Deeksha

ABHYAS KCET 2024

FREE TEST SERIES

Mock Test 5 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. Of the ions Zn^{2+}, Co^{3+} and Cr^{3+} (At. Nos. $Zn = 30, Ni = 28, Cr = 24$)

   (a) Only Zn^{2+} is colourless and Co^{3+} and Cr^{3+} are coloured

   (b) All three are colourless

   (c) All three are coloured

   (d) Only Co^{3+} is coloured and Zn^{2+} and Cr^{3+} are colourless

2. Mercury is liquid at room temperature. This is due to the

   (a) High viscosity of mercury

   (b) Weak metallic bonding and weak van der Waals forces

   (c) Large surface tension of mercury

   (d) Strong metallic bonding and strong van der Waals forces

3. Which of the following are d – block elements but not regarded as transition elements?

   (a) Cu, Ag, Au (b) Ru, Rh, Pd (c) Fe, Co, Ni (d) Zn, Cd, Hg

4. The correct order of ionic radii of $Yb^{3+}, La^{3+}, Eu^{3+}$ and Lu^{3+} is

   (a) $Yb^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (b) $Lu^{3+} < Eu^{3+} < La^{3+} < Yb^{3+}$

   (c) $Lu^{3+} < Yb^{3+} < Eu^{3+} < La^{3+}$ (d) $La^{3+} < Eu^{3+} < Yb^{3+} < Lu^{3+}$

5. The hypothetical complex triamminediaquachloridocobalt(III) chloride can be represented as

   (a) $\left[Co(NH_3)_3(H_2O)_2Cl\right]Cl_2$ (b) $\left[Co(NH_3)_3(H_2O)Cl_3\right]$

   (c) $\left[Co(NH_3)_3(H_2O)_2Cl\right]$ (d) $\left[Co(NH_3)_3(H_2O)_3\right]Cl_3$

6. Which of the following speies represents the example of dsp^2 – hybridization?

   (a) $\left[Fe(CN)_6\right]^{3-}$ (b) $\left[Ni(CN)_4\right]^{2-}$ (c) $\left[Zn(NH_3)_4\right]^{2+}$ (d) $\left[FeF_6\right]^{3-}$

7. The compound which does not show paramagnetism is

   (a) $\left[Cu(NH_3)_4\right]Cl_2$ (b) $\left[Ag(NH_3)_2\right]Cl$ (c) NO (d) NO_2

8. Which of the following solutions will exhibit highest boiling point?

   (a) 0.01 M $Na_2SO_4(aq)$ (b) 0.01 M $KNO_3(aq)$

   (c) 0.015 M urea (aq) (d) 0.015 M glucose (aq)

9. Osmotic pressure observed when benzoic acid is dissolved in benzene is less than that expected from theoretical considerations. This is because

   (a) Benzoic acid is an organic solute

   (b) Benzoic acid has higher molar mass than benzene

   (c) Benzoic acid gets associated in benzene

   (d) Benzoic acid gets dissociated in benzene

10. The standard reduction potential values of the elements A, B and C are $+0.34$ V, -3.05 V and $+2.86$ V respectively. The order of their oxidising power will be

(a) B > A > C (b) A < B < C (c) B < A < C (d) C < B < A

11. For hydrogen-oxygen fuel cell at one atm and 298 K

$H_2(g)+\frac{1}{2}O_2(g)\rightarrow H_2O(l);$

$\Delta G^\circ = -240$ kJ

E° for the cell is approximately,(Given $F = 96,500$ C)

(a) 1.24 V (b) 1.26 V (c) 2.48 V (d) 2.5 V

12. $RCOOR' + H_2O \xrightarrow{(HCl)} RCOOH + R'OH$ what type of reaction is this?

(a) Second order (b) Unimolecular (c) Pseudounimolecular (d) Third order

13. Half life period of a reaction is found to be inversely proportional to the cube of the initial concentration. The order of reaction is

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

14. The incorrect relation for a first order reaction is

(a) $t_{99\%} = 2\times t_{90\%}$ (b) $k=\frac{2.303}{t}\log\frac{[R]_0}{[R]}$

(c) $k=\frac{[R]_0-[R]}{t}$ (d) $[R]=[R]_0 e^{-kt}$

15. For reaction, $2N_2O_5 \longrightarrow 4NO_2 + O_2$, rate and rate constant are 1.02×10^{-4} mol L^{-1} sec^{-1} and 3.4×10^{-5} sec^{-1} The concentration of N_2O_5 at that time will be

(a) 1.732 mol L^{-1} (b) 3 mol L^{-1} (c) 1.02×10^{-4} mol L^{-1} (d) 3.2×10^{5} mol L^{-1}

16. A reaction is first order in A and second order in B. How is the rate affected when the concentrations of both A and B are doubled?

(a) 5 times (b) 8 times (c) 4 times (d) 9 times

17. A reaction which is of first order w.r.t reactant A, has a rate constant $0.6\,min^{-1}$. If we start with $[A] = 0.5$ mol L^{-1}, when would $[A]$ reach the value of 0.05 mol L^{-1}

(a) 0.384 min (b) 0.15 min (c) 3 min (d) 3.84 min

18. If the standard electrode potential of Cu^{2+}/Cu electrode is 0.34 V, what is the electrode potential of 0.01M concentration of Cu^{2+} ?$(T = 298K)$

(a) 0.399 V (b) 0.281 V (c) 0.222 V (d) 0.176 V

19. Molar conductivities at infinite dilution at 293 K for aqueous HCl, CH_3COONa and $NaCl$ are $384, 78$ and 102 S cm^2 mol^{-1} respectively. The molar conductivity of CH_3COOH at some other dilution is 108 S cm^2 mol^{-1} at 293 K. Calculate the degree of ionization of acetic acid at the given dilution.

Options:

(a) 0.150 (b) 0.6 (c) 0.3 (d) 0.48

20. H_2S a toxic gas with rotten egg like smell, is used for qualitative analysis. If the mole fraction of H_2S in water at STP is 0.004 , Henry's law constant is

(a) 300 atm (b) 250 atm (c) 100 atm (d) 125 atm

21. A binary liquid solution is prepared by mixing $n-$heptane and ethanol. Which one of the following statements is correct regarding the behaviour of the solution?

(a) The solution formed is an ideal solution.

