state in oxides is $+7(Mn_2O_7)$ because

   (a) fluorine is more electronegative than oxygen

   (b) fluorine does not possess $d-$ orbitals

   (c) fluorine stabilises lower oxidation state

   (d) in covalent compounds, fluorine can form single bond only while oxygen forms double bond

6. $142\,g$ of chlorine represents

   (a) $4\,\text{mol}$ of chlorine atoms (b) $2\,g\,\text{mol}$ of chlorine gas

   (c) $2\,\text{mol}$ of Cl atoms (d) both (a) and (b)

7. Tertiary butyl alcohol can be prepared by the reaction of

   (a) acetaldehyde and ethyl magnesium iodide

   (b) acetone and methyl magnesium iodide

   (c) formaldehyde and propyl magnesium iodide

   (d) butanone and methyl magnesium iodide

8. The $CFSE$ for octahedral $[CoCl_6]^{4-}$ is $18,000\text{cm}^{-1}$. The $CFSE$ for tetrahedral $[CoCl_4]^{2-}$ will be

   (a) $18,000\text{cm}^{-1}$ (b) $16,000\text{cm}^{-1}$ (c) $8,000\text{cm}^{-1}$ (d) $20,000\text{cm}^{-1}$

9. An element with atomic number 106 has been discovered recently. Which of the following electronic configurations will it possess?

   (a) $[\text{Rn}]\,5f^{14}\,6d^4\,7s^2$ (b) $[\text{Rn}]\,5f^{14}\,6d^5\,7s^1$

   (c) $[\text{Rn}]\,5f^{14}\,6d^6\,7s^0$ (d) $[\text{Rn}]\,5f^{14}\,6d^1\,7s^2\,7p^3$

10. When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is

    (a) first (b) second

    (c) more than zero but less than first (d) zero

11. The rate constant of a first order reaction is $15\times10^{-3}s^{-1}$. How long will $5.0\,g$ of this reactant take to reduce to $3.0\,g$?

(a) 34.07 s (b) 7.57 s (c) 10.10 s (d) 15 s

12. If threshold wavelength (λ_0) for ejection of electron from metal is $330\,nm$, then work function for the photoelectric emission is

(a) $1.2\times10^{-18}\,J$ (b) $1.2\times10^{-20}\,J$ (c) $6\times10^{-19}\,J$ (d) $6\times10^{-12}\,J$

13. What will be the emf of the following concentration cell at $25°C$?

$Ag_{(s)}\,|\,AgNO_3\,(0.01M)\,\|\,AgNO_3\,(0.05M)\,|\,Ag_{(s)}$

(a) 0.828 V (b) 0.0413 V (c) −0.0413 V (d) −0.828 V

14. Which of the following compounds does not react with $NaHSO_3$?

(a) $HCHO$ (b) $C_6H_5COCH_3$ (c) CH_3COCH_3 (d) CH_3CHO

15. A certain current liberates 0.504g of hydrogen in 2hr . How many gram of copper can be liberated by the same current flowing for the same time in $CuSO_4$ solution?

(a) 12.7 (b) 16 (c) 31.8 (d) 63.5

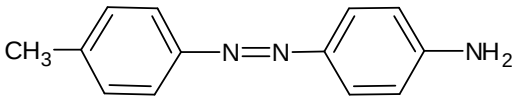
16. Osmotic pressure of a solution containing $2g$ dissolved protein per $300\,cm^3$ of solution in $20\,mm$ of Hg at $27°C$. The molecular mass of protein is

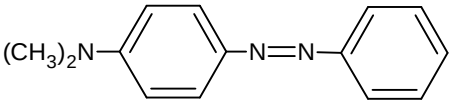
(a) $6239.6\,g\,mol^{-1}$ (b) $12315.5\,g\,mol^{-1}$ (c) $3692.1\,g\,mol^{-1}$ (d) $7368.4\,g\,mol^{-1}$

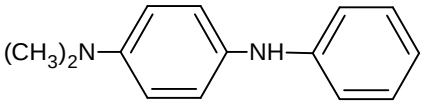
17. Which of the following polymers is stored in the liver of animals?

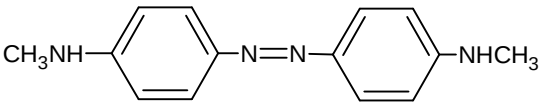
(a) Amylose (b) Cellulose (c) Amylopectin (d) Glycogen

18. Aniline when diazotised in cold and then treated with N,N – dimethylaniline gives a coloured product. The structure of this product is

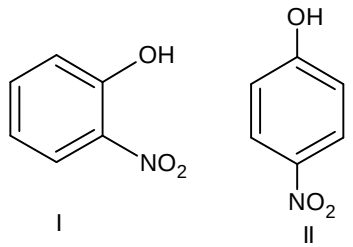
(a) 

(b) 

(c) 

(d) 

19. Consider the compounds:



I II

The vapour pressure of compound I at a given temperature would be expected to be:

(a) lower than that of II

(b) higher than that of II

(c) same as that of II

(d) higher or lower than that of II depending upon the nature of material of the flask in which their vapour pressures are measured

20. The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes, $\left[Co(NH_3)_6\right]^{+}$, $\left[Co(CN)_6\right]^{3-}$, $\left[Co(H_2O)_6\right]^{3+}$?

(a) $\left[Co(CN)_6\right]^{3-} > \left[Co(NH_3)_6\right]^{+} > \left[Co(H_2O)_6\right]^{3+}$

(b) $\left[Co(NH_3)_6\right]^{+} > \left[Co(H_2O)_6\right]^{3+} > \left[Co(CN)_6\right]^{3-}$

(c) $\left[Co(H_2O)_6\right]^{3+} > \left[Co(NH_3)_6\right]^{+} > \left[Co(CN)_6\right]^{3-}$

(d) $\left[Co(NH_3)_6\right]^{+} > \left[Co(CN)_6\right]^{3-} > \left[Co(H_2O)_6\right]^{3+}$

21. When $100\,g$ of water is electrolysed at constant pressure of 1 atmosphere and temperature of $25°C$, the work of expansion is (Given $2H_2O_{(l)} \longrightarrow 2H_{2(g)} + O_{2(g)}$)

(a) $-203.8\,kJ$ (b) $-20.6\,kJ$ (c) $-23.6\,kJ$ (d) $-101.9\,kJ$

22. A gaseous carbon compound is soluble in dilute HCl. The solution on treating with $NaNO_2$ / HCl gives nitrogen leaving behind a solution which gives smell of wood spirit. The carbon compound is

(a) $C_2H_5NH_2$ (b) CH_3NH_2 (c) HCHO (d) CO

23. For the reaction $A+B\rightarrow$products, what will be the order of reaction with respect to A and B?

Exp.	$[A]\left(\text{mol L}^{-1}\right)$	$[B]\left(\text{mol}^{-1}\ \text{L}^{-1}\right)$	Initial rate $\left(\text{mol L}^{-1}\text{s}^{-1}\right)$
1.	2.5×10^{-4}	3×10^{-5}	5×10^{-4}
2.	5×10^{-4}	6×10^{-5}	4×10^{-3}
3.	1×10^{-3}	6×10^{-5}	1.6×10^{-2}

(a) 1 with respect to A and 2 with respect to B (b) 2 with respect to A and 1 with respect to B

(c) 1 with respect to A and 1 with respect to B (d) 2 with respect to A and 2 with respect to B

24. Which compounds will not reduce Fehling's solution?

(a) Methanal (b) Ethanal (c) Trichloroethanal (d) Benzaldehyde

25. The equilibrium constant K_p for the reaction: $PCl_5 \rightleftharpoons PCl_3+Cl_2$ is 1.6 at $200°C$. The pressure at which PCl_5 will be 50% dissociated at $200°C$ is

(a) 3.2 atm (b) 4.8 atm (c) 2.4 atm (d) 6.4 atm

26. The hybridisation state of the central atom and shape of the molecules is given below. Mark the incorrect combination.

