

## MATHS-IA

1. The minimum value of  $f(x) = \frac{x^2 - 2x + 3}{x^2 - 4x + 7}$  is
- 1)  $1 + \frac{1}{\sqrt{3}}$       2)  $2 - \frac{1}{\sqrt{3}}$       3)  $\frac{3 - \sqrt{3}}{3}$       4)  $3 - \frac{1}{\sqrt{3}}$
2. The domain of the real valued function  $f(x) = \sqrt{9 - \sqrt{x^2 - 144}}$  is
- 1)  $[-15 - 12] \cup [12, 15]$       2)  $[-\infty - 12] \cup [12, \infty)$   
 3)  $[-15, 15]$       4)  $[-12, 12]$
3.  $F: R \rightarrow R$  is defined by  $f(x+y) = f(x) + 12y \quad \forall x, y \in R$ . If  $f(1) = 6$  then  $\sum_{r=1}^n f(x) =$
- 1)  $n^2$       2)  $5n^2$       3)  $6n^2$       4)  $\frac{3n(n+1)}{2}$
4. If  $[a, b]$  is the range of the function  $\frac{x+2}{2x^2+3x+6}$  for  $x \in R$  then
- 1)  $a < 0, b < 0$       2)  $a < 0, b > 0$       3)  $a > 0, b > 0$       4)  $a < 0, b < 0$
5.  $\sin \frac{\pi}{12} \sin \frac{2\pi}{12} \sin \frac{3\pi}{12} \sin \frac{4\pi}{12} \sin \frac{5\pi}{12} \sin \frac{6\pi}{12} =$  -----
- 1)  $\frac{\sqrt{3}}{16\sqrt{2}}$       2)  $\frac{\sqrt{3}}{8\sqrt{2}}$       3)  $\frac{1}{32}$       4)  $\frac{1}{16}$
6. The range of the real valued function  $f(x) = \frac{15}{3\sin x + 4\cos x + 10}$  is
- 1)  $[0, 3]$       2)  $[-1, 3]$       3)  $[1, 3]$       4)  $[-1, 1]$
7.  $\tan 2\alpha, \tan(30\alpha - \alpha) + \tan 2\alpha, \tan(60\alpha - \alpha) + \tan(60 - \alpha) \tan(30 - \alpha) =$
- 1)  $\tan 3\alpha$       2)  $\tan^2 2\alpha - \tan^2 60$       3) 1      4) 0
8. If  $\tanh(x) = \frac{1}{3}$  then  $\tanh(3x)$  is
- 1)  $\frac{8}{9}$       2)  $\frac{2}{3}$       3) 1      4)  $\frac{7}{9}$
9. The possible value of  $\sin^6 \theta + \cos^6 \theta - 3\cos^4 \theta$  is
- 1) 2      2) -2      3) -3      4) 3
10. If A and B are acute angles satisfying  $3\cos^2 A + 2\cos^2 B = 4$  and  $\frac{3\sin A}{\sin B} = \frac{2\cos B}{\cos A}$ , then  $A + 2B =$
- 1)  $\frac{\pi}{2}$       2)  $\frac{\pi}{3}$       3)  $\frac{\pi}{4}$       4)  $\frac{\pi}{6}$
11. If  $\cos \theta = \frac{-3}{5}$  and  $\theta$  does not lie in second quadrant. Then  $\tan \frac{\theta}{2} =$
- 1) 2      2) 1      3) -2      4) -1
12. If the period of the function  $f(x) = \frac{\tan 5x \cos 3x}{\sin 6x}$  is  $\alpha$  then  $f\left(\frac{\alpha}{8}\right) =$
- 1)  $\frac{1}{2}$       2) -1      3)  $\frac{1}{\sqrt{2}}$       4)  $\frac{-1}{\sqrt{2}}$
13. If  $x = \sin(2 \tan^{-1} 2)$  and  $y = \sin\left(\frac{1}{2} \tan^{-1} \frac{4}{3}\right)$  then
- 1)  $x > y$       2)  $x = y$       3)  $x = 0 = y$       4)  $x < y$





