Deeksha

ABHYAS KCET 2024

FREE TEST SERIES

MOCK TEST 1 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. If one atom of an element A weighs $6.644\times10^{-23}\,g$, then the molar mass in $g\,mol^{-1}$ of the element is

   (a) 50 (b) 40 (c) 100 (d) 20

2. The uncertainity in the momentum of an electron is $1.0\times10^{-5}\,kg\ ms^{-1}$. The uncertainty in its position will be (given $\frac{h}{4\pi}\approx5.25\times10^{-35}$)

   (a) $1.05\times10^{-28}\,m$ (b) $1.05\times10^{-26}\,m$ (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. Arrange the following in the increasing order of their bond order: O_2, O_2^+, O_2^- & O_2^{2-}

   (a) $O_2^{-2}, O_2^-, O_2, O_2^+$ (b) $O_2^{2-}, O_2^-, O_2^+, O_2$ (c) $O_2^+, O_2, O_2^-, O_2^{-2}$ (d) $O_2, O_2^+, O_2^-, O_2^{-2}$

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 $-382.0\,kJ\ mol^{-1}$ and $-145.0\,JK^{-1}\ mol^{-1}$ respectively. Standard Gibb's energy change for the same reaction at $300\ K$ is

   (a) −523.2 kJ mol (b) −221.1 kJ mol (c) −338.5 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_2S_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. The increasing order of ionic character of $CsF, LiI, NaBr$ & KCl is

(a) $NaBr < KCl < LiI < CsF$ (b) $CsF < KCl < NaBr < LiI$

(c) $LiI < NaBr < KCl < CsF$ (d) $LiI < KCl < CsF < NaBr$

13. Variable valency is exhibited by

(a) F (b) Na (c) Fe (d) Ne

14. What is X in the following reaction?

$CH_3 - C \equiv CH \xrightarrow{2HBr} X$

(a) $CH_3—HC(Br)—CH_2(Br)$ (b) $CH_2(Br)—C(H)=CH(Br)$

(c) $CH_3—CH_2—HC(Br)_2$ (d) $CH_3—C(Br)_2—CH_3$

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) $CH_3 - \overset{+}{C}(CH_3) - CH_3$ (d) $CH_3 - C(CH_3) - \overset{+}{C}H - C_6H_5$

16. The IUPAC name of the compound,

$CH_3—C(OH)=CH-CH_2-COOH$ is

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

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

17. The order of reactivity of halogens in the substitution reaction of aliphatic hydrocarbons 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. The time required for 100 percent completion of a zero order reaction is

(a) $\frac{2k}{a}$ (b) $\frac{a}{2k}$ (c) $\frac{a}{k}$ (d) ak

19. The charge required for the oxidation of 1 mol of FeO to Fe_2O_3 is

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

20. The relative lowering in vapour pressure is

(a) $\alpha(x)^2_{\text{solute}}$ (b) $\alpha.\frac{1}{x_{\text{solute}}}$ (c) αx_{solute} (d) αm

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 $2.52\ \text{K kg mol}^{-1}$, the molar mass of the solute is

(a) $15\ \text{g mol}^{-1}$ (b) $20\ \text{g mol}^{-1}$ (c) $25\ \text{g mol}^{-1}$ (d) $63\ \text{g mol}^{-1}$

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

(a) $K_c=4.92\times10^{25}$ (b) $K_c=2.5\times10^{18}$ (c) $K_c=3.98\times10^{15}$ (d) $K_c=7.5\times10^{12}$

25. Λ°_m for $NaCl$, HCl and sodium acetate are 126.4, 425.9 and 91.0 $S\ \text{cm}^2\ \text{mol}^{-1}$ respectively. Λ°_m for acetic acid is

(a) $285\ S\ \text{cm}^{-2}\ \text{mol}^{-1}$ (b) $400\ S\ \text{cm}^{-2}\ \text{mol}^{-1}$ (c) $390.5\ S\ \text{cm}^{-2}\ \text{mol}^{-1}$ (d) $125\ S\ \text{cm}^{-2}\ \text{mol}^{-1}$

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

(a) Ni^{2+}, Co^{3+} (b) Fe^{3+}, Mn^{2+} (c) Fe^{2+}, Mn^{2+} (d) Sc^{3+}, Ti^{3+}

31. The elements in which electrons are progressively filled in $4f$ orbital are called

(a) Actinoids (b) Lanthanoids (c) Transition elements (d) Halogens

32. The co-ordination number and oxidation number of X in $\left[X(SO_4)(NH_3)_5\right]Cl$ is

(a) 10 & 3 (b) 2 & 6 (c) 6 & 3 (d) 6 & 4

33. Ammonia will not form complex ions with

(a) Ag^+ (b) Cd^{2+} (c) Cu^{2+} (d) Pb^{2+}

34. If liquids A & B form an ideal solution

(a) the enthalpy of mixing is zero

(b) the entropy of mixing is zero

(c) the free energy of mixing is zero

(d) the free energy as well as the entropy of mixing are each zero

35. Which of the following concentration factor is affected by change in temperature?

(a) molarity (b) molality (c) mole fraction (d) weight fraction

36. What is the oxidation number of sulphur in $Na_2S_4O_6$?

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

37. $C_2H_5Br \xrightarrow{AgCN} X \xrightarrow[Zn-Hg/HCl]{\text{Reduction}} Y$.

