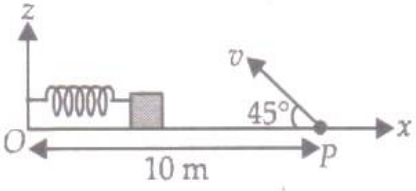
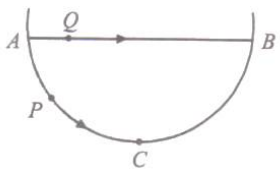
Physics

Q.1 A small block is connected to one end of a massless spring of up-stretched length 4.9 m. The other end of the spring (see the figure) is fixed. The system lies on a horizontal frictionless surface. The block is stretched by 0.2 m and released from rest at t = 0 . It then executes simple harmonic motion with angular frequency $\omega = \frac{\pi}{3} rad/s$. Simultaneously at t = 0, a small pebble is projected with speed v from point P at an angle of 45° as shown in the figure. Point P is at a horizontal distance of 10 m from O. If the pebble hits the block at t = 1s, the value of v is (Take g = 10m/s^2)



(A)$\sqrt{50}\, m/s$
(B) $\sqrt{51}\, m/s$
(C) $\sqrt{52}\, m/s$
(D) $\sqrt{53}\, m/s$

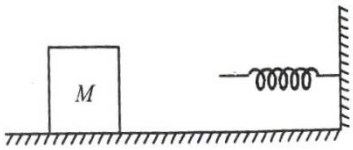
Q.2 A particle P is sliding down a frictionless hemispherical bowl. It passes the point A at t = 0. At this instant of time, the horizontal components of its velocity is v. A bead Q of the same mass as P is ejected from A at t = 0 along the horizontal string AB, with speed v. Friction between the bead and the string may be neglected. Let $t_p and\ t_Q$ be the respective times taken by P and Q to reach the point B. Then



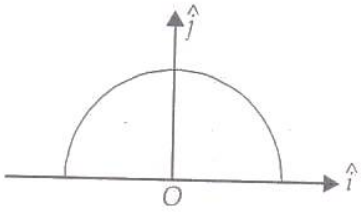
(A) $t_p < t_Q$
(B) $t_p = t_Q$
(C) $t_p > t_Q$
(D) $\frac{t_p}{t_Q} = \frac{Length\ of\ arc\ ACB}{Length\ of\ chord\ AB}$

Q.3 The block of mass M moving on the frictionless horizontal surface collides with the spring of spring constant K and compresses it by length L. The maximum momentum of the block after collision is

(A) Zero
(B) $\frac{ML^2}{K}$
(C) $L\sqrt{MK}$
(D) $\frac{KL^2}{2M}$

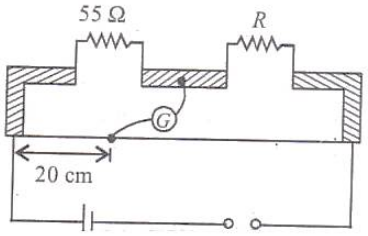


Q.4 A thin semi-circular ring of radius r has a positive charge q distributed uniformly over it. The net electric field $\vec{E}$ at the centre O is



(A) $\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$
(B) $\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$
(C) $-\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$
(D) $-\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$

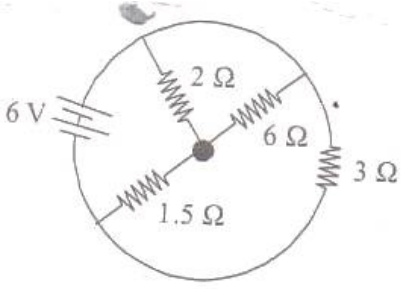
Q.5 Shown in the figure below is a meter-bridge set up with null deflection in the galvanometer. The value of the unknown resistance R is



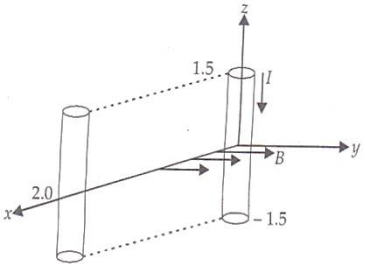
(A) 55 Ω
(B) 13.75 Ω
(C) 220 Ω
(D) 110 Ω