(a) SO_3-sp^2 hybridisation, planar triangular (b) SO_2-sp^2 hybridisation, V – shaped

(c) $H_2SO_4-sp^2$ hybridisation, V – shaped (d) O_3-sp^2 hybridisation, angular

27. Actinoids in general show more oxidation states than the lanthanoids. The main reason for this is

(a) higher energy difference between $5f$ and $6d$ orbitals than between $4f$ and $5d$ orbitals

(b) lower energy difference between $5f$ and $6d$ orbitals than between $4f$ and $5d$ orbitals

(c) higher reactivity of actinoids than lanthanoids

(d) actinoids are more basic than lanthanoids

28. Standard enthalpies of formation of O_3, CO_2, NH_3 and HI are 142.2, -393.3, -46.2 and $+25.9\,\text{kJ mol}^{-1}$ respectively. The order of their increasing stabilities will be

(a) O_3, CO_2, NH_3, HI (b) CO_2, NH_3, HI, O_3

(c) O_3, HI, NH_3, CO_2 (d) NH_3, HI, CO_2, O_3

29. Alkyl halides are immiscible in water though they are polar because

(a) they react with water to give alcohols

(b) they cannot form hydrogen bonds with water

(c) $C-X$ bond cannot be broken easily

(d) they are stable compounds and are not reactive

30. The van't Hoff factor of $0.005\,\text{M}$ aqueous solution of KCl is 1.95. The degree of ionisation of KCl is

(a) 0.95 (b) 0.97 (c) 0.94 (d) 0.96

31. Increasing order of ionic radius among $Al^{3+}, Mg^{2+}, O^{2-}, F^-$ is (lowest first)

(a) $F^-, Mg^{2+}, Al^{3+}, O^{2-}$ (b) $Mg^{2+}, F^-, O^{2-}, Al^{3+}$

(c) $Al^{3+}, Mg^{2+}, F^-, O^{2-}$ (d) $Al^{3+}, Mg^{2+}, O^{2-}, F^-$

32. Which of the following statements is correct?

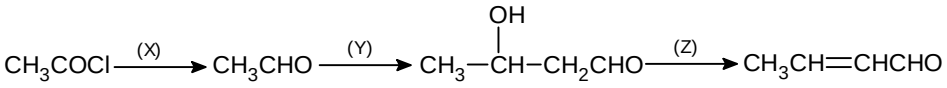
(a) The reaction of methyl magnesium iodide with acetone followed by hydrolysis gives secondary butanol.

(b) Primary alcohols are dehydrated easily than secondary and tertiary alcohols.

(c) Tertiary alcohol is more acidic than primary alcohol.

(d) Tertiary butyl alcohol gives turbidity fastest with Lucas reagent.

33. Fill in the reagents for the given conversion:



(a)	$Pd / BaSO_4$	dil. $NaOH$	heat
(b)	$NaOH$	Hydrolysis	heat
(c)	$I_1 / NaOH$	$LiAlH_4$	H_3O^+
(d)	CrO_3	Warm	CO_2

34. The system that forms maximum boiling azeotrope is

(a) acetone - chloroform (b) ethanol - acetone

(c) $n-$hexane - $n-$heptane (d) carbon disulphide – acetone

35. The decreasing order of boiling points of ethyldimethylamine, $n-$butylamine and diethylamine is $n-$Butylamine > Diethylamine > Ethyldimethylamine. This trend of boiling point can be explained as

(a) boiling point increases with increase in molecular mass

(b) tertiary amines have highest boiling point due to highest basicity

(c) intermolecular hydrogen bonding is maximum in primary amines and absent in tertiary amines

(d) intermolecular hydrogen bonding is present in tertiary amines

36. In the chemical reaction: $K_2Cr_2O_7 + X\ H_2SO_4 + Y\ SO_2 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + Z\ H_2O$: X, Y and Z are

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

37. What will be the value of pH of 0.01mol dm^{-3} CH_3COOH $\left(K_a = 1.74 \times 10^{-5}\right)$?

(a) 3.4 (b) 3.6 (c) 3.9 (d) 3.0

38. How much metal will be deposited when a current of 12 ampere with 75% efficiency is passed through the cell for 3h ? $\left(\text{Given}: Z = 4 \times 10^{-4}\right)$

(a) $32.4\,g$ (b) $38.8\,g$ (c) $36.0\,g$ (d) $22.4\,g$

39. IUPAC name of $m-$cresol is

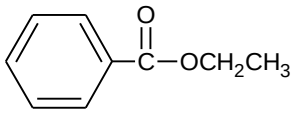
(a) 3−methylphenol (b) 3−chlorophenol (d) 3−methoxyphenol (d) benzene −1,3− diol

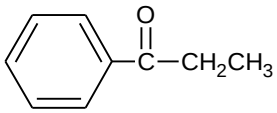
40. The dihedral angle betweenthe two methyl groups in *gauche* conformation of $n-$butane is

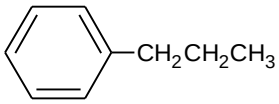
(a) 120° (b) 180° (c) 45° (d) 60°

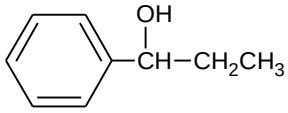
41. The final product (C) obtained in the reaction sequence is:

$$CH_3CH_2COOH \xrightarrow{PCl_3} (A) \xrightarrow[AlCl_3]{C_6H_6} (B) \xrightarrow[\text{base, heat}]{NH_2NH_2} (C)$$

(a) 

(b) 

(c) 

(d) 

42. Which of the following on oxidation with alkaline $KMnO_4$ followed by acidification with dil. HCl does not give benzoic acid

(a) toluene (b) ethylbenzene (c) isopropylbenzene (d) *tert* – butylbenzene

43. Which of the following pairs of ions have the same electronic configuration?

(a) Cu^{2+}, Cr^{2+} (b) Fe^{3+}, Mn^{2+} (c) CO^{3+}, Ni^{3+} (d) Sc^{3+}, Cr^{3+}