- 1)  $(3\sqrt{3}, -5)$       2)  $(-1, -5)$       3)  $(5\sqrt{3}, -7)$       4)  $(7, -\sqrt{3})$
43. The circumcenter of the triangle formed by the lines  $x + y + 2 = 0, 2x + y + 8 = 0$  and  $x - y - 2 = 0$  is
- 1)  $(-5, 1)$       2)  $(-4, 0)$       3)  $(0, -2)$       4)  $\left(\frac{-8}{3}, \frac{-2}{3}\right)$
44. Let  $P = (-1, 0), Q = (0, 0)$  and  $R = (3, 3\sqrt{3})$  be three points. Then the equation of the bisector of the  $\angle PQR$  is
- 1)  $\sqrt{3}x + y = 0$       2)  $x + \frac{\sqrt{3}}{2}y = 0$       3)  $\frac{-\sqrt{3}}{2}x + y = 0$       4)  $x + \sqrt{3}y = 0$
45. The area of the triangle formed by the pair of lines  $23x^2 - 48xy + 3y^2 = 0$  with the line  $2x + 3y + 5 = 0$  is
- 1)  $\frac{1}{13\sqrt{3}}$       2)  $\frac{25}{13\sqrt{3}}$       3)  $\frac{7}{13\sqrt{5}}$       4)  $\frac{9}{25\sqrt{3}}$
46. If the slope of one line of the pair of lines  $2x^2 + hxy + 6y^2 = 0$  is thrice the slope of the other line then  $h =$
- 1)  $\pm 16$       2)  $\pm 9$       3)  $\pm 18$       4)  $\pm 8$
47. If  $Q(h, k)$  is the inverse point of the point  $P(1, 2)$  with respect to the circle  $x^2 + y^2 - 4x + 1 = 0$ , then  $2h + k =$
- 1) 3      2) 4      3) 7      4) 11
48. If the circles  $x^2 + y^2 - 8x - 8y + 28 = 0, x^2 + y^2 - 8x - 6y + 25 - \alpha^2 = 0$  have only one common tangent, then  $\alpha =$
- 1)  $\alpha = 4$       2)  $\alpha = 2$       3)  $\alpha = 1$       4)  $\alpha = 5$
49. The distance between the centres of similitude of the circles  $x^2 + y^2 + 6x - 8y + 16 = 0$  and  $x^2 + y^2 - 2x - 2y + 1 = 0$  is
- 1)  $15/4$       2)  $5/4$       3)  $5/2$       4)  $15/2$
50. If the equation of the circle passing through the points of intersection of the circles  $x^2 - 2x + y^2 - 4y - 4 = 0, x^2 + 2x + y^2 + 4y - 4 = 0$  and the point  $(3, 3)$  is given by  $x^2 + y^2 + \alpha x + \beta y + \gamma = 0$ , then  $3(\alpha + \beta + \gamma) =$
- 1) 32      2) -32      3) -26      4) 26
51. The normal drawn at a point  $(2, -4)$  on the parabola  $y^2 = 8x$  cuts again the same parabola at  $(\alpha, \beta)$ , then  $\alpha + \beta =$
- 1) 8      2) 16      3) 24      4) 30
52. If the chord of the ellipse  $\frac{x^2}{4} + \frac{y^2}{9} = 1$  having  $(1, 1)$  as its middle point is  $x + \alpha y = \beta$  then
- 1)  $\alpha + \beta = 1$       2)  $\alpha + 1 = \beta$       3)  $\alpha - 1 = \beta$       4)  $2\alpha - 1 = 3\beta$
53. The equation of one of the tangents drawn from the point  $(0, 1)$  to the hyperbola  $45x^2 - 4y^2 = 5$  is
- 1)  $4y + 5 = 0$       2)  $3x + 4y - 4 = 0$       3)  $5x - 6y + 6 = 0$       4)  $9x - 2y + 2 = 0$
54. If a tangent to the hyperbola  $x^2 - \frac{y^2}{3} = 1$  is also a tangent to the parabola  $y^2 = 8x$ , then equation of such tangent with the positive slope is
- 1)  $y - x - \frac{1}{2} = 0$       2)  $y - 2x - 1 = 0$       3)  $2y - 4x - 1 = 0$       4)  $y - x - 1 = 0$
55. If  $A(1, 2, 0), B(2, 0, 1)$  and  $C(-3, 0, 2)$  are the vertices of  $\Delta ABC$  then the length of the internal bisector of  $\angle BAC$  is
- 1)  $3\sqrt{6}$       2)  $\frac{2\sqrt{14}}{3}$       3)  $6\sqrt{14}$       4)  $\frac{2\sqrt{6}}{3}$
56. A point on the plane passing through the points  $(\sqrt{2}, 1, 4), (0, -1, 0)$  and  $(0, 0, 1)$  is
- 1)  $(-\sqrt{2}, 1, -4)$       2)  $(\sqrt{2}, 1, 4)$       3)  $(\sqrt{2}, -1, 4)$       4)  $(-\sqrt{2}, -1, -4)$
57. If the direction cosines of a line are  $\left(\frac{a}{\sqrt{83}}, \frac{5}{\sqrt{83}}, \frac{c}{\sqrt{83}}\right)$  and  $c - a = 4$  then  $ca =$
- 1) 24      2) 21      3) 18      4) 33



$$1) \frac{-xe^x}{(x+4)^2} + c$$

$$2) -\frac{xe^x}{(x+4)} + c$$

$$3) \frac{xe^x}{(x+4)} + c$$

$$4) \frac{2xe^x}{(x+4)} + c$$

$$73. \int \frac{x^4+1}{x^6+1} dx =$$

- 1)  $\tan^{-1} x - \tan^{-1} x^3 + c$     2)  $\tan^{-1} x - \frac{1}{3} \tan^{-1} x^3 + c$     3)  $\tan^{-1} x + \tan^{-1} x^3 + c$     4)  $\tan^{-1} x + \frac{1}{3} \tan^{-1} x^3 + c$

$$74. \lim_{n \rightarrow \infty} \frac{1^{77} + 2^{77} + \dots + n^{77}}{n^{78}} =$$

- 1) 1/77                                      2) 1                                      3) 76                                      4) 1/78

$$75. \int_{-1}^1 (\sqrt{1+x+x^2} - \sqrt{1-x+x^2}) dx =$$

- 1) 2                                      2) 4                                      3) 0                                      4) 8

$$76. \int_{-\pi}^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx =$$

- 1)  $\frac{3\pi^2}{4}$                                       2)  $\frac{\pi}{2} + 1$                                       3)  $\frac{\pi^2}{4}$                                       4)  $\frac{\pi^2}{2}$

77. The area bounded by the curves  $x^2 = 9y$ ,  $(x-6)^2 = 9y$  and the X-axis is

- 1) 0                                      2) 1                                      3) 2                                      4) 4

78. The difference of the order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^{-\frac{7}{2}} \left(\frac{d^3y}{dx^3}\right)^2 - \left(\frac{d^2y}{dx^2}\right)^{-\frac{5}{2}} \left(\frac{d^4y}{dx^4}\right) = 0 \text{ is}$$

- 1) 5                                      2) 3                                      3) 4                                      4) 2

79. If  $xdy + (y + y^2x)dx = 0$  and  $y = 1$  at  $x = 1$  then

- 1)  $y = \frac{x}{1 + \log x}$                                       2)  $y = \frac{1 + \log x}{x}$                                       3)  $y = x(1 + \log x)$                                       4)  $y = \frac{1}{x(1 + \log x)}$

80. The integrating factor of  $x \frac{dy}{dx} + 3y = x^2$  is

- 1) 3/x                                      2) log x                                      3)  $x^3$                                       4) x