Here Y is

(a) n-propyl amine (b) Ethylamine (c) Isopropylamine (d) Ethylmethylamine

38. $R-CH_2OH \xrightarrow{\Delta} RCHO + H_2$

The catalyst used in this reaction is

(a) Ni (b) Pd (c) Cu (d) $SoCl_2$

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

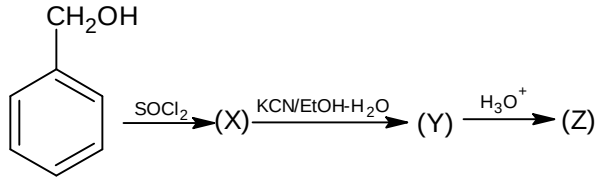
(a) $\left[Fe(H_2O)_6\right]^{3+}$ (b) $\left[Fe(NH_3)_6\right]^{3+}$ (c) $\left[Fe(C_2O_4)_3\right]^{3-}$ (d) $\left[FeCl_6\right]^{3-}$

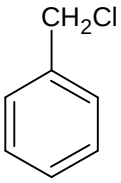
44. The IUPAC name of $K_2\left[Ni(CN)_4\right]$ is

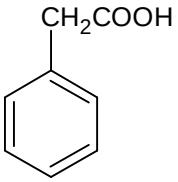
(a) Potassium tetracyanidonickelate(II) (b) Potassium tetracyanidonickelate(III)

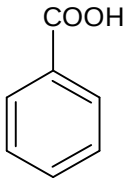
(c) Potassium tetracyanidonickle(II) (d) Potassium tetracyanidonickle(III)

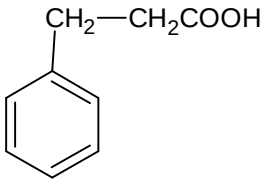
45. Identify Z in the following sequence of reactions.



(a) 

(b) 

(c) 

(d) 

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

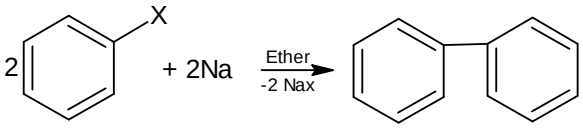
(a) 1-Chloropropane<1-Chlorobutane< 2-Chloropropane

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

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

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

47. The following reaction is called



(a) Wurtz Fitting reaction (b) Fittig reaction

(c) Wurtz reaction (d) Friedel-Crafts reaction

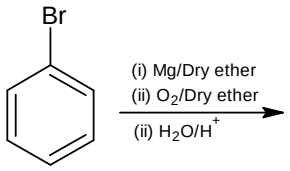
48. Arrange the following compounds in increasing order of solubility in water

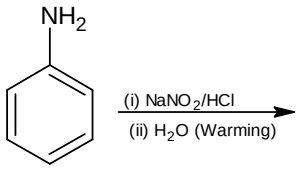
(I). Pentan-1-ol (II) $n-$Butane (III) Pentanal (IV) Ethoxyethane

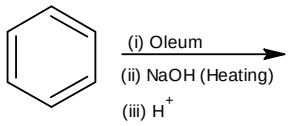
(a) (III)<(IV)<(I)<(II) (b) (IV)<(II)<(III)<(I)

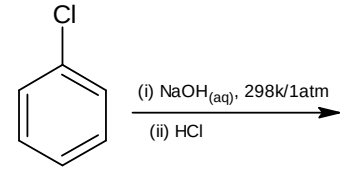
(c) (II)<(IV)<(III)<(I) (d) (II)<(III)<(IV)<(I)

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?

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

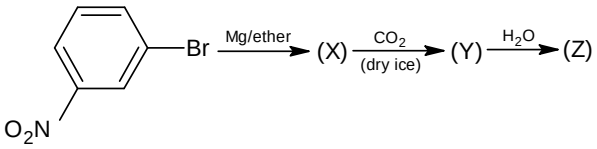
(a) $K_2Cr_2O_7$ in acidic medium
(b) DIBAL-H
(c) PCC
(d) $O_3/H_2O - Zn$ dust

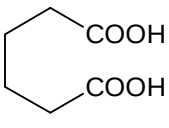
52. Arrange the following compounds in the increasing order of ease of hydrogen bond formation

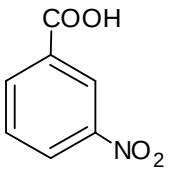
I. $CH_2CH_2CH_2CHO$ II. $CH_3CH_2CH_2CH_2OH$ III. $C_2H_5 - O - C_2H_5$ IV. $CH_3CH_2CH_2COOH$

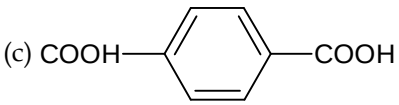
(a) I<III<II<IV (b) III<I<II<IV (c) III<II<IV<I (d) IV<III<II<I

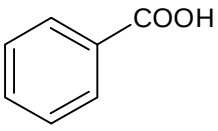
53. What is Z in the following sequence of reactions?