44. The correct order of increasing acidic strength is _____

(a) phenol < ethanol < chloroacetic acid < acetic acid

(b) ethanol < phenol < chloroacetic acid < acetic acid

(c) ethanol < phenol < acetic acid < chloroacetic acid

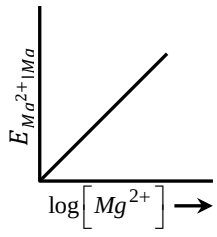
(d) chloroacetic acid < acetic acid < phenol < ethanol

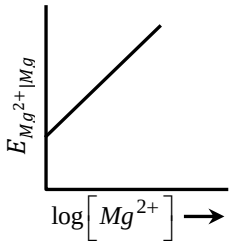
45. The number of coulombs required for the deposition of 107.87g of silver is

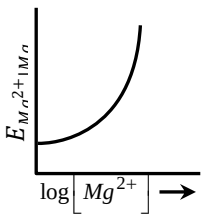
(a) 96500 (b) 48205 (c) 19300 (d) 10000

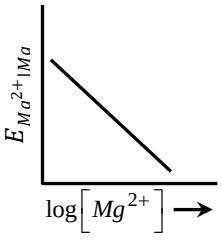
46. Electrode potential for Mg electrode varies according to the equation

$E_{Mg^{2+}|Mg} = E^{\circ}_{Mg^{2+}\backslash Mg} - \frac{0.059}{2}\log\frac{1}{\left[Mg^{2+}\right]}$. The graph of $E_{Mg^{2+}|Mg}$ *vs* $\log\left[Mg^{2+}\right]$ is

(a) 

(b) 

(c) 

(d) 

47. Which of the following statements is incorrect about the collision theory of chemical reaction?
    (a) It considers reacting molecules or atoms to be hard spheres and ignores their structural features.
    (b) Number of effective collisions determines the rate of reaction.
    (c) Collision of atoms or molecules possessing sufficient threshold energy results into the product formation.
    (d) Molecules should collide with sufficient threshold energy and proper orientation for the collision to be effective.

48. e.m.f of cell $Ni\left|Ni^{2+}(0.1M)\right|\left|Au^{3+}(1.0M)\right|Au$ is …, if E° for $Ni^{2+}|\ Ni$ is –0.25V, E° for $Au^{3+}|\ Au$ is 1.50V
    (a) +1.25V (b) –1.75V (c) +1.75V (d) +4.0V

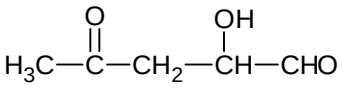
49. If the maximum concentration of $PbCl_2$ in water is 0.01M at $25°C$, its maximum concentration in 0.1M $NaCl$ will be
    (a) 2×10^{-3} M (b) 1×10^{-4} M (c) 1.6×10^{-2} M (d) 4×10^{-4} M

50. An alkaloid contains 17.28% of nitrogen and its molecular mass is 162 . The number of nitrogen atoms present in one molecule of the alkaloid is
    (a) five (b) four (c) three (d) two

51. One mole of acidified $K_2Cr_2O_7$ on reaction with excess KI will liberate …….. mole(s) of I_2
    (a) 6 (b) 1 (c) 7 (d) 2

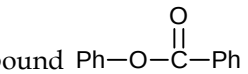
52. H_2O_2 on reacting with ethylene gives
    (a) ethylene glycol (b) ethanal (c) ethane (d) ethanol

53. The IUPAC name of

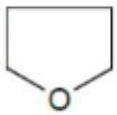


    (a) 5-Oxo-4-hydroxy-2-pentanone (b) 4-Hydroxy-5-al-2-pentanone
    (c) 2-Hydroxy-4-oxopentantal (d) 1-Al-4-oxo-2-pentanol

54. According to MO theory which of the lists ranks the nitrogen species in terms of increasing bond order?
    (a) $N_2^{2-} < N_2^- < N_2$ (b) $N_2 < N_2^{2-} < N_2^-$ (c) $N_2^- < N_2^{2-} < N_2$ (d) $N_2^- < N_2 < N_2^{2-}$

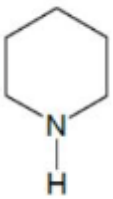
55. Compound  can be prepared by the reaction of _____
    (a) phenol and benzoic acid in the presence of $NaOH$
    (b) phenol and benzoyl chloride in the presence of pyridine
    (c) phenol and benzoyl chloride in the presence of $ZnCl_2$
    (d) phenol and benzaldehyde in the presence of palladium

56. Which of the following is heterocyclic aromatic species?

(a) 

(b) 

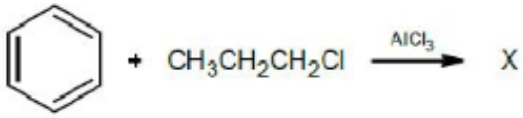
(c) 

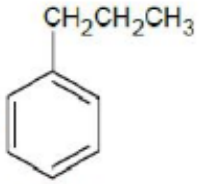
(d) 

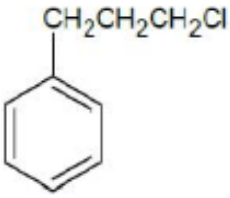
57. Compound with the geometry square pyramidal and sp^3d^2 hybridisation is

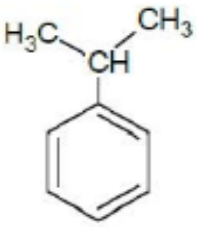
(a) $XeOF_2$ (b) $XeOF_4$ (c) XeO_4 (d) XeO_2F_2

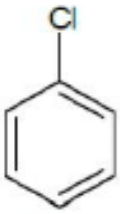
58. The structure of compound X in the following reaction is



(a) 

(b) 

(c) 

(d) 

59. How many $C-$atoms ate there in a pyranose ring?

(a) 3 (b) 5 (c) 6 (d) 7

60. Which of the following products are not correctly matched in the given reactions?

(a) $C_2H_5OCH_3 + HBr \xrightarrow{373K} C_2H_5OH + CH_3Br$

(b) $C_2H_5OC_2H_5 + \underset{\text{Excess}}{2HI} \rightarrow C_2H_5I + C_2H_5OH$

(c) $C_2H_5OC_2H_5 + HCl \xrightarrow{\text{Cold}} \left[(C_2H_5)_2O^+H\right]Cl^-$

(d) $(CH_3)_3COC_2H_5 \xrightarrow{HI} (CH_3)_3Cl + C_2H_5OH$

Mathematics

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

61. $A=\begin{pmatrix}-1 & 0\\ 0 & 2\end{pmatrix}$ then $A^3-A^2=$

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

62. If A and B are square matrices of the same order such that $(A+B)(A-B)=A^2-B^2$ then $(ABA^{-1})^2=$

(a) A^2B^2 (b) A^2 (c) B^2 (d) I

63. The value of x for which the matrix product

$$\begin{pmatrix}2 & 0 & 7\\ 0 & 1 & 0\\ 1 & -2 & 1\end{pmatrix}\begin{pmatrix}-x & 14x & 7x\\ 0 & 1 & 0\\ x & -4x & -2x\end{pmatrix}$$

Equals an identity matrix is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$

