Deeksha

ABHYAS KCET 2024

FREE TEST SERIES

MOCK TEST 6

PDF

QUESTION PAPER

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. If one atom of an element A weighs $6.644\times10^{-23}g$, then number of gram-atom in 20 kg of it is

   (a) 500 (b) 20 (c) 1000 (d) 2000

2. The uncertainity in the momentum of an electon is $1.0\times10^{-5}kg\ ms^{-1}$. The uncertainty in its position will be $\left(h=6.62\times10^{-34}kg\ m^2s^{-1}\right)$

   (a) $1.05\times10^{-28}m$ (b) $1.0510^{-26}m$ (c) $5.27\times10^{-30}m$ (d) $5.25\times10^{-28}m$

3. The order of first ionisation energies of the elements $Li,\ Be,\ B,\ Na$ is

   (a) $Li > Be > B > Na$ (b) $Be > B > Li > Na$

   (c) $Na > Li > B > Be$ (d) $Be > Li > B > Na$

4. The hybridisation of xenon in XeF_2 is

   (a) sp^3 (b) sp^2 (c) sp^3d (d) sp^3d^2

5. H_2O is dipolar, whereas BeF_2 is not. It is because

   (a) H_2O is angular and BeF_2 is linear

   (b) The electronegativity of F is greater than that of O.

   (c) H_2O involves hydrogen bonding whereas BeF_2 is a discrete molecule

   (d) H_2O is linear and BeF_2 is angular

6. Equal masses of methane and hydrogen are mixed in an empty container at $25°C$. The fraction of the total pressure exerted by hydrogen is

   (a) 1/2 (b) 8/9 (c) 1/9 (d) 16/17

7. Standard enthalpy and standard entropy changes for the oxidation of ammonia at $298K$ are $-382.64\,kJ\ mol^{-1}$ and $-145.6\ JK^{-1}\ mol^{-1}$ respectively. Standard Gibb's energy change for the same reaction at $298\ K$ is

   (a) $-523.2\ kJ\ mol$ (b) $-221.1\ kJ\ mol$ (c) $-339.3\ kJ\ mol$ (d) $-439.3\ kJ\ mol$

8. Heat of neutralization of a strong acid by a strong base is a constant value because

   (a) Salt formed does not hydrolyse

   (b) Only H^+ and OH^- ions react in every case

   (c) The strong base and strong acid react completely

   (d) The strong base and strong acid react in aqueous solution

9. $NH_4COONH_{2(s)} \rightleftharpoons 2NH_{3(g)} + CO_{2(g)}$. If equilibrium pressure is 3 atm for the above reaction, K_p for the reaction is

   (a) 4 (b) $\frac{4}{27}$ (c) $\frac{1}{27}$ (d) 27

10. Why only As^{3+} gets precipitated as As_2S_3 and not Zn^{2+} as ZnS when H_2S is passed through an acidic solution containing As^{3+} and Zn^{2+}?

(a) Solubility product of As_3S_3 is less than that of ZnS

(b) Enough As^{3+} are present in acidic medium

(c) Zinc salt does not ionise in acidic medium

(d) Solubility product changes in presence of an acid

11. Which of the following species do not show disproportionation reaction?

(a) ClO^- (b) ClO_2^- (c) ClO_3^- (d) ClO_4^-

12. Which one of the following sets of ions represents the collection of isoelectronic species?

(a) $K^+, Cl^-, Mg^{2+}, Sc^{3+}$ (b) $Na^+, Ca^{2+}, Sc^{3+}, F^-$

(c) $K^+, Ca^{2+}, Sc^{3+}, Cl^-$ (d) $Na^+, Mg^{2+}, Al^{3+}, Cl^-$

13. Which of the following ions has the highest value of ionic radius?

(a) O^{2-} (b) B^{3+} (c) Li^+ (d) F^-

14. Acidified sodium fusion extract on addition of ferric chloride solution gives blood red colouration which confirms the presence of:

(a) N and S (b) S and Cl (c) S (d) N

15. Which of the following is least stable?

(a) $CH_3-CH_2\overset{+}{C}H_2$ (b) $CH_3-\overset{+}{C}H-CH_2-CH_3$

(c) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle +}{\underset{|}{C}}}-CH_3$ (d) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}}-\overset{+}{C}H-C_6H_5$

16. The IUPAC name of the compound,

$CH_3-\underset{\displaystyle OH}{\overset{\displaystyle }{\underset{|}{C}}}=CH-CH_2-COOH$ is

(a) Hydroxypentenoic acid (b) 4-Hydroxypent-3-enoic acid

(c) 2-Hydroxypent-4-enoic acid (d) 4-Hydroxy-4-methylpent-3-enoic acid

17. The order of reactivity of halogen in aliphatic substitution reaction is

(a) $Br_2 > Cl_2 > F_2$ (b) $Cl_2 > Br_2 > F_2$ (c) $F_2 > Cl_2 > Br_2$ (d) $F_2 > Br_2 > Cl_2$

18. A plot of $\frac{1}{T}$ Vs $\ln k$ for a reaction gives the slope -1×10^4 K. The energy of activation for the reaction is (Given $R = 8.314$ J $K^{-1}mol^{-1}$)

(a) 1.202 kJ mol^{-1} (b) 83.14 kJ mol^{-1} (c) 8314 J mol^{-1} (d) 12.02 J mol^{-1}

19. Which is a wrong statement?

(a) Rate constant k = Arrhenius constant A : if $E_a = 0$

(b) $\ln k$ vs $\frac{1}{T}$ plot is a straight line.

(c) $e^{-E_a/RT}$ gives the fraction of reactant molecules that are activated at the given temp.

(d) Presence of catalyst will not alter the value of E_a

20. In a *hydrogen-oxygen* fuel cell, combustion of hydrogen occurs to

(a) generate heat

(b) remove absorbed oxygen from electrode surface

(c) produce high purity water

(d) create potential difference between the two electrodes.