(b) The solution is non- ideal, showing +ve deviation from Raoult's law

(c) The solution is non- ideal, showing -ve deviation from Raoult's law

(d) $n-$Heptane shows +ve deviation while ethanol shows –ve deviation from Raoult's law

22. 45 g of ethylene glycol $(C_2H_6O_2)$ is mixed with 600g of water. The freezing point depression is

(a) 3.5 (b) 2.25 (c) 4.3 (d) 5.4

23. The decreasing order of osmotic pressure of 10 g glucose (P_1),$10g$ urea (P_2) and 10 g sucrose (P_3) at 273 K when dissolved in 250 mL of water separately is

(a) $P_1 > P_2 > P_3$ (b) $P_3 > P_3 > P_1$ (c) $P_2 > P_1 > P_3$ (d) $P_3 > P_2 > P_1$

24. On analysis a certain compound was found to contain 254g of iodine (at. mass 127) and 64g oxygen (at. mass 16). What is the formula of the compound?

(a) IO (b) I_2O_4 (c) I_2O_3 (d) I_2O_5

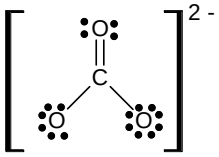
25. Nitrogen laser produces a radiation at a wavelength of 337.1 nm. If the number of photons emitted is 5.6×10^{24}, the power of this laser is

(a) $2.3\times10^{6}\,\text{J}$ (b) $3.3\times10^{6}\,\text{J}$ (c) $4.3\times10^{-7}\,\text{J}$ (d) $5.3\times10^{-6}\,\text{J}$

26. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species?

(a) $Cl < F < S < O$ (b) $O < S < F < Cl$ (c) $S < O < Cl < F$ (d) $F < Cl < O < S$

27. In the following structure of CO_3^{2-}, formal charges on carbon atom, double bonded oxygen atom and single bonded oxygen atom are respectively.



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

28. Which of the following pairs is isoelectronic?

(a) Ar and Cl (b) Na^+ and Ne (c) Na^+ and Mg (d) Mg and Ne

29. A system is provided with $50J$ of heat and work done on the system is $10J$. The change in internal energy during the process is:

(a) $40J$ (b) $60J$ (c) $80J$ (d) $50J$

30. Values of ΔH and ΔS for four different reactions are given below:

Reaction	$\Delta H\left(\text{kJ mol}^{-1}\right)$	$\Delta S\left(\text{kJ mol}^{-1}\right)$
I	+98.0	+14.8
II	-55.5	-84.8
III	+28.3	-17.0
IV	-40.5	+24.6

On the basis of these values predict which one of these will be spontaneous at all temperatures?

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

31. $NH_4COONH_{2(s)} \rightleftharpoons 2NH_{3(g)} + CO_{2(g)}$. 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

32. pH of the solution at $25°C$ is 2. If the pH is to be doubled then the hydronium ion concentration of the solution should be

(a) Halved (b) Doubled

(c) Increased to 100 times (d) Decreased to 100 times

33. In the reaction, $3I_2 + 6NaOH \rightarrow NaIO_3 + 5NaI + 3H_2O$ oxidising agent is

(a) $NaOH$ (b) $NaIO_3$ (c) I_2 (d) Nal

34. Which of the following is the correct order of radius

(a) $H^- > H > H^+$ (b) $Na^+ > F^- > O^{2-}$ (c) $F^- > O^{2-} > Na^+$ (d) $Al^{3+} > Mg^{2+} > N^{3-}$

35. The set representing the correct order of first ionization potential is

(a) K > Na > Li (b) Be > Mg > Ca (c) Ge > Si > C (d) B > C > N

36. The correct statement is

(a) The extent of actinoid contraction is almost the same as lanthanoid contraction.

(b) Ce^{+4} in aqueous solution is not known.

(c) The earlier members of lanthanoid series resemble calcium in their chemical properties.

(d) In general, lanthanoids and actinoids do not show variable oxidation states.

37. The correct order of reactivity towards electrophilic substitution is

(a) Phenol>benzene> chlorobenzene>benzoic acid

(b) Benzoic acid> chlorobenzene >benzene >phenol

(c) Phenol > chlorobenzene> benzene >benzoic acid

(d) Benzoic acid > Phenol> benzene >chlorobenzene

38. Which of the following pairs of elements cannot form an alloy?

(a) Zn, Cu (b) Fe, Hg (c) Fe, C (d) Hg, Na

39. Which among the following is the strongest ligand?

(a) CN^- (b) CO (c) NH_3 (d) en

40. Cationic complex is

(a) hexa amino platinum chloride (b) potassium ferrocyanide

(c) sodium argentocyanide (d) nickel carbonyl

41. The compound that exhibit geometrical isomerism are

(I) $\left[Pt(en)Cl_2\right]$ (ii) $\left[Pt(en)_2\right]Cl_2$ (iii) $\left[Pt(en)_2Cl_2\right]Cl_2$ (iv) $\left[Pt(NH_3)_2Cl_2\right]$

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

42. The product of reaction of alcoholic silver nitrite with ethyl bromide is

(a) Ethane (b) Ethene (c) Ethyl alcohol (d) Nitroethane

43. In which case formation of butane nitrile is possible?

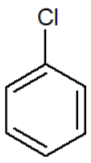
(a) $C_3H_7Br + KCN$ (b) $C_4H_9Br + KCN$ (c) $C_3H_7OH + KCN$ (d) $C_4H_9OH + KCN$

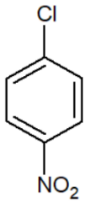
44. An alkyl chloride produces a single alkene on reaction with sodium ethoxide and ethanol. The alkene further undergoes hydrogenation to yield 2-methylbutane. Identify the alkyl chloride from the following

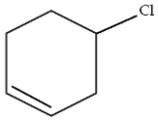
(a) $ClCH_2C(CH_3)_2CH_3$ (b) $ClCH_2CH_2CH_2CH_3$

(c) $ClCH_2CH(CH_3)CH_2CH_3$ (d) $CH_3C(Cl)(CH_3)CH_2CH_3$

45. The compound having longest C-Cl bond is

(a) 

(b) 

(c) 

(d) $CH_2 = CH - Cl$

46. An organic compound (A) reacts with sodium metal and forms (B). On heating with conc. H_2SO_4 (A) gives diethylether. (A) and (B) are respectively

