Deeksha

ABHYAS KCET 2024

FREE TEST SERIES

Mock Test 7

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. Most common oxidation states of Ce (Cerium) are_____.

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

2. Which one of these is not known?

   (a) CuI_2 (b) $CuBr_2$ (c) $CuCl_2$ (d) CuF_2

3. In which of the following coordination compounds, the central metal atom obeys the EAN rule?

   (a) $K_3\left[Fe(CN)_6\right]$ (b) $K_4\left[Fe(CN)_6\right]$ (c) $\left[Cu(NH_3)_4\right]SO_4$ (d) All

4. Which of the following can participate in linkage isomerism?

   (a) NO_2^- (b) $H_2\ddot{N}CH_2CH_2\ddot{N}H_2$ (c) H_2O (d) $:NH_3$

5. The structure of $Fe(CO)_5$ is $(Z = 26 \text{ for } Fe)$

   (a) octahedral (b) tetrahedral (c) square pyramidal (d) trigonal bipyramidal

6. Which of the following descriptions about $\left[FeF_6\right]^{4-}$ is correct about complex ion?

   (a) sp^3d, inner orbital complex, diamagnetic (b) sp^3d^2, outer orbital complex, paramagnetic

   (c) d^2sp^3, inner orbital complex, paramagnetic (d) d^2sp^3, outer orbital complex, diamagnetic

7. Which of the following ligands will not show chelation?

   (a) *EDTA* (b) *DMG*

   (c) Ethane $-1,\ 2-$ diamine (d) SCN^-

8. The magnetic moment of a divalent ion in aqueous solution with atomic number 25 is

   (a) 5.9 *BM* (b) 2.9 *BM* (c) 6.9 *BM* (d) 9.9 *BM*

9. Which of the following element has lowest melting point?

   (a) *Cr* (b) *Fe* (c) *Ni* (d) *Cu*

10. Which of the following Lanthanoids is commonly used?

    (a) Lanthanum (b) Nobelium (c) Thorium (d) Cerium

11. The trend of basicity of lanthanoid hydroxides

    (a) increases across the lanthanoid series

    (b) decrease across the lanthanoid series

    (c) first increases and then decreases

    (d) first decreases and then increases

12. In a mixture of A and B, components show negative deviation when

    (a) A – B interaction is stronger that A – A and B – B interaction

    (b) A – B interaction is weaker that A – A and B – B interaction

    (c) $\Delta V_{mix} > 0, \Delta S_{mix} > 0$

    (d) $\Delta V_{mix} = 0, \Delta S_{mix} > 0$

13. For which of the following electrolyte, $\alpha\Lambda_m^c / \Lambda_m^\infty$ doesn't hold good:

(a) CH_3OH (b) $HClO_4$ (c) $HCOOH$ (d) CH_3COOH

14. The rate of reaction increases with rise in temperature because of

(a) Increase in number of activated molecules (b) Increase in energy of activation

(c) Decrease in energy of activation

(d) Increase in the number of effective collisions.

15. The rate constant for a first order reaction is $2\times10^{-2}\,\text{min}^{-1}$. The $t_{75\%}$ of reaction is

(a) 69.3 (b) 34.65 (c) 17.37 (d) 3.46

16. The unit of rate constant for the reaction $2H_2 + 2NO \rightarrow 2H_2O + N_2$ which has rate $= k[H_2][NO]^2$ is

(a) $\text{mol}\,L^{-1}S^{-1}$ (b) S^{-1} (c) $\text{mol}^{-2}L^2S^{-1}$ (d) $\text{mol}\,L^{-1}$

17. Half-life of a first order reaction is 10 mins. What percentage of the reaction will be completed in 100 min?

(a) 25% (b) 50% (c) 99.9% (d) 75%

18. Limiting molar conductivity of NH_4OH is

(a) $\Lambda_m^\circ(NH_4OH) = \Lambda_m^\circ(NH_4Cl) + \Lambda_m^\circ(NaCl)$

(b) $\Lambda_m^\circ(NH_4OH) = \Lambda_m^\circ(NH_4Cl) + \Lambda_m^\circ(NaOH) - \Lambda_m^\circ(NaCl)$

(c) $\Lambda_m^\circ(NH_4OH) = \Lambda_m^\circ(NaOH) - \Lambda_m^\circ(NaCl)$

(d) $\Lambda_m^\circ(NH_4OH) = \Lambda_m^\circ(NaOH) + \Lambda_m^\circ(NaCl) - \Lambda_m^\circ(NH_4Cl)$

19. The equivalent conductivity of $N/10$ solution of acetic acid at $25°\text{C}$ is $14.3\,\text{Scm}^2\,eq^{-1}$. What will be the degree of dissociation of acetic acid?

$\left(\Lambda_m^\circ(CH_3COOH) = 390.71\,\text{Scm}^2\text{eq}^{-1}\right)$

(a) 3.66% (b) 4.9% (c) 2.12% (d) 0.008%

20. Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend on _____

(a) temperature (b) nature of solute (c) pressure (d) nature of solvent

21. Value of Henry's law constant K_H

(a) increases with increase in temperature

(b) decreases with increase in temperature

(c) remains constant

(d) first increases then decreases

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

Options:

(a) $5630\,\text{g mol}^{-1}$ (b) $6239.6\,\text{g mol}^{-1}$ (c) $7130\,\text{g mol}^{-1}$ (d) $5120\,\text{g mol}^{-1}$

23. A plant cell shrinks when it is kept in a

(a) hypotonic solution (b) hypertonic solution (c) isotonic solution (d) pure water

24. In the given set of reactions $2-\text{Bromopropane} \xrightarrow[\text{alc/heat}]{\text{AgCN}} X \xrightarrow{\text{LiA/H}_4} Y$ the IUPAC name of product 'Y' is

(a) N-Isopropylmethanamine (b) N-Methylpropan-2-amine

(c) N-Methylpropanamine (d) Butan-2-amine

25. Lucas test is associated with

(a) Aldehydes (b) Phenols (c) Carboxylic acid (d) Alcohols

26. Which represents the correct order of relative acidic strengths?

(a) $HCOOH > CH_3COOH > ClCH_2COOH > C_2H_5COOH$

(b) $ClCH_2COOH > HCOOH > CH_3COOH > C_2H_5COOH$

(c) $CH_3COOH > HCOOH > ClCH_2COOH > C_2H_5COOH$

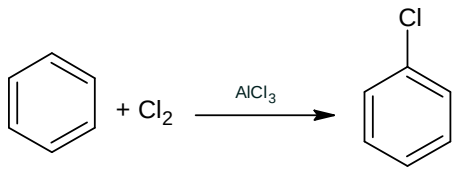
(d) $C_2H_5COOH > CH_3COOH > HCOOH > ClCH_2COOH$

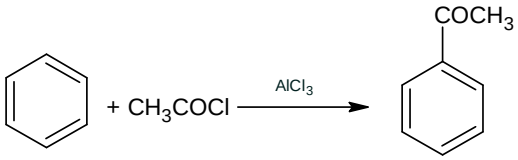
27. Which of the following ions have maximum stability?