**PHYSICS**

81. The potential difference across the ends of conductor is  $(30 \pm 0.3)V$  and the current through the conductor is  $(5 \pm 0.10)A$ . The error in the determination of the resistance of the conductor is

- 1) 1%                                      2) 2%                                      3) 3%                                      4) 4%

82. A body starting from rest moving with an acceleration of  $\frac{5}{4}ms^{-2}$ . The distance travelled by the body in the third second is

- 1)  $\frac{15}{8}m$                                       2)  $\frac{25}{8}m$                                       3)  $\frac{25}{4}m$                                       4)  $\frac{12}{7}m$

83. Path of projectile is given by the equation  $Y = PX - Qx^2$  match the following accordingly (acceleration due to gravity =g)

a.	Range	i.	$\frac{P}{Q}$
b.	Maximum height	ii.	$P$
c.	Time of flight	iii.	$\frac{P^2}{4Q}$
d.	Tangent of angle of projection	iv.	$\left(\sqrt{\frac{2}{gQ}}\right)P$

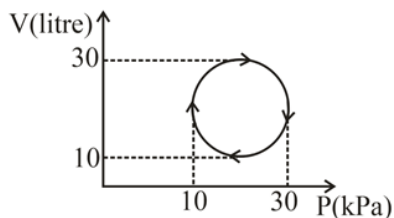
1) a-i, b-iii, c-iv, d-ii

2) a-i, b-iii, c-ii, d-iv

3)  $a - iii, b - i, c - iv, d - ii$

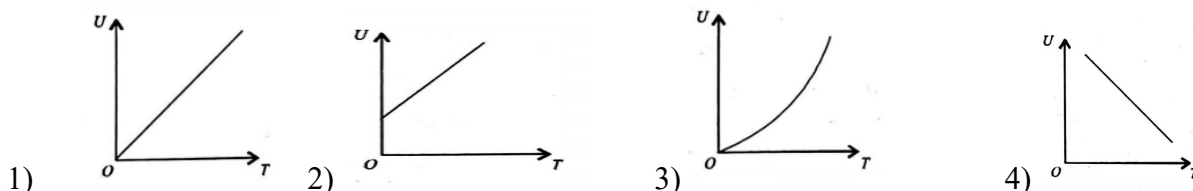
4)  $a - iv, b - ii, c - iii, d - i$

84. A black metal 4 kg is in rest on a frictionless surface. It was targeted by a releasing water of  $2\text{Kgs}^{-1}$  at a speed of  $10\text{ms}^{-1}$ . The acceleration of the block is  
 1)  $10\text{ms}^{-2}$                       2)  $15\text{ms}^{-2}$                       3)  $20\text{ms}^{-2}$                       4)  $5\text{ms}^{-2}$
85. A lorry is moving on a smooth circular path of radius 50 m with a velocity of  $20\text{ms}^{-1}$ . Then the banking angle of the road is  
 1)  $\tan^{-1} \frac{5}{4}$                       2)  $\tan^{-1} \frac{4}{5}$                       3)  $\tan^{-1} \frac{2}{5}$                       4)  $\tan^{-1} \frac{5}{2}$
86. A spring of spring constant  $200\text{N} - \text{m}^{-1}$  is initially stretched by 10cm from the unstretched position. The work to be done to stretch the spring further by another 10cm is  
 1) 3 J                      2) 6 J                      3) 9 J                      4) 12 J
87. Assertion ( A ) : In an elastic collision of two billiard balls, the total KE is conserved during the short time of collision of the balls  
 Reason ( R ) : Energy spent against friction does not follow the law of conservation of energy  
 1) both are true and R is a correct explanation for A  
 2) both are true but R is not a correct explanation for A  
 3) A is true but R is false                      4) both A and R is false
88. A solid sphere of mass 2 kg is rolling without slipping on a horizontal surface with a velocity  $5 \text{ms}^{-1}$ . The rotational kinetic energy of the sphere is  
 1) 25 J                      2) 12.5 J                      3) 10 J                      4) 20 J
89. What is the height from the surface of earth, where acceleration due to gravity will be  $\frac{1}{4}$  of that of the earth ( $R_E = 6400 \text{ km}$ )  
 1) 6400 km                      2) 3200 km                      3) 1600 km                      4) 640 km
90. The pressure required to decrease the volume of 4000 cc water by 0.05% is ( Bulk modulus of water =  $22 \times 10^9 \text{ NM}^{-2}$ )  
 1)  $11 \times 10^6 \text{ Nm}^{-2}$                       2)  $5 \times 10^5 \text{ Nm}^{-2}$                       3)  $22 \times 10^6 \text{ Nm}^{-2}$                       4)  $1.1 \times 10^6 \text{ Nm}^{-2}$
91. Statement( A ) : When the temperature increases the viscosity of gases increases and the viscosity of liquids decreases  
 Statement ( B ) : Water does not wet an oily glass because cohesive force of oil is less than that of water .  
 Statement ( C ) : A liquid will wet a surface of a solid, If the angle of contact is greater than  $90^\circ$   
 1) A,B and C are false                      2) A and B false , C is true  
 3) B and C false, A is true                      4) A and C false, B is true
92. Water flows through a hose pipe whose internal diameter is 4 cm at a speed of  $1\text{ms}^{-1}$ . If water has to emerge at a speed of  $4\text{ms}^{-1}$  then the diameter of the nozzle should be  
 1) 1 cm                      2) 2 cm                      3) 4 cm                      4) 0.5cm
93. A slab consists of two identical plates of copper and brass. The free face of the brass is at  $0^\circ\text{C}$  and that of copper at  $100^\circ\text{C}$ . If the thermal conductivities of brass and copper are in the ratio 1:4, then the temperature of interface is  
 1)  $20^\circ\text{C}$                       2)  $40^\circ\text{C}$                       3)  $60^\circ\text{C}$                       4)  $80^\circ\text{C}$
94. Heat energy absorbed by a system going through the cyclic process shown in the figure is



- 1)  $10^7 \pi J$       2)  $10^4 \pi J$       3)  $10^2 \pi J$       4)  $10^{-3} \pi J$

95. Which one of the graphs below best illustrates the relationship between internal energy  $U$  of an ideal gas and temperature  $T$  of the gas in K?