(a) 

(b) 

(c) 

(d) 

54. In Clemmensen's 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 inter conversion of $\alpha-D-$ glucose and $\beta-D-$ glucose in solution is known as

(a) Racemization (b) Specific rotation (c) Inversion (d) Mutarotation

59. The pH value of the solution at which a particular amino acid does not migrate under the influence 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 single 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. $2^{3n}-7n-1$ is divisible by

(a) 36 (b) 64 (c) 49 (d) 25

62. If the product of the roots of the equation $mx^2+6x+(2m-1)=0$ is -1, then the value of m is

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

63. The smallest set A such that $A\cup\{1,2\}=\{1,2,3,5,9\}$ is

Options:

(a) $\{2,3,5\}$ (b) $\{3,5,9\}$ (c) $\{1,2,5,9\}$ (d) None of these

64. Domain of $\sqrt{4x-x^2}$ is

(a) $[0, 4]$ (b) $(0, 4)$ (c) $(0,1)\cup(1,\infty)$ (d) $R-[0, 4]$

65. The range of the function $f(x)=|x-1|$ is

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

66. If $1+2x$ is a function having $(-\infty,\infty)$ as domain and $(-\infty,\infty)$ as codomain, then it is

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

67. Let $f\left(x+\frac{1}{x}\right)=x^2+\frac{1}{x^2}, x\neq 0,$ then $f(x)=$

(a) x^2 (b) x^2-1 (c) x^2-2 (d) x^2+1

68. The value of $\sin 28°\cos 17°+\cos 28°\sin 17°$ is

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

69. If $\cos 20°=k$ and $\cos x=2k^2-1,$ then the possible values of x between $0°$ and $360°$ are

(a) $140°$ (b) $40°$ and $140°$ (c) $50°$ and $130°$ (d) $40°$ and $320°$

70. $\sin 200°+\cos 200°$ is

(a) Negative (b) Positive (c) Zero (d) Zero or positive

71. Two points $(a, 0)$ and $(0, b)$ are joined by a straight line. Another point on this line is

(a) $(3a, -2b)$ (b) (a^2, ab) (c) $(-3a, 2b)$ (d) (a, b)

72. The line passing through $(0,1)$ and perpendicular to the line $x-2y+11=0$ is

(a) $2x-y+1=0$ (b) $2x-y+3=0$ (c) $2x+y-1=0$ (d) $2x+y-2=0$

73. $\lim_{x\to 0}\frac{1-\cos 2x}{\cos 2x-\cos 8x}=$

74. $\lim_{x\to 3^+}\frac{|x-3|}{x-3}$

(a) 1 (b) -1 (c) 0 (d) does not exist

75. If $f(x)=x+2$ when $x\leq 1$ and $f(x)=4x-1$ when $x>1,$ then

(a) $f(x)$ is continuous at $x=1$
(b) $\lim_{x\to 1} f(x)=4$
(c) $f(x)$ is discontinuous at $x=0$
(d) none of these

76. If $A=\begin{bmatrix}4 & 2\\ -1 & 1\end{bmatrix},$ then $(A-2I)(A-3I)=$

(a) A
(b) I
(c) O, where O is null matrix
(d) $5I$

77. If $A=\begin{bmatrix}1 & 3\\ 2 & 1\end{bmatrix}$, then determinant of A^2-2A is

(a) 5 (b) 25 (c) −5 (d) −25

78. Let $\begin{vmatrix}6i & -3i & 1\\ 4 & 3i & -1\\ 20 & 3 & i\end{vmatrix}=x+iy$, then (x, y) is equal to

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

79. $ABCD$ is a parallelogram with AC, BD as diagonals. Then $\overrightarrow{AC}-\overrightarrow{BD}=$

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

80. $ABCDEF$ is a regular hexagon. If $\overrightarrow{AB}=\vec{a}$ and $\overrightarrow{BC}=\vec{b}$, the $\overrightarrow{CD}=$

(a) $\vec{a}+\vec{b}$ (b) $\vec{b}-\vec{a}$ (c) $\vec{a}-\vec{b}$ (d) none of these

81. The position vectors of A, B, C are $\vec{i}+\vec{j}+\vec{k}, 4\vec{i}+5\vec{j}+\vec{k}, 5\vec{i}-2\vec{j}+\vec{k}$. Then the area of ΔABC is

(a) 5 square units (b) $\frac{25}{2}$ square units (c) 25 square units (d) 50 square units

82. Let $\vec{a}=pi+qj$ and $\vec{b}=5i+j$, then $\vec{a}$ & $\vec{b}$ are parallel if

(a) $p+q=5$ (b) $pq=5$ (c) $p=5q$ (d) $q=5p$

83. If n is any integer, then i^n is

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

84. The value of $\tan\left(\frac{1}{2}\cos^{-1}\frac{\sqrt{5}}{3}\right)$ is

(a) $\frac{3-\sqrt{5}}{2}$ (b) $\frac{3+\sqrt{5}}{2}$ (c) $\frac{\sqrt{5}-3}{2}$ (d) none of these

85. If $y=x\sin^{-1}x+\sqrt{1-x^2}$, then $\frac{dy}{dx}=$

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

86. If $y=\sqrt{x\log_e x}$, then $\frac{dy}{dx}$ at $x=e$ is

(a) $\frac{1}{e}$ (b) $\frac{1}{\sqrt{e}}$ (c) $\sqrt{e}$ (d) none of these

87. Let $f(x)=e^x g(x), g(0)=4, g'(0)=2$, then $f'(0)$ is

(a) 1 (b) 3 (c) 2 (d) 6

88. If $y=(\sin x)^{(\sin x)^{(\sin x)\ldots\infty}}$, then $\frac{dy}{dx}=$

(a) $\frac{y^2}{\sin x(1-\log y)}$ (b) $\frac{y^2\sin x}{1-\log y}$ (c) $\frac{y^2\cot x}{1-\log y}$ (d) $\frac{y^2\tan x}{1-\log y}$

89. Derivative of $\tan^{-1}\left(\frac{t}{1+z}\right)$ w.r.t. $\tan^{-1}\left(\frac{z}{1+t}\right)$, where $t=\sin x,\ z=\cos x$ is

