MATHEMATICS (PART–I)
BOARD'S QUESTION PAPER (MARCH 2023)

(With Full Solution and Marking Scheme)

Time : 2 Hours] **[Total Marks : 40**

Note : *(i) All questions are compulsory.*

(ii) Use of calculator is ***not*** *allowed.*

(iii) The numbers to the right of questions indicate full marks.

(iv) In case of MCQs [Q. No. 1(A)] only the first attempt will be evaluated and will be given credit.

(v) For every MCQ, four alternatives (A), (B), (C), (D) of answers are given. Alternative of correct answer is to be written in front of the subquestion number.

Q. 1. (A) For every subquestion four alternative answers are given. Choose the correct answer and write the alphabet of it in front of the subquestion number : 4

(i) To draw the graph of $4x + 5y = 19$, find y when $x = 1$:

(A) 4 (B) 3 (C) 2 (D) -3

(ii) Out of the following equations which one is *not* a quadratic equation?

(A) $x^2 + 4x = 11 + x^2$ (B) $x^2 = 4x$

(C) $5x^2 = 90$ (D) $2x - x^2 = x^2 + 5$

(iii) For the given A.P., $a = 3.5$, $d = 0$, then $t_n =$ ..... .

(A) 0 (B) 3.5 (C) 103.5 (D) 104.5

(iv) If $n(A) = 2$, $P(A) = \frac{1}{5}$, then $n(S) = ?$

(A) 10 (B) $\frac{5}{2}$ (C) $\frac{2}{5}$ (D) $\frac{1}{3}$

Q. 1. (B) Solve the following subquestions : 4

(i) Find the value of the determinant $\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix}$.

(ii) Find the common difference of the A.P., 2, 4, 6, 8, ...

(iii) On certain article if rate of CGST is 9%, then what is the rate of SGST?

(iv) If one coin is tossed, write the sample space S.

Q. 2. (A) Complete and write *any two* activities from the following : 4

(i) Complete the following activity to find the value of x :

$5x + 3y = 9$ ... (I)

$2x - 3y = 12$ ... (II)

Add equations (I) and (II)

$5x + 3y = 9$ ... (I)

$2x - 3y = 12$ ... (II)

$7x = \square$

$\therefore x = \frac{\square}{\square}$

$\therefore x = \square$

(ii) Complete the following activity to determine the nature of the roots of the quadratic equation $x^2 + 2x - 9 = 0$:

Compare $x^2 + 2x - 9 = 0$ with $ax^2 + bx + c = 0$

$a = 1, b = 2, c = \square$

$\therefore b^2 - 4ac = (2)^2 - 4 \times \square \times \square$

$= 4 + \square = 40$

$\therefore b^2 - 4ac > 0$

$\therefore$ the roots of the equation are real and unequal.

(iii) Complete the following table using given information :

Sr. No.	FV	Share is at	MV
1.	₹ 100	Par	
2.		Premium ₹ 500	₹ 575
3.	₹ 10		₹ 5
4.	₹ 200	Discount ₹ 50	

Q. 2. (B) Solve the following subquestions : *(Any four)* 8

(i) Solve the simultaneous equations $x + y = 4$; $2x - y = 2$.

(ii) Write the following equation in the form $ax^2 + bx + c = 0$, then write the values of a, b, c :

$2y = 10 - y^2$.

(iii) Write an A.P. whose first term is $a = 10$ and common difference $d = 5$.

(iv) Courier service agent charged total ₹ 590 to courier a parcel from Nashik to Nagpur. In the tax invoice taxable value is ₹ 500 on which CGST is ₹ 45 and SGST is ₹ 45. Find the rate of GST charged for this service.

(v) Observe the following table and find Mean :

Assumed mean A = 300

Class	Class mark (x_i)	$d_i = x_i - A$ $d_i = x_i - 300$	Frequency (f_i)	Frequency × Deviation ($f_i d_i$)
200–240	220	– 80	5	– 400
240–280	260	– 40	10	– 400
280–320	300→A	0	15	0
320–360	340	40	12	480
360–400	380	80	8	640
Total			$\Sigma f_i = 50$	$\Sigma f_i d_i = 320$

Q. 3. (A) Complete and write *any one* activity from the following : 3

(i) Form a 'Road Safety Committee' of two, from 2 boys (B_1, B_2) and 2 girls (G_1, G_2).

Complete the following activity to write the sample space :

(a) Committee of 2 boys = {☐}

(b) Committee of 2 girls = {☐}

(c) Committee of one boy and one girl

= {(B_1 G_1), (B_1 G_2), ☐, ☐}

(d) Sample space (S) =

{(B_1 B_2), (B_1 G_1), ☐, ☐, (B_2 G_2), (G_1 G_2)}

(ii) Fill in the boxes with the help of given information :

Tax invoice of services provided (Sample)								
Food Junction, Khed-Shivapur, Pune Invoice No. 58 Mob. No. 7588580000, email – ahar.khed@yahoo.com								
GSTIN : 27AAAAA5555B1ZA					Invoice Date 25 Feb., 2020			
SAC	Food Items	Qty	Rate (in ₹)	Taxable amount	CGST		SGST	
9963	Coffee	1	20	20.00	2.5%	₹ 0.50	2.5%	☐
9963	Masala Tea	1	10	10.00	☐	₹ 0.25	2.5%	☐
9963	Masala Dosa	2	60	☐	2.5%	☐	2.5%	₹ 3.00
			Total	150.00		☐		₹ 3.75
					Grand Total		= ₹ 157.50	

Q. 3. (B) Solve the following subquestions : *(Any two)* **6**

(i) Solve the following simultaneous equations using Cramer's rule :

$4m + 6n = 54$; $3m + 2n = 28$.