96. When the temperature of a gas is raised from  $27^{\circ}C$  to  $90^{\circ}C$ . The increase in the rms velocity of the gas molecule is

- 1) 15%      2) 17.5%      3) 10%      4) 20%

97. The mass of a particle is 1 kg and it is moving along X-axis. The period of its oscillation is  $\frac{\pi}{2}$ . Its

potential energy at a displacement of 0.2m is

- 1) 0.24 J      2) 0.48 J      3) 0.32 J      4) 0.16 J

98. If the volume of a block of metal changes by 0.12% when heated through  $20^{\circ}C$ , then find its coefficient of linear expansion

- 1)  $4 \times 10^{-5} \text{ }^{\circ}C^{-1}$       2)  $4 \times 10^{-4} \text{ }^{\circ}C^{-1}$       3)  $2 \times 10^{-4} \text{ }^{\circ}C^{-1}$       4)  $2 \times 10^{-5} \text{ }^{\circ}C^{-1}$

99. Two particles of masses 1 g and 2 g move towards each other with velocities  $10ms^{-1}$  and  $20ms^{-1}$  respectively. The velocity of the centre of mass of the system of the two particles is

- 1)  $5ms^{-1}$       2)  $10ms^{-1}$       3)  $15ms^{-1}$       4)  $20ms^{-1}$

100. A body of mass 2 kg is on inclined plane of inclination  $30^{\circ}$  and coefficient of friction is  $\left(\frac{1}{\sqrt{3}}\right)$ . The

minimum force required to move the body up the inclined plane is

- 1) 5.77 N      2) 10 N      3) 20 N      4) 15 N

101. The frequency of fifth harmonic of a closed organ pipe is equal to the frequency of third harmonic of an open organ pipe. If the length of the open pipe is 72cm, then length of the closed organ pipe is

- 1) 60 cm      2) 45 cm      3) 30 cm      4) 75 cm

102. In a region, the intensity of an electric field is given by  $E = \left(2\hat{i} + 3\hat{j} + \hat{k}\right)NC^{-1}$ . The electric flux through

a surface of area  $10\hat{i}m^2$  in the region is

- 1)  $5N-m^2C^{-1}$       2)  $10N-m^2C^{-1}$       3)  $15N-m^2C^{-1}$       4)  $20N-m^2C^{-1}$

103. When a parallel plate capacitor is charged up to 95V its capacitance is C. If a dielectric slab of thickness 2mm is inserted between plates and distance between the plates is increased by 1.6 mm such that the same potential difference is maintained. The dielectric constant of the material is

- 1) 2.4      2) 4.5      3) 5.0      4) 9.0

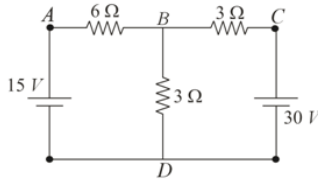
104. The equal electric charges of each charge q are placed at the vertices of an equilateral triangle of side of length L. Then potential energy of the system is

- 1)  $\frac{1}{4\pi\epsilon_0} \cdot \frac{3q^2}{L}$       2)  $\frac{1}{4\pi\epsilon_0} \cdot \frac{q^2}{3L}$       3)  $\frac{1}{4\pi\epsilon_0} \cdot \frac{2q^2}{3L}$       4)  $\frac{1}{4\pi\epsilon_0} \cdot \frac{q^2}{L}$

105. The charge q passing through a  $10\Omega$  resistor as a function of time t is given by  $q = 3t^2 - 2t + 6$ . The potential difference across the ends of the resistor at time  $t = 5s$  is

- 1) 120 V                      2) 240 V                      3) 140 V                      4) 280 V

106. Current through the branch BD, in the given circuit is

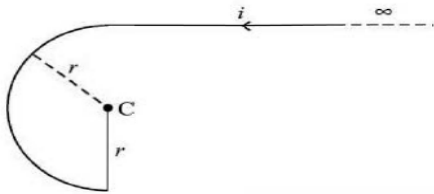


- 1) 6.6 A                      2) 5.0 A                      3) 4.3 A                      4) 3.2 A

107. The value of shunt resistance that allows only 10% of main current through the galvanometer of resistance  $99\Omega$  is

- 1)  $9\Omega$                       2)  $4\Omega$                       3)  $2\Omega$                       4)  $11\Omega$

108. The magnetic field at the centre C of the arrangement shown in figure is



- 1)  $\frac{\mu_0 i}{2\pi r}(1+\pi)$                       2)  $\frac{\mu_0 i}{4\pi r}(1+\pi)$                       3)  $\frac{\mu_0 i}{\pi r}(1+\pi)$                       4)  $\frac{\mu_0 i}{r}(1+\pi)$

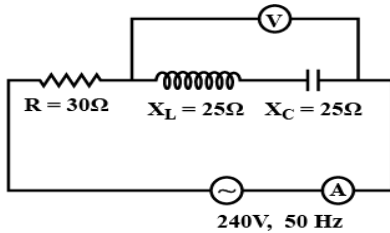
109. If the vertical component of the earth's magnetic field is 0.45 G at a location and angle of dip is  $60^\circ$ , then magnetic field of earth in that location is

- 1) 0.26 G                      2) 0.52 G                      3) 0.3 G                      4) 0.7 G

110. The energy stored in a 50mH inductor carrying a current of 4A is

- 1) 0.4J                      2) 4.0 J                      3) 0.8 J                      4) 0.04 J

111. In the circuit shown in the figure, neglecting the source resistance, the voltmeter and ammeter readings respectively are