Q.6 The total current supplied to the circuit by the battery is

(A) 1A
(B) 2A
(C) 4A
(D) 6A



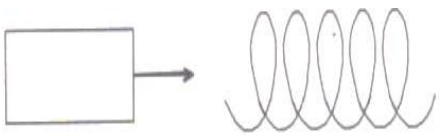
Q.7 A conductor lies along the z-axis at $-1.5 \leq z < 1.5\,m$ and carries a fixed current of 10.0 A in $-\hat{a}_z$ direction (see figure). For a field $\vec{B} = 3.0 \times 10^{-4} e^{-0.2x} \hat{a}_y T$, find the power required to move the conductor at constant speed to $x = 2.0\,m, y = 0m$ in $5 \times 10^{-3} s$. Assume parallel motion along x-axis.

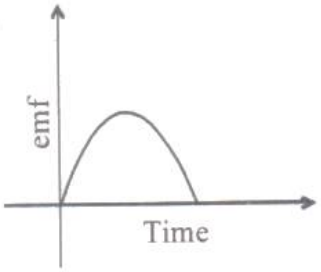


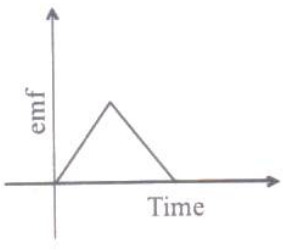
(A) 29.7 W
(B) 1.57 W
(C) 2.97 W
(D) 14.85 W

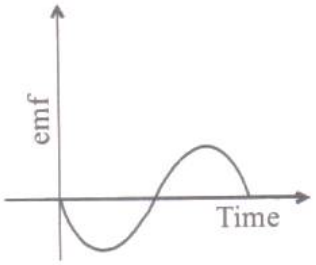
Q.8 The material suitable for making electromagnets should have
(A) High retentivity and high coercivity
(B) Low retentivity and low coercivity
(C) High retentivity and low coercivity
(D) Low retentivity and high coercivity

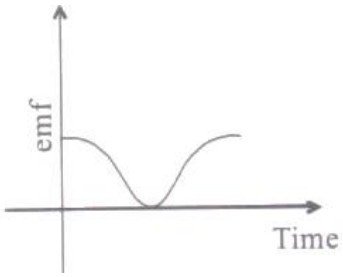
Q.9 A small bar magnet is being slowly inserted with constant velocity inside a solenoid as shown in figure. Which graph best represent the relationship between emf induced with time?



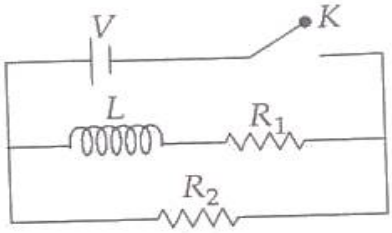
(a)


(b)


(c)


(d)


Q.10 In the circuit shown below, the key K is closed at $t = 0$. The current through the battery is



(A) $\frac{V(R_1+R_2)}{R_1R_2}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$
(B) $\frac{VR_1R_2}{\sqrt{R_1^2+R_2^2}}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$
(C) $\frac{V}{R_2}$ at $t = 0$ and $\frac{V(R_1+R_2)}{R_1R_2}$ at $t = \infty$
(D) $\frac{V}{R_2}$ at $t = 0$ and) $\frac{VR_1R_2}{\sqrt{R_1^2+R_2^2}}$ at $t = \infty$

ANSWER KEY:-
1.(A) 2.(A) 3.(C) 4.(D) 5.(C) 6.(C) 7.(C) 8.(B) 9.(C) 10.(C)

chemistry

Q.11 If the bond enthalpy of O_2, N_2 and H_2 are 498 KJ mol^{-1}, 946 KJ mol^{-1} and 435.8 KJ mol^{-1} respectively. Choose the correct order of decreasing bond strength.
(a) $H_2 > N_2 > O_2$
(b) $N_2 > O_2 > H_2$
(c) $O_2 > H_2 > N_2$
(d) $H_2 > O_2 > N_2$

Q.12 At 25°C and 750 mm of Hg pressure a gas occupies 600 mL volume. What will be its pressure at a height where temperature is 10°C had volume of the gas is 640 mL?
(a) 677 mm Hg
(b) 600 m Hg
(c) 700 mm Hg
(d) 752 mm Hg

