



97. 0.535g of a mixture of acetaldehyde and ethanol reacts with Fehling's solution and form 1.2g red precipitate. The percentage of acetaldehyde present into the mixture is-
- (a) 69% (b) 53.5% (c) 50% (d) 60.2%

**Solution:** (a);  $n_{\text{Cu}_2\text{O}} = \frac{1.2}{2 \times 63.5 + 16} = 8.39 \times 10^{-3} \text{ mol}$

$\therefore W_{\text{CH}_3\text{CHO}} = n_{\text{Cu}_2\text{O}} \times M_{\text{CH}_3\text{CHO}} = 8.39 \times 10^{-3} \times 44 = 0.369 \text{ gm}$  [ $\because n_{\text{CH}_3\text{CHO}} = n_{\text{Cu}_2\text{O}}$ ]

$\therefore \% \text{CH}_3\text{CHO} = \frac{0.369}{0.535} \times 100 = 69\%$

98. What is the oxidation number of sulfur in  $\text{Al}_2(\text{SO}_4)_3$ ?

- (a) 3 (b) 6 (c) 2 (d) None

**Solution:** (b);  $2 \times 3 + (x - 4 \times 2) \times 3 = 0 \Rightarrow x = +6$

99. The atomic weight of oxygen is 16. How many grams of electron are there in 1.0 mole oxygen atom?

- (a)  $6.023 \times 10^{-29} \text{ g}$  (b)  $9.1 \times 10^{-28} \text{ g}$  (c)  $4.03 \times 10^{-3} \text{ g}$  (d) None

**Solution:** (c);  $W_e = 1 \times 8 \times m_e \times N_A = 9.11 \times 10^{-31} \times 8 \times 6.02 \times 10^{23} \times 1000 = 4.3 \times 10^{-3} \text{ g}$

100. Which of the following metals produces medically usable alkaline oxides when burns in oxygen?

- (a) Na (b) K (c) Mg (d) Ca

**Solution:** (c); MgO is used as antacid.

## IUT Admission Test 2013-2014

### Mathematics

01. Find the root of  $2i$ .

- (a)  $\pm(1 - i)$  (b)  $\pm\sqrt{2i}$  (c)  $\pm i$  (d)  $\pm(1 + i)$

[Ans: d]

02. If the sides of a triangle are 5, 12, 13 cm respectively. Then the triangle is-

- (a) Obtuse angled (b) Acute angled (c) Right angled (d) None

**Solution:** (c);  $5^2 + 12^2 = 13^2$

03. What is the distance between  $4x + 3y + 16 = 0$  and  $4x + 3y + 26 = 0$ ?

- (a) 10 (b) 2 (c) 5 (d) 20

**Solution:** (b);  $d = \frac{10}{5} = 2$

04.  $\sin x \sin(x + 30^\circ) + \cos x \sin(x + 30^\circ) = ?$

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

**Solution:** (c);  $\sin x \sin(x + 30^\circ) + \cos x \cos(x + 30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$

05. The fundamental period of  $\frac{1}{2} \cot \frac{2}{3} \theta$  is-

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

**Solution:** (c);  $\frac{1}{2} \cot \frac{2}{3} \theta \therefore \text{period} = \frac{\pi}{\frac{2}{3}} = \frac{3\pi}{2}$

06. The value of  $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$

- (a) 0 (b)  $abc$  (c)  $4abc$  (d)  $a + b + c$

**Solution:** (c);  $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = \begin{vmatrix} 0 & -2c & -2b \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$





07. A particle has 3 velocities 10m/s, 20m/s and 30m/s inclined at angle of  $120^\circ$  to one another. The magnitude of the resultant velocity is-

- (a)  $10\sqrt{3}$  m/s      (b) 10 m/s      (c) 5 m/s      (d)  $\sqrt{3}$  m/s

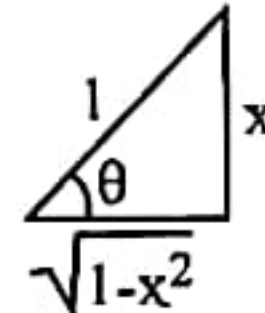
**Solution:** (a);  $V_x = 10 + 20\cos 120^\circ + 30\cos 240^\circ$ ;  $V_y = 0 + 20\sin 120^\circ + 30\sin 240^\circ$

$$V = \sqrt{V_x^2 + V_y^2} = 10\sqrt{3}$$

08. If  $y = \tan^{-1} \frac{x}{\sqrt{1-x^2}}$  then find the value of  $\frac{dy}{dx}$ .

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

**Solution:** (No correct answer);  $y = \tan^{-1} \frac{x}{\sqrt{1-x^2}} = \sin^{-1} x \therefore \frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$



09. How many ways can you arrange the letters ABCDEFGH so that the word will contain the string ABC?

- (a) 40320      (b) 720      (c) 120      (d) None of them

**Solution:** (b); Considering ABC as one element the number of ways, the letters can be arranged is  $6! = 720$

10. Let  $n$  be a positive integer. Then the value of  $\sum_{k=0}^n (-1)^k \binom{n}{k}$  is-

- (a) -1      (b) 0      (c) 1      (d) None of them

**Solution:** (b);  $\sum_{k=0}^n (-1)^k \binom{n}{k} = (1-1)^n = 0$

11. If point  $(a, 5)$  has equal distances from both the  $y$ -axis and a point  $(7, 2)$ , then the value of  $a$  is?

- (a) 49      (b) 29      (c) 49/29      (d) 29/7

**Solution:** (d);  $\sqrt{(a-7)^2 + (5-2)^2} = \pm a \Rightarrow a^2 - 14a + 58 = a^2 \Rightarrow a = \frac{58}{14} = \frac{29}{7}$

12. If  $x = a\cos^3 \theta$  and  $y = b\sin^3 \theta$  then  $\frac{dy}{dx} = ?$

- (a)  $-\frac{b}{a} \cot \theta$       (b)  $\frac{a}{b} \tan \theta$       (c)  $\frac{a}{b} \cot \theta$       (d)  $-\frac{b}{a} \tan \theta$

**Solution:** (d);  $\frac{dx}{d\theta} = 3a \cos^2 \theta (-\sin \theta) \Rightarrow \frac{dy}{d\theta} = 3b \sin^2 \theta \cos \theta \therefore \frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = -\frac{b}{a} \tan \theta$

13. Which of the following point is the reflection (image) of the point  $(3, -3)$  in the line  $2y = x + 1$ ?

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

**Solution:** (d); The perpendicular-bisector of  $x - 2y + 1 = 0$

Passing through the point  $(3, -3)$  is  $2x + y = 6 - 3 = 3 \Rightarrow 2x + y - 3 = 0$ .

Solving the equation,  $(x, y) = (1, 1)$

$\therefore$  The mid-point of the line segment connecting the point & its image is  $(1, 1)$

$\therefore$  The image is  $(2 \times 1 - 3, 2 \times 1 + 3) = (-1, 5)$

14. If the circles  $x^2 + y^2 - 16x - 12y + 75 = 0$  and  $5x^2 + 5y^2 - 32x - 24y + 75 = 0$  touch each other, then the equation of the common tangent of their point of contact is-

- (a)  $3y + 5x = 29$       (b)  $3y + 4x = 25$       (c)  $3y + 4x = 24$       (d)  $3y + 5x = 25$

**Solution:** (b);  $x^2 + y^2 - 16x - 12y + 75 = 0 \dots \dots (i)$ ;  $x^2 + y^2 - \frac{32}{5}x - \frac{24}{5}y + 15 = 0 \dots \dots (ii)$

$(i) - (ii) \Rightarrow \left(-16 + \frac{32}{5}\right)x + \left(\frac{24}{5} - 12\right)y + 60 = 0 \Rightarrow -\frac{48}{5}x - \frac{36}{5}y + 60 = 0 \Rightarrow 4x + 3y = 25$





15. An object is thrown vertically upward from the ground with an initial velocity of  $80 \text{ ft s}^{-1}$ . Its heights above the ground is parabola and is given by the equation:  $s = 80t - 16t^2$ . How high does the object rise above the ground?