- 1) 0 V , 8 A                      2) 150 V , 3 A                      3) 150 V , 6 A                      4) 0 V , 3 A

112. The rms value of the electric field of an electromagnetic wave emitted by a source is  $660NC^{-1}$ . The average energy density of the electromagnetic wave is

- 1)  $175 \times 10^{-6} Jm^{-3}$                       2)  $2.75 \times 10^{-6} Jm^{-3}$                       3)  $4.85 \times 10^{-6} Jm^{-3}$                       4)  $3.85 \times 10^{-6} Jm^{-3}$

113. The radii of curvature of a double convex lens are 4cm and 8 cm. If the refractive index of the material of the lens is 1.5, the focal length of the lens is nearly

- 1) 16 cm                      2) 12.11 cm                      3) 7.33 cm                      4) 5.33 cm

114. In young's double slit experiment, the intensity at a point where the path difference is  $\frac{\lambda}{6}$  is I. If  $I_0$

denotes the maximum intensity,  $\frac{I}{I_0}$  is equal to

- 1)  $\frac{1}{\sqrt{2}}$                       2)  $\frac{\sqrt{3}}{2}$                       3)  $\frac{1}{2}$                       4)  $\frac{3}{4}$

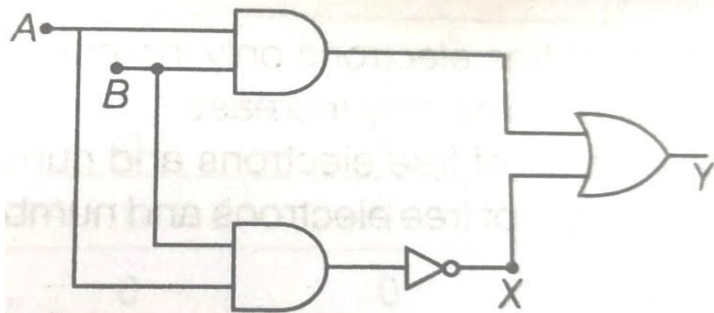
115. When light of wavelength  $\lambda$  incidents on a photosensitive material Photoelectrons are emitted. If the wavelength of the incident light is reduced by 50%, the maximum kinetic energy of the emitted photo electrons becomes 3 times the initial maximum kinetic energy. The work function of the material is

- 1)  $\frac{hc}{\lambda}$                       2)  $\frac{hc}{2\lambda}$                       3)  $\frac{2hc}{\lambda}$                       4)  $\frac{hc}{3\lambda}$

116. A hydrogen atom falls from nth higher energy orbit to first energy orbit ( $n=1$ ). The energy released is equal to 12.75 eV. The nth orbit is

- 1)  $n = 4$                       2)  $n = 3$                       3)  $n = 6$                       4)  $n = 5$

117.  ${}^{232}_{90}\text{Th}$  emits  $6\alpha$  and  $4\beta$  particles and gets converted into a lead. The mass number and atomic number of lead is  
 1) 208,82                      2) 82,208                      3) 210,82                      4) 210,84
118. In the given circuit, when  $A=1, B=1$  the values of X and Y respectively are



- 1) 1,0                      2) 1,1                      3) 0,1                      4) 0,0
119. The minimum size of an antenna for transmitting electromagnetic waves at 1500 MHz is  
 1) 2 cm                      2) 5 cm                      3) 5m                      4) 200m
120. The hole and the free electron concentrations in a pure silicon at room temperature are given by  $1.4 \times 10^{16} \text{ m}^{-3}$  each under equilibrium. When it is doped with indium and the hole concentration is  $n_h = 4 \times 10^{22} \text{ m}^{-3}$ , the electron concentration is  
 1)  $0.49 \times 10^{10} \text{ m}^{-3}$                       2)  $0.14 \times 10^{10} \text{ m}^{-3}$                       3)  $0.36 \times 10^{10} \text{ m}^{-3}$                       4)  $0.72 \times 10^{10} \text{ m}^{-3}$

### CHEMISTRY

121. The energy associated with Bohr's orbit in the hydrogen atom is given by the expression  $E_n = \frac{13.6}{n^2}$ .

The energy in eV associated with the orbit having a radius  $9r_1$  is

- 1) -13.6                      2) -6.8                      3) -1.51                      4) -1.36
122. When a certain metal was irradiated with light of frequency  $4.0 \times 10^{16} \text{ s}^{-1}$ , the photo electrons emitted had four times the kinetic energy as the kinetic energy of photo electrons emitted when the same metal was irradiated with light of frequency  $2.0 \times 10^{16} \text{ s}^{-1}$ . The threshold frequency of the metal in  $\text{s}^{-1}$  is  
 1)  $2 \times 10^{16}$                       2)  $4 \times 10^{16}$                       3)  $2.5 \times 10^{16}$                       4)  $1.33 \times 10^{16}$

123. Identify X and Y in the following reactions  $X \xrightarrow{\text{H}_2/\text{Ni}} \text{CH}_3\text{CH}_2\text{NH}_2 \xrightarrow{\text{Br}_2, \text{NaOH}} \text{Y}$

- 1)  $X = \text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$                        $Y = \text{CH}_3\text{CH}_2\text{CONH}_2$   
 2)  $X = \text{CH}_3\text{CH}_2\text{CN}$                        $Y = \text{CH}_3\text{CH}_2\text{CH}_2\text{CONH}_2$   
 3)  $X = \text{CH}_3\text{CH}_2\text{CH}_2\text{NC}$                        $Y = \text{CH}_3\text{CH}_2\text{CONHCH}_3$   
 4)  $X = \text{CH}_3\text{CH}_2\text{CN}$                        $Y = \text{CH}_3\text{CH}_2\text{CONH}_2$