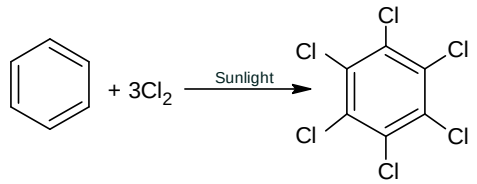
(a) $CH_3-\overset{+}{C}H-CH_3$ (b) $CH_3-\overset{+}{C}H-OCH_3$

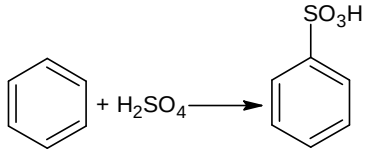
(c) $CH_3-CH_2-\overset{+}{C}H_2$ (d) $CH_3-\overset{+}{C}H-CH_2-OCH_3$

28. Which of the following reactions is not an example of electrophilic substitution in benzene ring?

(a) 

(b) 

(c) 

(d) 

29. The equilibrium constant at $717\,K$ for the reaction $H_2(g)+I_2(g)\rightleftharpoons 2HI(g)$ is 60. The equilibrium constant for the reaction: $2HI(g)\rightleftharpoons H_2(g)+I_2(g)$ is

(a) 1.6×10^{-2} (b) 2×10^{-2} (c) 2.56×10^{-2} (d) 3×10^{-2}

30. 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

31. Which of the following statements is not correct?

(a) the shape of an atomic orbital depends on the magnetic quantum number

(b) the orientation of an atomic orbital depends on the magnetic quantum number

(c) the energy of an electron in an atomic orbital of multi electron atom depends on principal quantum number

(d) the number of degenerate atomic orbitals of one type depends on the values of azimuthal and magnetic quantum numbers

32. Which of the following is incorrect for SF_4 ?

(a) it has sp^3d hybridization (b) it has two lone pairs of electrons

(c) it has four bonding electrons (d) it has see-saw shape

33. For the reaction at $25°C$, $X_2O_4\rightarrow 2XO_2$; $\Delta H = 211\,k\text{cal}$ and $\Delta S = 20\,\text{cal}\,K^{-1}$. The reaction would be

(a) Spontaneous (b) Non-spontaneous (c) At equilibrium (d) unpredictable

34. The reaction in which $\Delta H > \Delta U$ is

(a) $N_2(g)+O_2(g)\rightarrow 2NO(g)$

(b) $N_2(g)+3H_3(g)\rightarrow 2NH_3(g)$

(c) $CaCO_3\rightarrow CaO(s)+CO_2(g)$

(d) $CH_4(g)+2O_2(g)\rightarrow CO_2(g)+2H_2O(l)$

35. The *trans*-alkenes are formed by the reduction of alkynes with

(a) H_2-Pd/C,$BaSO_4$ (b) $NaBH_4$ (c) Na/liq. NH_3 (d) Sn-HCl

36. Which has maximum number of molecules?

(a) $7gN_2$ (b) $2gH_2$ (c) $16g\ NO_2$ (d) $16g\ O_2$

37. The shape of ClF_3 according to *VSEPR* theory is

(a) planar triangle (b) $T-$shape (c) tetrahedral (d) square planar

38. The *pH* of $0.05\,M$ $Ba(OH)_2$ solution is

(a) 12 (b) 13 (c) 1 (d) 10

39. Which of the following elements will have highest second ionization enthalpy?

(a) $1s^2, 2s^2, 2p^6, 3s^2$ (b) $1s^2, 2s^2, 2p^6, 3s^1$

(c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$ (d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^3$

40. Functional group of acid anhydride is

(a) $-\overset{\overset{O}{\|}}{C}-O$ (b) $-\overset{\overset{O}{\|}}{C}-O-\overset{\overset{O}{\|}}{C}-$ (c) $-\overset{\overset{O}{\|}}{C}-Cl$ (d) $-\overset{\overset{O}{\|}}{C}-NH_2$

41. For which of the process, ΔS is negative?

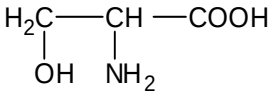
(a) $H_2(g) \rightarrow 2H(g)$ (b) $N_2(g, 1\text{atm}) \rightarrow N_2(g, 8\text{atm})$

(c) $2SO_3(g) \rightarrow 2SO_2(g) + O_2(g)$ (d) $C(\text{diamond}) \rightarrow C(\text{graphite})$

42. Oxidation state of P in $Ba(H_2PO_2)_2$?

(a) +3 (b) +2 (c) +1 (d) −1

43. The IUPAC name of the compound



(a) 2 – amino –3 – hydroxypropanoic acid (b) 1 – hydroxyl –2 – aminoprop –3 – oic acid

(c) 1 – amino –2 – hydroxypropanoic acid (d) 3 – hydroxyl –2 – aminopropanoic acid

44. The incorrect statement regarding glucose

(a) Glucose on reduction with HI/ red P forms n – hexane

(b) Glucose does not react with hydroxylamine (NH_2OH)

(c) Glucose on oxidation with Br_2 / H_2O given Gluconic acid

(d) Glucose on acetylation forms pentaacetyl derivative

45. Each polypeptide in a protein has amino acids linked with each other in a specific sequence. This sequence of amino acids is said to be

(a) primary structure of proteins (b) secondary structure of protein

(c) tertiary structure of protein (d) quaternary structure of protein

46. In DNA, the complimentary bases are

(a) adenine and guanine : thymine and cytosine

(b) uracil and adenine : cytosine and guanine

(c) adenine and thymine : guanine and cytosine

(d) adenine and thymine : guanine and uracil

47. The best reagent for converting 2 – phenylpropanamide into 2 – phenylpropanamine is

(a) excess of H_2 (b) Br_2 in aqueous $NaOH$

(c) iodine in presence of red P (d) $LiAlH_4$ in ether

48. The source of nitrogen in Gabriel synthesis of amine is

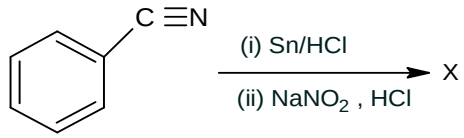
(a) sodium azide NaN_3

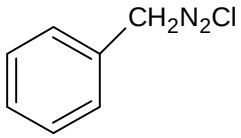
(b) sodium nitride $NaNO_2$

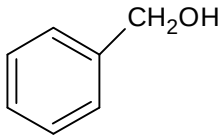
(c) potassium cyanide KCN

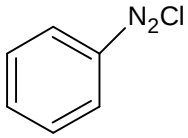
(d) potassium pthalimide $C_6H_4(CO)_2N^-K^+$