(a) 100 ft                      (b) 120 ft                      (c) 96 ft                      (d) None of these

**Solution:** (a);  $V = \frac{ds}{dt} = 80 - 32t = 0$  [at maximum height]  $\Rightarrow t = \frac{80}{32}$

$$\therefore S = 80 \cdot \frac{80}{32} - 16 \cdot \left(\frac{80}{32}\right)^2 = 100 \text{ ft}$$

16. The orbit of the earth around the sun is an ellipse with the sun at one focal point. If the ellipse has a major axis of length 186 million miles and an eccentricity of approximately 0.016. Then, the shortest and greatest distances between the earth and the sun are-

(a) 91.5 and 184.5 million miles, respectively      (b) 92.9 and 185.5 million miles, respectively

(c) 92.9 and 184.5 millions miles, respectively      (d) 91.5 and 185.5 millions miles, respectively

**Solution:** (No answer);  $2a = 186 \Rightarrow a = 93$ ;  $e = 0.016$

$\therefore$  Shortest distance =  $a - ae = 91.5$  millions miles

Greatest distance =  $a + ae = 94.488$  millions miles

17. Two listening posts, A and B are 500m apart. An explosion is heard at these posts. From the difference in times it is determined that the site of explosion is 800m closer to A than to B. If the site of explosion lies on a hyperbolic curve, then the equation of the hyperbola is-

(a)  $\frac{x^2}{(400)^2} - \frac{y^2}{(5000)^2} = 1$       (b)  $\frac{x^2}{(400)^2} - \frac{y^2}{(2468)^2} = 1$       (c)  $\frac{x^2}{(8000)^2} - \frac{y^2}{(2500)^2} = 1$       (d)  $\frac{x^2}{(800)^2} - \frac{y^2}{(2468)^2} = 1$

**Solution:** (No answer);  $PB - PA = 2a = 800 \Rightarrow a = 400$ ;  $AB = 2ae = 500 \Rightarrow e = \frac{500}{800} = \frac{5}{8} < 1$

$\therefore$  It cannot be a hyperbola.  $\therefore$  The question is wrong.

18. The value of  $\lim_{x \rightarrow 2} \frac{\cos \frac{\pi}{x}}{x-2}$  is?

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

**Solution:** (c);  $\lim_{x \rightarrow 2} \frac{\cos \frac{\pi}{x}}{x-2} = \lim_{k \rightarrow 2} \frac{-\sin(\frac{\pi}{x}) \cdot (-\frac{\pi}{x^2})}{1} \left[ \frac{0}{0} \text{ form} \right] = \frac{\pi}{4}$

19.  $\frac{d}{dx} \ln \frac{\sin x}{1 - \cos x} = ?$

(a) -1                      (b)  $\cot x - \tan x + 1$       (c)  $\operatorname{cosec} x$                       (d)  $-\operatorname{cosec} x$

**Solution:** (d);  $\frac{d}{dx} \left[ \ln \left( \frac{\sin x}{1 - \cos x} \right) \right] = \frac{d}{dx} \ln \left[ \frac{2 \sin \frac{x}{2} \cos \frac{x}{2}}{2 \sin^2 \frac{x}{2}} \right] = \frac{d}{dx} \left[ \ln \left( \cot \frac{x}{2} \right) \right]$

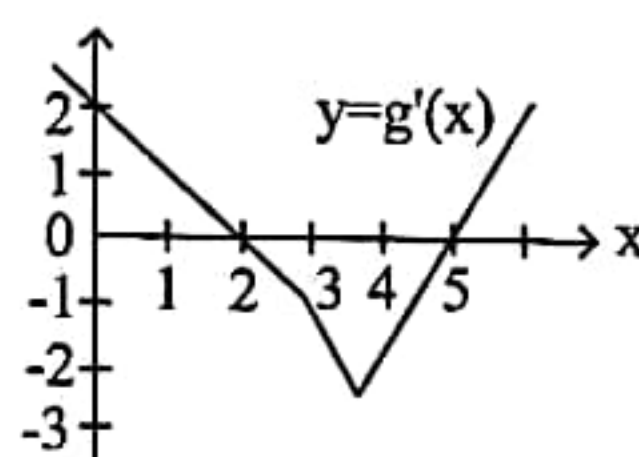
$$= -\frac{\frac{1}{2} \operatorname{cosec}^2 \frac{x}{2}}{\cot \frac{x}{2}} = -\frac{\sin \frac{x}{2}}{2 \cos \frac{x}{2} \cdot \sin^2 \frac{x}{2}} = -\frac{1}{\sin x} = -\operatorname{cosec} x$$

20. The function  $x^3 - 12x + 5$  has a stationary value when-

(a)  $x = -2$                       (b)  $x = \sqrt{6}$                       (c)  $x = 0$                       (d)  $x = 4$

**Solution:** (a);  $f(x) = x^3 - 12x + 5$ ;  $f'(x) = 0 \Rightarrow 3x^2 - 12 = 0 \Rightarrow x = \pm 2$

21. Let  $g$  be a function whose derivative  $g'$  and is shown in the graph below. For what value of  $x$ , the value of  $g$  is maximum? [Ans: a]



(a) 2

(b) 3

(c) 4

(d) 5





22. A stone dropped into a still pond sends out a circular ripple whose radius increases at a constant rate of 3 ft  $s^{-1}$ . How rapidly is the area enclosed by the ripple increasing at the end of 10s?  
 (a)  $90\pi \text{ fts}^{-2}$  (b)  $180 \text{ fts}^{-2}$  (c)  $180\pi \text{ fts}^{-2}$  (d)  $90 \text{ fts}^{-2}$

Solution: (No answer);  $A = \pi r^2$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} = 2\pi \times 30 \times 3 = 180\pi \text{ ft}^2 \text{ s}^{-1} \quad \left| \frac{dr}{dt} = 3 \Rightarrow r = 3t \therefore r = 30 \text{ ft [for } t = 10\text{ s]} \right.$$

23.  $\int \tan^3 5x \sec^2 5x \, dx = ?$   
 (a)  $\frac{1}{12} \sec^4 5x + C$  (b)  $\frac{1}{20} \tan^4 5x + C$  (c)  $\frac{1}{20} \sec^4 5x + C$  (d)  $\frac{1}{12} \sec^3 5x + C$