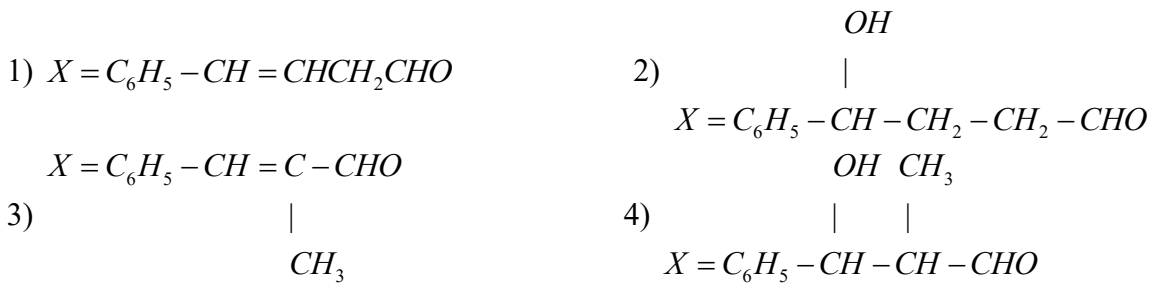
124. In the following reaction sequence, the product D is  
 $\text{CH}_3\text{COOH} \xrightarrow{\text{SOCl}_2} \text{A} \xrightarrow[\text{AlCl}_3]{\text{C}_6\text{H}_6} \text{B} \xrightarrow{\text{HCN}} \text{C} \xrightarrow{\text{H}_2\text{O}} \text{D}$

- 1)
- 2)
- 3)
- 4)

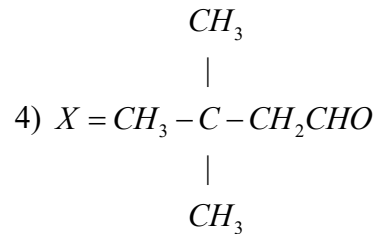
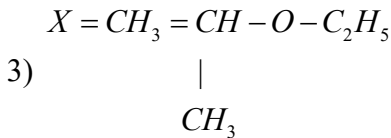
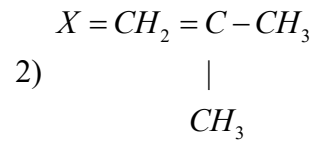
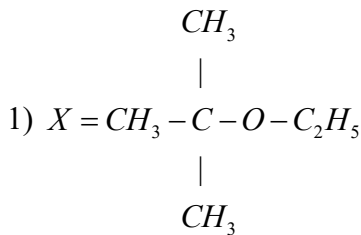
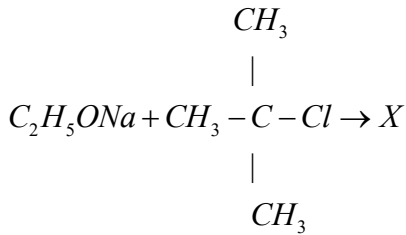
125. If general formula of oxime and semi carbazone is  $\frac{\text{CH}_3}{\text{CH}_3'}\text{C} = \text{N} - \text{Z}$  what is 'Z' in oxime (A) and semicarbazone(B) ?

- 1)  $\text{A} = \text{NHCONH}_2$                        $\text{B} = \text{OH}$                       2)  $\text{A} = \text{OH}$                        $\text{B} = \text{NH}_2$   
 3)  $\text{A} = \text{OH}$                        $\text{B} = \text{NHCONH}_2$                       4)  $\text{A} = \text{NH}_2$                        $\text{B} = \text{OH}$

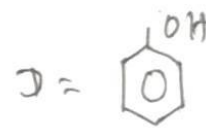
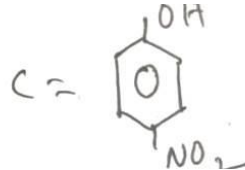
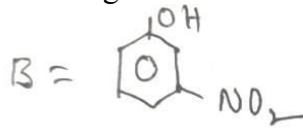
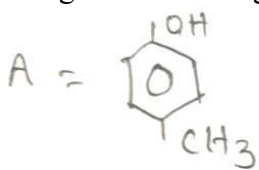
126. The product of the following reaction is  $\text{C}_6\text{H}_5\text{CHO} + \text{CH}_3\text{CHO} \xrightarrow[\Delta]{\text{dil NaOH}} \text{X}$



127. The major product obtained in the following reaction is



128. Arrange the following in increasing order of acid character



- 1)  $A < B < C < D$       2)  $A < D < B < C$       3)  $D < C < B < A$       4)  $B < C < D < A$

129. Which one of the following statements are correct?

- a) The c-cl bond in chlorobenzene is shorter than in chloromethane  
 b) It is difficult to replace chloride from chlorobenzene than from benzyl chloride  
 c) The c-cl bond in chlorobenzene has some double bond character.  
 d) Chlorobenzene on chlorination gives m-di chlorobenzene

- 1) A,B,C      2) A,D only      3) B,C,D      4) C,D ONLY

130. Which of the following is not analgesic?

- 1) Ofloxacin      2) Paracetamol      3) Morphine      4) Codeine

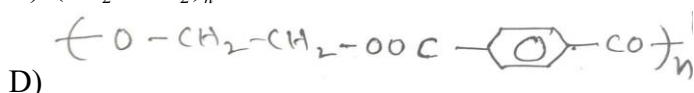
131. Which of the following statements about DNA is not correct ?

- 1) It has a double helix structure.  
 2) Adenine form hydrogen bonds with thymine and cytosine form hydrogen bond with Guanine  
 3) The two stand in a DNA molecule are not complementary to each other.  
 4) It contain the pentose sugar , 2-deoxyribose.