21. A mixture of two completely miscible non-ideal liquids which distils as such without change in its composition at a constant temperature like a pure liquid. This mixture is known as

(a) Binary liquid mixture (b) Azeotropic mixture

(c) Eutectic mixture (d) Ideal mixture

22. The osmotic pressure of 6.84% (mass/volume) solution of cane sugar at $300\ K$ (molecular weight of sugar $= 342$) is

(a) 4 atm (b) 4.926 atm (c) 3.55 atm (d) 2.45 atm

23. The boiling point of benzene is $353.3\ K$. When $1.80\ g$ of a non-volume solute was dissolved in $90\ g$ of benzene, the boiling point is raised to $354.1\ K$ given that K_b for benzene is $2.52\ K\ kg\ mol^{-1}$, the molar mass of the solute is

(a) $15\ g\ mol$ (b) $20\ g\ mol$ (c) $25\ g\ mol$ (d) $63\ g\ mol$

24. $Cu_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$ $E^{\circ}_{cell} = 0.46$ V. The equilibrium constant of above reaction is

(a) $K_c = 4.92\times10^{25}$ (b) $K_c = 2.5\times10^{18}$ (c) $K_c = 3.92\times10^{15}$ (d) $K_c = 7.5\times10^{12}$

25. Λ°_m for $NaCl$, HCl and $NaAc$ are 126.4, 425.9 and 91.0 $S\ cm^2\ mol^{-1}$ respectively. Λ° for HAc is

(a) 285 $S\ cm^{-2}\ mol^{-1}$ (b) 400 $S\ cm^{-2}\ mol^{-1}$

(c) 390.5 $S\ cm^{-2}\ mol^{-1}$ (d) 125 $S\ cm^{-2}\ mol^{-1}$

26. Which of the following will not displace hydrogen?

(a) Pb (b) Sn (c) Ba (d) Hg

27. What is the order of a reaction which has a rate expression, rate $= K[A]^{3/2}[B]^{-1}$?

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

28. The following data were obtained during the first order thermal decomposition of $A_{(g)}$ at constant volume:

$A_{(g)} \rightarrow B_{(g)} + C_{(g)}$

S. No.	Time/s	Total pressure/(atm)
1.	0	0.5
2.	100	0.512

The rate constant is

(a) $2.3\times10^{-4}\,s^{-1}$ (b) $4.8\times10^{-4}\,s^{-1}$ (c) $3\times10^{-4}\,s^{-1}$ (d) $8\times10^{-4}\,s^{-1}$

29. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, the rate constant of the reaction is

(a) $1.92\times10^{-4}\,s^{-1}$ (b) $3\times10^{-2}\,s^{-1}$ (c) $5\times10^{-3}\,s^{-1}$ (d) $4.75\times10^{-4}\,s^{-1}$

30. When an electrolyte is dissociated in solution, the van't Hoff's factor(i) is,

(a) $=0$ (b) >1 (c) $=1$ (d) <1

31. A galvanic cell is constructed using a redox reaction

$1/2\ H_2(g) + AgCl(s) \rightleftharpoons H^+(aq) + Cl^-(aq) + Ag(s)$

It is represented as:

(a) $Pt/H_2(g)\,|\,KCl(aq)\,||\,AgCl(s)/Ag(s)$ (b) $Pt/H_2(g);HCl(aq)\,||\,AgCl(s)/Ag(s)$

(c) $Pt/H_2(g)\,|\,HCl(aq)\,||\,AgNO_3(s)/Ag(s)$ (d) $Ag/AgCl(s)\,|\,KCl(aq)\,||\,HCl(aq),\ H_2(g)/Pt$

32. Colour of light absorbed by aqueous solution of $CuSO_4$ is

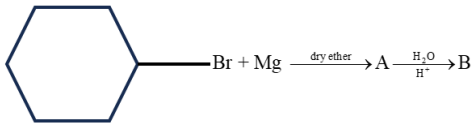
(a) Orange red (b) Bluish green (c) Yellow (d) Violet

33. The degenerate orbitals of $\left[Cr(H_2O)_6\right]^{3+}$ are

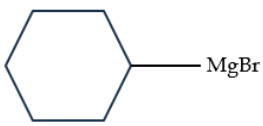
(a) d_{xz} and d_{yz} (b) $d_{x^2-y^2}$ and d_{xy} (c) d_{x^2} and d_{xz} (d) d_{yz} and d_{z^2}

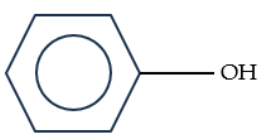
34. The number of unidentate ligands in the complex ion is called

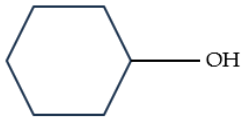
(a) primary valency (b) oxidation number (c) EAN (d) Coordination number

35. 

The product 'B' is

(a) 

(b) 

(c) 

(d) 

36. A reaction in which a primary amine is formed from primary amide is called

(a) Hoffmann bromamide reaction (b) Gabriel phthalimide reaction

(c) Carbylamine reaction (d) Libermann's nitrosoamine reaction

37. $X \xleftarrow{LiAlH_4} C_6H_5-CH=CH-CH=O \xrightarrow{NaBH_4} Y$

X and Y respectively are

(a) $C_6H_5-CH_2CH_2CH_2OH,\ C_6H_5-CH=CH-CH_2OH$

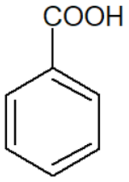
(b) $C_6H_5-CH=CH-CH_2OH,\ C_6H_5-CH_2CH_2CH_2OH$

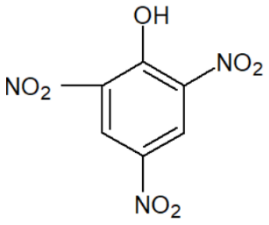
(c) $C_6H_5-CH_2CH_2CH_3,\ C_6H_5-CH=CH-CH_2OH$

(d) $C_6H_5-CH=CH-CH_2OH,\ C_6H_5-CH_2CH_2CH_3$

38. The strongest acid among the following is:

(a) CCl_3COOH (b) FCH_2COOH

(c) 

(d) 

39. Which of the following will be colourless in aqueous solution

I. Ti^{3+} II. V^{3+} III. Cu^{+}

IV. Mn^{2+} V. Co^{2+} VI. Sc^{3+}

(a) (I), (II), (IV) (b) (III) and (V) (c) (II), (IV) and (VI) (d) (III) and (VI)

40. Magnetic moment of Cr^{2+} is nearest to

(a) Fe^{2+} (b) Mn^{2+} (c) Co^{2+} (d) Ni^{2+}

41. The lanthanide contraction is responsible for the fact that

(a) Zr and Y have about the same radius

(b) Zr and Hf have about the same radius

(c) Zr and Nb have similar oxidation state

(d) cannot be predicted

42. The oxidation state of Co in $\left[Co(H_2O)(CN)(en)_2\right]^{2+}$ is

(a) +2 (b) +3 (c) −3 (d) −2

43. Amongst the following the most stable complex is

(a) $\left[Fe(H_2O)_6\right]^{3+}$ (b) $\left[Fe(NH_3)_6\right]^{3+}$ (c) $\left[Fe(C_2O_4)_3\right]^{3-}$ (d) $\left[FeCl_6\right]^{3-}$