Solution: (b); let,  $\tan 5x = z, 5 \sec^2 5x \, dx = dz$

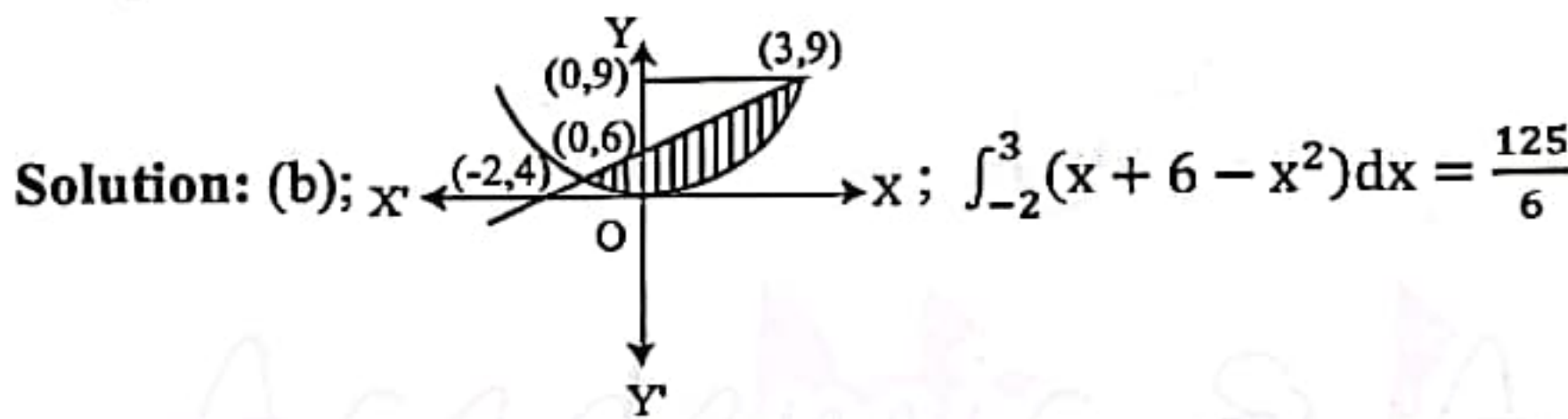
$$\int \tan^3 5x \sec^2 5x \, dx = \frac{1}{5} \int z^3 \, dz = \frac{z^4}{20} + C = \frac{1}{20} \tan^4 5x + C$$

24.  $\int_0^{\frac{3\pi}{4}} |\cos x| \, dx = ?$   
 (a)  $\frac{\sqrt{2}}{2}$  (b)  $1 - \frac{\sqrt{2}}{2}$  (c)  $2 - \frac{\sqrt{2}}{2}$  (d) None of these

Solution: (c);  $\int_0^{\frac{3\pi}{4}} |\cos x| \, dx = \int_0^{\frac{\pi}{2}} \cos x \, dx - \int_{\frac{\pi}{2}}^{\frac{3\pi}{4}} \cos x \, dx \quad \left[ \because |\cos x| = \begin{cases} \cos x, & 0 \leq x \leq \frac{\pi}{2} \\ -\cos x, & \frac{\pi}{2} < x < \frac{3\pi}{4} \end{cases} \right]$

$$= [\sin x]_0^{\frac{\pi}{2}} - [\sin x]_{\frac{\pi}{2}}^{\frac{3\pi}{4}} = 1 - \left( \frac{1}{\sqrt{2}} - 1 \right) = 2 - \frac{1}{\sqrt{2}}$$

25. Find the area of the region enclosed between the curves  $y = x^2$  and  $y = x + 6$ .  
 (a)  $\frac{157}{6}$  (b)  $\frac{125}{6}$  (c)  $\frac{95}{6}$  (d)  $\frac{13}{6}$



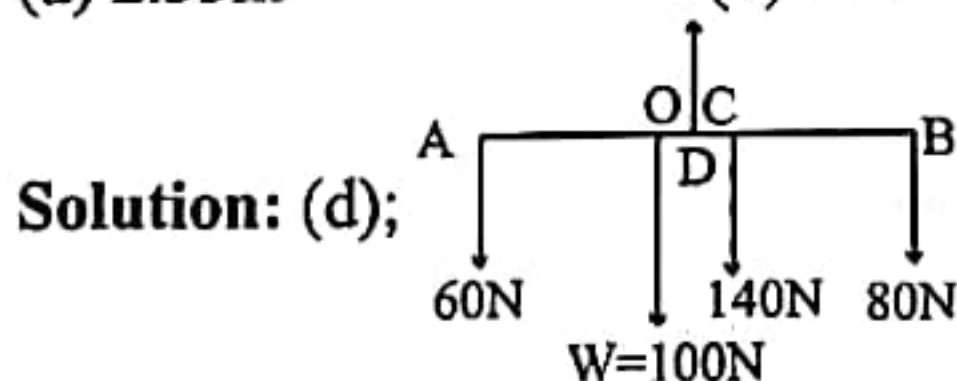
26. The resultant of two forces P and Q acting at a point is  $\sqrt{3} Q$  and it makes an angle of  $30^\circ$  with the direction of P.  $P = ?$   
 (a) Q (b) 2Q (c)  $\sqrt{Q}$  (d) Both a and b

Solution: (d);  $P + Q \cos \alpha = \sqrt{3} Q \cos 30^\circ \Rightarrow P + Q \cos \alpha = \frac{3}{2} Q \Rightarrow \cos \alpha = \frac{\frac{3}{2} Q - P}{Q}$

$$\therefore 3Q^2 = P^2 + Q^2 + 2PQ \cdot \left( \frac{\frac{3}{2} Q - P}{Q} \right) \Rightarrow 2Q^2 = P^2 + 2P \left( \frac{3}{2} Q - P \right) \Rightarrow 2Q^2 = P^2 + 3PQ - 2P^2$$

$$\Rightarrow 2Q^2 = 3PQ - P^2 \Rightarrow P^2 - 3PQ + 2Q^2 = 0 \Rightarrow P = 2Q, Q$$

27. A uniform beam AB of weight 100N and 6m long had two bodies of weights 60N and 80N suspended from its two ends A and B, respectively. At what distance from B, the beam should be supported so that it may rest horizontally?  
 (a) 2.55m (b) 3.25m (c) 3.45m (d) 2.75m



$$60 \times AC = 80 \times BC \Rightarrow 60AC = 80(6 - AC) \Rightarrow AC = 3.4286 \therefore OC = 0.4286 \text{ m}$$

$$100 \times OD = 140 \times CD \Rightarrow 100 \times OD = 140(OC - OD) \Rightarrow OD = 0.25 \text{ m}$$

$$\therefore AD = 3.25 \text{ m} \therefore BD = AB - AD = 2.75 \text{ m}$$





28. An airplane is flying on a straight level course at  $200 \text{ km hour}^{-1}$  at a height of  $1000 \text{ m}$  above the ground. An anti-aircraft gun located on the ground fires a shell with an initial velocity of  $300 \text{ ms}^{-1}$ , at the instant when the plane is vertically above it. At what inclination, to the horizontal, should the gun be fired to hit the plane?

- (a)  $86.96^\circ$  (b)  $79.33^\circ$  (c)  $83.68^\circ$  (d) None of these

**Solution:** (b);  $V_{\text{aircraft}} = \frac{200}{3.6} = 55.56 \text{ ms}^{-1} \Rightarrow V_{\text{aircraft}} \cdot t = (300 \cos \alpha)t \Rightarrow \cos \alpha = \frac{55.56}{300} \Rightarrow \alpha = 79.33^\circ$

29. A man takes  $8 \text{ min}$  to cross a  $400 \text{ m}$  wide river by swimming, if there is no current in the river. However, he takes  $10 \text{ minutes}$  to cross the river, if there is current in the river. The velocity of the current is-

- (a)  $15 \text{ m min}^{-1}$  (b)  $20 \text{ m min}^{-1}$  (c)  $25 \text{ m min}^{-1}$  (d)  $30 \text{ m min}^{-1}$

**Solution:** (d);  $V = \frac{400}{8} = 50 \text{ m/min}$

$W = \frac{400}{10} = 40 \text{ m/min} \therefore U = \sqrt{V^2 - W^2} = 30 \text{ m min}^{-1}$

30. In a study, it was discovered that  $25\%$  of the paintings of a certain art gallery are not original. A collector, in  $15\%$  cases, makes a mistake in judging if a painting is original or a copy. If she buys a painting thinking that it is original, what is the probability that it is not original?

