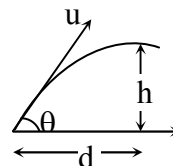
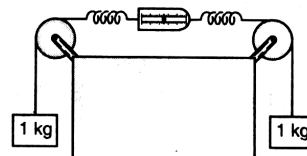


1. If a stone is to hit at a point which is at a distance 'd' away and at a height 'h' above the point from where the stone starts, then what is the value of initial speed 'u' if the stone is launched at an angle  $\theta$  ?



- (1)  $\frac{g}{\cos \theta} \sqrt{\frac{d}{2(d \tan \theta - h)}}$       (2)  $\frac{d}{\cos \theta} \sqrt{\frac{g}{2(d \tan \theta - h)}}$       (3)  $\sqrt{\frac{gd^2}{h \cos^2 \theta}}$       (4)  $\sqrt{\frac{gd^2}{(d-h)}}$

2. In the figure given below, what is the reading of the balance ?  
Take  $g = 10 \text{ N kg}^{-1}$ :

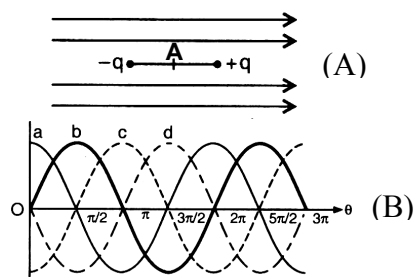


- (1) 10 N      (2) 20 N      (3) 5 N      (4) zero

3. Radius of earth and moon are  $R_e$  and  $R_m$  respectively. Acceleration due to gravity on earth and moon are  $g_e$  and  $g_m$ . Then ratio of mass of earth to moon is

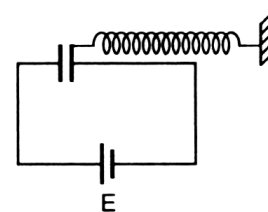
- (1)  $\frac{g_e}{g_m} \left( \frac{R_e}{R_m} \right)^2$       (2)  $\frac{g_m}{g_e} \left( \frac{R_e}{R_m} \right)^2$       (3)  $\left( \frac{g_e}{g_m} \right)^2 \frac{R_e}{R_m}$       (4)  $\frac{g_e}{g_m} \frac{R_e}{R_m}$

4. The electric dipole is situated in an electric field as shown in figure (A). The dipole and electric field are both in the plane of paper. The dipole is rotated about an axis perpendicular to the paper at point A in anticlockwise direction. If the angle of rotation is measured with respect to the direction of the electric field then the torque for different values of the angle of rotation  $\theta$  will be as represented in Fig. (B):



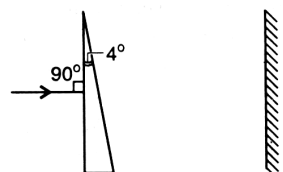
- (1) a      (2) b      (3) c      (4) d

5. One plate of a capacitor is connected to a spring as shown in the figure. Area of both the plates is A. In steady state separation between the plates is  $0.8d$  (spring was unstretched and the distance between the plates was 'd' when the capacitor was uncharged). The force constant of the spring is approximately:



- (1)  $\frac{4\epsilon_0 A E^2}{d^3}$       (2)  $\frac{2\epsilon_0 A E}{d^2}$       (3)  $\frac{6\epsilon_0 E^2}{A d^3}$       (4)  $\frac{\epsilon_0 A E^3}{2d^3}$

6. A prism having an apex angle  $4^\circ$  and refractive index 1.5 is located in front of a vertical plane mirror as shown in figure. Through what total angle is the ray deviated after reflection from the mirror?



- (1)  $176^\circ$       (2)  $4^\circ$       (3)  $178^\circ$       (4)  $2^\circ$

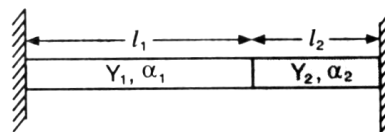
7. At constant plate potential if the grid is moved closer to the plate, the amplification factor of the triode:

- (1) increases  
(2) decreases  
(3) remains unchanged  
(4) may increase or decrease depending upon grid bias

8. The screen is placed at a distance  $D$  from the object. A convex lens of focal length ' $f$ ', forms real images of the object for its two positions separated by  $d$ . Which one of the following relations is correct ?