44. The IUPAC name of $K_2\left[Ni(CN)_4\right]$ is

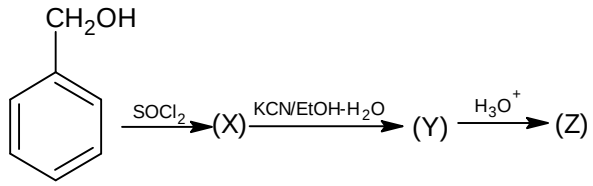
(a) Potassium tetracyanidonickelate (II)

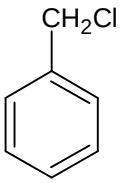
(b) Potassium tetracyanidonickelate (III)

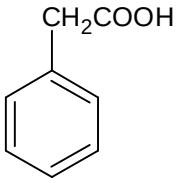
(c) Potassium tetracyanidonickle (II)

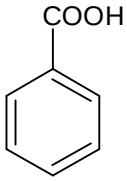
(d) Potassium tetracyanidonickle (III)

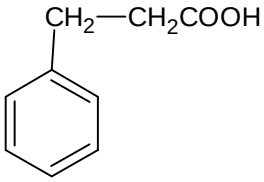
45. Identify Z in the following sequence of reactions



(a) 

(b) 

(c) 

(d) 

46. Which of the following represents the correct order of increasing boiling points?

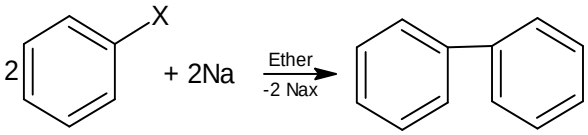
(a) 1-Chloropropane<1-Chlorobutane< Chloropropane

(b) 2- Chloropropane <1-Chloropropane<1-Chlorobutane

(c) 2-Chloropropane <1-Chlorobutane<1-Chloropropane

(d) 1-Chlorobutane< 2- Chloropropane<1-Chloroporpane

47. The reaction



is called

(a) Wurtz Fitting reaction

(b) Fittig reaction

(c) Wurtz reaction

(d) Friedel-Crafts reaction

48. Arrange the following compounds in increasing order of solubility in water

(I). Pentan-1-ol (II) $n-$Butane (III) Pentanal (IV) Ethoxyethane

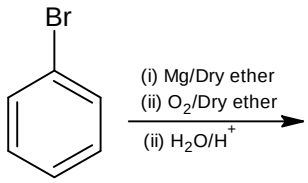
(a) (III)<(IV)<(I)<(II)

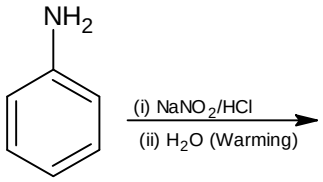
(b) (IV)<(II)<(III)<(I)

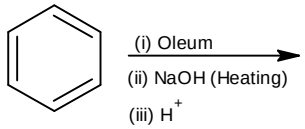
(c) (II)<(IV)<(III)<(I)

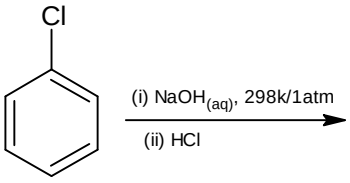
(d) (II)<(III)<(IV)<(I)

49. Which of the following reactions will not yield phenol?

(a) 

(b) 

(c) 

(d) 

50. On boiling with concentrated HBr, ethyl phenyl ether will give

(a) Phenol and ethyl bromide
(b) Bromobenzene and ethanol
(c) Phenol and ethane
(d) Bromobenzene and ethane

51. Which is the most suitable reagent for the following conversion?

$CH_2 = CHCH_2 - OH \longrightarrow CH_2 = CH - CHO$

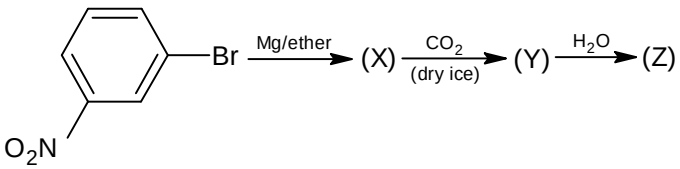
(a) $K_2Cr_2O_7$ in acidic medium
(b) DIBAL-H
(c) PCC
(d) $O_3/H_2O - Zn$ dust

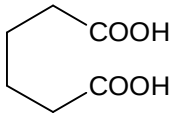
52. Arrange the following compounds in the increasing order of ease of hydrogen bond formation

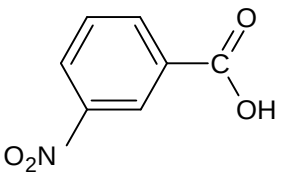
I. $CH_2CH_2CH_2CHO$ II. $CH_3CH_2CH_2CH_2OH$ III. $C_2H_5 - O - C_2H_5$ IV. $CH_3CH_2CH_2COOH$

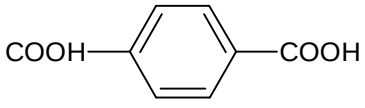
(a) I<III<II<IV (b) III<I<II<IV (c) III<II<IV<I (d) IV<III<II<I

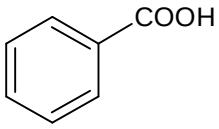
53. What is Z in the following sequence of reactions?



(a) 

(b) 

(c) 

(d) 

54. In Clemmensen reduction carbonyl compound is treated with

(a) Zinc amalgam + HCl
(b) Sodium amalgam + HCl
(c) Zinc amalgam + nitric acid
(d) Sodium amalgam + HNO_3

55. What is the decreasing order of basicity of primary, secondary and tertiary ethyl amines and NH_3 ?

(a) $NH_3 > C_2H_5NH_2 > (C_2H_5)_2\,NH > (C_2H_5)_3\,N$

(b) $(C_2H_5)_3\,N > (C_2H_5)_2\,NH > C_2H_5NH_2 > NH_3$

(c) $(C_2H_5)_2\,NH > C_2H_5NH_2 > (C_2H_5)_3\,N > NH_3$

(d) $(C_2H_5)_2\,NH > (C_2H_5)_3\,N > C_2H_5NH_2 > NH_3$

56. What is Z in the following sequence of reactions?

$$C_6H_5NH_2 \xrightarrow{(CH_3CO)_2O} X \xrightarrow{Br_2/CCl_4} Y \xrightarrow[H^+]{HOH} Z$$

(a) $p-$ Bromoaniline (b) Bromoacetophenone

(c) $p-$ Bromoacetanilide (d) $o-$ Bromoacetanilide

57. C_3H_9N represent

(a) Primary amine (b) Secondary amine (c) Tertiary amine (d) All of these

58. The rapid interconversion of $\alpha-D-$ glucose and $\beta-D-$ glucose in solution is known as

(a) Racemisation (b) Asymmetric induction

(c) Fluxional isomerism (d) Mutarotation

59. The pH value of the solution in which a particular amino acid does not migrate under the incluence of an electric field is called the

(a) Eutectic point (b) Yielding point

(c) Neutralisation point (d) Isoelectric point

60. Which of the following statements is not correct regarding the DNA?

(a) It has double stranded $\beta-$ helix structure

(b) It controls the synthesis of proteins

(c) It has the unique property of replication

(d) It chiefly occurs in the nucleus of cell

Mathematics

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

61. On the set of Z of integers define a relation R by a R b if $|a-b| \le 3$. Then R is

(a) an equivalence relation
(b) reflexive, symmetric but not transitive
(c) symmetric, transitive, but not reflexive
(d) symmetric but neither reflexive not transitive.