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

90. $\sin x+\sqrt{3}\cos x$ is maximum when

(a) $x=60°$ (b) $x=45°$ (c) $x=30°$ (d) $x=0°$

91. A man is walking at the rate of 8 kmph towards the foot of a tower 60 metres high. The rate at which he is approaching the top when he is 80 metres from the foot of the tower is

(a) $6\cdot4$ kmph (b) $\frac{32}{3}$ kmph (c) 6 kmph (d) none of these

92. $\int\frac{x^3}{1+x^8}dx$

(a) $\tan^{-1}\left(x^4\right)+C$ (b) $\frac{1}{4}\tan^{-1}\left(x^4\right)+C$ (c) $\tan^{-1}\left(x^8\right)+C$ (d) None of these

93. $\int e^{3x}\left(x^2+\frac{2x}{3}\right)dx$

(a) $\frac{1}{3}x^2e^{3x}+C$ (b) $x^2e^{3x}+C$ (c) $\frac{1}{9}x^2e^{3x}+C$ (d) None of these

94. If $\int\frac{2^{\frac{1}{x}}}{x^2}dx=K.2^{\frac{1}{x}}$, then K is

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

95. $\int\frac{x}{x-\sqrt{x^2-1}}dx=$

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

96. $\int\frac{dx}{\sqrt{e^{2x}-1}}=$

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

97. $\int_0^1 x\,e^{x^2}dx=$

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

98. $\int_0^{\pi/2}\frac{\sin x\cos x}{1+\sin^4 x}dx=$

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{8}$ (d) $\frac{\pi}{6}$

99. $\int_{-5}^{5} |x+2|\,dx =$

(a) 15 (b) 40 (c) 29 (d) 10

100. The area enclosed by the curve $y = \sin 2x$, $x-$axis and the lines $x = \frac{\pi}{4}$ and $x = \frac{3\pi}{4}$ is

(a) $\frac{1}{2}$ square unit (b) 1 square unit (c) 2 square unit (d) none of these

101. The complete solution of differential equation $\frac{dy}{dx} = 2x+5$ is

(a) $y = x^2 + 5x$

(b) $y = x^2 + 5x + 1$

(c) $y = x^2 + 5x + 2$

(d) $y = x^2 + 5x + c$ where c is an arbitrary constant

102. The equation of the curve, whose slope at any point different from origin is $y + \frac{y}{x}$, is

(a) $y = c\ xe^x, c \neq 0$ (b) $y = xe^x$ (c) $xy = e^x$ (d) $y + xe^x = c$

103. Equation of line passing through $(1, 0, 2)$ intersecting the line $\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z+1}{-1}$ at right angles is:

(a) $\frac{x-1}{3} = \frac{y}{2} = \frac{z-2}{1}$ (b) $\frac{x+1}{3} = \frac{y}{2} = \frac{z+1}{-1}$ (c) $\frac{x-1}{1} = \frac{y}{-2} = \frac{z-2}{7}$ (d) $\frac{x+1}{2} = \frac{y-1}{3} = \frac{z-1}{4}$

104. The maximum value of $z = 10x + 9y$ subject to the conditions $x + y \leq 50;\ 2x + y \leq 80;\ x \geq 0,\ y \geq 0$ is

(a) 500 (b) 450 (c) 480 (d) None of these

105. A card from a pack of 52 cards is lost. From the remaining cards a card is drawn and found to be spade. The probability that the card lost in spade:

(a) $\frac{12}{52}$ (b) $\frac{13}{51}$ (c) $\frac{12}{51}$ (d) None of these

106. A die is thrown 3 times. The probability of getting different number is:

(a) $\frac{5}{36}$ (b) $\frac{5}{9}$ (c) $\frac{13}{36}$ (d) None of these

107. Integrating factor of $x\frac{dy}{dx} - y = x^4 - 3x$ is

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

108. The value of $\int \frac{e^{6\log x} - e^{5\log x}}{e^{4\log x} - e^{3\log x}} dx$ is equal to

(a) $\frac{3}{x^3}$ (b) 0 (c) $\frac{1}{x}$ (d) $\frac{x^3}{3}$

109. If the straight lines $2x+3y-3=0$ and $x+ky+7=0$ are perpendicular, then the value of k is

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

110. If A is any square matric of order 3×3 then $|3A|$ is equal to

(a) $27|A|$ (b) $3|A|$ (c) $9|A|$ (d) $\frac{1}{3}|A|$

111. The solution for the differential equation $\frac{dy}{y}+\frac{dx}{x}=0$ is

(a) $xy=c$ (b) $\frac{1}{y}+\frac{1}{x}=c$ (c) $x+y=c$ (d) $\log x\cdot\log y=c$

112. The value of $\int\frac{e^x(1+x)dx}{\cos^2(e^x\cdot x)}$ is equal to

(a) $\tan(e^x)+c$ (b) $-\cot(e\cdot x^x)+c$ (c) $\cot(e^x)+c$ (d) $\tan(e^x\cdot x)+c$

113. The set A has 4 elements and the set B has 5 elements then the number of injective mappings that can be defined from A to B is

(a) 60 (b) 144 (c) 120 (d) 72

114. The value of $\int_2^8\frac{\sqrt{10-x}}{\sqrt{x}+\sqrt{10-x}}dx$ is

(a) 8 (b) 10 (c) 3 (d) 0

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

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

116. The distance of the point $(-2,\ 4,\ -5)$ from the line $\frac{x+3}{3}=\frac{y-4}{5}=\frac{z+8}{6}$ is

(a) $\frac{\sqrt{37}}{10}$ (b) $\sqrt{\frac{37}{10}}$ (c) $\frac{37}{\sqrt{10}}$ (d) $\frac{37}{10}$