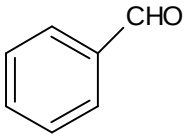
49. In the following reaction X is



(a) 

(b) 

(c) 

(d) 

50. Which of the following reagents are used for detecting the presence of carbonyl group?

(a) NH_2NH_2 (b) NH_2OH (c) NH_4Cl (d) Both (a) and (b)

51. Under Wolf Kishner reduction, the conversions which may be brought about are

(a) Benzophenone to diphenyl methanol

(b) Benzaldehyde into benzyl alcohol

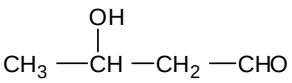
(c) 2 – Hexanone into n – Hexane

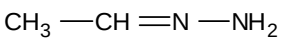
(d) 2 – Hexanone into 2 – Hexanol

52. Which of the following acids has the smallest dissociation constant?

(a) $CH_3CHFCOOH$ (b) FCH_2CH_2COOH (c) $BrCH_2CH_2COOH$ (d) $CH_3CHBrCOOH$

53. Which among the following reactants and products not correctly matched

(a) $2CH_3CHO + NaOH$ 

(b) $CH_3CHO + H_2N - NH_2$ 

(c) $CH_3CHO + HCN$ $CH_3 - CH(OH)CN$

(d) $2CH_3CHO + KOH$ $CH_3COOK + CH_3CH_2OH$

54. Iodoform can be prepared from all except

(a) isopropyl alcohol (b) 3 – methyl –2 – butanone

(c) isobutyl alcohol (d) ethyl methyl Ketone

55. From among the following alcohols the one that would react fastest with conc. HCl and anhydrous $ZnCl_2$ is____.

(a) 2 – Methyl Propanol (b) 1 – Butanol

(c) 2 – Butanol (d) 2 – Methyl propan –2 – ol

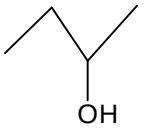
56. Phenol on treatment with alcoholic KOH and chloroform gives

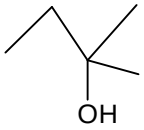
(a) Salicylaldehyde (b) Salicylic acid (c) Phthalic acid (d) benzoic acid

57. Which of the following has maximum pK_a value?

(a) 

(b) 

(c) 

(d) 

58. Which of the following is an example of $S_N 2$ reaction?

(a) $CH_3Br + OH^- \rightarrow CH_3OH + Br$

(b) $(CH)_2 CHBr + OH^- \rightarrow (CH_3)_2 CHOH + Br^-$

(c) $CH_3CH_2OH \xrightarrow{-H_2O} CH_2 = CH_2$

(d) $(CH_3)_3 C - Br + OH^- \rightarrow (CH_3)_3 C - OH + Br^-$

59. In the following reaction

$$C_6H_5CH_2Br \xrightarrow[(ii)\,H_3O^+]{(i)\,\text{Mg. ether}} X$$

The product X is

(a) $C_6H_5CH_2OCH_2C_6H_5$ (b) $C_6H_5CH_2C_6H_5$ (c) $C_6H_5CH_3$ (d) $C_6H_5CH_2CH_2C_6H_5$

60. Which of the following is the correct method of preparation of methyl fluoride?

(a) $CH_4 + HF \rightarrow$ (b) $CH_3OH + HF \rightarrow$ (c) $CH_4 + F_2 \rightarrow$ (d) $CH_3Br + AgF \rightarrow$

Mathematics

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

61. The relation R, defined on real numbers by a R b iff $a - b$ is rational, is

(a) Reflexive but not symmetric

(b) Symmetric but not transitive

(c) Transitive but not reflexive

(d) Reflexive, symmetric and transitive

62. The domain of the function $f(x) \dfrac{1}{\sqrt{[x]^2 - [x] - 6}}$ is

(a) $(-\infty, -2] \cup (4, \infty)$ (b) $(-\infty, -2) \cup (4, \infty)$ (c) $(-\infty, -2] \cup [4, \infty)$ (d) $(-\infty, -2) \cup [4, \infty)$

63. If the moduli of z and $1 + z$ are equal, then

(a) z is a real number

(b) real part of z is $-\dfrac{1}{2}$

(c) real part of z is zero

(d) real part of z is $\dfrac{1}{2}$

64. If $8\sin\theta = 4 + \cos\theta$, then one of the values of $\sin\theta$ is equal to

(a) $\dfrac{5}{11}$ (b) $\dfrac{5}{13}$ (c) $\dfrac{5}{7}$ (d) $\dfrac{5}{9}$

65. $\tan 10° \tan 20° \tan 30° \tan 40° \tan 50° \tan 60° \tan 70° \tan 80° =$

(a) 0 (b) -1 (c) $\dfrac{1}{\sqrt{3}}$ (d) 1

66. If $1+\tan\theta+\tan^2\theta+.....\text{upto}+\infty=\frac{\sqrt{3}}{\sqrt{3}-1}$, then the least +ve value of θ is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{8}$ (d) $\frac{\pi}{12}$

67. If $\sin(45°+A)\sin(45°-A)=k\cos 2A$, then $k=$

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

68. If $\sin x\cos y=\frac{1}{2}$ and $2\tan x=5\tan y$, then $\sin(x+y)=$

(a) $\frac{7}{10}$ (b) $\frac{3}{10}$ (c) $\frac{1}{10}$ (d) $\frac{9}{10}$

69. The value of $\sin\left(2\tan^{-1}\frac{1}{3}\right)+\cos\left(\tan^{-1}\left(2\sqrt{2}\right)\right)=$

(a) $\frac{4}{5}$ (b) $\frac{13}{15}$ (c) $\frac{14}{15}$ (d) 1

70. Two finite sets have m and n elements. The number of subsets of the first set 112 more than that of the second set. The value of m and n are respectively

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

71. If $3\text{cosec}^{-1}\frac{1+x^2}{2x}-4\sec^{-1}\frac{1+x^2}{1-x^2}+2\cot^{-1}\frac{1-x^2}{2x}=\cot^{-1}\frac{\sqrt{3}}{3}$, then $x=$

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

72. If $|3-2x|<1$, then x lies on the interval

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

73. The total number of 3 digit even numbers than can be composed from the digits $1,2,3,.....9$, when the repetition of digits is not allowed is

(a) 224 (b) 280 (c) 324 (d) 405

74. ABC is an equilateral triangle. If A is $(1,2)$ and the equation of the side BC is $3x+4y+14=0$, then the mid-point of the side BC is