(ii) Solve the following quadratic equation by formula method :

$x^2 + 10x + 2 = 0$.

(iii) A two-digit number is formed with digits 2, 3, 5, 7, 9 without repetition. What is the probability of the following events?

Event A : The number formed is an odd number.

Event B : The number formed is a multiple of 5.

(iv) The frequency distribution table shows the number of mango trees in a grove and their yield of mangoes. Find the median of data :

Number of Mangoes	Number of Trees
50–100	33
100–150	30
150–200	90
200–250	80
250–300	17

Q. 4. Solve the following subquestions : *(Any two)* **8**

(i) If the first term of an A.P. is p, second term is q and last term is r, then show that sum of all terms is $(q + r - 2p) \times \frac{(p + r)}{2(q - p)}$.

(ii) Show the following data by a frequency polygon :

Electricity bill (₹)	Families
200–400	240
400–600	300
600–800	450
800–1000	350
1000–1200	160

(iii) The sum of the squares of five consecutive natural numbers is 1455. Find the numbers.

Q. 5. Solve the following subquestions : *(Any one)* **3**

(i) Draw the graph of the equation $x + 2y = 4$. Find the area of the triangle formed by the line intersecting the X-axis and the Y-axis.

(ii) A survey was conducted for 180 people in a city. 70 ate pizza, 60 ate burgers and 50 ate chips. Draw a pie diagram for the given information.

MATHEMATICS (PART–II)

BOARD'S QUESTION PAPER (MARCH 2023)

(With Full Solution and Marking Scheme)

Time : 2 Hours] **[Total Marks : 40**

Note : *(i) All questions are compulsory.*

(ii) Use of calculator is not allowed.

(iii) The numbers to the right of the questions indicate full marks.

(iv) In case of MCQs [Q. No. 1(A)], only the first attempt will be evaluated and will be given credit.

(v) For every MCQ, the correct alternative (A), (B), (C) or (D) with subquestion number is to be written as an answer.

(vi) Draw the proper figures for answers wherever necessary.

(vii) The marks of construction should be clear and distinct. Do not erase them.

(viii) Diagram is essential for writing the proof of the theorem.

Q. 1. (A) For each of the following subquestions four alternative answers are given. Choose the correct alternative and write its alphabet : 4

(i) If a, b, c are sides of a triangle and $a^2 + b^2 = c^2$, name the type of triangle.

(A) Obtuse angled triangle (B) Acute angled triangle

(C) Right angled triangle (D) Equilateral triangle

(ii) Chords AB and CD of a circle intersect inside the circle at point E. If AE = 4, EB = 10, CE = 8, then find ED.

(A) 7 (B) 5 (C) 8 (D) 9

(iii) Coordinates of origin are ..... .

(A) (0, 0) (B) (0, 1) (C) (1, 0) (D) (1, 1)

(iv) If radius of the base of cone is 7 cm and height is 24 cm, then find its slant height.

(A) 23 cm (B) 26 cm (C) 31 cm (D) 25 cm

Q. 1. (B) Solve the following subquestions : 4

(i) If $\triangle ABC \sim \triangle PQR$ and $\frac{A(\triangle ABC)}{A(\triangle PQR)} = \frac{16}{25}$, then find AB : PQ.

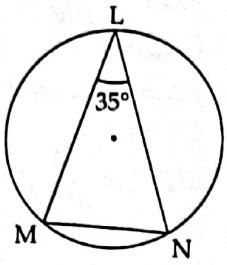
(ii) In $\triangle RST$, $\angle S = 90°$, $\angle T = 30°$, RT = 12 cm, then find RS.

(iii) If radius of a circle is 5 cm, then find the length of longest chord of a circle.

(iv) Find the distance between the points O(0, 0) and P(3, 4).

Q. 2. (A) Complete the following activities and rewrite it : *(Any two)* **4**

(i)



In the given figure, $\angle L = 35°$, find :

(1) m(arc MN)

(2) m(arc MLN).

Activity :

(1) $\angle L = \frac{1}{2} m(\text{arc MN})$ ... (By inscribed angle theorem)

$\therefore \square = \frac{1}{2} m(\text{arc MN})$

$\therefore 2 \times 35 = m(\text{arc MN})$

$\therefore m(\text{arc MN}) = \square$

(2) $m(\text{arc MLN}) = \square - m(\text{arc MN})$ ... (Definition of measure of an arc)

$= 360° - 70°$

$\therefore m(\text{arc MLN}) = \square$

(ii) Show that, $\cot\theta + \tan\theta = \text{cosec}\,\theta \times \sec\theta$.

Activity :

$\text{LHS} = \cot\theta + \tan\theta$

$= \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}$

$= \frac{\square + \square}{\sin\theta \times \cos\theta}$

$= \frac{1}{\sin\theta \times \cos\theta}$ ... $(\square)$

$= \frac{1}{\sin\theta} \times \frac{1}{\square}$

$= \text{cosec}\,\theta \times \sec\theta$

$\text{LHS} = \text{RHS}$

$\therefore \cot\theta + \tan\theta = \text{cosec}\,\theta \times \sec\theta$.

(iii) Find the surface area of a sphere of radius 7 cm.