132. Match the following

List I

- A)  $(NH + CH_2)_6 - NH - CO + (CH_2)_6 - CO)_n$   
 B)  $(CO - (CH_2)_5 - NH)_n$   
 C)  $(CF_2 - CF_2)_n$



- 1) A-IV, B-III, C-V, D-I

List II

- I. Ethylene glycol and terephthalic acid  
 II. Phenol and formaldehyde  
 III. Caprolactam

- IV) Hexamethylene diamine and adipic acid

- V) Tetra fluoro ethene

- 2) A-III, B-II, C-IV, D-I

3)  $A-IV, B-III, C-II, D-I$

4)  $A-II, B-IV, C-III, D-V$

133. Disproportionation products of one mole of  $MnO_4^{2-}$  in aqueous acidic medium are

1)  $1/3$  mole of  $MnO_4$ ,  $2/3$  mole of  $MnO_2$

2)  $2/3$  mole of  $MnO_4^-$ ,  $1/3$  mole of  $MnO_2$

2)  $1/3$  mole of  $Mn_2O_7$ ,  $1/3$  mole of  $MnO_2$

4)  $2/3$  mole of  $Mn_2O_7$ ,  $1/3$  mole of  $MnO_2$

134. Which one of the following coordination complexes exhibits the lowest value of magnetic moment [in B.M] ?

1)  $[Cr(CN)_6]^{3-}$

2)  $[Mn(CN)_6]^{3-}$

3)  $[Fe(CN)_6]^{3-}$

4)  $[Co(CN)_6]^{3-}$

135. Which one of the following statements regarding helium is not correct?

1. It is used to fill gas balloons instead of hydrogen because it is lighter and not inflammable.

2. It is used in gas cooled nuclear reactors.

3. It is used to produce and sustain powerful superconducting magnets.

4. It is not used as a cryogenic agent.

136. Which one of the following reactions does not occur

1)  $Cl_2 + 2Br^- \rightarrow Br_2 + 2Cl^-$

2)  $ClF_3 + H_2O \rightarrow HCl + HOF + F_2$

3)  $2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$

4)  $Na_2SO_3 + 2HCl \rightarrow 2NaCl + SO_2 + H_2O$

137. Assertion(A):  $P_4O_{10}$  cannot be used to remove moisture from ammonia gas

Reason(R):  $P_4O_{10}$  reacts with ..... gas the correct answer is.

1. Both (A) and (R) are correct and (R) is the correct explanation of (A).

2. Both (A) and (R) are correct and (R) is not the correct explanation of (A).

3. (A) is correct but (R) is not correct.

4. (A) is not correct but (R) is not correct.

138. Which one of the following statements is not correct?

1. Van Arkel method is used for refining of zirconium.

2. Mond process is used for refining of Nickel.

3. Zone refining is based on the principle that the impurities are more soluble in the melt than in the solid state of the metal.

4. High melting metals are refined by liquation.

139. Which of the following statements is not correct.

1. Both physical and chemical adsorptions are exothermic.

2. Physical adsorption takes place with decreases of free energy. Whereas chemical adsorption occurs with increases of free energy.

3. Physical adsorption requires low activation energy but chemical adsorption requires high activation energy.

4. The magnitude of chemical adsorption increases and that of physical adsorption decreases with rise in temperature.

140. The reaction  $X \rightarrow$  products is a first order reaction in 40 minutes. The concentration

of  $x$  changes from  $1.0M$  to  $0.025M$ . What is the initial rate of reaction when  $[X] = 0.1M$ ? ( $\log 4 = 0.60$ )

1)  $1.73 \times 10^{-3} \text{ Mol L}^{-1} \text{ min}^{-1}$

2)  $3.47 \times 10^{-4} \text{ Mol L}^{-1} \text{ min}^{-1}$

3)  $1.73 \times 10^{-4} \text{ Mol L}^{-1} \text{ min}^{-1}$

4)  $3.45 \times 10^{-3} \text{ Mol L}^{-1} \text{ min}^{-1}$

141. The end of the following cell  $Mg / Mg^{+2}(0.01M) // Sn^{+2}(0.1M) / Sn$  at 298 K in 'V' is

1) 2.17

2) 2.23

3) 2.51

4) 2.45

142. 100 ml. of 1.5% (W/V) of urea is found to have an osmotic pressure of 6.0 atm and 100ml of 3.42% (W/V) solution of cane sugar is found to have an osmotic pressure 2.4 atm. If the two solutions are mixed the osmotic pressure of the resulting solution in atm is

1) 8.4

2) 16.8

3) 4.2

4) 2.1

143. 1.2ml of acetic acid having density  $1.06 \text{ g cm}^{-3}$  is dissolved in 1 ltr of water. The depression in freezing point observed for the concentration of acid was  $0.041^\circ C$ . The van't Hoff factor of the acid is

1) 0.41

2) 1.04

3) 0.96

4) 1.54

144. Which one of the following statements is not correct?

1) Schottky defect in ionic solids does not change the density of the crystal

2) Packing efficiency is the percentage of total space filled by the particles

3) In body centered cubic unit cell, the relationship between atomic radius  $R$  and the edge length is

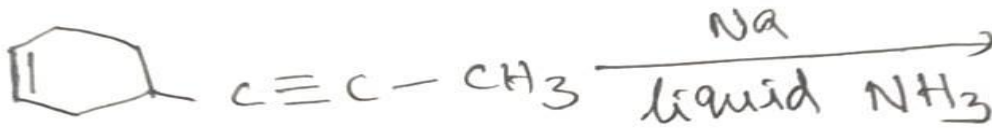
$$r = \frac{\sqrt{3}}{4} a$$

4) photovoltaic cell is used for conversion of light energy into electrical energy