Q.13 The total number of equilateral triangle faces in an truncated tetrahedron is (truncated along all corners):
(a) 0
(b) 4
(c) 6
(d) 1

Q.14 18 g of glucose ($C_6H_{12}O_6$) is added to 178.2 g water . The vapour pressure of water (in torr) for this aqueous solution is
(a) 76.0
(b) 752.4
(c) 759.0
(d) 7.6

Q.15 A hydrogen gas electrode is made by dipping platinum wire in a solution of HCI and pH=10 and by passing hydrogen gas around the platinum wire at 1 atm pressure. The oxidation potential of electrode would be
(a) 0.059 V
(b) 0.59 V
(c) 0.118 V
(d) 0.18 V

Q.16 Select the statement which is not true?
(a) A colloid is a heterogeneous system
(b) The substance which is depressed in another substance is called dispersed phase
(c) Depending upon the shape of particles, solution may be true solution or colloid or suspension
(d) The dispersed phase of colloid may contain a single macromolecules or an aggregate of many atom, ions or molecule.

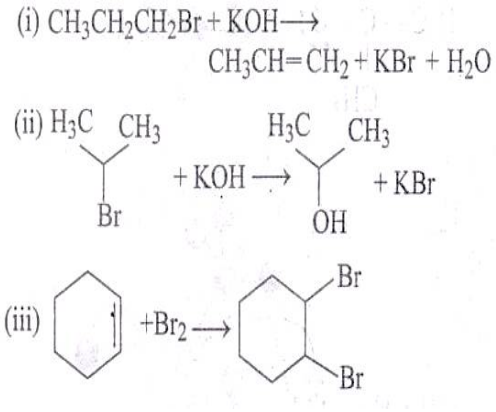
Q.17 Match items of Column I with the item of Column II and assign the correct code

Column I	Column II
A. Cyanide process	1. Ultrapure Ge
B. Froth floatation process	2. Dressing of ZnS
C. Electrolytic reduction	3. Extraction of Al
D. Zone refining	4. Extraction of Au
	5. Purification of Ni

Codes

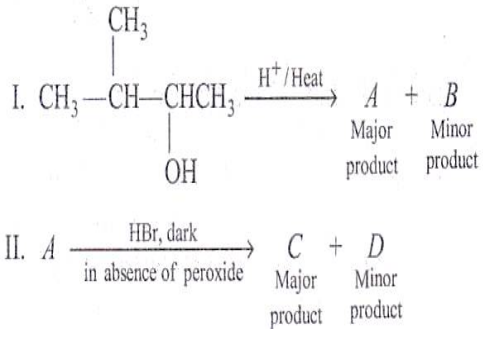
	A	B	C	D
(a)	4	2	3	1
(b)	2	3	1	5
(c)	1	2	3	4
(d)	3	4	5	1

Q.18 For the following reactions:

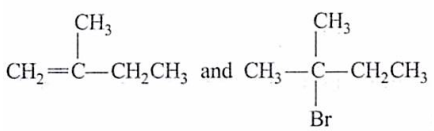


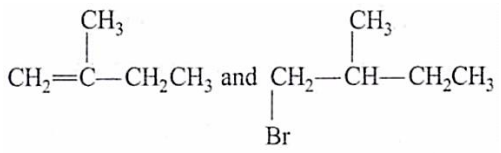
Which of the following statement is correct?
(a) (i) is elimination reaction (ii) is substitution and (iii) is addition reaction
(b) (i) is elimination, (ii) and)iii) are substitution reactions
(c) (i) is substitutions, (ii) and (iii) are addition reactions
(d) (i) and (ii) are elimination reactions and (iii) is addition reaction

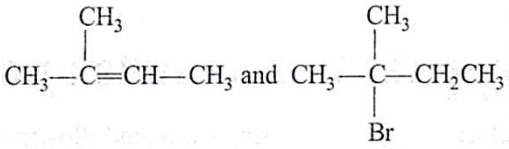
Q.19 In the following reactions:

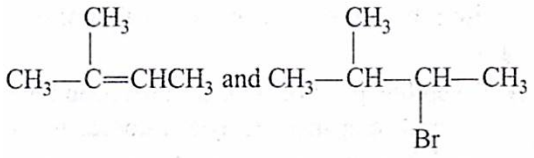


The major products (A) and (C) are, respectively

(a) 