64. If x takes negative permissible value, then $\sin^{-1}x$ is equal to

(a) $\pi-\cos^{-1}\sqrt{1-x^2}$ (b) $\cos^{-1}\sqrt{1-x^2}$ (c) $-\cos^{-1}\sqrt{1-x^2}$ (d) $\cos^{-1}\sqrt{x^2-1}$

65. Let T be the set of all triangles in the Euclidean plane and let a relation R on T be defined as $a\,R\,b$, If a is congruent to b, for all $a,b\in T$. Then R is

(a) reflexive but not transitive (b) transitive but not symmetric

(c) equivalence relation (d) symmetric but not reflexive

66. Let $A=\{1,2,3,4\}$ and $B=\{1,2\}$. Then the number of onto functions from A to B is

(a) 14 (b) 16 (c) 12 (d) 8

67. On the set Z of all integers define $f:Z-\{0\}\to Z$ as follows.

$$f(n)=\begin{cases}\frac{n}{2} & n \text{ is even}\\ 0 & n \text{ is odd}\end{cases}$$ then f is

(a) onto but not one-one (b) one-one but not onto

(c) one-one and onto (d) into

68. $\begin{vmatrix}\log e & \log e^2 & \log e^3\\ \log e^2 & \log e^3 & \log e^4\\ \log e^3 & \log e^4 & \log e^5\end{vmatrix}=$

(a) 0 (b) 1 (c) $4\log e$ (d) $5\log e$

69. Let A be a non-singular square matrix of order 3×3. The $|2\,adj\,(3A)|$ is equal to

(a) $9^3|A|^2$ (b) $(18)^3|A|^2$ (c) $10^5|A|$ (d) $16|A|^2$

70. If $f(x)=\begin{cases}\dfrac{\sqrt{1+kx}-\sqrt{1-kx}}{x} & -1\le x<0\\ 2x^2+3x-2 & 0\le x\le 1\end{cases}$ is continuous at $x=0$, then $k=$

(a) – 4 (b) – 3 (c) – 2 (d) – 1

71. If $f:R\to R$ is defined by

$f(x)=\begin{cases}\dfrac{\cos 3x-\cos x}{x^2} & x\neq 0\\ \lambda & x=0\end{cases}$ and if f is continuous at $x=0$ then λ is equal to

(a) – 2 (b) – 4 (c) – 6 (d) – 8

72. If $y=\log\sqrt{\sin x}, \dfrac{dy}{dx}=$

(a) $\dfrac{\cos x}{\sqrt{\sin x}}$ (b) $\dfrac{1}{2}\cot x$ (c) $\dfrac{1}{2}\tan x$ (d) $\sqrt{\sin x\cos x}$

73. If $y=e^{\sin(\log x)}$, then $\dfrac{dy}{dx}=$

(a) $e^{\cos(\log x)}$ (b) $\dfrac{y}{x}\cos(\log x)$ (c) $-\sin(\log x)$ (d) $\dfrac{x}{y}\cos(\log x)$

74. $y=\log\left[\sqrt{x+\sqrt{x^2+a^2}}\right]$, then $\dfrac{dy}{dx}$

(a) $\dfrac{1}{2\sqrt{x^2+a^2}}$ (b) $\dfrac{1}{\sqrt{x^2+a^2}}$ (c) $\dfrac{1}{x+\sqrt{x^2+a^2}}$ (d) $\dfrac{1}{2\left(x+\sqrt{x^2+a^2}\right)}$

75. If $y=(\sin x)^{\tan x}$, then $\dfrac{dy}{dx}=$

(a) $(\sin x)^{\tan x}[1+\sec^2 x.\log\sin x]$ (b) $\tan x\,.\,(\sin x)^{\tan x-1}$

(c) $\tan x\,.\,(\sin x)^{\tan x-1}.\cos x$ (d) $(\sin x)^{\tan x}.\log(\sin x).\sec^2 x$

76. The maximum area of a rectangle that can be inscribed in a circle of radius 2 units is (in square units) is

(a) 8π (b) 4 (c) 5 (d) 8

77. The interval on which function $f(x)=2x^3+9x^2+12x-1$ is decreasing is

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

78. $\int\dfrac{x^3+x^2+1}{x+1}dx$

(a) $\dfrac{x^2}{2}+\log|x+1|+c$ (b) $\dfrac{x^3}{2}+\log|x+1|+c$ (c) $\dfrac{x^2}{4}+\dfrac{x^3}{3}+|\log x|+c$ (d) $\dfrac{x^3}{3}+\log|x+1|+c$

79. $\int\dfrac{x^2+1}{x^4+1}dx=$

(a) $\dfrac{1}{\sqrt{2}}\tan^{-1}\left(x^2+1\right)$ (b) $\dfrac{1}{\sqrt{2}}\tan^{-1}\left(\dfrac{x^2+1}{\sqrt{2}x}\right)$ (c) $\dfrac{1}{\sqrt{2}}\tan^{-1}\left(x^2-1\right)$ (d) $\dfrac{1}{\sqrt{2}}\tan^{-1}\left(\dfrac{x^2-1}{\sqrt{2}x}\right)$

80. $\int \frac{dx}{x^2+2x+2} = f(x)+c \Rightarrow f(x)$

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

81. $\int\left(e^{a\log x}+e^{x\log a}\right)dx =$

(a) $\frac{x^{a+1}}{a+1}+c$ (b) $x^{a+1}+a^x+c$ (c) $\frac{x^{a+1}}{a+1}+\frac{a^x}{\log a}+c$ (d) $\frac{x^{a+1}}{a-1}-\frac{\log a}{a^x}$

82. $\int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx =$

(a) $\frac{\pi^2}{8}$ (b) $\frac{\pi^2}{4}$ (c) $\frac{\pi^3}{8}$ (d) $\frac{\pi^4}{8}$

83. $\int_2^3 \frac{dx}{x^2-x} =$

(a) $\log\frac{2}{3}$ (b) $\log\frac{4}{3}$ (c) $\log\frac{8}{3}$ (d) $\log\frac{1}{4}$

84. $\int_{-1}^{1}\left(ax^3+bx\right)dx = 0$ for

(a) any value of a and b (b) $a>0$ and $b>0$ only

(c) $a>0$ and $b<0$ only (d) $a<0$ and $b<0$ only

85. $\int_0^1 \sin\left(2\tan^{-1}\sqrt{\frac{1+x}{1-x}}\right)dx =$

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

86. The area bounded by $y = 4x-x^2$ and x-axis is

(a) $\frac{16}{5}$ (b) $\frac{32}{3}$ (c) $\frac{64}{3}$ (d) $\frac{32}{5}$

87. If m and n are order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^5+\frac{\left(\frac{d^2y}{dx^2}\right)^3}{\left(\frac{d^3y}{dx^3}\right)}+\frac{d^3y}{dx^3} = x^2-1 \text{ then}$$