(a) C_2H_5OH and C_2H_5ONa

(b) C_3H_7OH and CH_3ONa

(c) CH_3OH and CH_3ONa

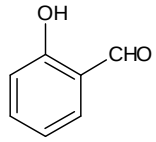
(d) C_4H_9OH and C_4H_9ONa

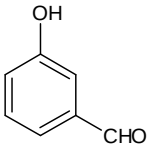
47. Identify Z in the following series: $C_2H_5OH \xrightarrow{PBr_3} X \xrightarrow{alc.\,KOH} Y \xrightarrow[(ii)\,H_2O+\text{heat}]{(i)\,H_2SO_4} Z$

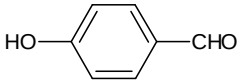
(a) $CH_2 = CH_2$ (b) $CH_3 - CH_2OH$

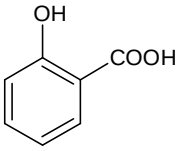
(c) $CH_3 - CH_2 - O - CH_2 - CH_3$ (d) $CH_3 - CHO$

48. What is the major product obtained when phenol is treated with chloroform and aqueous alkali?

(a) 

(b) 

(c) 

(d) 

49. Which is not true about acetophenone ($C_6H_5COCH_3$) ?

(a) Reacts to form 2, 4- dinitrophenylhydrazone

(b) Reacts with Tollens' reagent to form silver mirror

(c) Reacts with $I_2/NaOH$ to form iodoform

(d) On oxidation with alkaline $KMnO_4$ followed by hydrolysis gives benzoic acid

50. Propanal on treatment with dilute sodium hydroxide forms

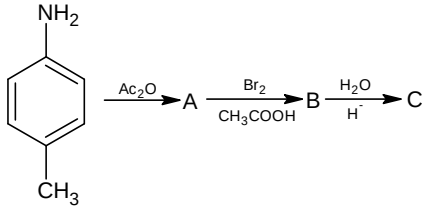
(a) $CH_3CH_2CH_2CH_2CH_2CHO$ (b) $CH_3CH_2CH(OH)CH_2CH_2CHO$

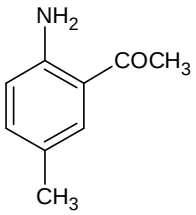
(c) $CH_3CH_2CH(OH)CH(CH_3)CHO$ (d) CH_3CH_2COONa

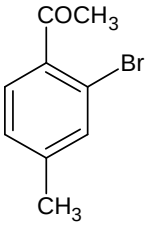
51. Which of the following is the strongest acid?

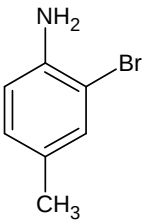
(a) CF_3COOH (b) CBr_3COOH (c) CH_3COOH (d) CCl_3COOH

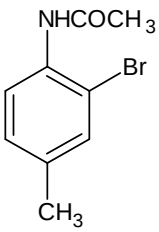
52. Identify C



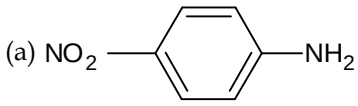
(a) 

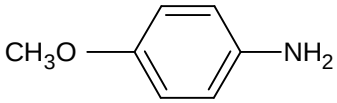
(b) 

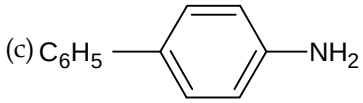
(c) 

(d) 

53. Which of the following is least basic?

(a) 

(b) 

(c) 

(d) All are equally basic

54. Which amine amongst the following will positively answer the carbylamines test (i.e., heating with $CHCl_3$ and KOH)?

(a) $C_6H_5-NH-CH_3$ (b) $CH_3-C_6H_4-NH_2$

(c) $C_6H_5-NH-C_4H_9$ (d) $C_6H_5-N\left(C_2H_5\right)_2$

55. Which one of the following is an essential amino acid?

(a) Lysine (b) Tyrosine (c) Proline (d) Glycine

56. Which of the following is a non-reducing sugar?

(a) Galactose (b) Glucose (c) Fructose (d) Sucrose

57. In DNA, the complementary bases are

(a) Uracil and adenine: cytosine and guanine

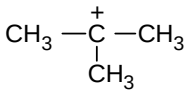
(b) Adenine and thymine: guanine and cytosine

(c) Adenine and thymine: Guanine and uracil

(d) Adenine and guanine: thymine and cytosine

58. 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)  (d) $(CH_3)_3C-\overset{+}{C}H-C_6H_5$

59. Tetrabromoethane on treatment with alcoholic zinc gives

(a) Ethyl bromide (b) Ethane (c) Ethene (d) Ethyne

60. Identify the name of the reaction which is not correctly matched with the reaction

(a) $CH_3CH_2CH_2CH_3 \xrightarrow{Anhy.AlCl_3/HCl} CH_3CH(CH_3)CH_3$ Isomerization

(b) $CH_4+O_2 \xrightarrow{Mo_2O_3\ \Delta} HCHO+H_2O$ Controlled oxidation

(c) $CH_4+Cl_2 \longrightarrow CH_3Cl+HCl$ Chlorination

(d) $C_6H_{14} \xrightarrow[Benzene]{Cr_2O_3/V_2O_5\ ,773K} C_6H_6$ Isomerization

Mathematics

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

61. If R is a relation on the set N, defined by $\{(x, y): 2x - y = 10\}$, then R is

(a) Reflexive (b) Symmetric (c) Transitive (d) None of these

62. If $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, then which of the following relations is a function from A to B?