(1)  $D = 4f$                       (2)  $D > 4f$                       (3)  $d = 4f$                       (4)  $d > 4f$

9. Two rods different materials having the same area of cross-section  $A$ , are placed between two massive walls as shown in figure. The first rod has a length  $l_1$ , coefficient of linear expansion  $\alpha_1$  and Young's modulus  $Y_1$ . The corresponding quantities for the second rod are  $l_2$ ,  $\alpha_2$  and  $Y_2$ . The temperature of both end is now raised by  $T$  degrees. The force with which the rods act on each other at higher temp. is given by:



(1)  $F = \frac{T(l_1\alpha_1^2 + l_2\alpha_2^2)A}{\left(\frac{l_1}{Y_1} + \frac{l_2}{Y_2}\right)}$

(2)  $F = \frac{T(l_1\alpha_1 + l_2\alpha_2)A}{\left(\frac{l_1}{Y_1} + \frac{l_2}{Y_2}\right)}$

(3)  $F = \frac{T\left(\frac{l_1}{Y_1} + \frac{l_2}{Y_2}\right)A}{(l_1\alpha_1 + l_2\alpha_2)}$

(4)  $F = \frac{T\left(\frac{l_1}{\alpha_1} + \frac{l_2}{\alpha_2}\right)A}{(l_1Y_1 + l_2Y_2)}$

10. A faulty thermometer has its fixed points marked  $5^\circ$  and  $95^\circ$ . This thermometer reads the temperature of a body as  $59^\circ$ . Then the correct temperature of the body on the Celsius scale is:

(1)  $59^\circ$                       (2)  $60^\circ$                       (3)  $48.6^\circ$                       (4)  $58^\circ$

11. A hydrocarbon contains 86% carbon. 488 ml of the hydrocarbon weigh 1.68 g at STP. Then the hydrocarbon is an

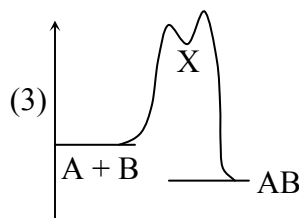
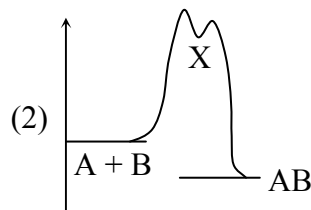
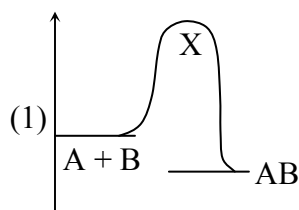
(1) alkyne                      (2) alkane                      (3) alkene                      (4) arene.

12. A 2.24 L cylinder of oxygen at N.T.P. is found to develop to leakage. When the leakage was plugged, the pressure dropped to 560 mm of Hg. The number of moles of gas that escaped will be

(1) 0.026                      (2) 0.050                      (3) 0.074                      (4) 0.01

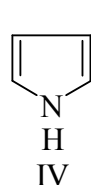
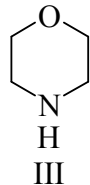
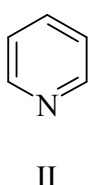
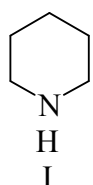
13. An exothermic chemical reaction occurs in two steps as follows

(i)  $A + B \rightarrow X$  (fast);    (ii)  $X \rightarrow AB$  (slow); the progress of the reaction can be best represented by



(4) All are correct

14. In the following compounds



the order of basicity

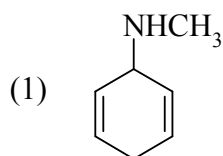
(1) I > III > II > IV

(3) II > I > III > IV

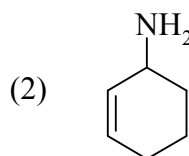
(2) III > I > IV > II

(4) IV > I > III > II.

15. An optically active compound with M.F.  $C_6H_{11}N$  dissolves in dilute aqueous hydrochloric acid and releases  $N_2$  gas on treatment with nitrous acid. The compound is



(3)  $C_6H_5CH(NH_2)CH_3$



(4)  $C_4H_5-NH-C_2H_5$

16. A positive carbylamine test is not given by

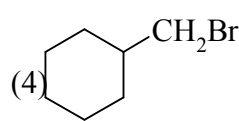
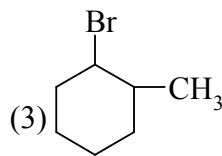
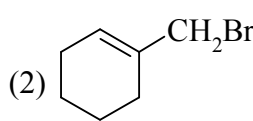
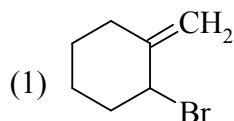
(1) 2, 4-Dimethylaniline

(3) p-methylbenzylamine

(2) N, N-dimethylaniline

(4) o-methylaniline.