62. The function $f : R \to R$ defined by $f(x) = 4 + 3\cos x$ is

(a) bijective
(b) one-one but not onto
(c) onto but not one-one
(d) neither one-one nor onto

63. If $m = \sin x + \cos x$ and $n = \sec x + \cos ecx$ then n in terms of m is

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

64. In a right angled triangle $ABC, \sin^2 A + \sin^2 B - \cos^2 C =$

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

65. If $\sin A + \sin B + \sin C = 3$, then $\cos 2A + \cos 2B + \cos 2C =$

(a) 3 (b) -3 (c) 1 (d) -1

66. The value of $\frac{\cos 3}{2\cos 2 - 1}$ is

(a) 1 (b) $\cos 1$ (c) $\sin 1$ (d) 0

67. If $\sin x - \sin y = \frac{1}{2}$ and $\cos x - \cos y = \frac{1}{3}$ then $\cos(x+y) =$

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$ (c) $-\frac{5}{13}$ (d) $\frac{5}{13}$

68. If $1 + \cos x + \cos^2 x + \ldots\ldots = 4 + 2\sqrt{3}$, then $\cos x =$

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

69. The second, third and sixth terms of an *A.P.* Which are distinct consecutive terms of a *G.P* the common ratio of the *G.P* is

(a) 1 (b) -1 (c) 3 (d) -3

70. Let $z_1 = 1 - i, z_2 = 1 + i$ and $z_3 = -2$, then $z_1^3 + z_2^3 + z_3^3 =$

(a) -4 (b) -12 (c) $3 - 3i$ (d) -6

71. In triangle $PQR, \angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of the eqaution $ax^2 + bx + c = 0$, then

(a) $a + b = c$ (b) $b + c = a$ (c) $a + c = b$ (d) $b = c$

72. The number of ways in which the letters of the word MOBILE can be arranged so that consonants always occupy odd places is

(a) 12 (b) 36 (c) 72 (d) 144

73. If ${}^{2n}C_n + {}^{2n}C_{n-1} = 400$, then ${}^{2n+1}C_{n+1}$ equals

(a) 200 (b) 400 (c) 600 (d) 800

74. If $\begin{bmatrix} -2 & 5 \\ 3 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ -1 \end{bmatrix}$, then (x, y) is

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

75. If $AB = A$ and $BA = B$, then $B^2 + B =$

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

76. If $A = [2\ -3\ 4], B = \begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}, X = [1\ 2\ 3]$ and $Y = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$, then $AB + XY =$

(a) $[20]$ (b) $[24]$ (c) $[22]$ (d) $[28]$

77. Let $A = \begin{pmatrix} 200 & 50 \\ 10 & 2 \end{pmatrix}, B = \begin{pmatrix} 50 & 40 \\ 2 & 3 \end{pmatrix}$. Then the value of determinant of the product matrix AB is

(a) 460 (b) 2000 (c) -7000 (d) 3000

78. If $A = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ and $B = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$, then $\frac{dA}{dx} =$

(a) $3B + 1$ (b) $3B$ (c) $-3B$ (d) $1 - 3B$

79. If $A = \begin{bmatrix} 1 & -2 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$, then A adj (A) is equal to

(a) $\begin{bmatrix} 8 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 5 & 1 & 1 \\ 1 & 5 & 1 \\ 1 & 1 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

80. The vectors $\vec{a}, \vec{b}$ *and* $(\vec{a} - \vec{b})$ have same magnitude. Then the angle between the vectors $\vec{a}$ and $\vec{b}$ is

(a) 30° (b) 150° (c) 60° (d) 120°

81. 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

82. If the vectors $(x-1)\vec{a} + \vec{b}$ and $(3x+2)\vec{a} - 2\vec{b}$ are collinear vectors, then $x =$

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

83. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is

(a) 90° (b) 0° (c) 30° (d) 45°

84. A line makes angles $\frac{3\pi}{17}$ and $\frac{11\pi}{34}$ with the positive directions of $x-$axis and $z-$axis. Then the sine of the angle made by the line with $y-$axis is

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

85. $x=0, y=0, 2x-y=2$ and $x+3y-8=0$ are the sides of a quadrilateral. Then the product of the slopes of the diagonal is

(a) -6 (b) $-\frac{2}{3}$ (c) $-\frac{8}{3}$ (d) $-\frac{3}{8}$

86. The point on the circle $x^2+y^2-80x-60y+2100=0$ which is nearest to origin is

(a) $(24, 18)$ (b) $(18, 24)$ (c) $(20, 25)$ (d) $\left(15, \frac{45}{4}\right)$

87. The standard deviation of $x_1, x_2, x_3, x_4, \ldots x_n$ is 6 . The variance of $2x_1, +3, 2x_2+3, 2x_3+3, \ldots, 2x_n+3$ is

(a) 12 (b) 36 (c) 144 (d) 225

88. The solution of $\frac{6x}{4x-1}<\frac{1}{2}$ is

(a) $x<-\frac{1}{8}$ (b) $-\frac{1}{8}<x<\frac{1}{4}$ (c) $x<\frac{1}{8}$ and $x>\frac{1}{4}$ (d) $x>\frac{1}{8}$