117. Two events A and B will be independent if

(a) A and B are mutually exclusive

(b) $P(A'\cap B')=(1-P(A))(1-P(B))$

(c) $P(A)=P(B)$

(d) $P(A)+P(B)=1$

118. If $\vec{a},\vec{b},\vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then the value of $\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$ is equal to

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

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

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

120. The eccentricity of the ellipse $\frac{x^2}{36}+\frac{y^2}{16}=1$ is

(a) $\frac{2\sqrt{5}}{6}$ (b) $\frac{2\sqrt{5}}{4}$ (c) $\frac{2\sqrt{13}}{6}$ (d) $\frac{2\sqrt{13}}{4}$

Physics

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

121. The potential energy of a satellite, having mass m and rotating at a height of 6.4×10^6 m from the earth surface, is

(a) $-mgR_e$ (b) $-0.67\,mgR_e$ (c) $-0.5\,mgR_e$ (d) $-0.33\,mgR_e$

122. Which of the following statements is correct regarding Poisson's ratio?

(a) It is the ratio of the longitudinal strain to the lateral strain

(b) Its value is independent of the nature of the material

(c) It is unitless and dimensionless quantity

(d) The practical value of Poisson's ratio lies between 0 and 1

123. The wheel of a car is rotating at the rate of 1200 revolutions per minute. On pressing the accelerator for 10 seconds. It starts rotating at 4500 revolutions per minute. The angular acceleration of the wheel is

(a) 30 radians/second^2 (b) 1880 degree/second^2 (c) 40 radians/second^2 (d) 1980 degree/second^2

124. The cylindrical tube of a spray pump has a cross-section of $8\,\text{cm}^2$, one end of which has 40 fine holes each of area $10^{-8}\,\text{m}^2$. If the liquid flows inside the tube with a speed of $0.15\,\text{m min}^{-1}$, the speed with which the liquid is ejected through the hole is

(a) 50 ms^{-1} (b) 5 ms^{-1} (c) 0.05 ms^{-1} (d) 0.5 ms^{-1}

125. A beaker is completely filled with water at $4°\text{C}$. It will overflow, if

(a) heated above $4°\text{C}$

(b) cooled below $4°\text{C}$

(c) both heated and cooled above and below $4°\text{C}$ respectively

(d) none of these

126. A graph is plotted with PV/T on $y-$axis and mass of the gas along $x-$axis for different gases. The graph is

(a) a straight line parallel to $x-$axis for all the gases

(b) a straight line passing through origin with a slope having a constant value for all the gases

(c) a straight line passing through origin with a slope having different values for different gases

(d) a straight line parallel to $y-$axis for all the gases

127. A perfect gas contained in a cylinder is kept in vacuum. If the cylinder suddenly bursts, then the temperature of the gas

(a) remains constant (b) becomes zero (c) increases (d) decreases

128. If the length of a simple pendulum is increased by 2%, then the time period

(a) increases by 2% (b) decreases by 2% (c) increases by 1% (d) decreases by 1%

129. A 5.5 metre long string has a mass of $0.035\,\text{kg}$. If the tension in the string is 77 N, the speed of a wave on the string is

(a) $110\ \text{ms}^{-1}$ (b) $165\ \text{ms}^{-1}$ (c) $77\ \text{ms}^{-1}$ (d) $102\ \text{ms}^{-1}$

130. One metallic sphere A is given positive charge whereas another identical metallic sphere B of exactly same mass as of A is given equal amount of negative charge. Then

(a) mass of A and mass of B still remain equal

(b) mass of A increases

(c) mass of B decreases

(d) mass of B increases

131. If the electric field is given by $\left(5\hat{i}+4\hat{j}+9\hat{k}\right)$. The electric flux through a surface of area 20 units lying in the $Y-Z$ plane will be

(a) 100 units (b) 80 units (c) 180 units (d) 20 units

132. Three concentric metal shells A, B and C of respective radii a,b and $c\left(a<b<c\right)$ have surface charge densities $+\sigma, -\sigma$ and $+\sigma$ respectively. The potential of shell B is

(a) $\frac{\sigma}{\varepsilon_0}\left[\frac{a^2-b^2}{a}+c\right]$ (b) $\frac{\sigma}{\varepsilon_0}\left[\frac{a^2-b^2}{b}+c\right]$ (c) $\frac{\sigma}{\varepsilon_0}\left[\frac{b^2-c^2}{b}+a\right]$ (d) $\frac{\sigma}{\varepsilon_0}\left[\frac{b^2-c^2}{c}+a\right]$

133. Equal charges q are placed at the four corners A,B,C,D of a square of length a. The magnitude of the force on the charge at B will be

(a) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (b) $\frac{4q^2}{4\pi\varepsilon_0 a^2}$

(c) $\left(\frac{1+2\sqrt{2}}{2}\right)\frac{q^2}{4\pi\varepsilon_0 a^2}$ (d) $\left(2+\frac{1}{\sqrt{2}}\right)\frac{q^2}{4\pi\varepsilon_0 a^2}$

134. Two points P and Q are maintained at the potentials of $10\,\text{V}$ and $-4\,\text{V}$, respectively. The work done in moving 100 electrons from P and Q is

(a) $9.60\times10^{-7}\ \text{J}$ (b) $-2.24\times10^{-16}\ \text{J}$ (c) $2.24\times10^{-16}\ \text{J}$ (d) $-9.60\times10^{-17}\ \text{J}$