- (a)  $0.056$  (b)  $0.25$  (c)  $0.0625$  (d) None of these

**Solution:** (a);  $P\left(\frac{F}{O}\right) = \frac{P(F \cap O)}{P(O)} = \frac{0.25 \times 0.15}{0.75 \times 0.85 + 0.25 \times 0.15} = 0.056$

## Physics

31. An engineer designs a runway to accommodate airplanes that must reach a ground velocity of  $61 \text{ ms}^{-1}$  before they can take off. These planes are capable of being accelerated uniformly at the rate of  $2.5 \text{ ms}^{-2}$ . What must be the minimum length of the runway?

- (a)  $785.2 \text{ m}$  (b)  $760.2 \text{ m}$  (c)  $744.2 \text{ m}$  (d)  $670.2 \text{ m}$

**Solution:** (c);  $V^2 = 2as \Rightarrow s = \frac{V^2}{2a} = \frac{61^2}{2 \times 2.5} = 744.2 \text{ m}$

32. As a traffic light turns green, a waiting car starts with a constant acceleration of  $6.0 \text{ ms}^{-2}$ . At the instant the car begins to accelerate, a truck with a constant velocity of  $21 \text{ ms}^{-1}$  passes the car through the next lane. How fast will the car be traveling when it overtakes the truck?

- (a)  $78 \text{ ms}^{-1}$  (b)  $42 \text{ ms}^{-1}$  (c)  $35 \text{ ms}^{-1}$  (d)  $25 \text{ ms}^{-1}$

**Solution:** (b);  $\frac{1}{2} \times 6 \times t^2 = 21t \Rightarrow t = 7 \therefore V = 6t = 6 \times 7 = 42 \text{ ms}^{-1}$

33. A race car has a mass of  $710 \text{ kg}$ . It starts from rest and travels  $40.0 \text{ m}$  in  $3.0 \text{ s}$ . The car is uniformly accelerated during the entire time. What net force is exerted on it?

- (a)  $6.3 \times 10^3 \text{ N}$  (b)  $8.3 \times 10^3 \text{ N}$  (c)  $7.3 \times 10^3 \text{ N}$  (d)  $3.3 \times 10^3 \text{ N}$

**Solution:** (a);  $S = \frac{1}{2}at^2 \Rightarrow 40 = \frac{1}{2}a \times 3^2 \Rightarrow a = \frac{80}{9} \therefore F = ma = 710 \times \frac{80}{9} = 6.3 \times 10^3 \text{ N}$

34. A partially inflated balloon contains  $500 \text{ m}^3$  of Helium at  $27^\circ \text{C}$  at  $1\text{-atm}$  pressure. What is the volume of the Helium at an altitude of  $3000 \text{ m}$ , where the pressure is  $0.5 \text{ atm}$  and temperature is  $-3^\circ \text{C}$ ?

- (a)  $900 \text{ m}^3$  (b)  $910 \text{ m}^3$  (c)  $790 \text{ m}^3$  (d)  $850 \text{ m}^3$

**Solution:** (a);  $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow V_2 = \frac{P_1 V_1 T_2}{T_1 P_2} = \frac{1 \times 500 \times (273 - 3)}{(27 + 273) \times 0.5} = 900 \text{ m}^3$

35. On July 19, 1969, Apollo 11's orbit around the moon was adjusted to an average orbit of  $111 \text{ km}$ . The radius of the moon is  $1785 \text{ km}$ , and the mass of the moon is  $7.3 \times 10^{22} \text{ kg}$ . How many minutes did Apollo I take to orbit the moon once? [ $G = 6.67 \times 10^{-11} \text{ N - m}^2 \text{ Kg}^{-2}$ ]

- (a)  $2.31 \times 10^2 \text{ min}$  (b)  $1.23 \times 10^2 \text{ min}$  (c)  $1.35 \times 10^2 \text{ min}$  (d)  $1.56 \times 10^2 \text{ min}$





$$\text{Solution: (b); } \frac{mv^2}{R+h} = \frac{GMm}{(R+h)^2} \Rightarrow \frac{4\pi^2(R+h)^2}{T^2} = \frac{GM}{(R+h)} \Rightarrow T^2 = \frac{4\pi^2(R+h)^3}{GM}$$

$$\Rightarrow T = 2\pi \sqrt{\frac{(R+h)^3}{GM}} = 2\pi \sqrt{\frac{(1785 \times 10^3 + 111 \times 10^3)^3}{6.67 \times 10^{-11} \times 7.3 \times 10^{22}}} = 7.43 \times 10^3 \text{ s} = 1.23 \times 10^2 \text{ min}$$

36. A 35.0g bullet strikes a 5.0Kg stationary wooden block and embeds itself in the block. The block and bullet fly off together at  $8.6 \text{ ms}^{-1}$ . What was the original speed of the bullet?

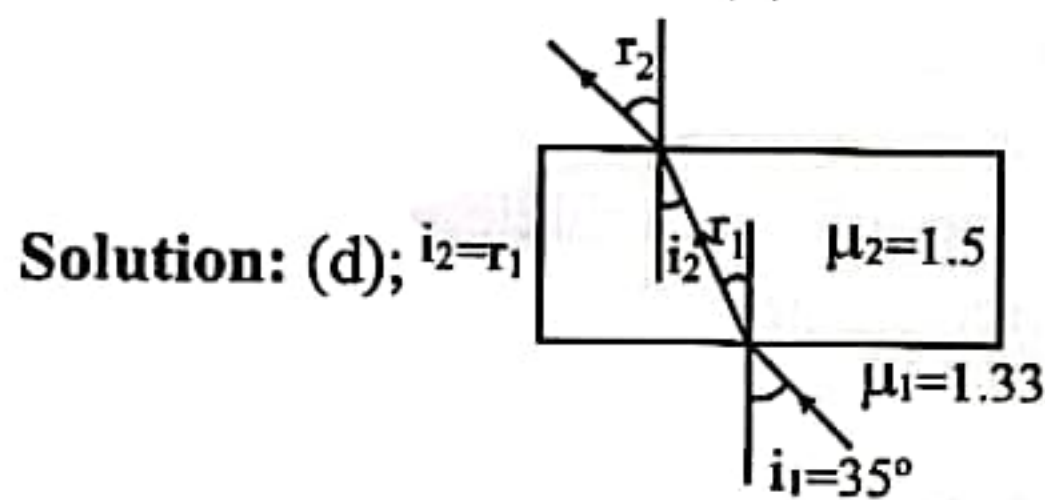
(a)  $1.2 \times 10^3 \text{ ms}^{-1}$       (b)  $1.35 \times 10^3 \text{ ms}^{-1}$       (c)  $1.35 \times 10^2 \text{ ms}^{-1}$       (d)  $1.2 \times 10^2 \text{ ms}^{-1}$

$$\text{Solution: (a); } m_1 u_1 + m_2 u_2 = (m_1 + m_2) V$$

$$\Rightarrow 0.035 u_1 = (5 + 0.035) \times 8.6 \Rightarrow u_1 = 1.237 \times 10^3 \text{ ms}^{-1}$$