(a) $m=3, n=1$ (b) $m=3, n=3$ (c) $m=3, n=2$ (d) $m=3, n=5$

88. Solution of differential equation $(\sin x+\cos x)dy+(\cos x-\sin x)dx = 0$ is

(a) $e^x(\sin x+\cos x)+c=0$ (b) $e^y(\sin x+\cos x)=c$

(c) $e^y(\cos x-\sin x)=c$ (d) $e^x(\sin x-\cos x+x)=c$

89. If $P(A\cup B)=0.8, P(A\cap B)=0.3,$ the $P(\bar{A})+P(\bar{B}) =$

(a) 0.3 (b) 0.5 (c) 0.7 (d) 0.9

90. The probability that in a random arrangement of the letters of the word UNIVERSITY. The two I's do not come together is

(a) $\frac{4}{5}$ (b) $\frac{1}{5}$ (c) $\frac{1}{10}$ (d) $\frac{9}{10}$

91. If a dice is thrown twice, the probability occurrence of 4 at least once is

(a) $\frac{11}{36}$ (b) 35 (c) $\frac{7}{12}$ (d) $\frac{7}{36}$

92. The probability that in a year of the 22nd century chosen at random there will be 53 Sunday is

(a) $\frac{3}{28}$ (b) $\frac{2}{28}$ (c) $\frac{7}{28}$ (d) $\frac{5}{28}$

93. Objective function of L.P.P is

(a) a function to be optimized (b) a constant function

(c) a relation between the variables (d) a function to be minimised

94. The feasible solution for a LPP is shown in the following figure. Let $Z = 3x - 4y$ be the objective function.

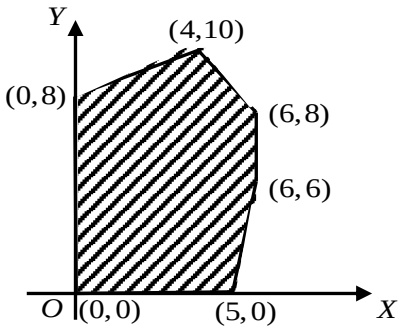
(Maximum value of Z + Minimum value of Z is

(a) 13

(b) 1

(c) – 13

(d) – 17



95. If $OACB$ is a parallelogram with $\vec{OC} = \vec{a}$ and $\vec{AB} = \vec{b}$ then $\vec{OA} =$

(a) $\vec{a} + \vec{b}$ (b) $\vec{a} - \vec{b}$ (c) $\frac{1}{2}(\vec{b} - \vec{a})$ (d) $\frac{1}{2}(\vec{a} - \vec{b})$

96. If $\vec{u} = \vec{a} - \vec{b}, \vec{v} = \vec{a} + \vec{b}$ and $|\vec{a}| = |\vec{b}| = 2$, then $|\vec{u} \times \vec{v}| =$

(a) $2\sqrt{16 - (\vec{a}.\vec{b})^2}$ (b) $2\sqrt{4 - (\vec{a}.\vec{b})^2}$ (c) $\sqrt{16 - (\vec{a}.\vec{b})^2}$ (d) $\sqrt{4 - (\vec{a}.\vec{b})^2}$

97. The area of the parallelogram with $\vec{a}$ and $\vec{b}$ as adjacent sides is 20 sq. units. Then the area of the parallelogram having $7\vec{a} + 5\vec{b}$ and $8\vec{a} + 11\vec{b}$ as adjacent sides is

(a) 2960 sq. units (b) 740 sq. units (c) 1340 sq. units (d) 3400 sq. units

98. If a line makes an angle α, β, γ with the positive direction of coordinate axes then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma$ is

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

99. The vector equation of the line passing through the points $(3,2,1)$ and parallel to the line $\frac{x-5}{-5} = \frac{y+2}{-1} = \frac{z-1}{2}$ is

(a) $\vec{r} = 3\hat{i} + 2\hat{j} + \hat{k} + \lambda(-5\hat{i} - \hat{j} + 2\hat{k})$ (b) $\vec{r} = 3\hat{i} + 2\hat{j} - \hat{k} + \lambda(-5\hat{i} - \hat{j} + \hat{k})$

(c) $\vec{r} = -2\hat{i} + \hat{j} + 3\hat{k} + \lambda(5\hat{i} + \hat{j} + 2\hat{k})$ (d) $\vec{r} = -2\hat{i} + \hat{j} + \hat{k} + \lambda(5\hat{i} + \hat{j} + 2\hat{k})$

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

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

101.If the events A and B are mutually exclusive, then $P\left(\frac{A}{B}\right)=$

(a) 0 (b) 1 (c) $\frac{P(A\cap B)}{P(A)}$ (d) $\frac{P(A\cup B)}{P(A)}$

102.If A and B are two independent events, then $P\left(\frac{A}{B}\right)=$

(a) 0 (b) 1 (c) $P(A)$ (d) $P(B)$

103.The solution of the differential equation $\frac{dy}{dx}+\frac{2x}{1+x^2}y=\frac{1}{\left(1+x^2\right)}$, is

(a) $y\left(1-x^2\right)=\tan^{-1}x+c$ (b) $y\left(1+x^2\right)=\tan^{-1}x+c$

(c) $y\left(1+x^2\right)=2\tan^{-1}x+c$ (d) $y\left(1-x^2\right)^2=\tan^{-1}x+c$

104. $\int_0^{1000} e^{x-[x]}dx$ is

(a) e^{1000-1} (b) $\frac{e^{1000-1}}{e-1}$ (c) $1000(e-1)$ (d) $\frac{e-1}{1000}$

105.The function $\sin x-\cos x$ is increasing in the interval

(a) $\left[\frac{3\pi}{4},\frac{7\pi}{4}\right]$ (b) $\left[0,\frac{3\pi}{4}\right]$ (c) $\left[\frac{\pi}{4},\frac{3\pi}{4}\right]$ (d) None of these

106.The domain $y=\frac{1}{\sqrt{|x|-x}}$ is

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

107.If $2+i\sqrt{3}$ is a root of the equation $x^2+px+q=0$, where p,q are real, then $(p,q)=$

(a) $(4,-7)$ (b) $(4,7)$ (c) $(-4,7)$ (d) $(-4,-7)$

108.Solution set of $|x-4|<5, |2x+5|>7$ is

(a) $(-1,9)$ (b) $(-1,9)\cap(-\infty,-6)$ (c) $(1,9)$ (d) $(-\infty,-6)\cup(1,\infty)$

109. $\lim_{x\to 0}\frac{\sin x^0}{x}=$

(a) 1 (b) $\pi/180$ (c) Does not exist (d) None of these

110. $\lim_{n\to\infty}\left[\frac{1^3+2^3+3^3+.....+n^3}{n^4}\right]=$

(a) 1/2 (b) 1/3 (c) 1/4 (d) None of these

111. The S.D of 15 items is 6 and if each item is decreased or increased by 1, then standard deviation will be

(a) 5 (b) 7 (c) $91/15$ (d) 6

112. The inclination of the line $x-y+3=0$ with the positive direction of $x-axis$ is

(a) 45° (b) 135° (c) –45° (d) 135°

113. The equation of the line passing through $(1,2)$ and perpendicular to $x+y+7=0$ is

(a) $y-x+1=0$ (b) $y-x-1=0$ (c) $y-x+2=0$ (d) $y-x-2=0$

114. The major axis of an ellipse is three times the minor axis. Then the eccentricity is

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

115. Focus of the parabola $y^2-8x-32=0$ is at

(a) $(0,2)$ (b) $(4,0)$ (c) $(2,0)$ (d) $(-2,0)$

116. If $\left(\frac{1+i}{1-i}\right)^m=1$ then $m=$

(a) 4 (b) 5 (c) 6 (d) 7

117. The total number of terms in the expansion of $(x+a)^{100}+(x-a)^{100}$ after simplification is

(a) 50 (b) 202 (c) 51 (d) None of these

118. The first two terms of a geometric progression add upto 12. The sum of the third and the fourth terms is 48. If the terms of the geometric progression are alternatively positive and negative, then the first term is