135. A parallel plate capacitor with air between the plates has a capacitance of $9\,\text{pF}$. The separation between its plates is 'd'. The space between the plates is now filled with two dielectrics. One of the dielectrics has dielectric constant $k_1=3$ and thickness $d/3$ while the other one has dielectric constant $k_2=6$ and thickness $2d/3$. Capacitance of the capacitor is now

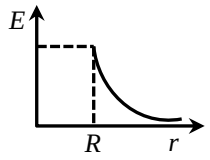
(a) 45 pF (b) 40.5 pF (c) 20.25 pF (d) 1.8 pF

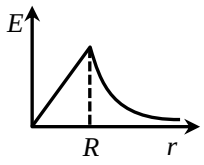
136. An oil drop of radius r and density ρ is held stationary in a uniform vertically upwards electric field $'E'$. If $\rho_0 (< \rho)$ is the density of air and e is charge on electron, then the drop has -

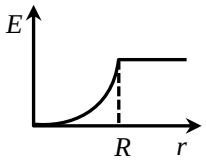
(a) $\frac{4\pi r^3 (\rho - \rho_0) g}{3eE}$ excess electrons (b) $\frac{4\pi r^2 (\rho - \rho_0) g}{3eE}$ excess electrons

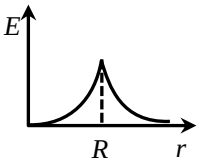
(c) deficiency of $\frac{4\pi r^3 (\rho - \rho_0) g}{3eE}$ electrons (d) deficiency of $\frac{4\pi r^2 (\rho - \rho_0) g}{eE}$ electrons

137. Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre of the spherical conductor?

(a) 

(b) 

(c) 

(d) 

138. In the equation $AB = C$, A is the current density, C is the electric field, then B is

(a) Resistivity (b) Conductivity (c) Potential difference (d) Resistance

139. If negligibly small current is passed through a wire of length $15\,\text{m}$ and of resistance $5\,\Omega$ having uniform cross-section of $6\times10^{-7}\,\text{m}^2$, then coefficient of resistivity of material, is

(a) $1\times10^{-7}\,\Omega-\text{m}$ (b) $2\times10^{-7}\,\Omega-\text{m}$ (c) $3\times10^{-7}\,\Omega-\text{m}$ (d) $4\times10^{-7}\,\Omega-\text{m}$

140. A current of $1\,\text{mA}$ flows through a copper wire. How many electrons will pass through a given point of wire in each second?

(a) 6.25×10^{8} (b) 6.25×10^{31} (c) 6.25×10^{15} (d) 6.25×10^{19}

141. The number of free electrons per $100\,\text{mm}$ of ordinary copper wire is 2×10^{21}. Average drift speed of electrons is $0.25\ \text{mm s}^{-1}$. The current flowing is

(a) $5\,\text{A}$ (b) $80\,\text{A}$ (c) $8\,\text{A}$ (d) $0.8\,\text{A}$

142. We are able to obtain fairly large currents in a conductor because

(a) The electron drift speed is usually very large

(b) The number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge

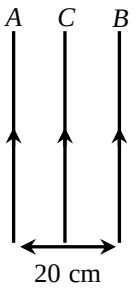
(c) The number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge

(d) The very small magnitude of the electrons charge has to be divided by the still smaller product of the number density and drift speed to get the electric current

143. 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 per $°\text{C}$]

(a) 36°C (b) 83°C (c) 63°C (d) 33°C

144. In the adjoining figure, two very long parallel wires A and B carry currents of 10 ampere and 20 ampere respectively, and are at a distance $20\,\text{cm}$ apart. If a third wire C (length $15\,\text{cm}$) having a current of 10 ampere is placed midway between them, then how much force will act on C. The direction of current in all the three wires is same.



(a) $3\times10^{-5}\ \text{N}\ (\text{left})$ (b) $3\times10^{-5}\ \text{N}\ (\text{right})$ (c) $6\times10^{-5}\ \text{N}\ (\text{left})$ (d) $6\times10^{-5}\ \text{N}\ (\text{right})$

145. In a moving coil galvanometer, the deflection of the coil θ is related to the electrical current i by the relation

(a) $i\propto\tan\theta$ (b) $i\propto\theta$ (c) $i\propto\theta^2$ (d) $i\propto\sqrt{\theta}$

146. A beam of electrons is moving with constant velocity in a region having simultaneous perpendicular electric and magnetic fields of strength $20\,\text{Vm}^{-1}$ and $0.5\,\text{T}$ respectively at right angles to the direction of motion of the electrons. Then the velocity of electrons must be

(a) $8\ \text{ms}^{-1}$ (b) $20\ \text{ms}^{-1}$ (c) $40\ \text{ms}^{-1}$ (d) $\frac{1}{40}\ \text{ms}^{-1}$

147. At what distance from a long straight wire carrying a current of $12\,\text{A}$ will the magnetic field be equal to $3\times10^{-5}\ \text{Wb m}^{-2}$?

(a) $8\times10^{-2}\ \text{m}$ (b) $12\times10^{-2}\ \text{m}$ (c) $18\times10^{-2}\ \text{m}$ (d) $24\times10^{-2}\ \text{m}$

148. A coil in the shape of an equilateral triangle of side $0.02\,\text{m}$ is suspended from its vertex such that it is hanging in a vertical plane between the pole pieces of permanent magnet producing a uniform field of $5\times10^{-2}\ \text{T}$. If a current of 0.1A is passed through the coil, what is the couple acting?