Activity :

Surface area of sphere $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times \square^2$

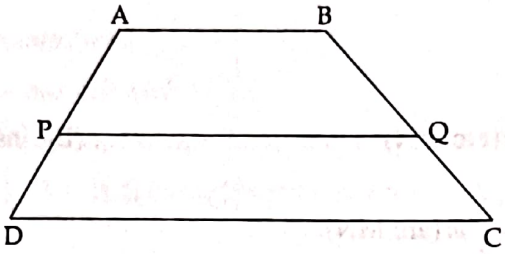
$= 4 \times \frac{22}{7} \times \square$

$= \square \times 7$

$\therefore$ surface area of sphere = $\square$ sq cm.

Q. 2. (B) Solve the following subquestions : *(Any four)* 8

(i)

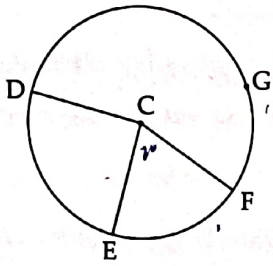


In trapezium ABCD, side AB ∥ side PQ ∥ side DC.

AP = 15, PD = 12, QC = 14, find BQ.

(ii) Find the length of the diagonal of a rectangle whose length is 35 cm and breadth is 12 cm.

(iii)



In the given figure, points G, D, E, F are points of a circle with centre C, ∠ECF = 70°, m(arc DGF) = 200°.

Find :

(1) m(arc DE)

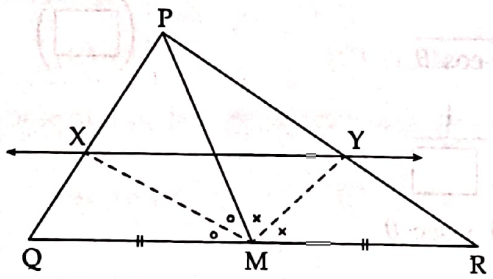
(2) m(arc DEF).

(iv) Show that points A(− 1, − 1), B(0, 1), C(1, 3) are collinear.

(v) A person standing at a distance of 50 m from a temple is looking at its top. The angle of elevation is of 45°. Find the height of the temple.

Q. 3. (A) Complete the following activities and rewrite it : *(Any one)* 3

(i)



In ΔPQR, seg PM is a median. Angle bisectors of ∠PMQ and ∠PMR intersect side PQ and side PR in points X and Y respectively. Prove that XY ∥ QR. Complete the proof by filling in the boxes.

Activity :

In ΔPMQ,

ray MX is the bisector of ∠PMQ.

$\therefore \frac{MP}{MQ} = \frac{\square}{\square}$ ... (Theorem of angle bisector) (1)

Similarly, in $\triangle PMR$, ray MY is the bisector of $\angle PMR$

$\therefore \frac{MP}{MR} = \frac{\square}{\square}$ ... (Theorem of angle bisector) (2)

But $\frac{MP}{MQ} = \frac{MP}{MR}$ ... (As M is the midpoint of QR) (3)

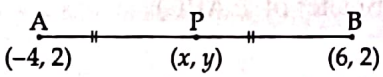
Hence, $MQ = MR$

$\therefore \frac{PX}{\square} = \frac{\square}{YR}$ ... [From (1), (2) and (3)]

$\therefore XY \parallel QR$ ... (By converse of basic proportionality theorem)

(ii) Find the coordinates of point P where P is the midpoint of a line segment AB with A$(-4, 2)$ and B$(6, 2)$

Activity :



Suppose, $(-4, 2) = (x_1, y_1)$ and $(6, 2) = (x_2, y_2)$ and coordinates of P are (x, y)

$\therefore$ according to midpoint theorem,

$x = \frac{x_1 + x_2}{2} = \frac{\square + 6}{2} = \frac{\square}{2} = \square$

$y = \frac{y_1 + y_2}{2} = \frac{2 + \square}{2} = \frac{4}{2} = \square$

$\therefore$ coordinates of midpoint P are $\square$

Q. 3. (B) Solve the following subquestions : *(Any two)* 6

(i) In $\triangle ABC$, seg AP is a median. If $BC = 18$, $AB^2 + AC^2 = 260$, find AP.

(ii) Prove that, "Angles inscribed in the same arc are congruent."

(iii) Draw a circle of radius 3.3 cm. Draw a chord PQ of length 6.6 cm. Draw tangents to the circle at points P and Q.

(iv) The radii of circular ends of a frustum are 14 cm and 6 cm respectively and its height is 6 cm. Find its curved surface area. $(\pi = 3.14)$

Q. 4. Solve the following subquestions : *(Any two)* 8

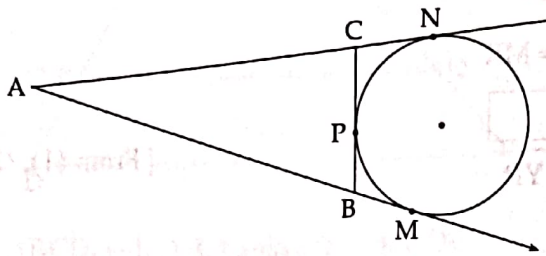
(i) In $\triangle ABC$, seg DE $\parallel$ side BC. If $2A(\triangle ADE) = A(\square DBCE)$, find AB : AD and show that $BC = \sqrt{3}\,DE$.