145. The correct order of reactions of the following compounds towards electrophilic substitution reactions is

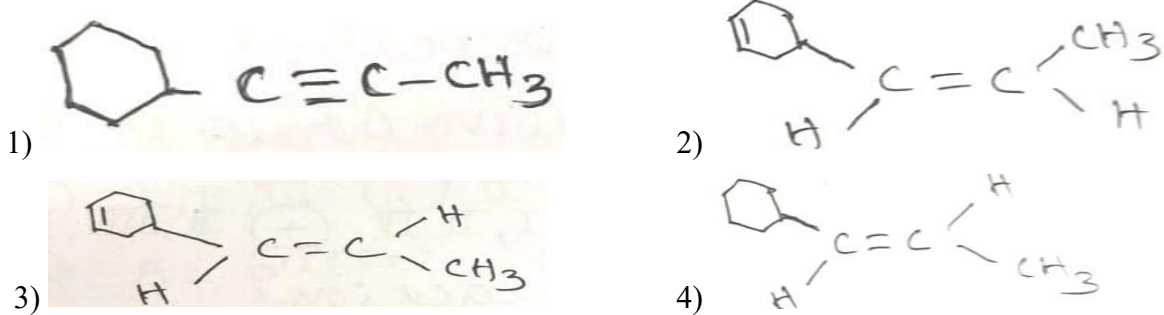


- 1)  $a > b > c > d$       2)  $d > c > b > a$       3)  $c > b > a > d$       4)  $b > c > a > d$

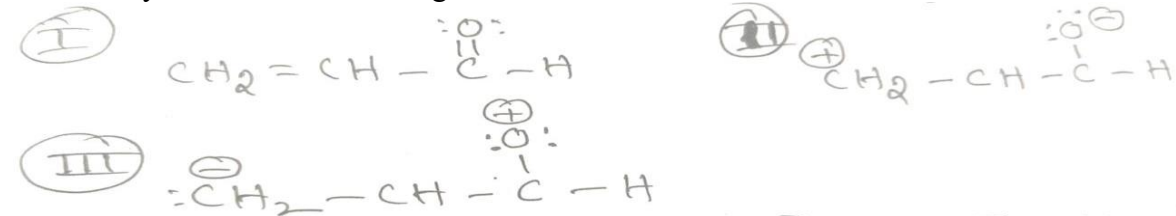


146.

The product formed in the above reaction is



147. The stability order of the following resonance structures is



- 1)  $III < II < I$       2)  $II > I > III$       3)  $II < I < III$       4)  $II > III > I$

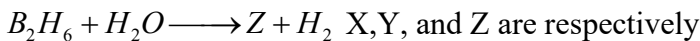
148. which one of the following statement is not correct?

- $NO_2$  is a Lung irritant.
- The municipal sewage has BOD value of 100-4000 PPM.
- Main source of CO is automobile exhaust fumes.
- COD is the measure of bacteria in water.

149. Consider the following statements.

- In diamond each carbon atom is  $sp^3$  hybridized.
  - Graphite has planer hexagonal layers of carbon atoms.
  - Silicones being surrounded by non polar alkyls groups are water repelling in nature.
  - The order of catenation in group 14 Elements is  $Si > C > Ge > Pb$ .
1. I, II, III      2. II, III, IV      3. I, II, IV      4. I, III, IV.

150. In the following reactions  $B_2H_6 + NH_3(excess) \xrightarrow{\Delta} X + H_2$ ,  $NaH + BF_3 \xrightarrow{450K} Y + NaF$



- 1)  $B_2H_6, LiBH_2, H_3BO_3$     2)  $B_3N_3H_6, B_2H_6, H_3BO_3$     3)  $(BN)_n, LiBH_4, HBO_2$     4)  $B_2H_6, B_2H_6, HBO_2$

151. Compound 'A' is prepared by the electrolysis of aqueous solution of 'B' using castor-Kellner anode A and B respectively are

- 1) NaOH, NaCl      2) NaCl, NaOH      3)  $NaHCO_3, NaOH$       4)  $Na_2CO_3, NH_3$

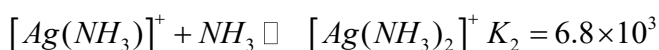
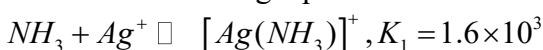
152. Identify the correct statements from the following

- I)  $B_2H_6$  is an electron deficient hydride    II)  $NH_3$  is an electron rich hydride  
 III) NaH is a covalent hydride    IV)  $YbH_{2.5}$  is an interstitial hydride

153. A buffer solution is prepared by mixing 10ml of 0.1M acetate and then distributed to 100ml. with distributed water. The Ph of the buffer solution is [ PKA of acetic acid is 4.76]

- 1) 4.84      2) 5.21      3) 4.34      4) 4.76

154. Observe the following equations



The equilibrium constant for the following reaction  $Ag^+ + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$  is

- 1)  $6.008 \times 10^3$       2)  $1.008 \times 10^7$       3)  $1.088 \times 10^6$       4)  $1.028 \times 10^3$

155. At 300k the equilibrium constant for a reaction is 10. The standard free energy change ( in  $KJ Mol^{-1}$  ) for the reaction is .

- 1). -57.4      2. -115.2      3) +57.4      4) -5.74.

156. On reduction with hydrogen, 3.6g of an oxide of metal (M) left 3.2g of the metal . If the atomic weight of the metal is 64,the formula of the oxide is

- 1)  $M_2O_3$       2)  $M_2O$       3)  $MO$       4)  $MO_2$

157. The ratio between RMS velocities  $H_2$  at 50k and  $O_2$  at 800k is.

1. 4:1      2. 2:1      3. 1:1      4. 1:4

158. Arrange the following species in the increasing order of lone pair of electrons

- a)  $CO$       b)  $NO_2^-$       c)  $NF_3$       4)  $CO_3^{2-}$

159. The changes in bond length with respect to N-N and O-O when  $N_2$  becomes ..... And ....becomes ...are respectively.

1. Increasing, Decreases      2. Decreases, Increases.  
3. Increases, Increases      4. Decreases, Decreases

160. Which of the following statements are correct for classification of elements?

- I. The properties of elements are periodic functions of their atomic numbers.  
II. Non metallic elements are less in number than the metallic elements.  
III. The first Ionization energies of elements along a period do not vary in a regular manner.  
IV. The ground state electronic configuration of pd  $[Kr]4d^{10}5S^0$

1. I, II, III, IV      2. I, II, III ONLY      3. II, III, IV ONLY,      4. I, II, IV ONLY