(a) 12 (b) 4 (c) –4 (d) –12

119. Every body in a room shakes hands with every body else. The total number of hand shakes is 66. The total number of persons in the room is

(a) 11 (b) 12 (c) 13 (d) 14

120. If $\vec{a}\cdot\hat{i}=\vec{a}\cdot\left(\hat{i}+\hat{j}\right)=\vec{a}\cdot\left(\hat{i}+\hat{j}+\hat{k}\right)$, then $\vec{a}=$

(a) $\hat{i}$ (b) $\hat{k}$ (c) $\hat{j}$ (d) $\hat{i}+\hat{j}+\hat{k}$

Physics

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

121. Illuminance of surface is measured in

(a) Lumen (b) Candela (c) lux (d) lux m^{-2}

122. Speedometer of a car measures

(a) average speed (b) average velocity

(c) instantaneous speed (d) instantaneous velocity

123. Water is used as a coolant because

(a) it has lower density (b) it has low specific heat

(c) it has high specific heat (d) it is easily available

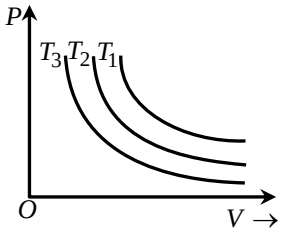
124. Which of the following systems of units is not based on units of mass, length and time alone?

(a) *SI* (b) *MKS* (c) *CGS* (d) *FPS*

125. A vessel has $6g$ of oxygen at pressure P and temperature $400\,\text{K}$. A small hole is made in it so that oxygen leaks out. How much oxygen leaks out if the final pressure is $\frac{P}{2}$ and temperature $300\,\text{K}$?

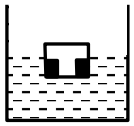
(a) 5g (b) 4g (c) 2g (d) 3g

126. The isothermal diagram of a gas at three different temperatures T_1, T_2 and T_3, is show in the given figure. Then



(a) $T_1 < T_2 < T_3$ (b) $T_1 < T_2 > T_3$ (c) $T_1 > T_2 > T_3$ (d) $T_1 > T_2 < T_3$

127. An ice block having two similar metallic pieces is floating in water in a vessel as shown in figure. After sometime the ice melts completely then



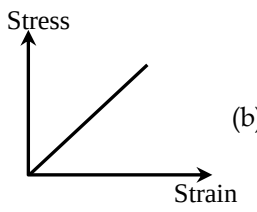
(a) the water level rises in the vessel

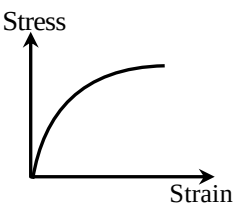
(b) the water level falls in the vessel

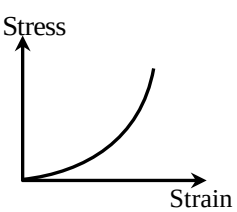
(c) the water level does not change in vessel

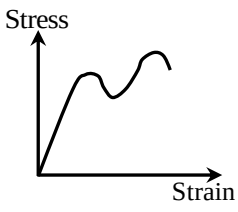
(d) the water level may rise or fall depending upon the ratio of masses of ice and metallic pieces

128. Which of the following graphs represents stress-strain variation for elastomers?

(a) 

(b) 

(c) 

(d) 

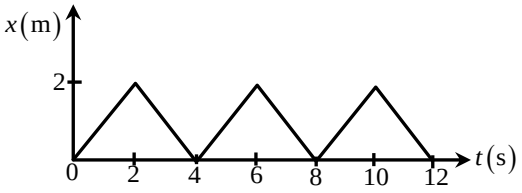
129. The centre of mass of a body

(a) lies always at the geometrical centre
(b) lies always inside the body
(c) lies always outside the body
(d) may lie within or outside the body

130. When a disc rotates with uniform angular velocity, which of the following is not true?

(a) The sense of rotation remains same.
(b) The orientation of the axis of rotation remains same.
(c) The speed of rotation is non-zero and remains same.
(d) The angular acceleration is non-zero and remains same.

131. Figure shows the position-time $(x-t)$ graph of one dimensional motion of a body mass $500\,\text{g}$. What is the time interval between two consecutive impulses received by the body?



(a) $2\,\text{s}$
(b) $4\,\text{s}$
(c) $6\,\text{s}$
(d) $8\,\text{s}$

132. The coefficient of static friction between the box and the train's floor is 0.2. The maximum acceleration of the train in which a box lying on its floor will remain stationary is (Take $g = 10\,\text{ms}^{-2}$)

(a) $2\,\text{ms}^{-2}$
(b) $4\,\text{ms}^{-2}$
(c) $6\,\text{ms}^{-2}$
(d) $8\,\text{ms}^{-2}$

133. A person of mass $50\,\text{kg}$ stands on a weighing scale on a lift. If the lift is ascending upwards with a uniform acceleration of $9\,\text{ms}^{-2}$, what would be the reading of the weighing scale? (Take $g = 10\,\text{ms}^{-2}$)

(a) $50\,\text{kg}$
(b) $60\,\text{kg}$
(c) $95\,\text{kg}$
(d) $100\,\text{kg}$

134. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The operating frequency of the scanner is $3.2\,\text{MHz}$. The speed of sound in a tissue is $1.6\,\text{kms}^{-1}$. The wavelength of sound in the tissue is

(a) $0.25\,\text{mm}$
(b) $0.5\,\text{mm}$
(c) $0.75\,\text{mm}$
(d) $1\,\text{mm}$

135. The time period of an artificial satellite in a circular orbit of radius R is 2 days and its orbital velocity is v_0. If time period of another satellite in a circular orbit is 16 days then

(a) its radius of orbit is $4R$ and orbital velocity is v_0.
(b) its radius of orbit is $4R$ and orbital velocity is $\frac{v_0}{2}$.
(c) its radius of orbit is $2R$ and orbital velocity is v_0.
(d) its radius of orbit is $2R$ and orbital velocity is $\frac{v_0}{2}$.

136. Which of the following statements is correct regarding the universal gravitational constant G?

(a) G has same value in all systems of units.
(b) The value of G is same everywhere in the universe.
(c) the value of G was first experimentally determined by Johannes Kepler
(d) G is a vector quantity.