(a) $(-2,-1)$ (b) $(2,-5)$ (c) $(-2,-2)$ (d) $(-3,-1)$

75. If C is the centre and L and L' are the ends of the latus rectum of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$, then the area of the triangle CLL' is

(a) 4.8 sq. units (b) 9.6 sq. units (c) 19.6 sq. units (d) None of these

76. If the eccentricity of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is $\frac{5}{4}$ and $2x+3y-6=0$ is a focal chord of the hyperbola, then the length of transverse axis equal to……

(a) $\frac{12}{5}$ (b) $\frac{24}{5}$ (c) $\frac{6}{4}$ (d) $\frac{5}{24}$

77. Find the value of k for which the lines $\frac{x-1}{2}=\frac{2y-1}{3}=\frac{1-3z}{k}$ and $\frac{x+1}{2}=\frac{3y-5}{2}=\frac{z-4}{3}$ are perpendicular to each other

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

78. If the points with position vectors $10\hat{i}+3\hat{j}, 12\hat{i}-5\hat{j}$ and $x\hat{i}+11\hat{j}$ are collinear, then $x=$

(a) -8 (b) 4 (c) 8 (d) -4

79. The diagonal of a parallelogram are along the vectors $3i+6j-2k$ and $-1-2j+8k$. Then the length of shorter side of the parallelogram is

(a) $2\sqrt{3}$ (b) $\sqrt{14}$ (c) $3\sqrt{5}$ (d) $4\sqrt{3}$

80. If $\vec{a}$ and $\vec{b}$ are the two vectors such that $|\vec{a}|=3\sqrt{3}, |\vec{b}|=4$ and $|\vec{a}+\vec{b}|=\sqrt{7}$, then the angle between $\vec{a}$ and $\vec{b}$ is

(a) 150° (b) 30° (c) 60° (d) 120°

81. If $\begin{pmatrix}-1 & 2\\ 3 & -2\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}0\\ 4\end{pmatrix}$, then $(x,y)=$

(a) $(4,0)$ (b) $(0,4)$ (c) $(4,4)$ (d) None of these

82. If $A=\begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & 2\cos\theta\end{bmatrix}$ and $A^T+A=I_2$, then

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) None of these

83. If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, then $A^{-1}=$

(a) $\frac{1}{2}\begin{bmatrix}4 & -2\\ -3 & 1\end{bmatrix}$ (b) $\frac{-1}{2}\begin{bmatrix}4 & -2\\ -3 & 1\end{bmatrix}$ (c) $\begin{bmatrix}2 & 4\\ 1 & 3\end{bmatrix}$ (d) $\begin{bmatrix}-2 & 4\\ 1 & 3\end{bmatrix}$

84. $\lim_{n\to\infty}\left(2^n+3^n+5^n\right)^{1/n}=$ _____

(a) 2 (b) 3 (c) 5 (d) e^{2+3+5}

85. $\lim_{x\to 0}\frac{(1-\cos 2x)\ (3+\cos x)}{x\tan 4x}$ is equal to

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

86. $\lim_{x\to 0}\frac{\sec 5x-\sec 3x}{\sec 3x-\sec x}=$

(a) 2 (b) 1 (c) 4 (d) 8

87. Let $f(x)=\begin{cases}x^2+1 & x\le 0\\ 2-x & x>0\end{cases}$, then which of the following is true?

(a) $f(x)$ is continuous for all x (b) $\lim_{x\to 0} f(x)$ doesn't exist

(c) $\lim_{x\to 0} f(x)=1$ (d) $f(x)$ is not defined for all x

88. The function $f(x)=\begin{cases} x^2 & \text{for } x<1 \\ 2-x & \text{for } x\geq 1 \end{cases}$ is

(a) not differentiable at $x=1$ (b) differentiable at $x=1$

(c) not continuous at $x=1$ (d) none of these

89. If $f(x)=1+\sin x+\frac{\sin^2 x}{2!}+\frac{\sin^3 x}{3!}+\ldots\ldots\ldots\ldots$ then $f'(x)=$

(a) $f(x)$ (b) $f(x)\cos x$ (c) $f(x)\operatorname{cosec} x$ (d) $f(x)\sin x$

90. Is $f(\sin x)=\tan^2 x$, then $f'(x)=$

(a) $\frac{x^2}{1-x^2}$ (b) $\frac{2x}{\left(1-x^2\right)^2}$ (c) $\frac{2x-4x^2}{\left(1-x^2\right)^2}$ (d) $\frac{2x}{\left(1+x^2\right)^2}$

91. If $x=a\cos^2 t$, $y=a\sin^2 t$, $\frac{dy}{dx}=?$

(a) 1 (b) -1 (c) 0 (d) none of these

92. If A and B are two events such that $P(A)=\frac{1}{2}, P(B)=\frac{1}{3}$ and $P(A\mid B)=\frac{1}{4}$, then $P(A'\cap B')$ equal

(a) $\frac{1}{12}$ (b) $\frac{3}{4}$ (c) $\frac{1}{4}$ (d) $\frac{3}{16}$

93. The interval in which the function $y=x^3+6x^2+6$ is increasing, is

(a) $(-\infty,-4)\cup(0,\infty)$ (b) $(-\infty,4)$ (c) $(-4,0)$ (d) $(-\infty,0)\cup(4,\infty)$

94. The area of an equilateral triangle is increasing at the rate of $10\sqrt{3}$ sq.cm/sec. Then the rate of increase of the sides of the triangle when the area is $4\sqrt{3}$, is

(a) 4 cm/ sec (b) 5 cm/ sec (c) $\frac{10}{3}$ cm/ sec (d) 2 cm/ sec

95. A rectangle has three of it vertices on the coordinate axes and fourth on the curve $y=4-x^2$. Then the maximum area of the rectangle is (in sq. units)

(a) $\frac{1}{3\sqrt{3}}$ (b) $\frac{4}{3\sqrt{3}}$ (c) $\frac{8}{3\sqrt{3}}$ (d) $\frac{16}{3\sqrt{3}}$

96. $\int(1-\cos x)\operatorname{cosec}^2 x\,dx=$

(a) $\tan\frac{x}{2}+c$ (b) $\cot\frac{x}{2}+c$ (c) $\frac{1}{2}\tan\frac{x}{2}+c$ (d) $2\tan\frac{x}{2}+c$

97. $\int\frac{e^{2x}+1}{e^{2x}-1}dx=$

(a) $\log\left(e^x+e^{-x}\right)+c$ (b) $\tan^{-1}\left(2^x\right)+c$ (c) $\frac{1}{2}\log\frac{e^x-1}{e^x+1}$ (d) $\log\left(e^x-e^{-x}\right)+c$