89. If the minimum value of an objective function $Z=ax+by$ occurs at two points $(3, 4)$ and $(4, 3)$, then

(a) $a+b=0$ (b) $a=b$ (c) $3a=b$ (d) $a=3b$

90. $\lim\limits_{x\to a}\frac{a\sin x-x\sin a}{ax^2-xa^2}=$

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

91. $\lim\limits_{x\to\infty}\frac{(n+1)!+n!}{(n+2)!-n!}=$

(a) 1 (b) n (c) $(n+1)(n+2)$ (d) 0

92. If $f(x)=x^2+\frac{1}{x^2}$ and $(g\ o\ f)(x)=x^6+\frac{1}{x^6}$, then $g''(1)=$

(a) 0 (b) 3 (c) 6 (d) 1

93. The derivative of $\sin^{-1}\sqrt{x}$ w.r.t. $\cos^{-1}\sqrt{1-x}$ is

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

94. If $xy=\tan(xy)$, then $\frac{dy}{dx}=$

(a) $\frac{y}{x}$ (b) $\frac{x}{y}$ (c) $-\frac{y}{x}$ (d) $-\frac{x}{y}$

95. If $f(x)=\min\{x^2, 2x\}$, then $f'(-1)+f'(1)=$

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

96. $\int \frac{\sec x}{\sec x - \tan x} dx =$

(a) $\sec x - \tan x$ (b) $\sec x + \tan x$ (c) $\tan x - \sec x$ (d) $-(\sec x + \tan x)$

97. $\int \frac{\cos x}{\sin(a+x)} dx =$

(a) $\log \sin(a+x)$ (b) $\cos a . \log \sin(a+x) - x \cos a$

(c) $\cos a \log \sin(a+x) - \cos a$ (d) $\cos a . \log \sin(a+x) + x \sin a$

98. $\int_0^1 \frac{x^2 + x + 2}{(1+x^2)(1+x)} dx =$

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

99. $\int_0^{\frac{\pi}{2}} e^{\cos x} \sin 2x \, dx =$

(a) $2(1-e)$ (b) 2 (c) -2 (d) $2(1+e)$

100. $\int_1^e \left[(\log x)^5 + 5(\log x)^4 \right] dx =$

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

101. $\int \frac{dx}{1 - 10\sin^2 x} =$

(a) $\frac{1}{6}\log \frac{3+\tan x}{3-\tan x} + C$ (b) $\frac{1}{6}\log \frac{1-3\tan x}{1+3\tan x} + C$

(c) $\frac{1}{6}\log \frac{1+3\tan x}{1-3\tan x} + C$ (d) $\frac{1}{6}\log \frac{3-\tan x}{3+\tan x} + C$

102. If $\frac{dy}{dx} = y + 3 > 0$ and $y(0) = 2$, then $y(\log 2)$ is equal to

(a) 5 (b) 13 (c) -2 (d) 7

103. The solution of the D.E. $x\,dy - y\,dx + x^2(x\,dy + y\,dx) = 0$ is

(a) $xy - \frac{y}{x} = c$ (b) $x^2 y + y = c$ (c) $xy + \frac{y}{x} = c$ (d) $xy + \frac{x}{y} = c$

104. $\sin^2\left(\cos^{-1}\frac{1}{3}\right) + \cos^2\left(\sin^{-1}\frac{1}{3}\right) =$

(a) 1 (b) $\frac{2}{9}$ (c) $\frac{7}{9}$ (d) $\frac{16}{9}$

105. If $\sin^{-1}\left(\frac{3\sin 2\theta}{5 + 4\cos 2\theta}\right) = \frac{\pi}{2}$, then $\tan\theta =$

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

106. A coin is tossed three times in succession. If E is the event that there are at least two heads and F is the event in which first throw is a head, then $P(E/F) =$

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

107. In a box there are 2 red, 3 black, and 4 white balls. Out of these, three balls are drawn together. The probability of these being of same colour is

(a) $\frac{1}{84}$ (b) $\frac{1}{21}$ (c) $\frac{5}{84}$ (d) $\frac{2}{21}$

108. A bag 'A' contains 3white and 2 black balls. A bag 'B' contains 2 white and 4 black balls. First a bag is chosen and then a ball is drawn. What is the probability that is a white ball?

(a) $\frac{7}{12}$ (b) $\frac{7}{15}$ (c) $\frac{8}{15}$ (d) $\frac{5}{11}$

109. 6 boys and 6 girls sit in a row at random. The probability that all the girls sit together is

(a) $\frac{1}{432}$ (b) $\frac{12}{431}$ (c) $\frac{1}{132}$ (d) None of these

110. The domain of the function $f(x) = \sqrt{2x-1} + \sqrt{3-2x}$ is

(a) $\left(\frac{1}{2}, \infty\right)$ (b) $\left(-\infty, \frac{3}{2}\right)$ (c) $\left(\frac{1}{2}, \frac{3}{2}\right)$ (d) $\left[\frac{1}{2}, \frac{3}{2}\right]$

111. If m and n are degree and order of $\left(1+y_1^2\right)^{2/3} = y_2$ then the value of $\frac{m+n}{m-n}$ is

(a) 3 (b) 4 (c) 5 (d) 12

112. If $I = \int_{-\pi}^{\pi} \frac{e^{\sin x}}{e^{\sin x} - e^{-\sin x}} dx$ then $I =$

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

113. $\int \frac{\sin x \cos x}{\sqrt{1-\sin^4 x}} dx =$

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

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

114. If $y = x^{x^{x^{\cdot^{\cdot^{\cdot^{\infty}}}}}}$,then $x(1-y\log x)\frac{dy}{dx} =$

(a) x^2 (b) y^2 (c) xy^2 (d) xy

115. The length of the perpendicular from $(1,6,3)$ to the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ is

(a) 3 (b) $\sqrt{11}$ (c) $\sqrt{13}$ (d) 5

116. If $f(x)=\begin{cases} x\cdot\sin\left(\frac{1}{x}\right) & x\neq 0 \\ 0 & x=0 \end{cases}$ then at $x=0$, the function is

(a) differentiable but not continuous
(b) continuous but not differentiable
(c) not continuous
(d) continuous and differentiable

117. If $f(x)=\begin{cases} \frac{\sin 5x}{x^2+2x} & x\neq 0 \\ k+\frac{1}{2} & x=0 \end{cases}$ is continuous at $x=0$, then the value of k is

(a) 2 (b) 1/2 (c) 1 (d) –4

118. In the interval $(-3,3)$ the function $f(x)=\frac{x}{3}+\frac{3}{x}, x\neq 0$ is

(a) increasing
(b) decreasing
(c) neither increasing nor decreasing
(d) partly increasing and partly decreasing

119. The function $f(x)=xe^{-x}\,(x\in R)$ attains a maximum value at $x=$

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

120. Area of the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ is

(a) 36π (b) 6π (c) 6 (d) none of these

Physics

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

121. If C be the capacitance and V be the electric potential, then the dimensional formula of CV^2 is

(a) $\left[M^1L^2T^{-2}A^0\right]$ (b) $\left[M^1L^1T^{-2}A^{-1}\right]$ (c) $\left[M^0L^1T^{-2}A^0\right]$ (d) $\left[M^1L^{-3}T^1A^{-1}\right]$

122. The velocity time graph of a particle comes out to be a non-linear curve. The motion is

(a) uniform velocity motion
(b) uniformly accelerated motion
(c) non-uniform accelerated motion
(d) nothing can be said about the motion

123. If $(\text{range})^2$ is 48 times $(\text{maximum height})^2$, then angle of projection is

(a) 45° (b) 60° (c) 75° (d) 30°

124. A rocket of mass 120 kg is moving vertically up at 600 m/s such that gas is escaping at the rate of 1 kg per second. Find out acceleration of the rocket.