37. A thick sheet of plastic having refractive index of 1.50 is used as the side of an aquarium tank. Light reflected from a fish in the water has an angle of incidence of  $35.0^\circ$ . At what angle does the light enter the air? [Refractive index of water is 1.33]

(a)  $59.8^\circ$       (b)  $49.0^\circ$       (c)  $47.8^\circ$       (d)  $49.8^\circ$



$$\frac{1.5}{1.33} = \frac{\mu_2}{\mu_1} = \frac{\sin i_1}{\sin r_1} \Rightarrow r_1 = \sin^{-1} \left( \frac{1.33}{1.5} \times \sin 35^\circ \right) = 30.57^\circ \therefore i_2 = r_1 = 30.57^\circ$$

$$\text{Again, } \mu_2 = \frac{\sin r_2}{\sin i_2} \therefore r_2 = \sin^{-1} (1.5 \times \sin 30.57^\circ) = 49.717^\circ$$

38. A circuit contains six  $480\Omega$  lamps and a  $24.0\Omega$  heater connected in parallel. The voltage across the circuit is 240V. What is the total current in the circuit?

(a) 11.25A      (b) 13.0A      (c) 12.5A      (d) 15.0A

$$\text{Solution: (b); } \frac{1}{R_{eq}} = \frac{1}{24} + \frac{6}{480} \Rightarrow R_{eq} = 18.46 \Omega \therefore I = \frac{V}{R_{eq}} = \frac{240}{18.46} = 13.0 \text{ A}$$

39. A wire 75cm long carrying a current of 6.0A is at right angles to a uniform magnetic field. The magnitude of the force action on the wire is 0.60N. What is the strength of the magnetic field?

(a) 0.13T      (b) 1.30T      (c) 0.09T      (d) 0.50T

$$\text{Solution: (a); } F = I l B \sin 90^\circ \Rightarrow F = I l B \Rightarrow 0.6 = 6 \times 0.75 \times B \Rightarrow B = 0.13 \text{ T}$$

40. A laptop computer requires an effective voltage of 9.0 volts from the 240V line. Current drawn by the computer is 125mA. What is the current in the primary circuit?

(a) 4.52 mA      (b) 4.32 mA      (c) 5.52 mA      (d) 4.69 mA

$$\text{Solution: (d); } V_p I_p = V_s I_s \Rightarrow I_p = \frac{V_s I_s}{V_p} = \frac{9 \times 125 \times 10^{-3}}{240} = 4.69 \times 10^{-3} = 4.69 \text{ mA}$$

41. An electron is accelerated across a potential difference of  $5.0 \times 10^3 \text{ V}$  in the CRT of a television. What is the velocity of the electron if it starts from rest?

(a)  $4.193 \times 10^7 \text{ ms}^{-1}$       (b)  $4.253 \times 10^7 \text{ ms}^{-1}$       (c)  $5.351 \times 10^7 \text{ ms}^{-1}$       (d)  $4.112 \times 10^7 \text{ ms}^{-1}$

$$\text{Solution: (a); } eV = \frac{1}{2} m v^2 \Rightarrow v = \sqrt{\frac{2eV}{m}} = \sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 5 \times 10^3}{9.1 \times 10^{-31}}} = 4.193 \times 10^7 \text{ ms}^{-1}$$

42. A spaceship is 98m long. How fast would it have to be moving to appear only 49m long?

(a)  $5.6 \times 10^8 \text{ ms}^{-1}$       (b)  $4.6 \times 10^8 \text{ ms}^{-1}$       (c)  $2.6 \times 10^8 \text{ ms}^{-1}$       (d)  $3.6 \times 10^8 \text{ ms}^{-1}$

$$\text{Solution: (c); } L = L_0 \sqrt{1 - \frac{v^2}{c^2}} \Rightarrow 49 = 98 \sqrt{1 - \frac{v^2}{c^2}} \Rightarrow \frac{1}{4} = 1 - \frac{v^2}{c^2} \Rightarrow v = \frac{\sqrt{3}}{2} c = 2.59 \times 10^8 \text{ ms}^{-1}$$





43. Liquid helium has a very low boiling point 4.2K as well as low latent heat of vaporization, equal to  $2.09 \times 10^4 \text{ J kg}^{-1}$ . What is the boiling time for 2 kg of liquid helium by a 100W heater.  
 (a) 6.97 min (b) 5.92 min (c) 6.35 min (d) 6.57 min

**Solution:** (a);  $P = \frac{W}{t} \Rightarrow P = \frac{ml_v}{t} \Rightarrow t = \frac{ml_v}{P} = \frac{2 \times 2.09 \times 10^4}{100} = 418 \text{ s} = 6.97 \text{ min}$

44. During one cycle an engine extracts  $2.00 \times 10^3 \text{ J}$  of energy from a hot reservoir and transfers  $1.50 \times 10^3 \text{ J}$  to a cold reservoir. How much power does the engine generate if it goes through 4 cycles in 2.5s?  
 (a) 750 W (b) 800 W (c) 825 W (d) 775 W

**Solution:** (b);  $P = \frac{W}{t} = \frac{4\Delta W}{t} = \frac{4(Q_1 - Q_2)}{t} = \frac{4 \times (2 \times 10^3 - 1.5 \times 10^3)}{2.5} = 800 \text{ W}$

45. A platform is suspended by four wires at its corners. The wires are 3m long and have a diameter of 2.00 mm. Young's modulus of the material of the wire is  $1.8 \times 10^{11} \text{ N m}^{-2}$ . How far will the platform drop due to the elongation of the wires if a 50kg load is placed at the centre of the platform?  
 (a) 0.65mm (b) 0.65cm (c) 0.42mm (d) 0.55mm

**Solution:** (a);  $Y = \frac{F}{\frac{\Delta l}{L}} \Rightarrow \Delta l = \frac{FL}{AY} = \frac{mgL}{AY} = \frac{\frac{50}{4} \times 9.8 \times 3}{\pi \times \left(\frac{2 \times 10^{-3}}{2}\right)^2 \times 1.8 \times 10^{11}} = 0.65 \text{ mm}$

46. Three particles are placed in a line. The left has a charge of  $-67 \mu\text{C}$ , the middle  $+45 \mu\text{C}$  and the right  $-83 \mu\text{C}$ . The middle is 72cm from each of the others. What is force on the middle particle?  
 (a) 12N (b) 22N (c) 16N (d) 13.0N

**Solution:** (d);  $F = F_1 - F_2 = \frac{9 \times 10^9}{0.72^2} \times (83 \times 10^{-6} - 67 \times 10^{-6}) \times 45 \times 10^{-6} = 12.5 \text{ N}$

47. When the velocity of a moving object is increased by  $4 \text{ ms}^{-1}$ , its kinetic energy is doubled. What is the initial velocity of the object?  
 (a)  $4.66 \text{ ms}^{-1}$  (b)  $9.66 \text{ ms}^{-1}$  (c)  $7.66 \text{ ms}^{-1}$  (d)  $6.66 \text{ ms}^{-1}$

**Solution:** (b);  $E_1 = \frac{1}{2}mv^2$ ;  $E_2 = 2E_1 = mv^2 = \frac{1}{2}m(v+4)^2 \Rightarrow 2v^2 = (v+4)^2 \Rightarrow 2v^2 = v^2 + 8v + 16$   
 $\Rightarrow v^2 - 8v - 16 = 0 \Rightarrow v = 4 \pm 4\sqrt{2}$  [v cannot be (-ve)]  $\therefore v = 4 + 4\sqrt{2} = 9.66 \text{ ms}^{-1}$