(ii) $\triangle SHR \sim \triangle SVU$. In $\triangle SHR$, $SH = 4.5$ cm, $HR = 5.2$ cm, $SR = 5.8$ cm and $\frac{SH}{SV} = \frac{3}{5}$, construct $\triangle SVU$.

(iii) An ice-cream pot has a right circular cylindrical shape. The radius of the base is 12 cm and height is 7 cm. This pot is completely filled with ice cream. The entire ice cream is given to the students in the form of right circular ice-cream cones, having diameter 4 cm and height is 3.5 cm. If each student is given one cone, how many students can be served?

Q. 5. Solve the following subquestions : *(Any one)* 3

(i)



A circle touches side BC at point P of the ΔABC, from outside of the triangle. Further extended lines AC and AB are tangents to the circle at N and M respectively. Prove that : $AM = \frac{1}{2}$ (Perimeter of ΔABC).

(ii) Eliminate θ, if $x = r \cos \theta$ and $y = r \sin \theta$.

प्र. क्र. Q. No. **1 (A)**

(i) (B)

(ii) (A)

(iii) (B)

(iv) (A) *(1 mark each)*

Note : Answers with solutions are expected.

1 (B) (i) Solution :

$\begin{vmatrix} 4 & 3 \\ 2 & 7 \end{vmatrix} = 4 \times 7 - 3 \times 2$ *(½ mark)*

$= 28 - 6 = 22$ *(½ mark)*

Ans : The value of the determinant is 22.

(ii) Solution :

The given A.P. is 2, 4, 6, 8, ...

$a = t_1 = 2, t_2 = 4, t_3 = 6, t_4 = 8$ *(½ mark)*

$d = t_2 - t_1 = 4 - 2 = 2$ *(½ mark)*

Ans : The common difference of the given A.P. is 2.

(iii) Solution :

The rate of CGST = 9%

The rate of SGST = the rate of CGST = 9% *(1 mark)*

Ans : The rate of SGST is 9%.

(iv) Solution :

One coin is tossed.

$\therefore S = \{H, T\}$ *(1 mark)*

प्र. क्र.
Q. No. 2 (A)

Note : Any two out of three activities are to be attempted. Here, we have completed all the three activities for the guidance of the students.

(i) Activity :

$5x + 3y = 9$ ... (I)

$2x - 3y = 12$ ... (II)

Adding equations (I) and (II),

$5x + 3y = 9$ ... (I)

$2x - 3y = 12$ ... (II)

$7x = \boxed{21}$ *(½ mark)*

$\therefore x = \dfrac{\boxed{21}}{\boxed{7}}$ *(½ mark)*

(½ mark)

$\therefore x = \boxed{3}$ *(½ mark)*

(ii) Activity :

Comparing $x^2 + 2x - 9 = 0$ with $ax^2 + bx + c = 0$,

$a = 1, b = 2, c = \boxed{-9}$ *(½ mark)*

$\therefore b^2 - 4ac = (2)^2 - 4 \times \boxed{1} \times \boxed{-9}$ *(1 mark)*

$= 4 + \boxed{36}$ *(½ mark)*

$= 40$

$\therefore b^2 - 4ac > 0$

$\therefore$ the roots of the equation are real and unequal

(iii) Activity :

Sr. No.	FV	Share is at	MV	
1.	₹ 100	Par	₹ 100	*(½ mark)*
2.	₹ 75	Premium ₹ 500	₹ 575	*(½ mark)*
3.	₹ 10	Discount ₹ 5	₹ 5	*(½ mark)*
4.	₹ 200	Discount ₹ 50	₹ 150	*(½ mark)*

प्र. क्र.
Q. No. 2 (B)

Note : Any four out of five questions are to be solved. Answers with solutions are expected.

(i) Solution :

$x + y = 4$ ... (1)

$2x - y = 2$ ... (2)

Adding equations (1) and (2),

$x + y = 4$ ... (1)

$2x - y = 2$ ... (2)

$3x = 6$ *(½ mark)*

$\therefore x = 2$ ... (Dividing both the sides by 3) *(½ mark)*

Substituting $x = 2$ in equation (1),

$x + y = 4$

$\therefore 2 + y = 4$ *(½ mark)*

$\therefore y = 4 - 2$

$\therefore y = 2$ *(½ mark)*

Ans. $(x, y) = (2, 2)$ is the solution.

(ii) Solution :

$2y = 10 - y^2$

$\therefore y^2 + 2y - 10 = 0$ ... (Standard form)

Comparing the equation $y^2 + 2y - 10 = 0$ with the standard form $ax^2 + bx + c = 0$, we get, *(½ mark)*

$a = 1$, *(½ mark)*

$b = 2$, *(½ mark)*

$c = -10$. *(½ mark)*

Ans. The values of a, b and c are 1, 2 and -10 respectively.

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Q. No. 2 (B)

(iii) Solution :

$a = 10$ and $d = 5$

Here, $a = t_1 = 10$ and $d = 5$ *(½ mark)*

$t_2 = t_1 + d = 10 + 5 = 15$ *(½ mark)*

$t_3 = t_2 + d = 15 + 5 = 20$ *(½ mark)*

$t_4 = t_3 + d = 20 + 5 = 25$ *(½ mark)*

Ans. 10, 15, 20, 25, ... is the required A.P.