(a) $\{(1, 2), (2, 3), (3, 4), (2, 2)\}$ (b) $\{(1, 2), (2, 3), (1, 3)\}$

(c) $\{(1, 3), (2, 3), (3, 3)\}$ (d) $\{(1, 1), (2, 3), (3, 4)\}$

63. The function $f: [0, \infty) \to [0, \infty)$ defined by $f(x) = \frac{2x}{1+2x}$

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

(c) not one-one but onto (d) neither one-one nor onto

64. The domain of the real function $f(x) = \frac{1}{\sqrt{4 - x^2}}$ is

(a) The set of all real numbers (b) The set of all positive real numbers

(c) $(-2, 2)$ (d) $[-2, 2]$

65. The value of $\frac{\cot 54^\circ}{\tan 36^\circ} + \frac{\tan 20^\circ}{\cot 70^\circ}$ is

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

66. If $\tan\theta = \frac{1}{\sqrt{7}}$, then $\frac{\left(\operatorname{cosec}^2\theta - \sec^2\theta\right)}{\left(\operatorname{cosec}^2\theta + \sec^2\theta\right)}$ is equal to

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

67. If $A = 35^\circ, B = 15^\circ$ and $C = 40^\circ$, then $\tan A\tan B + \tan B\tan C + \tan C\tan A$ is equal to

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

68. The value of $\sin^{-1}\{\cos(4095^\circ)\}$ is

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

69. If $z = \frac{\left(\sqrt{3} + i\right)^3 (3i + 4)^2}{(8 + 6i)^2}$, then $|z|$ is equal to

(a) 8 (b) 2 (c) 5 (d) 4

70. If gas is being pumped into a spherical balloon at the rate of $30\ \text{ft}^3/\text{min}$. Then, the rate at which the radius increases, when it reaches the value $15\ \text{ft}$ is

(a) $\frac{1}{15\pi}$ ft/min (b) $\frac{1}{30\pi}$ ft/min (c) $\frac{1}{20}$ ft/min (d) $\frac{1}{25}$ ft/min

71. The maximum value of $f(x)=\dfrac{x}{4+x+x^2}$ on $[-1,1]$ is

(a) $-\dfrac{1}{3}$ (b) $-\dfrac{1}{4}$ (c) $\dfrac{1}{4}$ (d) $\dfrac{1}{6}$

72. If $f(x)=\begin{cases}0, & x=0\\ x-3, & x>0\end{cases}$, then the function $f(x)$ is

(a) Increasing when $x\geq 0$

(b) Strictly increasing when $x>0$

(c) Strictly increasing at $x=0$

(d) Not continuous at $x=0$ and so it is not increasing when $x>0$

73. The number of permutations of the letters of the word CONSEQUENCE in which all the three E's are together is

(a) 9!3! (b) $\dfrac{9!}{2!2!}$ (c) $\dfrac{9!}{2!2!3!}$ (d) $\dfrac{9!}{2!3!}$

74. If 3 and 4 are intercepts of a line $L\equiv 0$, then the distance of $L\equiv 0$ from the origin is

(a) 5 units (b) 12 units (c) $\dfrac{5}{12}$ units (d) $\dfrac{12}{5}$ units

75. Compute the shortest distance between the circle $x^2+y^2-10x-14y-151=0$ and the point $(-7,2)$.

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

76. If a line in the space makes angles α,β and γ with the coordinate axes, then

$\cos 2\alpha+\cos 2\beta+\cos 2\gamma+\sin^2\alpha+\sin^2\beta+\sin^2\gamma$ equals

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

77. The foot of the perpendicular from $(2,4,-1)$ to the line $x+5=\dfrac{1}{4}(y+3)=-\dfrac{1}{9}(z-6)$ is

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

78. Given, $p=3\hat{i}+2\hat{j}+4\hat{k}, a=\hat{i}+\hat{j}, b=\hat{j}+\hat{k}, c=\hat{i}+\hat{k}$ and $p=xa+yb+zc$, then x, y and z are respectively,

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

79. If $\hat{i}+\hat{j}$, $\hat{j}+\hat{k}$ and $\hat{i}+\hat{k}$ are the position vectors of the vertices of a ΔABC taken in order, then $\angle A$ is equal to

(a) $\dfrac{\pi}{2}$ (b) $\dfrac{\pi}{5}$ (c) $\dfrac{\pi}{6}$ (d) $\dfrac{\pi}{3}$

80. $|a|=|b|=5$ and the angle between a and b is $\dfrac{\pi}{4}$. The area of the triangle constructed on the vectors $a-2b$ and $3a+2b$ is

(a) 50 (b) $50\sqrt{2}$ (c) $\dfrac{50}{\sqrt{2}}$ (d) 100

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

(a) $-\frac{1}{4}$ (b) $-\frac{1}{2}$ (c) 0 (d) $\frac{2}{9}$

82. $\lim_{x\to 0}\frac{a^x+a^{-x}-2}{x^2}$ is equal to

(a) $(\log a)^2$ (b) $\log a$ (c) 0 (d) none of these

83. The value of $\lim_{x\to 0}\frac{\sin^2 x+\cos x-1}{x^2}$ is

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

84. If $f(x)=\begin{cases}\frac{3\sin \pi x}{5x}, & x\neq 0\\ 2k, & x=0\end{cases}$ is continuous at $x=0$, then the value of k is

(a) $\frac{\pi}{10}$ (b) $\frac{3\pi}{10}$ (c) $\frac{3\pi}{2}$ (d) $\frac{3\pi}{5}$

85. The number of points of $f(x)=|x-1|+|x-3|+\sin x, x\in[0,4)$, where $f(x)$ is not differentiable, is

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

86. If $y=f\left(x^2+2\right)$ and $f'(3)=5$, then $\frac{dy}{dx}$ at $x=1$ is

(a) 5 (b) 25 (c) 15 (d) 10

87. If $y=\sec\left(\tan^{-1}x\right)$, then $\frac{dy}{dx}$ at $x=1$ is equal to

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

88. If $y=e^{ax}\sin bx$, then $\frac{d^2y}{dx^2}-2a\frac{dy}{dx}+a^2y$ is equal to

(a) 0 (b) 1 (c) $-b^2y$ (d) $-by$

89. $\frac{d}{dx}\left[\log_e e^{\sin\left(x^2\right)}\right]$ is equal to

(a) $2\cos\left(x^2\right)$ (b) $2\cos x$

(c) $2x\cdot\cos x$ (d) $2x\cos\left(x^2\right)$

90. Five persons A, B, C, D and E are in queue of a shop. The probability that A and E are always together, is

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

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

91. The probability of choosing randomly a number c from the set $\{1, 2, 3, ..., 9\}$ such that the quadratic equation $x^2 + 4x + c = 0$ has real roots, is

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

92. If four persons independently solve a certain problem correctly with probabilities $\frac{1}{2}, \frac{3}{4}, \frac{1}{4}$ and $\frac{1}{8}$. Then, the probability that the problem is solved correctly by atleast one of them, is

(a) $\frac{235}{256}$ (b) $\frac{21}{256}$ (c) $\frac{3}{256}$ (d) $\frac{253}{256}$

93. An urn contains 3 red and 5 blue balls. The probability that two balls are drawn in which 2^{nd} ball drawn is blue without replacement is