48. A plate of area  $10 \text{ cm}^2$  is to be electroplated with copper (density  $9.0 \text{ gm cm}^{-3}$ ) to a thickness of  $0.001 \text{ cm}$  on both sides using a battery of 12 volts. What is the energy spent by the battery in the process of deposition?  
 (a) 8500J (b) 7200J (c) 7600J (d) 7890J

**Solution:** (b);  $W = Zit \Rightarrow it = \frac{W}{Z} = \frac{\rho Ah \times 2}{Z} = \frac{9 \times 10 \times 0.001 \times 2}{0.0003} = 600 \text{ C} \therefore E = Vit = 12 \times 600 = 7200 \text{ J}$

49. The half life of Radon is 3.8 days. After how many days  $1/10^{\text{th}}$  part of an initial amount of the material will exist?  
 (a) 13.32 days (b) 11.626 days (c) 12.626 days (d) 12.12 days

**Solution:** (c);  $t = \frac{1}{K} \ln \frac{a}{\frac{1}{10}a} = \frac{3.8}{\ln 2} \ln 10 = 12.626 \text{ days}$

50. A person in a railroad car blows a trumpet note at 440Hz. The car is moving towards a wall at  $20.0 \text{ ms}^{-1}$ . What is the frequency of the sound heard by an observer at the wall? Assume that the speed of sound in air is  $343 \text{ ms}^{-1}$   
 (a) 467 Hz (b) 498 Hz (c) 450 Hz (d) 460 Hz

**Solution:** (a);  $f' = \frac{v}{v - v_s} f = \frac{343}{343 - 20} \times 440 = 467 \text{ Hz}$

51. A marbel with speed  $20 \text{ cm s}^{-1}$  rolls off the edge of a table 80cm high. How far, horizontally, from the tabel edge does the marbel strike the floor?  
 (a) 6.5cm (b) 7.0cm (c) 8.0cm (d) 8.5cm

**Solution:** (c);  $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 0.8}{9.8}} = 0.4041 \text{ s} \therefore s = vt = 20 \times 0.4041 = 8.08 \text{ cm}$





52. When an electric fan rotating at an angular velocity of 30 rad/s is switched off, its velocity reduces to 10 rad/s after 20 revolution. What is the angular retardation of the fan?  
 (a) 3.183 rad s<sup>-2</sup> (b) 2.183 rad s<sup>-2</sup> (c) 1.183 rad s<sup>-2</sup> (d) 3.363 rad s<sup>-2</sup>

**Solution:** (a);  $\alpha = \frac{\omega_i^2 - \omega_f^2}{2\theta} = \frac{30^2 - 10^2}{2 \times 20 \times 2\pi} = 3.183 \text{ rad s}^{-2}$

53. It is required to install an electric pump to lift water from an underground tank to a 1000 liter overhead reservoir which has 25 m height. What must be the power of the electric motor to fill the tank in 10 mins.  
 (a) 0.45 hp (b) 0.55 hp (c) 0.50 hp (d) 0.65 hp

**Solution:** (b);  $P = \frac{W}{t} = \frac{mgh}{t} = \frac{1000 \times 9.8 \times 25}{10 \times 60 \times 746} = 0.547 \text{ hp}$

54. A battery dissipates 5 watts when it supplies a current of 4A through it. The terminal potential at the load is 23 volt. What is the emf of the battery?

(a) 24.25 V (b) 23.25 V (c) 26.25 V (d) 21.25 V

**Solution:** (a);  $V_1 = \frac{P}{I} = \frac{5}{4} = 1.25 \text{ V} \therefore E = V_1 + V_2 = 1.25 + 23 = 24.25 \text{ V}$

55. The speed of light in a particular type of glass is  $1.6 \times 10^8 \text{ ms}^{-1}$ . What is the refractive index of the glass?  
 (a) 1.9 (b) 1.53 (c) 1.43 (d) 1.25

**Solution:** (a);  $\mu = \frac{3 \times 10^8}{1.6 \times 10^8} = 1.875 \approx 1.9$

56. Alpha particles ( $m = 6.68 \times 10^{-27} \text{ kg}$  and  $q = +2e$ ) accelerate to 2 keV through a potential difference V. They enter a magnetic field  $B = 0.2 \text{ T}$  perpendicular to their direction of motion. What is radius of their path?

(a) 35 mm (b) 46 mm (c) 32 mm (d) 41 mm

**Solution:** (c);  $eV = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{\frac{2eV}{m}} = \sqrt{\frac{2e \times 2 \times 10^3}{6.68 \times 10^{-27}}} = 3.097 \times 10^5 \text{ ms}^{-1}$

Again,  $qvB = \frac{mv^2}{r} \Rightarrow r = \frac{mv}{qB} = \frac{6.68 \times 10^{-27} \times 3.097 \times 10^5}{2 \times 1.6 \times 10^{-19} \times 0.2} = 32.285 \text{ mm} \approx 32 \text{ mm}$

57. If the sound level is increased by 3dB, what is the corresponding change in the intensity level?  
 (a) Doubled (b) 3 times (c) 2.5 times (d) 1.5 times

**Solution:** (a);  $P + 3 = 10 \log \left( \frac{I'}{I_0} \right)$

$\Rightarrow P + 3 = 10 \log \left( \frac{xI}{I_0} \right) \Rightarrow P + 3 = 10 \log x + 10 \log \left( \frac{I}{I_0} \right) \therefore 10 \log x = 3; x = 2$

58. Two  $10 \mu\text{F}$  capacitor are connected in parallel and the combination is fed by a 12V battery. What is the energy stored in the capacitors?

(a) 1.35 mJ (b) 1.10 mJ (c) 1.44 mJ (d) 1.56 mJ

**Solution:** (c);  $C_{eq} = 2 \times 10 \mu\text{F} \therefore E = \frac{1}{2} C_{eq} V^2 = \frac{1}{2} \times 2 \times 10 \times 10^{-6} \times 12^2 = 1.44 \text{ mJ}$

59. A 60W lamp is emitting green light with wavelength  $5550 \times 10^{-10} \text{ m}$ . If 5% of the electrical energy of the lamp is converted to light, how many photons are being emitted by the lamp in 1s. [ $h = 6.63 \times 10^{-34}$ ]  
 (a)  $7.37 \times 10^{18}$  (b)  $8.37 \times 10^{18}$  (c)  $9.5 \times 10^{18}$  (d)  $6.7 \times 10^{18}$

**Solution:** (b);  $0.05P = \frac{W}{t} = \frac{nhc}{t} \Rightarrow n = \frac{Pt\lambda \times 0.05}{hc} = \frac{60 \times 1 \times 5550 \times 10^{-10} \times 0.05}{6.63 \times 10^{-34} \times 3 \times 10^8} = 8.37 \times 10^{18}$

60. An FM radio station broadcasts on a frequency of 94.5 MHz. The station uses a half wavelength antenna. What is the length of the antenna?