(iv) Solution :

Total GST = CGST + SGST *(½ mark)*

= ₹ 45 + ₹ 45 = ₹ 90 *(½ mark)*

$$\text{Rate of GST} = \frac{\text{The amount of GST}}{\text{Taxable value}} \times 100$$

$$= \frac{90}{500} \times 100$$ *(½ mark)*

$= 18\%$ *(½ mark)*

Ans. The rate of GST charged by the courier service agent is 18%.

(v) Solution :

Assumed mean $(A) = 300$ ... (Given)

$\Sigma f_i = 50$, $\Sigma f_i d_i = 320$

$$\bar{d} = \frac{\Sigma f_i d_i}{\Sigma f_i}$$ *(½ mark)*

$$= \frac{320}{50}$$

$= 6.40$ *(½ mark)*

Mean $(\bar{X}) = A + \bar{d}$ *(½ mark)*

$= 300 + 6.40$

$= 306.40$ *(½ mark)*

Ans. The mean is 306.40.

प्र. क्र.
Q. No. 3 (A)

Note : Any one out of two activities are to be attempted. Here, we have completed both the activities for the guidance of the students.

(i) Activity :

(a) Committee of 2 boys = $\{B_1 B_2\}$ *(½ mark)*

(b) Committee of 2 girls = $\{G_1 G_2\}$ *(½ mark)*

(c) Committee of one boy and one girl
$= \{(B_1 G_1), (B_1 G_2), B_2 G_1, B_2 G_2\}$ *(1 mark)*

(d) Sample space (S) = $\{(B_1 B_2), (B_1 G_1), B_1 G_2, B_2 G_1, (B_2 G_2), (G_1 G_2)\}$ *(1 mark)*

(ii) Activity :

SAC	Food Items	Qty	Rate (in ₹)	Taxable amount	CGST		SGST	
9963	Coffee	1	20	20.00	2.5%	₹0.50	2.5%	₹0.50
9963	Masala Tea	1	10	10.00	2.5%	₹0.25	2.5%	₹0.25
9963	Masala Dosa	2	60	120.00	2.5%	₹3.00	2.5%	₹3.00
			Total	150.00		₹3.75		₹3.75
					Grand Total		= ₹ 157.50	

(½ mark for each correct answer)

प्र. क्र.
Q. No. 3 (B)

Note : Any two out of four questions are to be solved. Here, we have solved all the four questions for the guidance of the students.

(i) Solution :

$4m+6n=54$ ... (1) $3m+2n=28$ ... (2)

Here, $a_1=4, b_1=6, c_1=54$ Here, $a_2=3, b_2=2, c_2=28$

$$D=\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}=\begin{vmatrix} 4 & 6 \\ 3 & 2 \end{vmatrix}$$

$=4\times2-6\times3$

$=8-18=-10$ *(½ mark)*

$$D_m=\begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}=\begin{vmatrix} 54 & 6 \\ 28 & 2 \end{vmatrix}$$

$=54\times2-6\times28$

$=108-168=-60$ *(½ mark)*

$$D_n=\begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}=\begin{vmatrix} 4 & 54 \\ 3 & 28 \end{vmatrix}$$

$=4\times28-54\times3$

$=112-162=-50$ *(½ mark)*

By Cramer's rule,

$m=\frac{D_m}{D}=\frac{-60}{-10}=6$ *(½ mark)*

$n=\frac{D_n}{D}=\frac{-50}{-10}=5$ *(½ mark)*

Ans. $(m, n)=(6, 5)$ is the solution. *(½ mark)*

प्र. क्र.
Q. No. 3 (B)

(ii) Solution :

$x^2 + 10x + 2 = 0$

Comparing $x^2 + 10x + 2 = 0$ with $ax^2 + bx + c = 0$,

$a = 1,\ b = 10,\ c = 2$ *(½ mark)*

$\Delta = b^2 - 4ac = (10)^2 - 4 \times (1) \times (2)$

$= 100 - 8 = 92$ *(½ mark)*

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ *(½ mark)*

$= \dfrac{-10 \pm \sqrt{92}}{2 \times 1}$ *(½ mark)*

$= \dfrac{-10 \pm \sqrt{4 \times 23}}{2}$

$= \dfrac{-10 \pm \sqrt{4} \times \sqrt{23}}{2}$

$= \dfrac{-10 \pm 2\sqrt{23}}{2}$

$= \dfrac{2(-5 \pm \sqrt{23})}{2}$ *(½ mark)*

$= -5 \pm \sqrt{23}$

$\therefore x = -5 + \sqrt{23}$ or $x = -5 - \sqrt{23}$ *(½ mark)*

Ans. $-5 + \sqrt{23}$, $-5 - \sqrt{23}$ are the roots of the given quadratic equation.

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Q. No. 3 (B)

(iii) Solution :

The sample space is

$S = \{23, 25, 27, 29, 32, 35, 37, 39, 52, 53, 57, 59, 72, 73, 75, 79, 92, 93, 95, 97\}$ *(½ mark)*

$\therefore n(S) = 20$ *(½ mark)*

Let A be the event that two-digit odd numbers are formed.

Then $A = \{23, 25, 27, 29, 35, 37, 39, 53, 57, 59, 73, 75, 79, 93, 95, 97\}$

$\therefore n(A) = 16$ *(½ mark)*

$P(A) = \frac{n(A)}{n(S)}$

$\therefore P(A) = \frac{16}{20} = \frac{4}{5}$ *(½ mark)*

Let B be the event that the two-digit number is a multiple of 5.