(a) $\frac{5}{16}$ (b) $\frac{5}{56}$ (c) $\frac{5}{8}$ (d) $\frac{20}{56}$

94. The set of values of x satisfying $3(2-x) \geq 2(1-x)$

(a) $\{x : x \in R, x \leq 4\}$ (b) $\{x : x \in R, x < 4\}$ (c) $\{x : x \in R, x \geq 4\}$ (d) none of these

95. If given constraints are $5x + 4y \geq 2$, $x \leq 6$ and $y \leq 7$, then the maximum value of the function $z = x + 2y$ is

(a) 13 (b) 14 (c) 15 (d) 20

96. If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then the value of x is

(a) 4 (b) 3 (c) –4 (d) –3

97. If $U = [2 \; -3 \; 4]$, $X = [0 \; 2 \; 3]$, $V = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$ and $Y = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$ then $UV + XY$ is equal to

(a) $[20]$ (b) 20 (c) $[-20]$ (d) –20

98. $\int (x+1)(x+2)^7 (x+3)\,dx$ is equal to

(a) $\frac{(x+2)^{10}}{10} - \frac{(x+2)^8}{8} + C$ (b) $\frac{(x+1)^2}{2} - \frac{(x+2)^8}{8} - \frac{(x+3)^2}{2} + C$

(c) $\frac{(x+2)^{10}}{10} + C$ (d) $\frac{(x+2)^9}{9} - \frac{(x+2)^7}{7} + C$

99. $\int \frac{2dx}{\left(e^x + e^{-x}\right)^2}$ is equal to

(a) $\frac{-e^x}{e^{-x} + e^x} + C$ (b) $\frac{e^x}{x+1} + C$

(c) $\frac{xe^x}{x+1} + C$ (d) $e^x\left(\frac{x-1}{x+1}\right) + C$

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

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

101. The value of $\int_0^1 \frac{x^4+1}{x^2+1}dx$ is

(a) $\frac{1}{6}(3-4\pi)$ (b) $\frac{1}{6}(3\pi+4)$ (c) $\frac{1}{6}(3+4\pi)$ (d) $\frac{1}{6}(3\pi-4)$

102. If $f(x)=\begin{cases}2x^2+1, & x\le 1\\ 4x^3-1, & x>1\end{cases}$, then $\int_0^2 f(x)dx$ is equal to

(a) $\frac{47}{3}$ (b) $\frac{50}{3}$ (c) $\frac{1}{3}$ (d) $\frac{47}{2}$

103. The solution of the differential equation $x\frac{dy}{dx}+y=x\cos x+\sin x,$ given that $y=1$ when $x=\frac{\pi}{2},$ is

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

104. The slope at any point of a curve $y=f(x)$ is given by $\frac{dy}{dx}=3x^2$ and it passes through $(-1,1)$. The equation of the curve is

(a) $y=x^3+2$ (b) $y=-x^3-2$ (c) $y=3x^3+4$ (d) $y=-x^3+2$

105. The interesting factor of the differential equation $\cos x\frac{dy}{dx}+y\sin x=1,$ is

(a) $\sin x$ (b) $\sec x$ (c) $\tan x$ (d) $\cos x$

106. Consider an infinite geometric series with first term $'a'$ and common ratio $'r'$. If the sum 4 and the second term is $\frac{3}{4}$, then

(a) $a=2,r=\frac{3}{8}$ (b) $a=\frac{4}{7},r=\frac{3}{7}$ (c) $a=\frac{3}{2},r=\frac{1}{2}$ (d) $a=3,r=\frac{1}{4}$

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

(a) $0°$ (b) $45°$ (c) $90°$ (d) $30°$

108. 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) $\frac{37}{10}$

109. A straight line passes through the points $(5,0)$ and $(0,3)$. The length of perpendicular to the point $(4,4)$ on the line is

(a) $\frac{15}{\sqrt{34}}$ (b) $\frac{\sqrt{17}}{2}$ (c) $\frac{17}{2}$ (d) $\sqrt{\frac{17}{2}}$

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

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

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

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

112. If A and B are finite sets and $A\subset B$, then

(a) $n(A\cup B)=n(A)$ (b) $n(A\cap B)=n(B)$ (c) $n(A\cup B)=n(B)$ (d) $n(A\cap B)=\phi$

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

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

114. The value of integral $\int_{-\pi/4}^{\pi/4}\log(\sec\theta-\tan\theta)d\theta$ is

(a) 0 (b) $\frac{\pi}{4}$ (c) π (d) $\frac{\pi}{2}$

115. $\int e^{\sin x}\cdot\left(\frac{\sin x+1}{\sec x}\right)dx$ is equal to

(a) $\sin x\cdot e^{\sin x}+c$ (b) $\cos x\cdot e^{\sin x}+c$ (c) $e^{\sin x}+c$ (d) $e^{\sin x}(\sin x+1)+c$

116. If $y=\left(\tan^{-1}x\right)^2$, then $\left(x^2+1\right)^2 y_2+2x\left(x^2+1\right)y_1$ is equal to

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

117. The value of $\sin\left(2\sin^{-1}0.8\right)$ is equal to

(a) 0.48 (b) $\sin 1.2°$ (c) $\sin 1.6°$ (d) 0.96

118. The symmetric part of the matrix $A=\begin{pmatrix}1&2&4\\6&8&2\\2&-2&7\end{pmatrix}$

(a) $\begin{pmatrix}0&-2&-1\\-2&0&-2\\-1&-2&0\end{pmatrix}$ (b) $\begin{pmatrix}1&4&3\\2&8&0\\3&0&7\end{pmatrix}$ (c) $\begin{pmatrix}0&-2&1\\2&0&2\\-1&2&0\end{pmatrix}$ (d) $\begin{pmatrix}1&4&3\\4&8&0\\3&0&7\end{pmatrix}$

119. If A is a matrix of order 3, such that $A(adjA)=10I$, then $|adj\ A|=$

(a) 1 (b) 10 (c) 100 (d) 101

120. Area of region bounded by the curve $y=\cos x, x=0$ and $x=\pi$ is

(a) 2 sq.units (b) 4 sq.units (c) 3 sq.units (d) 1 sq.units

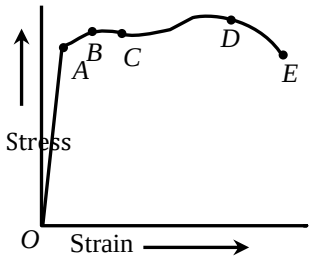
Physics

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

121. The distance of the centres of moon and earth is D. The mass of earth is 81 times the mass of the moon. At what distance from the centre of the earth, the gravitational force will be zero?