98. $\int\left(\frac{\cos x}{x}-\log x^{\sin x}\right)dx=$

(a) $\log x^{\cos x}+C$ (b) $\log x^{\sin x}+C$ (c) $\log(x\cos x)+C$ (d) $\log\left(\frac{\cos x}{x}\right)+C$

99. $\int e^x\left\{\frac{1+\sin x\cos x}{\cos^2 x}\right\}dx=$

(a) $e^2\cos x+c$ (b) $e^x\sec x\tan x+c$ (c) $e^x\tan x+c$ (d) $e^x\cos^2 x-1+c$

100. $\int_1^2\frac{dx}{x+x^9}=$

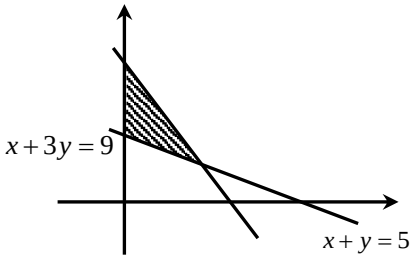
(a) $\frac{1}{8}\log\frac{128}{257}$ (b) $\frac{1}{8}\log\frac{512}{257}$ (c) $\frac{1}{8}\log\frac{1024}{257}$ (d) None of these

101. The probability that an event A happens in one trial of an experiment is 0.4. three independent trials of these experiments are performed. The probability that the event A happens atleast once is

(a) 0.936 (b) 0.784 (c) 0.904 (d) 0.216

102. The feasible region for an LPP is shown in the figure:

If $Z=11x+7y$, then $Z_{\max}=$



(a) 57 (b) 35 (c) 46 (d) 47

103. Bag A contains 2 white and 3 red balls and bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Then the probability that it was drawn from Bag B is

(a) $\frac{25}{52}$ (b) $\frac{25}{51}$ (c) $\frac{15}{52}$ (d) $\frac{5}{52}$

104. A die is thrown, Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then $(A\cup B)$ is

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) 0 (d) 1

105. The general solution of the differential equation $2x\frac{dy}{dx}-y=3$

(a) $y-3=cx$ (b) $(y-3)^2+2cx=0$ (c) $(y+3)^2=cx$ (d) $(y-3)^2=cx$

106. If $|x+5|\geq 10$ then

(a) $x\in(-15,5]$ (b) $x\in(-5,5]$ (c) $x\in(-\infty,-15]\cup[5,\infty)$ (d) $x\in(-\infty,-15)\cap(5,\infty)$

107. The equation of the line parallel to the line $3x-4y+2=0$ and passing through $(-2,3)$ is

(a) $3x-4y+18=-0$ (b) $3x-4y-18=0$ (c) $3x+4y+18=0$ (d) $3x+4y-18=0$

108. If $\left(\frac{1-i}{1+i}\right)^{96}=a+ib$ then (a,b) is

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

109. The number of ways in which 5 girls and 3 boys can be seated in a row so that no two boys are together is

(a) 14040 (b) 14440 (c) 14000 (d) 14400

110. For the LPP, maximise $z=x+4y$ subject to the constraints $x+2y\le 2,\ x+2y\ge 8,\ x,y\ge 0$

(a) $z_{\max}=4$ (b) $z_{\max}=8$ (c) $z_{\max}=18$ (d) Has no feasible solution

111. $\int_0^{\pi/2}\frac{\sin^{1000}x\,dx}{\sin^{1000}x+\cos^{1000}x}$ is equal to

(a) $\frac{\pi}{2}$ (b) 1000 (c) $\frac{\pi}{4}$ (d) 1

112. The value of $\sin^{-1}\left(\cos\frac{53\pi}{5}\right)$ is

(a) $\frac{\pi}{10}$ (b) $\frac{3\pi}{5}$ (c) $\frac{-\pi}{10}$ (d) $\frac{-3\pi}{5}$

113. The value of $\int\frac{e^x\left(x^2\tan^{-1}+\tan^{-1}x+1\right)}{x^2+1}dx$ is equal to

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

114. If A is a matrix of order $m\times n$ and B is a matrix such that AB' *and* $B'A$ are both defined order of the matrix B is

(a) $n\times m$ (b) $m\times m$ (c) $m\times n$ (d) $n\times n$

115. The total number of terms in the expansion of $(x+a)^{47}-(x-a)^{47}$ after simplification is

(a) 24 (b) 47 (c) 48 (d) 96

116. The range of the function $f(x)=\sqrt{9-x^2}$ is

(a) $(0,3)$ (b) $[0,3]$ (c) $(0,3]$ (d) $[0,3)$

117. The area of triangle with vertices $(K,0),(4,0),(0,2)$ is 4 square units, then the value of K is

(a) 0 *or* 8 (b) 0 *or* -8 (c) 0 (d) 8

118. Let $f:R\to R$ be defined by $f(x)=x^4$, then

(a) f is one-one and onto

(b) f may be one-one and onto

(c) f is one-one but not onto

(d) f is neither one-one nor onto

119. If A is a square matrix of order 3×3, then $|KA|$ is equal to

(a) $K|A|$ (b) $K^2|A|$ (c) $K^3|A|$ (d) $3K|A|$

120. The integrating factor of the differential equation $x\cdot\frac{dy}{dx}+2y=x^2$ is $(x\neq0)$

(a) x^2 (b) $\log|x|$ (c) $e^{\log x}$ (d) x

Physics

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

121. With what velocity should a particle be projected so that its height becomes equal to radius of Earth? (G is gravitational constant, M and R are mass and radius of the Earth)

(a) $\left(\frac{GM}{R}\right)^{1/2}$ (b) $\left(\frac{8GM}{R}\right)^{1/2}$ (c) $\left(\frac{2GM}{R}\right)^{1/2}$ (d) $\left(\frac{4GM}{R}\right)^{1/2}$

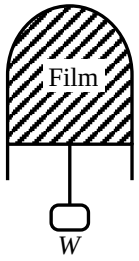
122. A ball is falling in a lake of depth $200\,\text{m}$ creates a decrease 0.1% in its volume at the bottom. The bulk modulus of the material of the ball will be $\left(g=9.8\,\text{m s}^{-2}\right)$

(a) $19.6\times10^{-8}\,\text{N m}^{-2}$ (b) $19.6\times10^{10}\,\text{N m}^{-2}$ (c) $19.6\times10^{-10}\,\text{N m}^{-2}$ (d) $19.6\times10^{8}\,\text{N m}^{-2}$

123. A ring of mass $10\,\text{kg}$ and diameter $0.4\,\text{m}$ is rotated about its axis. If it makes 2100 revolutions per minute, then its angular momentum will be about

(a) $44\,\text{kg m}^2\,\text{s}^{-1}$ (b) $88\,\text{kg m}^2\,\text{s}^{-1}$ (c) $4.4\,\text{kg m}^2\,\text{s}^{-1}$ (d) $0.4\,\text{kg m}^2\,\text{s}^{-1}$

124. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of 1.5×10^{-2} N (see figure). The length of the slider is $30\,\text{cm}$ and its weight negligible. The surface tension of the liquid film is



(a) $0.0125\,\text{N m}^{-1}$ (b) $0.1\,\text{N m}^{-1}$

(c) $0.05\,\text{N m}^{-1}$ (d) $0.025\,\text{N m}^{-1}$

125. The ratio of the coefficient of thermal conductivity of two different materials is $5:3$. If the thermal resistance of the two rods of these materials of same thickness is same, then the ratio of the length of these rods will be

(a) $5:3$ (b) $3:5$ (c) $9:25$ (d) $25:9$

126. A gas at the temperature $250\,\text{K}$ is contained in a closed vessel. If the gas is heated through $25\,\text{K}$, then the percentage increase in its pressure will be

(a) 10% (b) 20% (c) 30% (d) 40%

127. If Q, E and W denote respectively the heat added, change in internal energy and the work done in a closed cyclic process, then

(a) $E=0$ (b) $Q=0$ (c) $W=0$ (d) $Q=W=0$

128. A hollow sphere is filled with water. It is hung by a long thread. As the water flows out of a hole at the bottom, the period of oscillation will

(a) First increase and then decrease (b) First decrease and then increase

(c) Go on increasing (d) Go on decreasing

129. What type of vibrations are produced in a sitar wire?

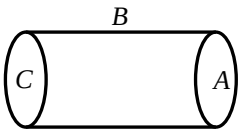
(a) Progressive transverse (b) Progressive longitudinal

(c) Stationary transverse (d) Stationary longitudinal

130. A hollow cylinder has a charge qC within it. If ϕ is the electric flux in units of V-m associated with the curved surface B, the flux linked with the plane surface A in units of V-m will be

(a) $\frac{q}{2\varepsilon_0}$ (b) $\frac{\phi}{3}$

(c) $\left(\frac{q}{\varepsilon_0}-\phi\right)$ (d) $\frac{1}{2}\left(\frac{q}{\varepsilon_0}-\phi\right)$



131. 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) $3\,\text{NC}^{-1}$ (b) $4\,\text{NC}^{-1}$ (c) $5\,\text{NC}^{-1}$ (d) $20\,\text{NC}^{-1}$

132. Two positive charges of magnitude q are placed at the ends of a side l of a square of side $2a$. Two negative charges of the same magnitude are kept at the other corners. Starting from rest, if a charge Q moves from the middle of side l to the centre of square, its kinetic energy at the centre of square is

(a) $\frac{1}{4\pi\varepsilon_0}\frac{2qQ}{a}\left(1-\frac{1}{\sqrt{5}}\right)$ (b) zero

(c) $\frac{1}{4\pi\varepsilon_0}\frac{2qQ}{a}\left(1+\frac{1}{\sqrt{5}}\right)$ (d) $\frac{1}{4\pi\varepsilon_0}\frac{2qQ}{a}\left(1-\frac{2}{\sqrt{5}}\right)$

133. 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

134. Four charges $q_1 = 2\times10^{-8}\,\text{C}$, $q_2 = -2\times10^{-8}\,\text{C}$, $q_3 = -3\times10^{-8}\,\text{C}$ and $q_4 = 6\times10^{-8}\,\text{C}$ are placed at four corners of a square of side $\sqrt{2}\,\text{m}$. What is the potential at the centre of the square?

(a) $270\,\text{V}$ (b) $300\,\text{V}$ (c) Zero (d) $100\,\text{V}$

135. A parallel plate capacitor has a plate area of $50\,\text{cm}^2$ and plate separation of $1.0\,\text{cm}$. A potential difference of 200 volt is applied across the plates with air as the dielectric between plates. The battery is then disconnected and a piece of Bakelite of dielectric constant 4.8 inserted which fills the complete volume between the plates. The capacitance before and after inserting Bakelite are respectively.

(a) $44\,\text{pF}$, $211.2\,\text{pF}$ (b) $4.4\,\text{pF}$, $211.2\,\text{pF}$ (c) $4.4\,\text{pF}$, $21.1\,\text{pF}$ (d) $21.12\,\text{pF}$, $44\,\text{pF}$

136. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be (e being the charge of an electron)

(a) $\frac{4\pi\varepsilon_0 Fd^2}{e^2}$ (b) $\sqrt{\frac{4\pi\varepsilon_0 Fe^2}{d^2}}$ (c) $\sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$ (d) $\frac{4\pi\varepsilon_0 Fd^2}{q^2}$

137. The electric field intensity just sufficient to balance the Earth's gravitational attraction on an electron will be (given mass and charge of an electron respectively are $9.1\times10^{-31}\,\text{kg}$, $1.6\times10^{-19}\,\text{C}$ and $g=10\,\text{m s}^{-2}$)

(a) $-5.6\times10^{-11}\,\text{N C}^{-1}$ (b) $-4.8\times10^{-15}\,\text{N C}^{-1}$ (c) $-1.6\times10^{-19}\,\text{N C}^{-1}$ (d) $-3.2\times10^{-19}\,\text{N C}^{-1}$

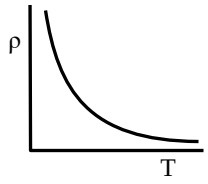
138. At room temperature, copper has free electron density of $8.4\times10^{28}\,\text{per m}^3$. The copper conductor has a cross-section of $10^{-6}\,\text{m}^2$ and carries a current of $5.4\,\text{A}$. The electron drift velocity in copper is

(a) $400\,\text{m s}^{-1}$ (b) $0.4\,\text{m s}^{-1}$ (c) $0.4\,\text{mm s}^{-1}$ (d) $72\,\text{m s}^{-1}$

139. 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

140. The graph shows the variation of resistivity with temperature T. The graph can be of



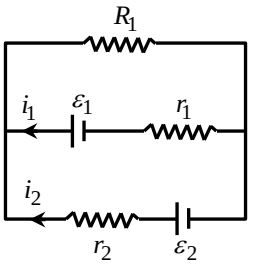
(a) Copper
(b) Nichrome
(c) Germanium
(d) Silver

141. The resistance of a wire at room temperature $30°\text{C}$ is found to be $10\,\Omega$. Now to increase the resistance by 10%, the temperature of the wire must be [The temperature coefficient of resistance of the material of the wire is $0.002\,\text{per }°\text{C}$]

(a) 36°C (b) 83°C (c) 63°C (d) 33°C

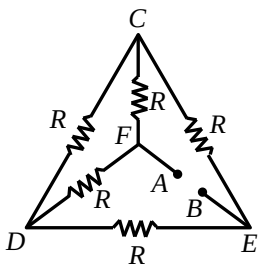
142. See the electric circuit shown in the figure. Which of the following equations is a correct equation for it?