Then $B = \{25, 35, 75, 95\}$

$\therefore n(B) = 4$ *(½ mark)*

$P(B) = \frac{n(B)}{n(S)}$

$\therefore P(B) = \frac{4}{20} = \frac{1}{5}$ *(½ mark)*

Ans. $P(A) = \frac{4}{5}$, $P(B) = \frac{1}{5}$.

प्र. क्र.
Q. No. 3 (B)

(iv) Solution :

Class Number of Mangoes	Frequency Number of Trees	Cumulative Frequency (less than type)
50-100	33	33
100-150	30	63→cf
150-200	90→f	153
200-250	80	233
250-300	17	250
	$\Sigma f_i = 250$	

(1 mark)

Here, total frequency $N = \Sigma f_i = 250$

$\frac{N}{2} = \frac{250}{2} = 125$

Cumulative frequency which is just greater than 125 is 153.

150 – 200 is the median class.

$L = 150,\ f = 90,\ cf = 63,\ h = 50$ *(½ mark)*

$$\text{Median} = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$ *(½ mark)*

$$= 150 + \left[\frac{125 - 63}{90}\right] \times 50$$ *(½ mark)*

$$= 150 + \frac{62}{90} \times 50$$

$$= 150 + 34.4 = 184.4$$ *(½ mark)*

Ans. The median of the data is 184.4 mangoes.

प्र. क्र.
Q. No. 4

Note : Any two out of three questions are to be solved. Here, we have solved all the three questions for the guidance of the students.

(i) Proof :

Here, $a = t_1 = p$, $t_2 = q$ and $t_n = r$. ... (1) *(½ mark)*

The common difference $(d) = t_2 - t_1 = q - p$.

Let us find the total number of terms in the A.P.

$t_n = a + (n-1)\,d$ ... (Formula) *(½ mark)*

$\therefore r = p + (n-1)(q-p)$ ... (Substituting the values) *(½ mark)*

$\therefore r - p = (n-1)(q-p)$

$\therefore \dfrac{r-p}{q-p} = n-1$

i.e. $n - 1 = \dfrac{r-p}{q-p}$

$\therefore n = \dfrac{r-p}{q-p} + 1$

$\therefore n = \dfrac{r-p+q-p}{q-p}$

$\therefore n = \dfrac{r+q-2p}{q-p}$ ... (2) *(½ mark)*

The sum of n terms of the A.P.

$S_n = \dfrac{n}{2}(t_1 + t_n)$ ... (Formula) *(½ mark)*

$= \dfrac{\frac{r+q-2p}{q-p}}{2} \times (p+r)$ ... [From (1) and (2)] *(1 mark)*

$= \dfrac{q+r-2p}{2(q-p)} \times (p+r)$

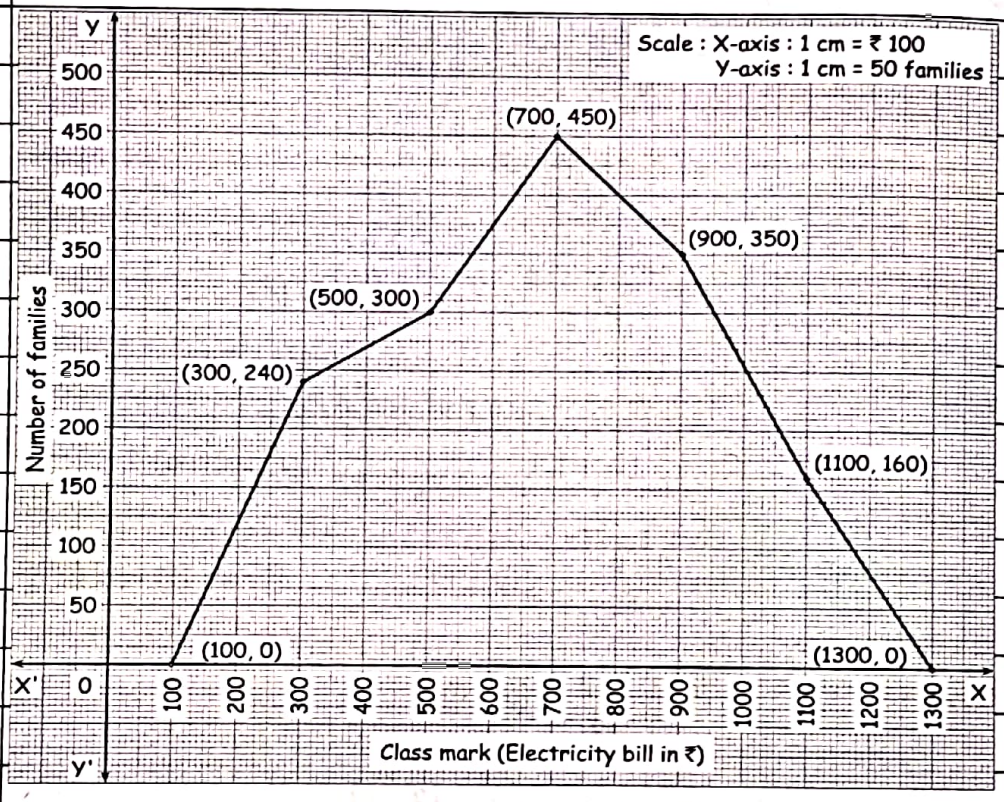
$\therefore S_n = (q+r-2p) \times \dfrac{(p+r)}{2(q-p)}$ *(½ mark)*

प्र. क्र.
Q. No. 4

(ii) Solution :