(b) 

(c) 

(d) 

Q.20 When the temperature rises, what happens to the peak of the curve in the Maxwell-Boltzmann distribution graph?
(a) Shifts forward and upward
(b) Shifts forward and downward
(c) Shifts backwards and upward
(d) Shifts backwards and downward

ANSWER KEY:-

11.(B)	**12.(A)**	**13.(B)**	**14.(B)**
15.(B)	**16.(B)**	**17.(A)**	**18.(A)**
19.(C)	**20.(B)**		

MATHEMATICS

Q.21 Let $f: R \to [1,\infty)$ be a function define by $f(x) = x^2 - 10ax + 5 - a + 25a^2$.
If f(x) is surjective on R, then the value of a is
(a)0 (b)1
(c)2 (d)4

Q.22 If $f(x) = \begin{cases} px + q & ; \quad x \le -1 \\ px^3 + x + 2q & ; \quad x > -1 \end{cases}$ is differentiable for all $x \in R$, then the ordered pair (p, q) is
(a)$\left(\frac{1}{2}, -1\right)$ (b)(0,1)
(c)$\left(\frac{-1}{2}, 1\right)$ (d)$\left(\frac{-1}{2}, -1\right)$

Q.23 The intervals of increase of $f(x)$ defined by $f(x)=\int_{-1}^{x}(t^2 + 2t)(t^2 - 1)dt$ is equal to
(a)$\left(-\infty, \frac{-3}{2}\right) \cup (0,3) \cup (10,\infty)$
(b)$(-\infty,-2) \cup \left(\frac{-1}{2}, \frac{1}{2}\right) \cup (4,\infty)$
(c)$(-\infty,-2) \cup (-1,0) \cup (1,\infty)$
(d) $(-\infty,-2) \cup \left(\left(\frac{-3}{4}, \frac{1}{4}\right) \cup (4,\infty)\right.$

Q.24 If $|z - i| \le 2$ and $z_0 = 5 + 3i$ then the maximum value of $|iz + z_0|$ is
(a) $2 + \sqrt{31}$
(b) 7
(c) $\sqrt{31} - 2$
(d) None of these

Q.25 If x, y, z are integers in AP, lying between 1 and 9, and x51, y41 and z31 are three – dight numbers then the value of $\begin{vmatrix} 5 & 4 & 3 \\ x51 & y41 & z31 \\ x & y & z \end{vmatrix}$ is
(a) $x + y + z$
(b) $x - y + z$
(c) 0
(d) None of these

Q.26 The system of equations
$ax + 4y + z = 0$
$bx + 3y + z = 0$
$cx + 2y + z = 0$
has nontrivial solutions if a, b, c are in
(a) AP (b) GP
(c) HP (d) None of these

Q.27 The sum of the coefficients of all the integral powers of x in the expansion of $(1 + 2\sqrt{x})^{40}$ is
(a) $3^{40} + 1$
(b) $3^{40} - 1$
(c) $\frac{1}{2}(3^{40} - 1)$
(d) $\frac{1}{2}(3^{40} + 1)$

Q.28 The point on the curve $9y^2 = x^3$ where the normal to the curve makes equal intercepts with the axes are
(a) $\left(4, -\frac{8}{3}\right)$
(b) $\left(4, \pm\frac{3}{8}\right)$
(c) $\left(\pm 4, \frac{8}{3}\right)$
(d) $\left(4, \pm\frac{8}{3}\right)$

Q.29 If the minimum value $f(x) = x^2 + 2bx + 2c^2$ is greater than the maximum value of $g(x) = -x^2 - 2cx + b^2$ then
(a) $|b| < 2|c|$

(b) $|c| < 2|b|$
(c) $|c| > \sqrt{2}|b|$
(d) $|b| > \sqrt{2}|c|$

Q.30 In career Academy Sr. Sec. School 60 students of class 12th get above 90% marks in board exam. 30 % students gets between 80% to 90% marks and remaining 150 students passed below 80% marks.
Then what is the % of students getting above 90% marks
(a) 10% (b) 20%
(c) 30% (d) None