(a) $\frac{D}{2}$ (b) $\frac{2D}{3}$ (c) $\frac{4D}{3}$ (d) $\frac{D}{10}$

122. The stress-strain graph for a metal wire is as shown in the figure. In the graph, the region in which Hooke's law is obeyed, the ultimate strength and fracture points are represented by



(a) OA, C, D (b) OB, D, E (c) OA, D, E (d) OB, C, D

123. During summersault, a swimmer bends his body to

(a) Increase moment of Inertia (b) Decrease moment of Inertia

(c) Decrease the angular momentum (d) Reduce the angular velocity

124. A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth $4y$ from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then, R is equal to

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

125. A clock with a metal pendulum beating seconds keeps correct time at $0°C$. If it loses $12.5s$ a day at $25°C$, the coefficient of linear expansion of metal pendulum is

(a) $\frac{1}{86400}/°C$ (b) $\frac{1}{43200}/°C$ (c) $\frac{1}{14400}/°C$ (d) $\frac{1}{28800}/°C$

126. The pressure is P, volume V and temperature T of a gas in jar A and the other gas in jar B is at pressure P, volume $V/4$ and temperature $2T$, then the ratio of the number of molecules in jar A and B will be

(a) $1:1$ (b) $1:2$ (c) $2:1$ (d) $8:1$

127. If ΔU and ΔW represent the increase in internal energy and work done by the system respectively in a thermodynamical process, which of the following is true?

(a) $\Delta U = -\Delta W$, in an adiabatic process

(b) $\Delta U = \Delta W$, in an isothermal process

(c) $\Delta U = \Delta W$, in adiabatic process

(d) $\Delta U = -\Delta W$, in an isothermal process

128. A particle is executing simple harmonic motion with frequency f. The frequency at which its kinetic energy change into potential energy is

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

129. The speed of longitudinal wave in a wire is 100 times the speed of transverse wave. If Young's modulus of the wire material is $1\times10^{11}\ \text{Nm}^{-2}$ then the stress in the wire is

(a) $1\times10^{7}\ \text{Nm}^{-2}$ (b) $1.5\times10^{7}\ \text{Nm}^{-2}$ (c) $1\times10^{11}\ \text{Nm}^{-2}$ (d) $1.5\times10^{11}\ \text{Nm}^{-2}$

130. Two equally charged, identical metal spheres A and B repel each other with a force $'F'$. The spheres are kept fixed with a distance $'r'$ between them. A third identical, but uncharged sphere C is brought in contact with A and then placed at the mid-point of the line joining A and B. The magnitude of the net electric force on C is

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

131. If the electric flux entering and leaving an enclosed surface respectively ϕ_1 and ϕ_2 then the electric charge inside the surface will be

(a) $(\phi_1+\phi_2)\varepsilon_0$ (b) $(\phi_2-\phi_1)\varepsilon_0$ (c) $(\phi_1-\phi_2)/\varepsilon_0$ (d) $(\phi_2-\phi_1)/\varepsilon_0$

132. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

(a) independent of the distance between the plates

(b) linearly proportional to the distance between the plates

(c) inversely proportional to the distance between the plates

(d) proportional to the square root of the distance between the plates

133. Electric lines of force about a negative point charge are

(a) Circular anticlockwise (b) Circular clockwise

(c) Radial, inwards (d) Radial, outwards

134. Equal charges are given to two spheres of different radii. The potential will be

(a) more on smaller sphere (b) more on bigger sphere

(c) equal on both sphere (d) none of these

135. 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 to Q is

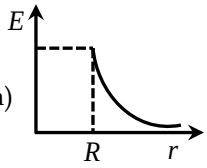
(a) $9.6\times10^{-17}\ \text{J}$ (b) $-2.24\times10^{-16}\ \text{J}$ (c) $2.24\times10^{-16}\ \text{J}$ (d) $-9.6\times10^{-17}\ \text{J}$

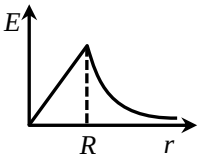
136. Equal charges q are placed at the four corners, A, B, C, D of a square of length a. The magnitude of the force on the charge at B will be

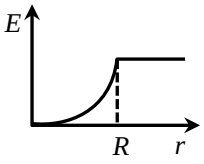
(a) $\frac{3q^2}{4\pi\varepsilon_0 a^2}$ (b) $\frac{4q^2}{4\pi\varepsilon_0 a^2}$

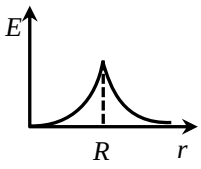
(c) $\left(\frac{1+2\sqrt{2}}{2}\right)\frac{q^2}{4\pi\varepsilon_0 a^2}$ (d) $\left(2+\frac{1}{\sqrt{2}}\right)\frac{q^2}{4\pi\varepsilon_0 a^2}$

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. Two wires have lengths, diameters and specific resistances all in the ratio of $1:2$. The resistance of the first wire is $10\,\text{ohm}$. Resistance of the second wire in ohm will be

(a) 5 (b) 10 (c) 20 (d) infinite

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

(a) 4.5 ohm (b) 2 ohm (c) 0.5 ohm (d) 1/4.5 ohm

140. How much heat is developed in 210 watt electric bulb in 5 minutes? (Chemical equivalent of heat $= 4.2\ \text{JC}^{-1}$)

(a) 30000 cal (b) 22500 cal (c) 15000 cal (d) 7500 cal

141. Drift velocity of electrons is due to

(a) Motion of conduction electrons due to random collisions.

(b) Motion of conduction electrons due to electric field $\vec{E}$.

(c) Repulsion to the conduction electrons due to inner electrons of ions.

(d) Collision of conduction electrons with each other.

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

(a) At a very low voltage.