137. The number of ways one can arrange three identical capacitors to obtain distinct effective capacitance is

(a) 8 (b) 6 (c) 4 (d) 3

138. The number of electrons present in -1C of charge is

(a) 6×10^{18} (b) 1.6×10^{19} (c) 6×10^{19} (d) 1.6×10^{18}

139. A particle of mass 10^{-3}kg and charge $5\mu\text{C}$ is thrown at a speed of $20\,\text{ms}^{-1}$ against a uniform electric field of strength $2\times10^{5}\,\text{NC}^{-1}$. The distance travel by particle before coming to rest is

(a) 0.1m (b) 0.2m (c) 0.3m (d) 0.4m

140. A circular plane sheet of radius 10cm is placed in a uniform electric field of $5\times10^{5}\,\text{NC}^{-1}$, making an angle of $60°$ with the field. The electric flux through the sheet is

(a) $1.36\times10^{2}\,\text{N m}^2\,\text{C}^{-1}$ (b) $1.36\times10^{4}\,\text{N m}^2\,\text{C}^{-1}$ (c) $0.515\times10^{2}\,\text{N m}^2\,\text{C}^{-1}$ (d) $0.151\times10^{4}\,\text{N m}^2\,\text{C}^{-1}$

141. A parallel plate capacitor is charged and then isolated. The effect of increasing the plate separation on charge, potential, capacitance respectively are

(a) constant, decreases, decreases
(b) increases, decreases, decreases
(c) constant, decreases, increases
(d) constant, increases, decreases

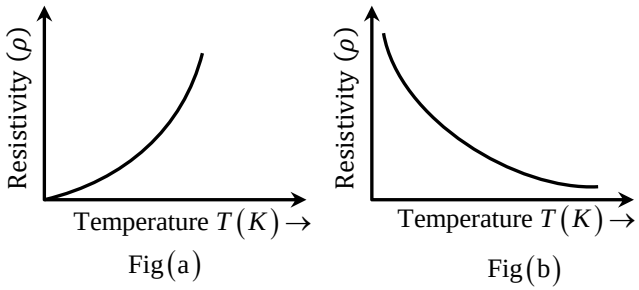
142. A parallel plate capacitor has a uniform electric field E in the space between the plates. If the distance between the plates is d and area of each plate is A, the energy stored in the capacitor is

(a) $\frac{1}{2}\varepsilon_0 E^2$ (b) $\frac{E^2Ad}{\varepsilon_0}$ (c) $\frac{1}{2}\varepsilon_0 E^2 Ad$ (d) $\varepsilon_0 E^2 Ad$

143. The electrical resistance of a conductor depends upon

(a) size of conductor
(b) temperature of conductor
(c) geometry of conductor
(d) all of these

144. Figure (a) and figure (b) both are showing the variation of resistivity (ρ) with temperature (T) for some materials. Identify the type of these materials.

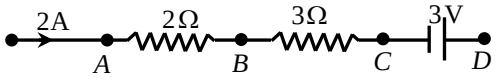


(a) Conductor and semiconductor
(b) Conductor and Insulator
(c) Insulator and semiconductor
(d) Both are conductors

145. If N, e, τ and m are representing electron density, charge, relaxation time and mass of an electron respectively, then the resistance of wire of length ℓ and cross-sectional area A is given by

(a) $\frac{m\ell}{Ne^2A^2\tau}$ (b) $\frac{2m\tau A}{Ne^2\ell}$ (c) $\frac{Ne^2\tau A}{2m\ell}$ (d) $\frac{Ne^2A}{2m\tau\ell}$

146. In the given circuit the potential at point B is zero, the potential at points A and D will be



(a) $V_A = 4$ V; $V_D = 9$V (b) $V_A = 3$ V; $V_D = 4$V (c) $V_A = 9$ V; $V_D = 3$V (d) $V_A = 4$ V; $V_D = 3$V

147. To minimise the power loss in the transmission cables connecting the power stations to homes and factories, the transmission cables carry current

(a) At a very low voltage.

(b) At a very high voltage

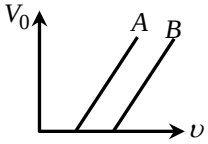
(c) At 220 volt

(d) Neither at a very high voltage nor at a very low voltage.

148. When a piece of aluminium wire of finite length is drawn through a series of dies to reduce its diameter to half its original value, its resistance will become

(a) Two times (b) Four times (c) Eight times (d) Sixteen times

149. The figure shows stopping potential V_0 and frequency υ for two different metallic surfaces A and B. The work function of A, as compared to that of B is



(a) less

(b) more

(c) equal

(d) nothing can be said

150. Light of wavelength 0.6 mm from a sodium lamp falls on a photocell and causes the emission of photoelectrons for which the stopping potential is 0.5 V. With light of wavelength 0.4 mm from a sodium lamp, the stopping potential is 1.5 V. With this data, the value of h/e is

(a) 4×10^{-19} V s (b) 0.25×10^{15} V s (c) 4×10^{-15} V s (d) 4×10^{-8} V s

151. When the velocity of an electron increases, its de Broglie wavelength

(a) increases (d) decreases

(c) remains same (d) may increase or decrease

152. Magnetic lines of force due to a bar magnet do not intersect because.

(a) a point always has a single net magnetic field

(b) the lines have similar charges and so repel each other

(c) the lines always diverge from a single force

(d) the lines need magnetic lenses to be made to intersect

153. In an experiment it is found that the magnetic susceptibility of given substance is much more greater than one. The possible substance is

(a) diamagnetic (b) paramagnetic (c) ferromagnetic (d) nonmagnetic

154. The magnetic field $d\vec{B}$ due to a small current element $d\vec{\ell}$ at a distance $\vec{r}$ and element carrying current i is,

(a) $d\vec{B}=\frac{\mu_0}{4\pi}i\left(\frac{d\vec{\ell}\times\vec{r}}{r}\right)$ (b) $d\vec{B}=\frac{\mu_0}{4\pi}i^2\left(\frac{d\vec{\ell}\times\vec{r}}{r}\right)$ (c) $d\vec{B}=\frac{\mu_0}{4\pi}i^2\left(\frac{d\vec{\ell}\times\vec{r}}{r^2}\right)$ (d) $d\vec{B}=\frac{\mu_0}{4\pi}i\left(\frac{d\vec{\ell}\times\vec{r}}{r^3}\right)$

155. If the current sensitivity of a galvanometer is doubled, then its voltage sensitivity will be

(a) doubled (b) halved (c) unchanged (d) four times

156. A long straight wire carries a current of $75\,\text{A}$, then the magnitude of the field B at a point $3\,\text{cm}$ away from the wire is

(a) $4\times10^{-6}\,\text{T}$, vertical up (b) $5\times10^{-6}\,\text{T}$, vertical down

(c) $5\times10^{-6}\,\text{T}$, vertical up (d) $4\times10^{-6}\,\text{T}$, vertical down

157. An electron is moving in a circle at a speed of $3.2\times10^{7}\,\text{ms}^{-1}$ in a magnetic field of $5\times10^{-4}\,\text{T}$ perpendicular to it. What is the frequency of this electron? $\left(q=1.6\times10^{-19}\,\text{C}, m_e=9.1\times10^{-31}\,\text{kg}\right)$

(a) $1.4\times10^{5}\,\text{Hz}$ (b) $1.4\times10^{7}\,\text{Hz}$ (c) $1.4\times10^{6}\,\text{Hz}$ (d) $1.4\times10^{9}\,\text{Hz}$

158. The Rutherford $\alpha-$particle experiment shows that most of the $\alpha-$particles pass through almost unscattered while some are scattered through large angles. What information does it give about the structure of the atom?