(a) 1.43m (b) 1.2m (c) 1.59m (d) 1.83m

**Solution:** (c);  $\lambda = \frac{c}{v} = \frac{3 \times 10^8}{94.5 \times 10^6} = 3.174 \text{ m} \therefore \text{length of antenna} = \frac{\lambda}{2} = 1.59 \text{ m}$





## Chemistry

61. The names and formulas of the following ores are given below: [Ans: c]  
 (i) corundum,  $\text{Al}_2\text{O}_3$   
 (ii) cryolite,  $\text{AlF}_3 \cdot 3\text{NaF}$   
 (iii) cerusite,  $\text{PbCO}_3$   
 Which statements are correct?  
 (a) i, ii (b) i, iii (c) i, ii, iii (d) ii, iii
62. What compound is formed when  $\text{Cl}_2$  is passed in slaked lime at  $40^\circ\text{C}$ ? [Ans: a]  
 (a)  $\text{Ca(OCl)Cl}$  (b)  $\text{CaCl}_2$  (c)  $\text{Ca(OCl)}_2$  (d)  $\text{CaO}$
63. How much percentage of inert gases (by volume) is present in air? [Ans: c]  
 (a) 0.1% (b) 2.0% (c) 0.93% (d) 2.5%
64. Among four elements with following electron distributions of the 2<sup>nd</sup> period which has largest atomic radius?  
 (a)  $1s^2 2s^1$  (b)  $1s^2 2s^2$  (c)  $1s^2 2s^2 2p^1$  (d)  $1s^2 2s^2 sp^2$  [Ans: a]
65. In some endothermic reaction ( $\text{P} \rightarrow \text{Q}$ ); activation energy is 60 kJ/mol and reaction enthalpy is 20 kJ/mol. In its opposite reaction, what will be its activation energy? [Ans: c]  
 (a) 80 kJ/mol (b) 60 kJ/mol (c) 40 kJ/mol (d) zero
66.  $\text{Sn(s)} + 2\text{Ag}^+ \rightarrow \text{Sn}^{2+}(\text{aq}) + 2\text{Ag(s)}$ ; what is helpful to increase the emf of this cell? [Ans: b]  
 (a) to (b) to increase  $\text{Ag}^+$  concentration  
 (c) to increase size of Ag rod (d) None these
67. Which one is not correct? [Ans: d]  
 (a) Ohm's law is valid for electronic conductors  
 (b) Delocalized electrons are present in metallic conductors  
 (c) Farady's law is valid for electrolyte  
 (d) Oxidation occurs at cathode during electrolysis
68. If a current of 5A is passed through a  $\text{CuSO}_4$  solution for 15 minutes, the amount of copper will be deposited on the cathode will be- [ $\text{Cu} = 63.5$ ]  
 (a) 1.48g Cu (b) 2.48g Cu (c) 0.148g Cu (d) 1.28g Cu  
**Solution:** (a);  $W = Zit = \frac{M}{xF} it = \frac{63.5}{2 \times 96500} \times 5 \times 15 \times 60 = 1.48\text{g Cu}$
69. Of the elements listed below, which set has the unpaired electrons in their electronic configurations?  
 (a) Ca, Sr, Ba (b) Na, Si, S (c) Ca, P, Xe (d) Zn, Mg, N [Ans: b]
70. A solution has hydroxyl ion ( $\text{OH}^-$ ) concentration of  $6.2 \times 10^{-7}$  mol/L. The pH of this solution will be-  
 (a) 8.7 (b) 7.8 (c) 6.8 (d) 2.1  
**Solution:** (b);  $\text{pOH} = -\log[\text{OH}^-] = -\log[6.2 \times 10^{-7}] = 6.2 \therefore \text{pH} = 14 - \text{pOH} = 7.8$
71.  $\text{N}_2\text{O}_4(\text{g}) \leftrightarrow 2\text{NO}_2(\text{g})$ , at  $250^\circ\text{C}$  in this reaction mixture, partial pressure of  $\text{N}_2\text{O}_4$  and  $\text{NO}_2$  are 0.69 and 0.31 atm. respectively, then what is the value of  $K_p$ ?  
 (a) 0.156 atm (b) 0.139 atm (c) 0.145 atm (d) 0.126 atm  
**Solution:** (b);  $K_p = \frac{P_{\text{NO}_2}^2}{P_{\text{N}_2\text{O}_4}} = \frac{0.31^2}{0.69} = 0.139\text{ atm}$
72.  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \leftrightarrow 2\text{HI}(\text{g})$ ; in equilibrium of this reaction,  $\text{H}_2$ ,  $\text{I}_2$  and  $\text{HI}$  concentration are 8, 3 and 28 mol/L; then  $K_c$  of this will be-  
 (a) 36 (b) 32.67 (c) 33.5 (d) 34.3  
**Solution:** (b);  $K_c = \frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]} = \frac{28^2}{8 \times 3} = 32.67$





73.  $\text{CH}_2\text{Cl}(\text{l}) + \text{Cl}_2(\text{g}) \rightarrow \text{CH}_2\text{Cl}_2(\text{l}) + \text{HCl}(\text{g})$ ; this reaction occurs with endothermic bond dissociation and exothermic bond formation. Here bond energy of C – H, C – Cl, Cl – Cl and H – Cl are 430, 328, 243 and 433 kJ/mol; respectively. What will be the value of  $\Delta H$  of the above reaction?  
 (a) 758 kJ (b) -88 kJ (c) -571 kJ (d) 676 kJ
- Solution:** (b);  $\text{H} - \begin{array}{c} \text{H} \\ | \\ \text{C} - \text{Cl} \\ | \\ \text{H} \end{array} (\text{l}) + \text{Cl} - \text{Cl}(\text{g}) \rightarrow \text{H} - \begin{array}{c} \text{Cl} \\ | \\ \text{C} - \text{Cl} \\ | \\ \text{H} \end{array} (\text{l}) + \text{H} - \text{Cl}(\text{g})$
- $\therefore \Delta H = \text{energy absorbed in bond breaking} - \text{energy released} = (430 + 243) - (328 + 433) = -88 \text{ kJ}$
74. Valency and oxidation number of C in compound  $\text{CH}_2\text{Cl}_2$  are as follows: [Ans: c]  
 (a) 2, +2 (b) 2, +4 (c) 4, 0 (d) 4, +2
75. Molar concentration of 10%  $\text{Na}_2\text{CO}_3$  solution is-  
 (a) 0.9434 mol/kg (b) 0.9434 M (c) 0.9434 mol/L<sup>2</sup> (d) 9.434 mol/L
- Solution:** (b);  $C = \frac{1000W}{MV} = \frac{1000 \times 10}{106 \times 100} = 0.9434 \text{ molL}^{-1} = 0.9434 \text{ M}$
76. A four-carbon alcohol was oxidized with acidified potassium dichromate to form ketone. Which structure does represent the original alcohol? [Ans: d]  
 (a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$  (b)  $\text{H}_2\text{C} = \text{CHCH}_2\text{CH}_2\text{OH}$   
 (c)  $\text{CH}_3\text{C}(\text{CH}_3)\text{OHCH}_3$  (d)  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
77. Benzene reacts with chlorine in presence of sunlight to produce- [Ans: c]  
 (a) Chlorobenzene (b) Toulene and HCl gas  
 (c) Gammazine (d) Chlorobenzene and water
78. The most suitable method of converting ethanol into iodoethane would be to- [Ans: c]  
 (a) Reflux iodine and ethanol  
 (b) Allow ethanol and KI to react in presence of dilute acid  
 (c) Reflux red phosphorus, ethanol and iodine  
 (d) React ethanol with copper (I) iodide in the cold.
79. During determination of nitrogen by Kjeldahl method, it is seen that evolved  $\text{NH}_3$  from 3.51 gm aniline can be neutralized by 3.69 cm<sup>3</sup> of 0.0103 M HCl. The percentage of nitrogen in aniline is-  
 (a) 15.16 (b) 18.31 (c) 14.28 (d) 16.15
- Solution:** (No answer);  $n = \frac{3.69 \times 0.0103}{1000} = 3.8007 \times 10^{-5} \text{ mol}$
- $\therefore W = n \times M_A = n \times 14 = 5.32 \times 10^{-4} \text{ gm}$
- $\therefore \%N = \frac{5.32 \times 10^{-4}}{3.51} \times 100 = 0.01516\% \text{ (ans.)}$
80. Complete the following chemical reaction:  $\text{C}_6\text{H}_5\text{COCl} + \text{CH}_3 - \text{NH}_2 \rightarrow \dots + \text{HCl}$  [Ans: c]  
 (a)  $\text{C}_6\text{H}_5\text{COCH}_3$  (b)  $\text{C}_6\text{H}_5\text{NH} - \text{CH}_3$   
 (c)  $\text{C}_6\text{H}_5 - \text{CO.NH} - \text{CH}_3$  (d)  $\text{C}_6\text{H}_5\text{CO} - \text{N}(\text{CH}_3)_2$