(b) At a very high voltage

(c) At 220 volt

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

143. The current through a bulb is increased by 1%. Assuming that the resistance of the filament remains unchanged the power of the bulb will

(a) increase by 1% (b) decrease by 1% (c) increase by 2% (d) decrease by 2%

144. Two long parallel wires P and Q are held perpendicular to the plane of the paper at a separation of $5\,\text{m}$. If P and Q carry currents of $2.5\,\text{A}$ and $5\,\text{A}$ respectively in the same direction, then the magnetic field at a point midway between P and Q is

(a) $\frac{\mu_0}{\pi}$ (b) $\sqrt{3}\frac{\mu_0}{\pi}$ (c) $\frac{\mu_0}{2\pi}$ (d) $\frac{3\mu_0}{2\pi}$

145. A straight section PQ of a circuit lies along the $X-$axis from $x=-\frac{a}{2}$ to $x=\frac{a}{2}$ and carries a steady current i. The magnetic field due to the section PQ at a point $X=+a$ will be

(a) proportional to a (b) proportional to a^2

(c) proportional to $1/a$ (d) zero

146. A uniform magnetic field acts at right angles to the direction of motion of electron. As a result, the electron moves in a circular path of radius 2 cm. If the speed of electron is doubled, then the radius of the circular path will be

(a) 2.0 cm (b) 0.5 cm (c) 4.0 cm (d) 1.0 cm

147. A charge moving with velocity v in $X-$direction is subjected to a magnetic field in negative $X-$direction. As a result, the charge will

(a) remain unaffected (b) start moving in a circular path $Y-Z$ plane

(c) retard along $X-$axis (d) move along a helical path around $X-$axis

148. Magnetic permeability is maximum for

(a) diamagnetic substance (b) paramagnetic substance

(c) ferromagnetic substance (d) all of these

149. A moving coil galvanometer has N number of turns in a coil of effective area A, it carries a current I. The magnetic field B is radial. The torque acting on the coil is

(a) NA^2B^2I (b) $NABI^2$ (c) N^2ABI (d) $NABI$

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

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

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

(c) the lines always diverge from a single force

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

151. A conducting circular loop is placed in a uniform magnetic field of $0.04\,\text{T}$ with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at 2 mm s^{-1}. The induced emf in the loop when the radius is $2\,\text{cm}$ is

(a) 4.8 πμV (b) 0.8 πμV (c) 1.6 πμV (d) 3.2 πμV

152. In an induction coil the current increases from 0 to $6\,\text{A}$ in $0.3\,\text{s}$ by which induced emf of 30 volts is produced in it. Then the value of coefficient of self-inductance of coil will be

(a) 3 henry (b) 2 henry (c) 1 henry (d) 1.5 henry

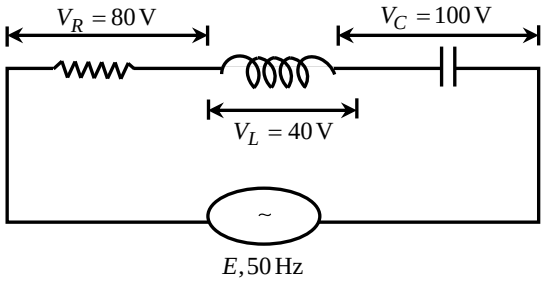
153. In LCR series a.c. circuit, the voltage across each of the components, L, C and R is $50\,\text{V}$. The voltage across the LC combination will be

(a) 100 V (b) $50\sqrt{2}$ V (c) 50 V (d) 0 V

154. In a series resonance LCR circuit, the voltage across R is 100 volt and $R = 1\text{k}\Omega$ with $C = 2\mu\text{F}$. The resonance frequency ω is $200\,\text{rad s}^{-1}$. At resonance the voltage across L is

(a) 2.5×10^{-2} V (b) 40 V (c) 250 V (d) 4×10^{-3} V

155. The value of alternating emf E in the given circuit will be



(a) 100 V (b) 20 V (c) 220 V (d) 140 V

156. Match List-I (Electromagnetic wave type) with List-II (its association/application) and select the correct option from the from the choices given below the lists

List I		List II	
(1)	Infrared waves	(i)	To treat muscular strain
(2)	Radio waves	(ii)	For broadcasting
(3)	X-rays	(iii)	To detect fracture of bones
(4)	Ultraviolet rays	(iv)	Absorbed by the ozone layer of the atmosphere

	1	2	3	4
(a)	(iv)	(iii)	(ii)	(i)
(b)	(i)	(ii)	(iv)	(iii)
(c)	(iii)	(ii)	(i)	(iv)
(d)	(i)	(ii)	(iii)	(iv)

157. When a plane face of planoconvex lens is silvered, it behaves as concave mirror of focal length 30 cm. But when its curved surface is silvered, it behaves as a concave mirror of focal length 10 cm. The refractive index of lens material is

(a) 1.25 (b) 1.33 (c) 1.732 (d) 1.5

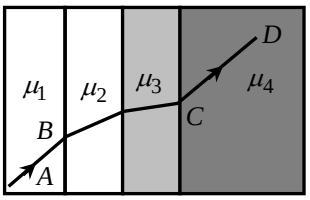
158. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of $45°$. For which of the following value of μ the ray can undergo total internal reflection?

(a) $\mu = 1.33$ (b) $\mu = 1.40$ (c) $\mu = 1.50$ (d) $\mu = 1.25$

159. Minimum deviation is observed with a prism having angle of prism A, angle of deviation δ, angle of incidence i and angle of emergence e. We then have generally

(a) $i > e$ (b) $i < e$ (c) $i = e$ (d) $i = e = \delta$

160. A ray of light passes through four transparent media with refractive indices μ_1, μ_2, μ_3 and μ_4 as shown in the figure. The surfaces of all media are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have



(a) $\mu_1 = \mu_2$ (b) $\mu_2 = \mu_3$

(c) $\mu_3 = \mu_4$ (d) $\mu_4 = \mu_1$

161. Huygens's concept of secondary wave

(a) Allows us to find the focal length of a thick lens

(b) Is a geometrical method to find a wave front

(c) Is used to determine the velocity of light

(d) Is used to explain polarisation

162. The condition for observing Fraunhoffer diffraction from a single slit is that the light wavefront incident on the slit should be

(a) Spherical (b) cylindrical (c) plane (d) elliptical

163. The momentum of a photon of wavelength λ is

(a) $h\lambda$ (b) h/λ (c) λ/h (d) $h/c\lambda$

164. In a photoelectric emission process from a metal of work function $1.8\,\text{eV}$, the kinetic energy of most energetic electrons is $0.5\,\text{eV}$. The corresponding stopping potential is