(a) $\varepsilon_2 - i_2 r_2 - \varepsilon_1 - i_1 r_1 = 0$
(b) $-\varepsilon_2 - (i_1 + i_2)R + i_2 r_2 = 0$
(c) $\varepsilon_1 - (i_1 + i_2)R + i_1 r_1 = 0$
(d) $\varepsilon_1 - (i_1 + i_2)R - i_1 r_1 = 0$

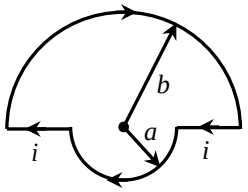


143. Five equal resistances each of resistance R are connected as shown in the figure. A battery of V volts is connected between A and B. The current flowing in $AFCEB$ will be

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



144. You are given a closed circuit with radii a and b as shown in figure carrying current i. The magnetic dipole moment of the circuit is



(a) $\pi\left(a^2+b^2\right)i$ (b) $\frac{1}{2}\pi\left(a^2+b^2\right)i$

(c) $\pi\left(a^2-b^2\right)i$ (d) $\frac{1}{2}\pi\left(a^2-b^2\right)i$

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

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

146. The length of a solenoid is $0.4\,\text{m}$ and the number of turns in it is 500. A current of $3\,\text{A}$ is flowing in it. In a small coil of radius $0.01\,\text{m}$ and number of turns 10, a current of $0.4\,\text{A}$ is flowing. The torque necessary to keep the axis of this coil perpendicular to the axis of solenoid will be

(a) $3.6\times10^{-6}\,\text{N m}$ (b) $3.6\times10^{-4}\,\text{N m}$ (c) 3.6×10^{-6} dyne-cm (d) 3.6×10^{-4} dyne-cm

147. An electric current of 30 ampere is flowing in each of two parallel conducting wires placed $5\,\text{cm}$ apart. The force acting per unit length on either of the wires will be

(a) $3.6\times10^{-3}\,\text{N m}^{-1}$ (b) $3.6\times10^{-3}\,\text{dyne cm}^{-1}$ (c) $3.6\times10^{-5}\,\text{N m}^{-1}$ (d) $3.6\times10^{-2}\,\text{N m}^{-1}$

148. A vibration magnetometer placed in magnetic meridian has a small bar magnet. The magnet executes oscillations with a time period of $2\,\text{s}$ in Earth's horizontal magnetic field of 24 microtesla. When a horizontal field of 18 microtesla is produced opposite to the Earth's field by placing a current carrying wire, the new time period of magnet will be

(a) $1\,\text{s}$ (b) $2\,\text{s}$ (c) $3\,\text{s}$ (d) $4\,\text{s}$

149. To convert $800\,\text{mV}$ 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) $40\,\Omega$

150. A magnetic needle is kept in a non-uniform magnetic field. It experiences

(a) neither a force nor a torque (b) a torque but not a force

(c) a force but not a torque (d) a force and a torque

151. A six pole generator with fixed field excitation develops an e.m.f. of 100 V when operating at 1500 r.p.m. At what speed must it rotate to develop $120\,\text{V}$?

(a) 1200 r.p.m (b) 1800 r.p.m (c) 1500 r.p.m (d) 400 r.p.m

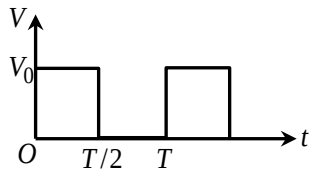
152. A coil of $N=100$ turns carries a current $I=5\,\text{A}$ and creates a magnetic flux $\phi=10^{-5}\,\text{Tm}^2$ per turn. The value of its inductance L will be

(a) $0.05\,\text{mH}$ (b) $0.10\,\text{mH}$ (c) $0.15\,\text{mH}$ (d) $0.20\,\text{mH}$

153. A transformer reduces $220\,\text{V}$ to $11\,\text{V}$. The primary draws $5\,\text{A}$ of current and secondary $90\,\text{A}$. The efficiency of the transformer is

(a) 20% (b) 40% (c) 70% (d) 90%

154. The r.m.s. value of potential difference V shown in the figure is



(a) V_0 (b) $V_0/\sqrt{2}$

(c) $V_0/2$ (d) $V_0/\sqrt{3}$

155. In series combination of R, L and C with an AC source at resonance, if $R = 20$ ohm, then impedence Z of the combination is

(a) 20 ohm (b) Zero (c) 10 ohm (d) 400 ohm

156. The range of wavelength of visible light is

(a) 10Å to 100 Å (b) 4000 Å to 8000Å

(c) 8000Å to 10,000Å (d) 10,000Å to 15,000Å

157. A $2.0\,\text{cm}$ tall object is placed $15\,\text{cm}$ in front of a concave mirror of focal length $10\,\text{cm}$. What is the size and nature of the image?

(a) $4\,\text{cm}$, real (b) $4\,\text{cm}$, virtual (c) $1.0\,\text{cm}$, real (d) None of these

158. A ray of light passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and the latter is equal to $\frac{3}{4}$th of angle of prism. The angle of deviation is

(a) 25° (b) 30° (c) 45° (d) 35°

159. Light travels in two media A and B with speeds $1.8\times10^8\,\text{m s}^{-1}$ and $2.4\times10^8\,\text{m s}^{-1}$ respectively. Then the critical angle between them is

(a) $\sin^{-1}\left(\frac{2}{3}\right)$ (b) $\tan^{-1}\left(\frac{3}{4}\right)$ (c) $\tan^{-1}\left(\frac{2}{3}\right)$ (d) $\sin^{-1}\left(\frac{3}{4}\right)$

160. A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prism produces dispersion without deviation. The angle of the second prism should be

(a) 7° (b) 10° (c) 12° (d) 5°

161. If two waves represented by $y_1 = 4\sin\omega t$ and $y_2 = 3\sin\left(\omega t + \frac{\pi}{3}\right)$ interfere at a point, the amplitude of the resulting wave will be about

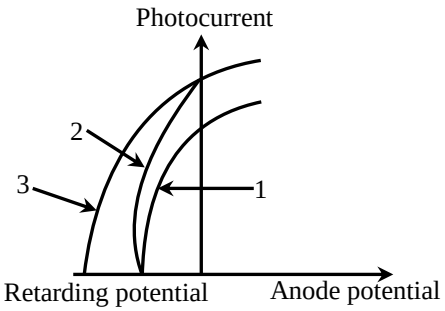
(a) 7 (b) 6 (c) 5 (d) 3.5

162. Green light of wavelength 5460 Å is incident on an air-glass interface. If the refractive index of glass is 1.5, the wavelength of light in glass would be ($c = 3\times10^8\,\text{m s}^{-1}$)

(a) 3640 Å (b) 5460 Å

(c) 4861 Å (d) None of these

163. The figure shows a plot of photocurrent versus anode potential for a photosensitive surface for three different radiations. Which one of the following is a correct statement?