### English

Read the following sentences and try to choose the best definition for the underlined and italicize word by searching for context clues in the sentence.

81. The baseball player's malice toward the referee was revealed in his spiteful remarks to the media, which almost ruined the referee's career. [Ans: a]  
 (a) vindictive (b) crazy (c) rude (d) unpleasant





82. Although Zahid is much too inexperienced for the managerial position, he is a willful young man and obdurately refuses to withdraw his application. [Ans: d]

- (a) foolishly (b) reluctantly (c) constantly (d) stubbornly

83. Excited about winning the award, Marium walked up to the podium and delivered an animated acceptance speech. [Ans: d]

- (a) abbreviated (b) courteous (c) reserved (d) lively

84. The doctors were pleased that their theory had been fortified by the new research. [Ans: a]

- (a) reinforced (b) altered (c) disputed (d) developed

Questions 85 and 86 are based on the following paragraph.

In a prolonged space flight, besides the obvious hazards of meteors, rocky debris, and radiation, astronauts will have to deal with muscle atrophy brought on by weightlessness; therefore, when they return to Earth, they face a protracted period of weight-training to rebuild their strength.

85. What is the most likely meaning of the underlined word debris as it is used in this passage? [Ans: a]

- (a) fragments (b) decay (c) bacteria (d) alien life

86. The underlined word atrophy, as used in the paragraph, most nearly means- [Ans: c]

- (a) pain (b) wasting (c) weakening (d) cramping

Choose the best pair of words that complete the sentence:

87. Because of the excellent preservation of the fossil, anatomical details of early horseshoe crabs were \_\_\_ for the first time, enabling experts to \_\_\_ the evolution of the horseshoe crab. [Ans: d]

- (a) scrutinized..ensure (b) verified..advance (c) identified..distort (d) clarified..reassess

88. The philosopher claimed that a person who must consciously \_\_\_ his or her own indifference before helping another is behaving more nobly than one whose basic disposition such an act to be performed without \_\_\_. [Ans: d]

- (a) feign...enthusiasm (b) censure...comment  
(c) embrace...duplicity (d) overcome...deliberation

89. The skeleton of \_\_\_ bird that was recently discovered indicated that this ancient creature \_\_\_ today's birds in that, unlike earlier birds and unlike reptilian ancestors, it had not a tooth in its head. [Ans: c]

- (a) a primeval... obscured (b) a unique... preempted  
(c) a primitive... anticipated (d) a contemporary... foreshadowed

Choose the pair of words that best expresses a relationship similar to that expressed in the original pair:

90. PROGRAM: CONCERT: [Ans: d]

- (a) bibliography : book (b) menu : entree (c) questionnaire : poll (d) agenda : meeting

91. ENTHUSIASM : MANIA: [Ans: d]

- (a) idea : inspiration (b) nightmare : hallucination  
(c) failure : disgust (d) suspicion : paranoia

92. CARTOGRAPHER : MAP: [Ans: d]

- (a) astronomer : stars (b) carpenter : wood (c) lumberjack : saw (d) tailor : clothing

Choose the word or phrase which is most nearly opposite in meaning to the given word.

93. TOUT [Ans: a]

- (a) cast aspersions on (b) deny the relevance of (c) placate (d) misrepresent

94. SCOTCH [Ans: d]

- (a) renovate (b) entrust (c) unfasten (d) encourage

95. PLUMB [Ans: c]

- (a) reversed (b) lofty (c) horizontal (d) thin







Read the following passage and then choose the best answer.

Mount Vesuvius, a volcano located between the ancient Italian cities of Pompeii and Herculaneum, has received much attention because of its frequent and destructive eruptions. The most famous of these eruptions occurred in A. D. 79.

The volcano had been inactive for centuries. There was little warning of the coming eruption, although one account unearthed by archaeologists says that a hard rain and a strong wind had disturbed the celestial calm during the preceding night. Early the next morning, the volcano poured a huge river of molten rock down upon Herculaneum, completely burying the city and filling in the harbor with coagulated lava. Meanwhile, on the other side of the mountain, cinders, stone and ash rained down on Pompeii. Sparks from the burning ash ignited the combustible rooftops quickly. Large portions of the city were destroyed in the conflagration. Fire, however, was not the only cause of destruction. Poisonous sulphuric gases saturated the air. These heavy gases were not buoyant in the atmosphere and therefore sank toward the earth and suffocated people.

Over the years, excavations of Pompeii and Herculaneum have revealed a great deal about the behavior of the volcano. By analyzing data, much as a zoologist dissects a specimen animal, scientists have concluded that the eruption changed large portions of the area's geography. For instance, it turned the Sarno River from its course and raised the level of the beach along the Bay of Naples. Meteorologists studying these events have also concluded that Vesuvius caused a huge tidal wave that affected the world's climate. In addition to making these investigations, archaeologists have been able to study the skeletons of victims by using distilled water to wash away the volcanic ash. By strengthening the brittle bones with acrylic paint, scientists have been able to examine the skeletons and draw conclusions about the diet and habits of the residents. Finally, the excavations at both Pompeii and Herculaneum have yielded many examples of classical art, such as jewelry made of bronze, which is an alloy of copper and tin.

The eruption of Mount Vesuvius and its tragic consequences have provided us with a wealth of data about the effects that volcanoes can have on the surrounding area. Today volcanologists can locate and predict eruptions, saving lives and preventing the destruction of cities and cultures.

96. Herculaneum and its harbor were buried under \_\_\_ lava. [Ans: b]  
 (a) liquid (b) solid (c) flowing (d) gas
97. The poisonous gases were not \_\_\_ in the air. [Ans: a]  
 (a) able to float (b) visible (c) able to evaporate (d) invisible
98. Scientists analyzed data about Vesuvius in the same way that a zoologist \_\_\_ a specimen. [Ans: b]  
 (a) describes in detail (b) studies by cutting apart  
 (c) photographs (d) chart
99. \_\_\_ have concluded that the volcanic eruption caused a tidal wave. [Ans: b]  
 (a) Scientist who study oceans (b) Scientist who study atmospheric conditions  
 (c) Scientist who study ash (d) Scientist who study animal behavior
100. Scientist have used \_\_\_ water to wash away volcanic ash from the skeletons of victims. [Ans: c]  
 (a) bottled (b) volcanic (c) purified (d) sea