(a) 1.8 V (b) 1.2 V (c) 0.5 V (d) 2.3 V

165. In a Rutherford scattering experiment when a projectile of charge Z_1 and mass M_1 approaches a target nucleus of charge Z_2 and mass M_2, the distance of closest approach is r_0. The energy of the projectile is

(a) Directly proportional to Z_1Z_2 (b) Inversely proportional to Z_1

(c) Directly proportional to mass M_1 (d) Directly proportional to $M_1 \times M_2$

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

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

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

167. The ratio of the energies of the hydrogen atom in its first to second excited states is

(a) 1/4 (b) 4/9 (c) 9/4 (d) 4

168. Fusion reaction takes place at high temperature because

(a) nuclei break up at high temperature

(b) atoms get ionised at high temperature

(c) kinetic energy is high enough to overcome the coulomb repulsion between nuclei

(d) molecules break up at high temperature

169. Neutron decay in free space is given as follows ${}_0n^1 \rightarrow {}_1H^1 + {}_{-1}e^0 + [\ ]$. Then the parenthesis $[\ ]$ represents as

(a) Neutrino (b) Photon (c) antineutrino (d) Graviton

170. The binding energy per nucleon of deuteron $\left({}_1^2H\right)$ and helium nucleus $\left({}_2^4He\right)$ is 1.1 MeV and 7 MeV respectively. If two deuteron nuclei react to from a single helium nucleus, then then energy released is

(a) 23.6 MeV (b) 26.9 MeV (c) 13.9 MeV (d) 19.2 MeV

171. The barrier potential of a $p-n$ junction depends on

(A) type of semiconductor material

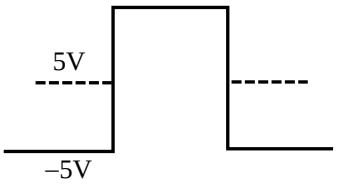
(B) amount of doping

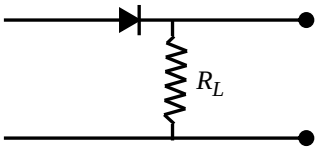
(C) temperature

(D) Only (A) and (C)

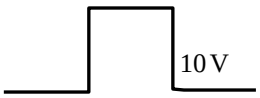
(a) (A) and (B) only (b) (B) & (D) only (c) (B) and (C) only (d) (A), (B) and (C)

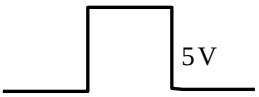
172. In a $p-n$ junction diode, a square input signal of 10 V is applied as shown in fig.

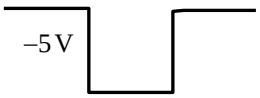


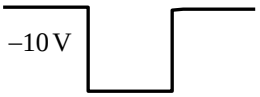


The output signal across R_L will be

(a) 

(b) 

(c) 

(d) 

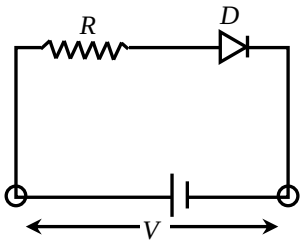
173. A d.c. battery of V volt is connected to a series combination of a resistor R and an ideal diode D as shown in the figure below. The potential difference across R will be

(a) 2 V when diode is forward biased

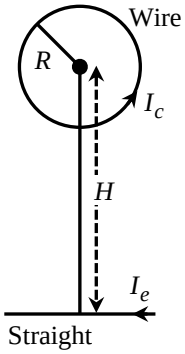
(b) Zero when diode is forward biased

(c) V when diode is reverse biased

(d) V when diode is forward biased



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



(a) $\frac{I_e R}{I_c \pi}$ (b) $\frac{I_c R}{I_e \pi}$

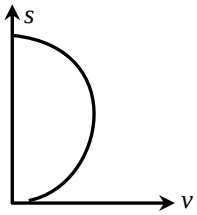
(c) $\frac{\pi I_c}{I_e R}$ (d) $\frac{I_e \pi}{I_c R}$

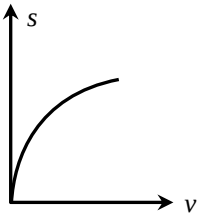
175. Which of the following set have different dimensions?

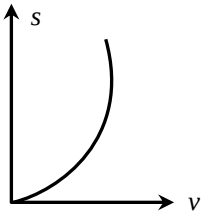
(a) pressure, Young's modulus, stress (b) EMF, potential difference, electric potential

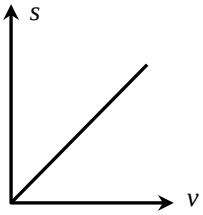
(c) heat, work done, energy (d) dipole moment, electric flux, electric field

176. An object is moving with a uniform acceleration which is parallel to its instantaneous direction of motion. The displacements $(s)-$ velocity (v) graph of this object is

(a) 

(b) 

(c) 

(d) 

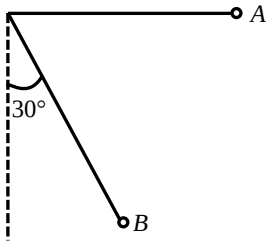
177. The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times its initial speed. If the range of the projectile is 'P' times the maximum height attained by it. P is –

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

178. A man weighing $80\,\text{kg}$, stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of $5\ \text{ms}^{-2}$. What would be the reading on the scale? $\left(g = 10\ \text{ms}^{-2}\right)$

(a) $1200\,\text{N}$ (b) zero (c) $400\,\text{N}$ (d) $800\,\text{N}$

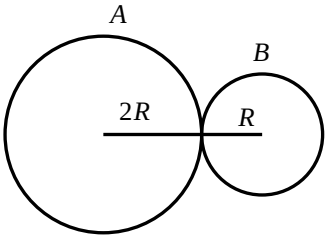
179. A simple pendulum is released from A as shown. If m and l represent the mass of the bob and length of the pendulum, the gain in kinetic energy at B is



(a) $\frac{mgl}{2}$ (b) $\frac{mgl}{\sqrt{2}}$

(c) $\frac{\sqrt{3}}{2}mgl$ (d) $\frac{2}{\sqrt{3}}mgl$

180. Two spheres A and B of masses m and $2m$, and radii $2R$ and R respectively are placed in contact as shown. The COM of the system lies



(a) inside A

(b) inside B

(c) at the point of contact

(d) none of these