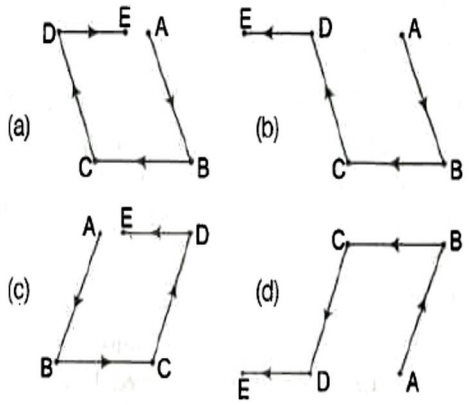
ANSWER KEY:-
21.(D) 22.(C) 23.(C) 24.(B) 25.(C) 26.(A) 27.(D) 28.(D) 29.(C) 30.(B)

Mental ability

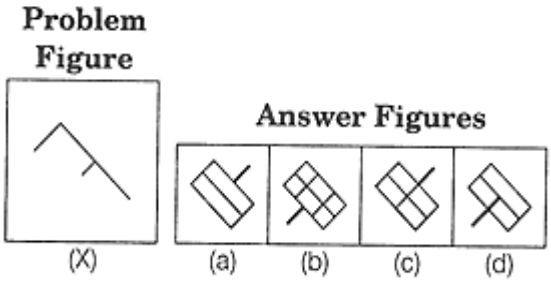
Q.31 If 'FULFNHW' is the code for 'CRICKET', then 'EULGH' is the code for which word?
(a) PRIDE
(b) BRIDE
(c) BLADE
(d) BLIND.

Q.32 A man travels 4 km due North, then travels 6 km due East and further travels 4 km due North. How far he is from the starting point?
(a) 6 km
(b) 14 km
(c) 8 km
(d) 10 km.

Q.33 Career Academy MBBS Topper Shivani starts from A and walks towards South – East to B. She turns West and walks to C. Then, she turns North- West and walks to D. Finally, she turns East and walks to E. Which of the answer exactly shows the path Shivani traced?



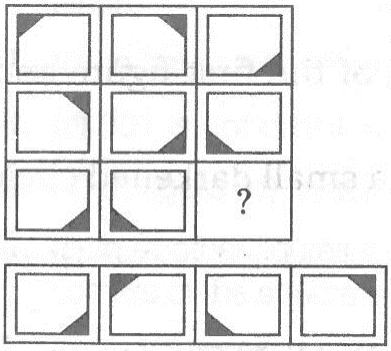
Q.34 You are given a figure (x) following by four (a), (b), (c) and (d) such that (x) is embedded in one of them. Trace out the correct alternative.



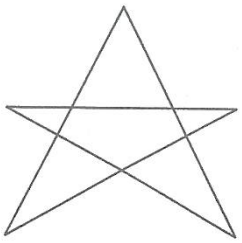
Q.35 If + means ×, – means ÷, × means + and ÷ means –, then 10 × 18 – 9 + 3 ÷ 1 is equal to
(a) 16
(b) 15
(c) 17
(d) 18.

Q.36 P, Q, R, S, T, U and V are seven members of a family of four adults and three children, two of whom, U and V are girls. P and S are brothers and Q is a doctor. T is an engineer married to one of the brothers and has two children. Q is married to S and V is their child. Who is R?
(a) P's son
(b) T's daughter
(c) U's father
(d) V's brother

Q.37



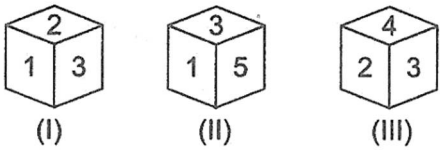
Q.38 How many triangles are there in the figure given below?



(a) 6
(b) 7
(c) 10
(d) 8

Q.39 Ina row of thirty boys, R is fourth from the right end and W is tenth from the left end. How many boys are there between R and W?
(a) 15
(b) 16
(c) 17
(d) cannot be determined

Q.40 Which number is opposite to face 3?



(a) 1
(b) 6
(c) 5
(d) 4

ANSWER KEY:-

31.(B) 32.(D) 33.(A) 34.(C) 35.(B)
36.(A) 37.(A) 38.(C) 39.(B) 40.(B)