(a) Atom is hollow

(b) The whole mass of the atom is concentrated is a small centre called nucleus

(c) Nucleus is positively charged

(d) All of the above

159. The de-Broglie wavelength of an electron in the first Bohr orbit is

(a) equal to one-fourth the circumference of the first orbit

(b) equal to half the circumference of first orbit

(c) equal to twice the circumference of first orbit

(d) equal to the circumference of the first orbit.

160. The binding energy per nucleon of deuterium and helium nuclei are $1.1\,\text{MeV}$ and $7.0\,\text{MeV}$ respectively. When two deuterium nuclei fuse to form a helium nucleus the energy released in the fusion is

(a) $23.6\,\text{MeV}$ (b) $2.2\,\text{MeV}$ (c) $28.0\,\text{MeV}$ (d) $30.2\,\text{MeV}$

161. When the number of nucleons in nuclei increases, the binding energy per nucleon

(a) Increases continuously with mass number

(b) Decreases continuously with mass number

(c) Remains constant with mass number

(d) First increases and then decreases with increases of mass number

162. An electromagnet has stored $648\,\text{J}$ of magnetic energy when a current of $9\,\text{A}$ exists in its coils. What average emf is induced if the current is reduced to zero in $0.45\,\text{s}$?

(a) $320\,\text{V}$ (b) $620\,\text{V}$ (c) $260\,\text{V}$ (d) $230\,\text{V}$

163. When a wire loop is rotated in a magnetic field, the direction of induced emf changes in every

(a) one revolution (b) $\frac{1}{2}$ revolution

(c) $\frac{1}{4}$ revolution (d) 2 revolution

164. A circular copper disc $10\,\text{cm}$ in diameter rotates at 1800 revolution per minute about an axis through its centre and a right angles to disc. A uniform field of induction B of $1\,\text{Wb}\,\text{m}^{-2}$ is perpendicular to disc. What potential difference is developed between the axis of the disc and the rim?

(a) $0.023\,\text{V}$ (b) $0.23\,\text{V}$ (c) $23\,\text{V}$ (d) $230\,\text{V}$

165. The relation between an ac voltage source and time in SI units is $V = 120\sin(100\pi t)\cos(100\pi t)\,\text{V}$. The value of peak voltage and frequency will be respectively

(a) $120\,\text{V}$ and $100\,\text{Hz}$ (b) $\frac{120}{\sqrt{2}}\,\text{V}$ and $100\,\text{Hz}$ (c) $60\,\text{V}$ and $200\,\text{Hz}$ (d) $60\,\text{V}$ and $100\,\text{Hz}$

166. Phase difference between voltage and current in a capacitor in an ac circuit is

(a) π (b) $\pi/2$ (c) 0 (d) $\pi/3$

167. At resonance frequency the impedance in series LCR circuit is

(a) maximum (b) minimum (c) zero (d) infinity

168. In a transformer the transformation ratio is 0.3. If 220V ac is fed to the primary, then the voltage across the secondary is

(a) $44\,\text{V}$ (b) $55\,\text{V}$ (c) $60\,\text{V}$ (d) $66\,\text{V}$

169. In the half wave rectifier circuit operating form $50\,\text{Hz}$ mains frequency, the fundamental frequency in the ripple would be

(a) 25 Hz (b) 50 Hz (c) 70.7 Hz (d) 100 Hz

170. Which of the following statements is incorrect for the depletion region of a diode?

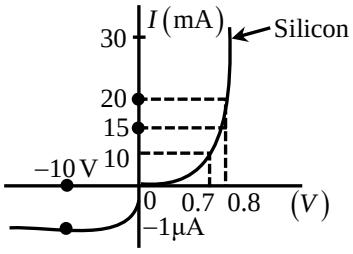
(a) There the mobile charges exist.

(b) Equal number of holes and electrons exist, making the region neutral.

(c) Recombination of holes and electrons has taken place.

(d) In depletion region electric field exist.

171. The $V-I$ characteristic of a silicon diode is shown in figure. The resistance of the diode at $I_D = 15\,\text{mA}$ is



(a) 5Ω (b) 10Ω (c) 2Ω (d) 20Ω

172. On doping germanium with donor atoms of density $10^{17}\,cm^{-3}$ its conductivity in mho/cm will be

[Given: $\mu_e = 3800\ cm^2/V\text{-}s$ and $n_i = 2.5\times10^{13}cm^{-13}$]

(a) 30.4 (b) 60.8 (c) 91.2 (d) 121.6

173. The ratio of electron and hole current in a semiconductor is $7/4$ and the ratio of drift velocity of electrons and holes is $5/4$, then the ratio of concentrations of electrons and holes will be

(a) $\frac{5}{7}$ (b) $\frac{7}{5}$ (c) $\frac{25}{49}$ (d) $\frac{49}{25}$

174. The image formed by a concave mirror is

(a) Always real (b) Always virtual

(c) Certainly real if the object is virtual (d) Certainly virtual if the object is real

175. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of $45°$. For which of the following value of μ the ray can undergo total internal reflection?

(a) $\mu = 1.3$ (b) $\mu = 1.40$ (c) $\mu = 1.50$ (d) $\mu = 1.25$

176. The angle of minimum deviation for prism of angle $\pi/3$ is $\pi/6$, if the velocity of light in vacuum is $3\times10^8 ms^{-1}$, then the velocity of light in material of the prism is

(a) $2.12\times10^8 ms^{-1}$ (b) $1.12\times10^8 ms^{-1}$ (c) $4.12\times10^8 ms^{-1}$ (d) $5.12\times10^8 ms^{-1}$

177. A plane wave passes through a convex lens. The geometrical shape of the wave front that emerges is

(a) plane (b) diverging spherical

(c) converging spherical (d) none of these

178. In Young's double slit experiment the ratio of intensity of the maxima and minima in the interference experiment is $25:9$. The ratio of widths of two slits is

(a) $18:3$ (b) $4:1$ (c) $8:1$ (d) $16:1$

179. Two nicols are oriented with their principal planes making an angle of 60^o. Then the percentage of incident unpolarised light which passes through the system is

(a) 100 (b) 50 (c) 12.5 (d) 37.5

180. A simple telescope, consisting of an objective of focal length 60 cm and a single eye lens of focal length 5 cm is focussed on a distant object in such a way that parallel rays emerge from the eye lens. If the object subtends an angle of $2°$ at the objective, the angular width of the image is

(a) $10°$ (b) $24°$ (c) $50°$ (d) $(1/6)°$