(a) 2 m/s^2 (b) 5 m/s^2 (c) 6 m/s^2 (d) 10 m/s^2

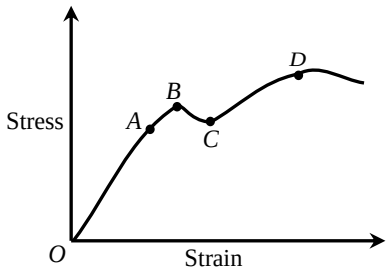
125. A 2 kg mass lying on a table is displaced in the horizontal direction through 50 cm. The work done by normal reaction will be

(a) 10 J (b) 0 (c) 100 erg (d) 100 J

126. A light rod of length l has two , masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

(a) $\frac{m_1 m_2}{m_1 + m_2} l^2$ (b) $\frac{m_1 + m_2}{m_1 m_2} l^2$ (c) $(m_1 + m_2) l^2$ (d) $\sqrt{m_1 m_2} l^2$

127. The stress-strain graph of a material is shown in the figure. The region in which the material is elastic is



(a) OA (b) OB (c) OC (d) AC

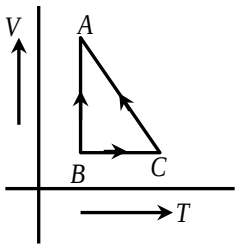
128. Two solids P and Q float in water. It is observed that P floats with half of its volume immersed and Q floats with $\left(\frac{2}{3}\right)^{\text{rd}}$ of its volume immersed. The ratio of densities of P and Q is

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

129. The quantities of heat required to raise the temperature of two copper spheres of radii r_1 and $r_2 (r_1 = 1.5 r_2)$ through 1K are in the ratio of

(a) $\frac{27}{8}$ (b) $\frac{9}{4}$ (c) $\frac{3}{2}$ (d) 1

130. One mole of an ideal gas is taken from A to B from B to C and then back to A. The variation of its volume with temperature for that change is as shown. Its pressure at A is P_0, volume is V_0. Then, the internal energy



(a) at A is more than at B

(b) at C is less than at B

(c) at B is more than at A

(d) at A and B are equal

131. The mean free path of molecules of a gas, (radius r) is inversely proportional to

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

132. A 10 kg metal block is attached to a spring of spring constant 1000 N m^{-1}. A block is displaced from equilibrium position by 10 cm and released. The maximum acceleration of the block is

(a) 200 ms^{-2} (b) 10 ms^{-2} (c) 0.1 m s^{-2} (d) 100 m s^{-2}

133. Sound waves transfer

(a) Only energy not momentum (b) Energy

(c) Momentum (d) Both energy and momentum

134. A stone weight is $100\,\text{N}$ on the surface of the earth. The ratio of its weight at a height of half the radius of the earth to a depth of half the radius of the earth will be approximately

(a) 3.6 (b) 2.2 (c) 1.8 (d) 0.9

135. Water rises in plant fibres due to

(a) capillarity (b) viscosity (c) fluid pressure (d) osmosis

136. If a charge on the body is $1\,\text{nC}$, then how many electrons are removed from the body?

(a) 6.25×10^{27} (b) 1.6×10^{19} (c) 6.25×10^{28} (d) 6.25×10^{9}

137. The potential of the electric field produced by a point charge at any point (x, y, z) is given by $V = 3x^2 + 5$, where, x, y, z are in metres and V is in volts. The intensity of the electric field at $(-2, 1, 0)$ is

(a) $+17\ \text{Vm}^{-1}$ (b) $-17\ \text{Vm}^{-1}$ (c) $+12\ \text{Vm}^{-1}$ (d) $-12\ \text{Vm}^{-1}$

138. A spherical conductor of radius $2\,\text{cm}$ is uniformly charged with $3\,\text{nC}$. What is the electric field at a distance of 3 cm from the centre of the sphere?

(a) $3\times10^{4}\ \text{Vm}^{-1}$ (b) $3\times10^{6}\ \text{Vm}^{-1}$ (c) $3\times10^{-4}\ \text{Vm}^{-1}$ (d) $3\ \text{Vm}^{-1}$

139. Pick out the statement which is incorrect.

(a) The electric field lines forms closed loop

(b) Electric field lines never intersect

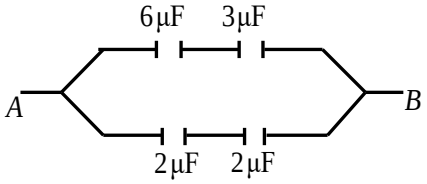
(c) The tangent drawn to a line of force represents the direction of electric field

(d) A negative test charge experiences a force opposite to the direction of the field

140. The equivalent capacitance between A and B as shown in figure is

(a) $\frac{25}{26}\ \mu\text{F}$ (b) $1\ \mu\text{F}$

(c) $3\ \mu\text{F}$ (d) $\frac{3}{4}\ \mu\text{F}$



141. If $\vec{E}_{ax}$ and $\vec{E}_{eq}$ represents electric field at a point on the axial and equatorial line of a dipole of dipole length $2a$. If points are at a distance r from the centre of the dipole, for $r >> a$

(a) $\vec{E}_{ax} = \vec{E}_{eq}$ (b) $\vec{E}_{ax} = -\vec{E}_{eq}$ (c) $\vec{E}_{ax} = -2\vec{E}_{eq}$ (d) $\vec{E}_{ax} = 2\vec{E}_{eq}$

142. An electric dipole consists of two opposite charges, each of magnitude $1.0\ \mu\text{C}$ separated by a distance of $2.0\,\text{cm}$. The dipole is placed in an external field of $10^{5}\ \text{N C}^{-1}$. The maximum torque on the dipole is

(a) $0.2\times10^{-3}\ \text{Nm}$ (b) $1\times10^{-3}\ \text{Nm}$ (c) $2\times10^{-3}\ \text{Nm}$ (d) $4\times10^{-3}\ \text{Nm}$

143. Two infinite parallel metal planes, contain electric charges with charge densities $+\sigma$ and $-\sigma$ respectively and they are separated by a small distance in air. If the permittivity of air is ε_0, then the magnitude of the field between the two planes with its direction will be