(a) $5\sqrt{3}\times10^{-7}\ \text{N}-\text{m}$ (b) $5\sqrt{3}\times10^{-10}\ \text{N}-\text{m}$ (c) $\frac{\sqrt{3}}{5}\times10^{-7}\ \text{N}-\text{m}$ (d) none of these

149. The distance at which the magnetic field on axis as compared to the magnetic field at the center of the coil carrying current I and radius R is $\frac{1}{8}$, would be

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

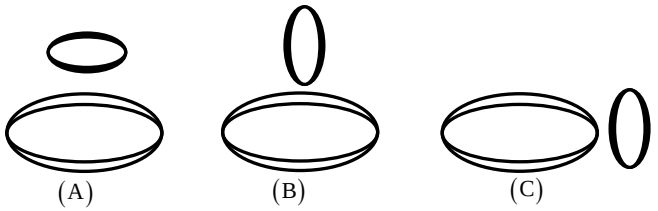
150. Magnetic permeability is maximum for

(a) diamagnetic substance (b) paramagnetic substance
(c) ferromagnetic substance (d) All of the above

151. A magnetic field of 2×10^{-2} T acts at right angles to a coil of area $100\,cm^2$, with 50 turns. The average e.m.f. induced in the coil is 0.1 V, when it is removed from the field in t s. The value of t is

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

152. Two circular coils can be arranged in any of the three situations shown in the figure. Their mutual inductance will be



(a) maximum in situation (A) (b) maximum in situation (B)

(c) maximum in situation (C) (d) the same in all situation

153. In an A.C. circuit with voltage V and current I the power dissipated is

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

(c) VI (d) dependent on the phase between V and I

154. A 100 μF capacitor in series with a 40 Ω resistance is connected to a 100 V, 60 Hz supply. What is the maximum current in the circuit?

(a) 3.24 A (b) 4.25 A (c) 2.25 A (d) 5.20 A

155. An alternating current in a circuit is given by $I = 20\sin(100\pi t + 0.05\pi)$ A. The r.m.s. value and the frequency of current respectively are

(a) 10 A and 100 Hz (b) 10 A and 50 Hz (c) $10\sqrt{2}$ A and 50 Hz (d) $10\sqrt{2}$ A and 100 Hz

156. The decreasing order of wavelength of infrared, microwave, ultraviolet and gamma rays is

(a) Microwave, infrared, ultraviolet, gamma rays

(b) Infrared, microwave, ultraviolet, gamma rays

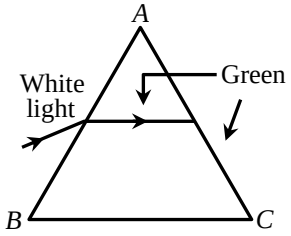
(c) Gama rays, ultraviolet, infrared, microwaves

(d) Microwaves, gamma rays, infrared, ultraviolet

157. Two lenses of power +12 and −2 diopters are placed in contact. The combined focal length of the combination will be

(a) 8.33 cm (b) 16.6 cm (c) 12.5 cm (d) 10 cm

158. White light is incident on face AB of a glass prism. The path of the green component is shown in the figure. If the green light is just totally internally reflected at face AC as shown, the light emerging from face AC will contain



(a) yellow, orange and red colours

(b) violet, indigo and blue colours

(c) all colours

(d) all colours except green

159. A 2.0 cm tall object is placed 15 cm in front of a concave mirror of focal length 10 cm . What is the size and nature of the image?

(a) 4 cm , real (b) 4 cm , virtual (c) 1.0 cm , real (d) none of these

160. A vessel of depth $2d$ cm is half filled with a liquid of refractive index μ_1 and the upper half with a liquid of refractive index μ_2 . The apparent depth of the vessel seen perpendicularly is

(a) $d\left(\frac{\mu_1\mu_2}{\mu_1+\mu_2}\right)$ (b) $d\left(\frac{1}{\mu_1}+\frac{1}{\mu_2}\right)$ (c) $2d\left(\frac{1}{\mu_1}+\frac{1}{\mu_2}\right)$ (d) $2d\left(\frac{1}{\mu_1\mu_2}\right)$

161. Two sources of light are said to be coherent, when they give light waves of same

(a) Amplitude and phase (b) Wavelength and constant phase difference

(c) Intensity and wavelength (d) Phase and speed

162. Raito of intensities of two waves are given by $4:1$. Then the ratio of the amplitudes of the two waves is

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

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

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

164. When a metal surface is illuminated by light of wavelengths $400\,\text{nm}$ and $250\,\text{nm}$, the maximum velocities of the photoelectrons ejected are υ and 2υ respectively. The work function of the metal is ($h=$ Planck's constant, $c=$ velocity of light in air)

(a) $2hc\times10^6$ J (b) $1.5hc\times10^6$ J (c) $hc\times10^6$ J (d) $0.5hc\times10^6$ J

165. As the quantum number increases, the difference of energy between consecutive energy levels

(a) remain the same

(b) increases

(c) decreases (d) sometimes increases and sometimes decreases

166. According to the Bohr theory of H-atom, the speed of the electron, its energy and the radius of its orbit varies with the principal quantum number n, respectively, as

(a) $\frac{1}{n},n^2\frac{1}{n^2}$ (b) $n,\frac{1}{n^2},n^2$ (c) $n,\frac{1}{n^2},\frac{1}{n^2}$ (d) $\frac{1}{n},\frac{1}{n^2},n^2$