Class Electricity Bill (₹)	Class mark	Frequency (Families)	Coordinates of points
0-200	100	0	(100, 0)
200-400	300	240	(300, 240)
400-600	500	300	(500, 300)
600-800	700	450	(700, 450)
800-1000	900	350	(900, 350)
1000-1200	1100	160	(1100, 160)
1200-1400	1300	0	(1300, 0)

Frequency Polygon :



[Scheme of marking :

(1) For preparing the table : (2 marks)

(2) For correct scale and axes : (½ mark)

(3) For drawing correct frequency polygon : (1½ marks)]

प्र. क्र.
Q. No. 4

(iii) Solution :

Let the five consecutive natural numbers be

$(x-2), (x-1), x, (x+1)$ and $(x+2)$ ... $(x>2)$ *(½ mark)*

From the given condition,

$(x-2)^2+(x-1)^2+x^2+(x+1)^2+(x+2)^2=1455$ *(½ mark)*

$\therefore x^2-4x+4+x^2-2x+1+x^2+x^2+2x+1+x^2+4x+4=1455$

(½ mark)

$\therefore 5x^2+10=1455$ *(½ mark)*

$\therefore x^2+2=291$ ... (Dividing both the sides by 5) *(½ mark)*

$\therefore x^2=291-2$

$\therefore x^2=289$ *(½ mark)*

$\therefore x=\pm 17$ ... (Taking square roots of both the sides) *(½ mark)*

$\therefore x=17$ or $x=-17$

But a natural number cannot be negative.

$\therefore x=-17$ is unacceptable.

$\therefore x=17$

$x-2=17-2=15$, $x-1=17-1=16$,

$x+1=17+1=18$, $x+2=17+2=19$

Ans. The five consecutive natural numbers are 15, 16, 17, 18, 19.

(½ mark)

5

Note : Any one out of two questions are to be solved. Here, we have solved both the questions for the guidance of the students.

(i) Solution :

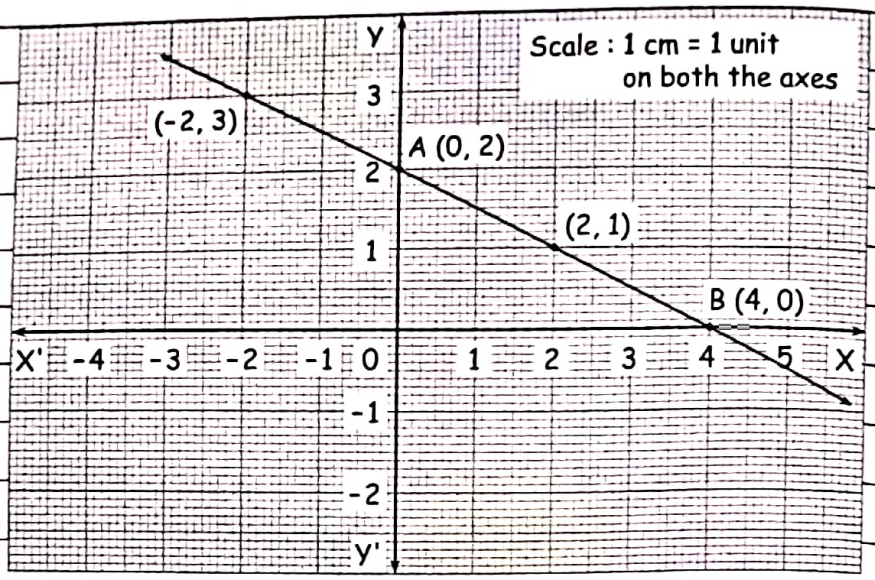
$x+2y=4$

$\therefore 2y=4-x$

$\therefore y=\dfrac{4-x}{2}$

x	-2	0	2	4
y	3	2	1	0
(x, y)	$(-2, 3)$	$(0, 2)$	$(2, 1)$	$(4, 0)$

प्र. क्र.
Q. No. 5



Here, height (OA) = 2 units, base (OB) = 4 units

$A(\triangle AOB) = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times OB \times OA = \frac{1}{2} \times 4 \times 2 = 4 \text{ cm}^2$

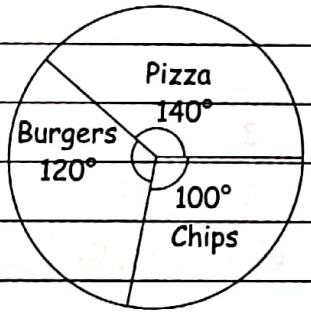
Ans. The area of the triangle is 4 cm^2.

[Scheme of marking : ½ mark for preparing table, 1 mark for drawing correct line, 1 mark for finding the area of the triangle, ½ mark for writing the area of the triangle.]

(ii) Solution :

Food Items	Number of People	Measure of Central Angle	
Pizza	70	$\frac{70}{180} \times 360° = 140°$	*(½ mark)*
Burgers	60	$\frac{60}{180} \times 360° = 120°$	*(½ mark)*
Chips	50	$\frac{50}{180} \times 360° = 100°$	*(½ mark)*
Total	180	360°	

On the basis of the table, the pie diagram is drawn :



(For drawing pie diagram : $1\frac{1}{2}$ marks)

प्र. क्र. Q. No. **1 (A)**

(i) (C) *(1 mark)*

(ii) (B) *(1 mark)*

(iii) (A) *(1 mark)*

(iv) (D) *(1 mark)*

1 (B)

Note : Here answers with solution are expected.