(a) σ/ε_0 towards the positively charged plane (b) σ/ε_0 towards the negatively charged plane

(c) σ/ε_0 towards the positively charged plane (d) 0 and towards any direction

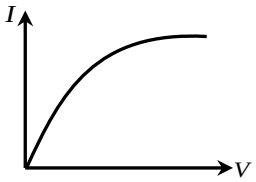
144. A 50 cm long wire and $1\ mm^2$ cross-sectional area carries a current of 4 A when connected to a 2 V battery. The resistivity of the wire is

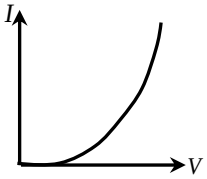
(a) $2\times10^{-7}\ \Omega m$ (b) $5\times10^{-7}\ \Omega m$ (c) $4\times10^{-6}\ \Omega m$ (d) $1\times10^{-6}\ \Omega m$

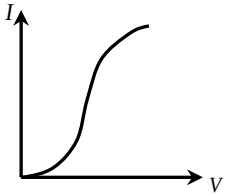
145. A metallic wire of cross sectional area $4\ mm^2$ carries a current of 3.2 A. If 5×10^{26} number of charge carries per unit volume flow across the wire, then their drift velocity (in ms^{-1}) is

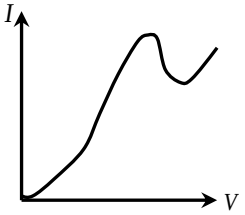
(a) 1 (b) 0.1 (c) 0.01 (d) 10

146. The variation between $V-I$ is shown by the following four graphs,. Which is the $V-I$ graph for heating filament?

(a) 

(b) 

(c) 

(d) 

147. A metal wire is subjected to a constant potential difference. When the temperature of the metal wire increases, the drift velocity of the electron in it

(a) increases and the thermal velocity of the electron increases

(b) decreases and the thermal velocity of the electron increases

(c) increases and the thermal velocity of the electron decreases

(d) decreases and the thermal velocity of the electron decreases

148. Three electric bulbs with same voltage ratings of 100 volts but wattage ratings of 40, 60 and 100 watts respectively, are connected in series across a volt supply line. If their brightness are B_1, B_2, B_3 respectively, then

(a) $B_1 > B_2 > B_3$ (b) $B_1 > B_2 < B_3$

(c) $B_1 = B_2 = B_3$

(d) bulbs will burn out due to the high voltage supply

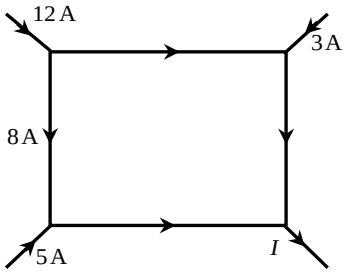
149. Figure shows a network of currents. The magnitude of currents is shown here. The current I will be

(a) 10 A

(b) 3 A

(c) 13 A

(d) 20 A



150. A charged particle is moving along a magnetic field line. The magnetic force on the particle is

(a) along its velocity (b) opposite to its velocity

(c) perpendicular to its velocity (d) zero

151. A proton beam enters a magnetic field of 10^{-4} Wb m^{-2} normally. If the specific charge of the proton is 10^{11} C kg^{-1} and its velocity is 10^{9} ms^{-1}, then the radius of the described circle will be

(a) 10 m (b) 1 m (c) 0.1 m (d) 100 m

152. A charged particle with a velocity 2×10^{3} ms^{-1} passes undeflected through electric field and magnetic fields which are mutually perpendicular to each other. The magnetic field is 1.5 T. The magnitude of electric field will be

(a) $1.5\times10^{3}NC^{-1}$ (b) 2×10^{3} N C^{-1} (c) 3×10^{3} NC^{-1} (d) 1.33×10^{3} NC^{-1}

153. Magnetic field at a distance r from an infinitely long straight conductor, carrying a steady current, varies as

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

154. 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

155. The magnetic dipole moment of a current loop is independent of

(a) magnetic field in which it is lying (b) number of turns

(c) area of the loop (d) current in the loop

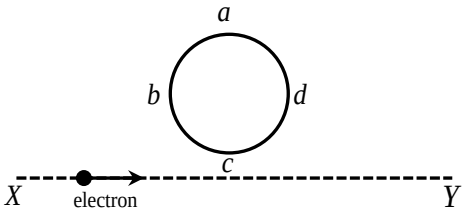
156. A solenoid has core of a material with relative permeability 500 and its windings carry a current of 1 A. The number of turns of the solenoid is 500 per metre. The magnetization of the material is nearly

(a) 2.5×10^{3} A m^{-1} (b) 2.5×10^{5} A m^{-1} (c) 2.0×10^{3} A m^{-1} (d) 2.0×10^{5} A m^{-1}

157. The normal magnetic flux passing through a coil changes with time according to the equation $\phi = 6t^2 - 5t + 1$. What is the magnitude of the induced current at $t = 0.5$s if resistance of coil is 10Ω ?

(a) 1.2 A (b) 0.8 A (c) 0.6 A (d) 0.1 A

158. An electron moves on a straight line path XY as shown. The $abcd$ is a coil adjacent to the path of electron. What will be the direction of current, if any, induced in the coil?



(a) The current will reverse its direction as the electron goes past the coil

(b) No current will be induced (c) The direction of induced current will be along the path $abcd$

(d) The direction of induced current will be along the path $adcb$

159. The rms value of current in a $50\,\text{Hz}$ AC circuit is $6\,\text{A}$. The average value of AC current over a cycle is

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

160. In an LCR circuit, at resonance

(a) the impedance is maximum (b) the current leads the voltage by $\pi/2$

(c) the current and voltage are in phase (d) the current is minimum

161. A current of $5\,\text{A}$ is flowing at $220\,\text{V}$ in the primary coil of a transformer. If the voltage produced in the secondary coil is $2200\,\text{V}$ and 50% of power is lost, then the current in the secondary will be

(a) $0.25\,\text{A}$ (b) $0.5\,\text{A}$ (c) $2.5\,\text{A}$ (d) $5\,\text{A}$

162. A vessel of height $2d$ is half-filled with a liquid of refractive index $\sqrt{2}$ and the other half with a liquid of refractive index n. (The given liquids are immiscible). Then the apparent depth of the inner surface of the bottom of the vessel (neglecting the thickness of the bottom of the vessel) will be