(a) Curves (1) and (2) represent incident radiations of same frequency but of different intensities

(b) Curves (2) and (3) represent incident radiations of different frequencies and different intensities

(c) Curves (2) and (3) represent incident radiations of same frequency having same intensity

(d) Curves (1) and (2) represent incident radiations of different frequencies and different intensities

164. Which metal will be suitable for a photoelectric cell using light of wavelength $4000\,\text{Å}$. The work functions of sodium and copper are respectively $2.0\,\text{eV}$ and $4.0\,\text{eV}$.

(a) Sodium (b) Copper (c) Both (d) None of these

165. In Bohr model of hydrogen atom, let $P.E.$ represents potential energy and $T.E.$ represents the total energy. In going to a higher level.

(a) $P.E.$ decreases, $T.E.$ increases (b) $P.E.$ increases, $T.E.$ decreases

(c) $P.E.$ decreases, $T.E.$ decreases (d) $P.E.$ increases, $T.E.$ increases

166. An $\alpha-$particle of energy $5\,\text{MeV}$ is scattered through $180°$ by a fixed uranium nucleus. The distance of closest approach is of the order of

(a) 10^{-12} cm (b) 10^{-10} cm (c) 1Å (d) 10^{-15} cm

167. Rutherford's atomic model was unstable because

(a) Nuclei will break down (b) Electrons do not remain in orbit

(c) Orbiting electrons radiate energy (d) Electrons are repelled by the nucleus

168. The mass defect in a particular nuclear reaction is 0.3 grams. The amount of energy liberated in kilowatt hour is (Velocity of light $= 3\times10^{8}\,\text{m s}^{-1}$)

(a) 1.5×10^{6} (b) 2.5×10^{6} (c) 3×10^{6} (d) 7.5×10^{6}

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. If the total binding energies of ${}_{1}^{2}H$, ${}_{2}^{4}He$, ${}_{26}^{56}Fe$ & ${}_{92}^{235}U$ nuclei are 2.22, 28.3, 492 and 1786 MeV respectively, identify the most stable nucleus of the following.

(a) ${}_{26}^{56}Fe$ (b) ${}_{1}^{2}H$ (c) ${}_{92}^{235}U$ (d) ${}_{2}^{4}He$

171. At absolute zero, Si acts as

(a) non-metal (b) metal (c) insulator (d) none of these

172. In semiconductors, at room temperature

(a) The conduction band is completely empty

(b) The valence band is partially empty and the conduction band is partially filled

(c) The valence band is completely filled and the conduction band is partially filled

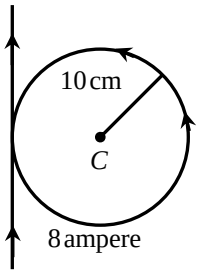
(d) The valence band is completely filled

173. Reverse bias applied to a junction diode

(a) Increases the minority carrier current (b) Lowers the potential barrier

(c) Raises the potential barrier (d) Increases the majority carrier current

174. A long straight wire is turned into a loop of radius $10\,\text{cm}$ (see figure). If a current of 8 amperes is passed through the loop, then the value of the magnetic field and its direction at the centre C of the loop shall be close to



(a) 5.0×10^{-5} Newton/(ampere-meter), upward

(b) 3.4×10^{-5} Newton/(ampere-meter), upward

(c) 1.6×10^{-5} Newton/(ampere-meter), downward

(d) 1.6×10^{-5} Newton/(ampere-meter), upward

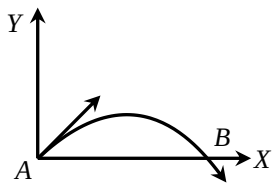
175. Turpentine oil is flowing through a tube of length l and radius r. The pressure difference between the two ends of the tube is p. The viscosity of oil is given by $\eta=\dfrac{p\left(r^2-x^2\right)}{4vl}$ where v is the velocity of oil at a distance x from the axis of the tube. The dimensions of η are

(a) $\left[M^0L^0T^0\right]$ (b) $\left[MLT^{-1}\right]$ (c) $\left[ML^2T^{-2}\right]$ (d) $\left[ML^{-1}T^{-1}\right]$

176. If a car covers $(2/5)^{\text{th}}$ of the total distance with v_1 speed and $(3/5)^{\text{th}}$ distance with v_2 then average speed is

(a) $\dfrac{1}{2}\sqrt{v_1v_2}$ (b) $\dfrac{v_1+v_2}{2}$ (c) $\dfrac{2v_1v_2}{v_1+v_2}$ (d) $\dfrac{5v_1v_2}{3v_1+2v_2}$

177. The velocity of a projectile at the initial point A is $\left(2\hat{i}+3\hat{j}\right)\text{m s}^{-1}$. Its velocity (in m s^{-1}) at point B is



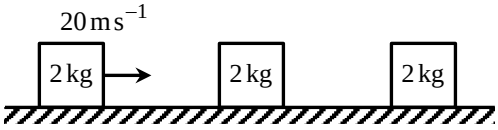
(a) $-2\hat{i}+3\hat{j}$ (b) $2\hat{i}-3\hat{j}$

(c) $2\hat{i}+3\hat{j}$ (d) $-2\hat{i}-3\hat{j}$

178. The maximum speed of a car on a road having turn of radius $30\,\text{m}$ if the coefficient of friction between the tyres and the road is 0.4 will be ($g=9.8\,\text{m s}^{-2}$)

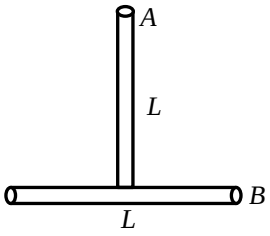
(a) $9.84\,\text{m s}^{-1}$ (b) $10.84\,\text{m s}^{-1}$ (c) $7.84\,\text{m s}^{-1}$ (d) $5.84\,\text{m s}^{-1}$

179. A block of mass $2\,kg$ collide with identical stationary block head on elastically with velocity of $20\,ms^{-1}$. After collision second block collide with the third block of mass $2\,kg$ initially at rest. If they collide head on perfectly inelastically then the velocity of their combination will be



(a) $5\,ms^{-1}$ (b) $4\,ms^{-1}$ (c) $10\,ms^{-1}$ (d) $20\,ms^{-1}$

180. A T joint is formed by two identical rods A and B each of mass m and length L in the XY plane as shown. Its moment of inertia about axis coinciding with rod A is



(a) $\frac{2mL^2}{3}$ (b) $\frac{mL^2}{12}$ (c) $\frac{mL^2}{6}$ (d) None of these