17. The major product formed in the reaction, is



18. The decay constant of a radioactive sample is ' $\lambda$ '. The half-life and mean life of the sample are respectively

(1)  $\frac{1}{\lambda}, \ln \frac{2}{\lambda}$

(2)  $\frac{\ln 2}{\lambda}, \frac{1}{\lambda}$

(3)  $\lambda \ln 2, \frac{1}{\lambda}$

(4)  $\frac{\lambda}{\ln 2}, \frac{1}{\lambda}$

19. When a light of frequency  $\nu_1$  is incident on a metal surface, the photo electrons emitted had twice the kinetic energy as did photo electrons emitted when the same metal had irradiated with light of frequency  $\nu_2$ . What will be the value of threshold frequency.

(1)  $\nu_0 = \nu_1 - \nu_2$

(2)  $\nu_0 = \nu_1 - 2\nu_2$

(3)  $\nu_0 = 2\nu_1 - \nu_2$

(4)  $\nu_0 = \nu_1 + \nu_2$

20. The degree of dissociation of  $PCl_5(\alpha)$  obeying the equilibrium,

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$ , is approximately related to the pressure at equilibrium by :

(1)  $\alpha \propto P$

(2)  $\alpha \propto \frac{1}{\sqrt{P}}$

(3)  $\alpha \propto \frac{1}{P^2}$

(4)  $\alpha \propto \frac{1}{P^4}$

21. If  $\alpha$  is a root of equation  $4x^2 + 2x - 1 = 0$  and  $f(x) = 4x^3 - 3x + 1$ , then  $2[f(\alpha) + \alpha] =$

(1) 0

(2) -1

(3) 1

(4) None of these

22. Equation  $\frac{a}{x-1} + \frac{b}{x-2} + \frac{c}{x-3} = 0$  ( $a, b, c > 0$ ) has

(1) two imaginary roots

(2) one real root in (1, 2) and other in (2, 3)

(3) no real root in [1, 4]

(4) two real roots in (1, 2)

23. If the vectors  $a\hat{i} + b\hat{j} + c\hat{k}$ ,  $b\hat{i} + c\hat{j} + a\hat{k}$  and  $c\hat{i} + a\hat{j} + b\hat{k}$  are coplanar such that  $a \neq b \neq c$  then

(1)  $a^3 + b^3 + c^3 = 1$

(2)  $a + b + c = 1$

(3)  $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$

(4)  $a + b + c = 0$

24. If  $\tan p\theta + \cot q\theta = 0$ , then the general values of  $\theta$  are

- (1)  $\frac{(2n+1)\pi}{2(p+q)}$                       (2)  $\frac{(2n+1)\pi}{2(p-q)}$                       (3)  $\frac{(4n-1)\pi}{2(p+q)}$                       (4)  $\frac{(4n+1)\pi}{2(p+q)}$

25. The length of the common chord of the circles  $x^2 + y^2 + 2x + 3y + 1 = 0$  and  $x^2 + y^2 + 4x + 3y + 2 = 0$ , is

- (1)  $\frac{9}{2}$                       (2)  $2\sqrt{2}$                       (3)  $3\sqrt{2}$                       (4)  $\frac{3}{2}$

26.  $\int_2^5 ([x] + [-x]) dx$  is equal to

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

27. The term independent of  $x$  in the expansion of  $\left(\sqrt{\frac{x}{3}} + \frac{3}{2x^2}\right)^{10}$  is

- (1)  $9/4$                       (2)  $3/4$                       (3)  $5/4$                       (4)  $7/4$

28. The system of equations

$$|z - 1 - i| = \sqrt{2} \text{ and}$$

$$|z| = 2 \text{ has}$$

- (1) one solution                      (2) two solutions                      (3) three solutions                      (4) none of these

29. Maximum value of  $x^x$  occurs at

- (1)  $x = e^{-1}$                       (2)  $x = -e^{-1}$                       (3)  $x = e^{-2}$                       (4) none

30. Three identical dice are rolled. The probability that the same number will appear on each of them is

- (1)  $1/6$                       (2)  $1/36$                       (3)  $1/18$                       (4)  $3/28$