167. The electron in a hydrogen atom makes a transition $n_1\to n_2$, where n_1 and n_2 are the principal quantum numbers of the two states. Assume the Bohr model to be valid. The time period of the electron in the initial state is eight times that in the final state. The possible values of n_1 and n_2 are

(a) $n_1=4,\ n_2=2$ (b) $n_1=8,\ n_2=2$ (c) $n_1=8,\ n_2=1$ (d) $n_1=6,\ n_2=3$

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

(a) Increases continuously with mass number

(b) Decreases continuously with mass number

(c) Remains constant with mass number

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

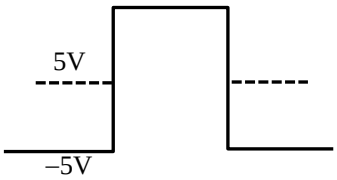
169. A nuclei having same number of neutron but different number of protons/atomic number are called

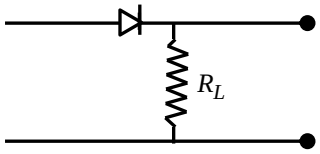
(a) Isobars (b) Isomers (c) Isotones (d) Isotopes

170. If $220\,\text{MeV}$ energy is released in the fission of a single U^{235} nucleus, the number of fissions required per second to produce 1 kilowatt power shall be (Given $1\text{eV} = 1.6\times10^{-19}\,\text{J}$)

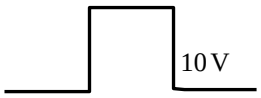
(a) 3.125×10^{13} (b) 3.125×10^{14} (c) 3.125×10^{15} (d) 3.125×10^{16}

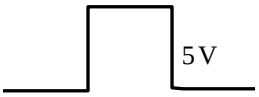
171. In a $p-n$ junction diode, a square input signal of $10\,\text{V}$ is applied as shown in fig.

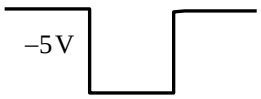


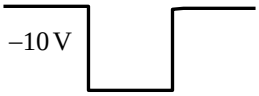


The output signal across R_L will be

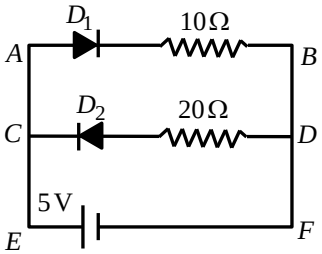
(a) 

(b) 

(c) 

(d) 

172. Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is



(a) $0.75\,\text{A}$ (b) zero (c) $0.25\,\text{A}$ (d) $0.5\,\text{A}$

173. A p-type semiconductor is

(a) Positively charged

(b) Negative charged

(c) Uncharged

(d) Uncharged at $0\,\text{K}$ but charged at height temperatures

174. A charged particle of charge q and mass m enters perpendicularly in a magnetic field $\vec{B}$. Kinetic energy of the particle is E; then frequency of rotation is

(a) $\frac{qB}{m\pi}$ (b) $\frac{qB}{2\pi m}$ (c) $\frac{qBE}{2\pi m}$ (d) $\frac{qB}{2\pi E}$

175. Which of the following is the most precise instrument for measuring length?

(a) Metre rod of least count 0.1 cm
(b) Vernier callipers of least count 0.01 cm
(c) Screw gauge of least count 0.001 cm
(d) None of these

176. The water drops fall at regular intervals from a tap $5\,\text{m}$ above the ground. The third drop is leaving the tap at an instant when the first drop touches the ground. How far above the ground is the second drop at that instant? (Take $g = 10\ \text{ms}^{-2}$)

(a) 1.25 m
(b) 2.50 m
(c) 3.75 m
(d) 5.00 m

177. A particle starts from origin at $t = 0$ with velocity $5\hat{i}\ \text{ms}^{-1}$ and moves in $x - y$ plane under the action of a force which produces a constant acceleration of $3\hat{i} + 2\hat{j}\ \text{ms}^{-2}$. The $y-$coordinate of the particle at the instant when its $x-$coordinate is $84\,\text{m}$, is

(a) 12 m
(b) 24 m
(c) 36 m
(d) 48 m

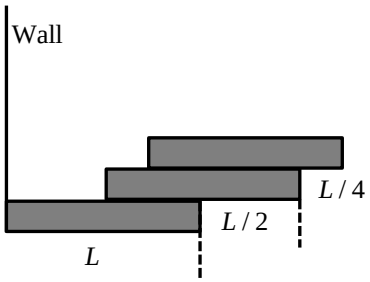
178. A block weighs W is held against a vertical wall by applying a horizontal force F. The minimum value of F needed to hold the block is

(a) Less than W
(b) Equal to W
(c) Greater than W
(d) Data is insufficient

179. A running man has half the kinetic energy of that of a boy of half of his mass. The man speeds up by 1ms^{-1} so as to have same K.E. as that of the boy. The original speed of the man will be

(a) $\sqrt{2}\ \text{ms}^{-1}$
(b) $\left(\sqrt{2}-1\right)\text{ms}^{-1}$
(c) $\frac{1}{\left(\sqrt{2}-1\right)}\text{ms}^{-1}$
(d) $\frac{1}{\sqrt{2}}\text{ms}^{-1}$

180. Three bricks each of length L and mass M arranged as shown from the wall. The distance of the centre of mass of the system from the wall is



(a) $\frac{L}{4}$
(b) $\frac{L}{2}$
(c) $\left(\frac{3}{2}\right)L$
(d) $\left(\frac{11}{12}\right)L$