(a) $\frac{n}{d\left(n+\sqrt{2}\right)}$ (b) $\frac{d\left(n+\sqrt{2}\right)}{n\sqrt{2}}$ (c) $\frac{\sqrt{2}n}{d\left(n+\sqrt{2}\right)}$ (d) $\frac{nd}{d+\sqrt{2}n}$

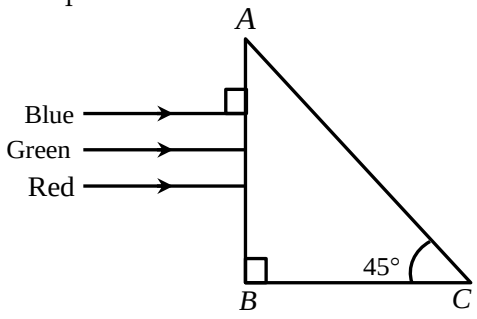
163. The speed of light in medium M_1, and M_2 are $1.5\times10^8\ \text{m s}^{-1}$ and $2\times10^8\ \text{m s}^{-1}$ respectively. A ray travels from medium M_1 to the medium M_2 with an angle of incidence θ. The ray suffers total internal reflection. Then the value of the angle of incidence θ is

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

164. Radii of curvature of a converging lens are in the ratio $1:2$. Its focal length is $6\,\text{cm}$ and refractive index is 1.5. Then its radii of curvature are _____ respectively

(a) 9 cm and 18 cm (b) 6 cm and 12 cm (c) 3cm and 6 cm (d) 4.5 cm and 9 cm

165. A beam of light consisting of red, green and blue colours is incident on a right-angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. The prism will



(a) not separate the three colours at all

(b) separate the red colour part from the green and blue colours

(c) separate the blue colour part from the red and green colours

(d) separate all the three colours from one another

166. Resolving power of a telescope increases with

(a) Increase in focal length of eye-piece
(b) Increase in focal length of objective
(c) Increase in aperture of eye piece
(d) Increase in aperture of objective

167. Wavefront is the locus of all point, where the particles of the medium vibrate with the same

(a) phase (b) amplitude (c) frequency (d) period

168. To observe diffraction, the size of the obstacle

(a) should be $\lambda/2$, where λ is the wavelength
(b) should be of the order of wavelengths
(c) has no relation to wavelength
(d) should be much larger that the wavelength

169. Maximum velocity of the photoelectron emitted by a metal is $1.8\times10^{6}\ \mathrm{m\,s^{-1}}$. Take the value of specific charge of the electron is $1.8\times10^{11}\ \mathrm{C\,kg^{-1}}$. Then the stopping potential (in volt) is

(a) 1 (b) 3 (c) 9 (d) 6

170. When a piece of metal is illuminated by a monochromatic light of wavelength λ, then stopping potential is $3V_s$. When same surface is illuminated by light of wavelength 2λ, then stopping potential becomes V_s. The value of threshold wavelength for photoelectric emission will be

(a) $(4\lambda)/3$ (b) 6λ (c) 4λ (d) 8λ

171. Rutherford's atomic model could account for

(a) stability of atoms
(b) origin of spectra
(c) the positively charged central core of an atom
(d) concept of stationery orbits

172. The amount of energy required to separate a hydrogen atom into a proton and an electron is

(a) 1.36 eV (b) 13.6 eV (c) 0.136 eV (d) 136 eV

173. An electron of a stationery hydrogen atom makes the transition from the fifth energy level to the ground level. The velocity that the atom acquired as a result of photon emission will be
($m=$ mass of hydrogen atom, $R=$ Rydberg constant and $h=$ Planck's constant)

(a) $\frac{24hR}{25m}$ (b) $\frac{25hR}{24m}$ (c) $\frac{25m}{24hR}$ (d) $\frac{24m}{25hR}$

174. The volume of a nucleus is directly proportional to

(a) A (b) A^3 (c) $\sqrt{A}$ (d) $A^{1/3}$

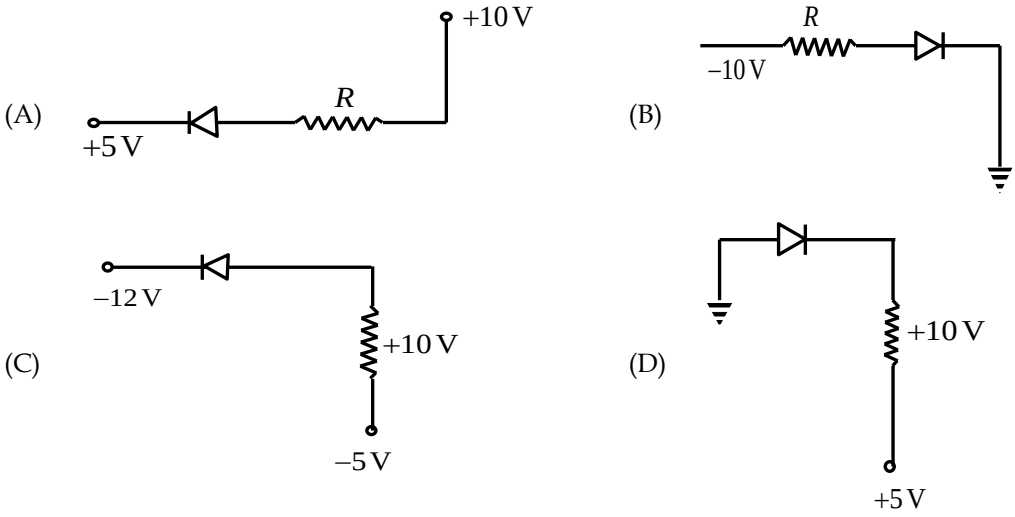
175. A force between two protons is same as the force between proton and neutron. The nature of the force is

(a) electrical force
(b) weak nuclear force
(c) gravitational force
(d) strong nuclear force

176. In which of the following statements, the obtained impure semiconductor is of $p-$type?

(a) Germanium is doped with bismuth
(b) Silicon is doped with antimony
(c) Germanium is doped with gallium
(d) Silicon is doped with phosphorus

177.In the following figure, the diodes which are forward biased, are



(a) (A), (B) and (D) (b) (C) only (c) (A) and (C) (d) (B) and (D)

178.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

179.The velocity of electromagnetic radiation in vacuum of permittivity ε_0 and permeability μ_0 is given by

(a) $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$ (b) $\sqrt{\frac{\mu_0}{\varepsilon_0}}$ (c) $\sqrt{\frac{\varepsilon_0}{\mu_0}}$ (d) $\sqrt{\mu_0\varepsilon_0}$

180.What is the de Brogile wavelength of the electron accelerated through a potential difference of 100 volt?

(a) 0.1227 Å (b) 12.27Å (c) 0.001227Å (d) 1.227Å