(i) Solution :

$\triangle ABC \sim \triangle PQR$

$\therefore \frac{A(\triangle ABC)}{A(\triangle PQR)} = \frac{AB^2}{PQ^2}$ ...(Theorem of areas of similar triangles)

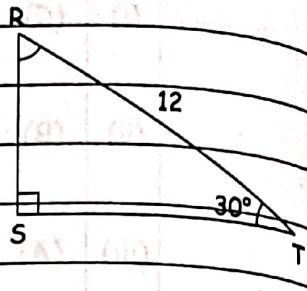
$\therefore \frac{16}{25} = \frac{AB^2}{PQ^2}$ *(½ mark)*

$\therefore \frac{AB}{PQ} = \frac{4}{5}$ ...(Taking square roots of both the sides)

Ans. $AB : PQ = 4 : 5$. *(½ mark)*

प्र. क्र.
Q. No. **1 (B)**

(ii) **Solution :**



In $\triangle RST$,

$\angle S = 90°$, $\angle T = 30°$ ... (Given)

$\therefore \angle R = 60°$

... (Remaining angle of the triangle)

$\therefore \triangle RST$ is a $30°-60°-90°$ triangle

$\therefore$ by $30°-60°-90°$ triangle theorem,

$RS = \frac{1}{2} \times RT$ ... (Side opposite to 30°) *(½ mark)*

$= \frac{1}{2} \times 12 = 6$ cm *(½ mark)*

Ans. $RS = 6$ cm.

(iii) **Solution :**

Radius $(r) = 5$ cm

Diameter is the longest chord of the circle. *(½ mark)*

$d = 2r$

$= 2 \times 5 = 10$ cm *(½ mark)*

Ans. The length of the longest chord is 10 cm.

(iv) **Solution :**

$O(0, 0)$ and $P(3, 4)$

$O(0, 0) \equiv (x_1, y_1)$; $P(3, 4) \equiv (x_2, y_2)$

Using distance formula,

$d(O, P) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ *(½ mark)*

$= \sqrt{(3-0)^2 + (4-0)^2}$

$= \sqrt{3^2 + 4^2}$

$= \sqrt{9 + 16}$

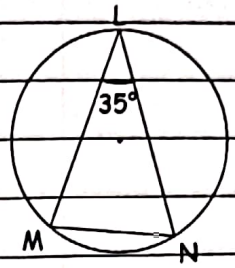
$= \sqrt{25} = 5$ *(½ mark)*

Ans. $d(O, P) = 5$.

प्र. क्र.
Q. No. **2 (A)**

***Note :** In this question type, students are required to solve any 2 of 3 activities. However, solutions to all 3 activities are given here, for the guidance of the students.*

(i) **Activity :**



(1) $\angle L = \frac{1}{2}$ m(arc MN)

... (By inscribed angle theorem)

$\therefore \boxed{\angle 35^\circ} = \frac{1}{2}$ m(arc MN) *(½ mark)*

$\therefore 2 \times 35^\circ =$ m(arc MN)

$\therefore$ m(arc MN) $= \boxed{70^\circ}$ *(½ mark)*

(2) m(arc MLN) $= \boxed{360^\circ} -$ m(arc MN)

... (Definition of measure of an arc) *(½ mark)*

$= 360^\circ - 70^\circ$

$\therefore$ m(arc MLN) $= \boxed{290^\circ}$ *(½ mark)*

(ii) **Activity :**

LHS $= \cot\theta + \tan\theta$

$= \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}$

$= \frac{\boxed{\cos^2\theta} + \boxed{\sin^2\theta}}{\sin\theta \times \cos\theta}$ *(½ + ½ mark)*

$= \frac{1}{\sin\theta \times \cos\theta}$ ... ($\boxed{\sin^2\theta + \cos^2\theta = 1}$) *(½ mark)*

$= \frac{1}{\sin\theta} \times \frac{1}{\boxed{\cos\theta}}$ *(½ mark)*

$= \text{cosec}\,\theta \times \sec\theta$

LHS = RHS

$\therefore \cot\theta + \tan\theta = \text{cosec}\,\theta \times \sec\theta.$

प्र. क्र.
Q. No. 2 (A)

(iii) Activity :

Surface area of sphere $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times \boxed{7}^2$ (½ mark)

$= 4 \times \frac{22}{7} \times \boxed{49}$ (½ mark)

$= \boxed{88} \times 7$ (½ mark)

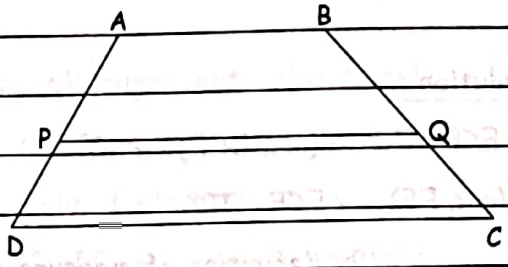
∴ surface area of sphere $= \boxed{616}$ sq cm. (½ mark)

प्र. क्र.
Q. No. **2 (B)**

Note : *In this question type, students are required to solve any 4 of 5 subquestions. However, solutions to all 5 subquestions are given here, for the guidance of the students.*

(i) **Solution :**

side AB ∥ side PQ ∥ side DC ... (Given)



$\therefore \frac{AP}{PD} = \frac{BQ}{QC}$ ... (Property of three parallel lines and their transversals)

(½ mark)

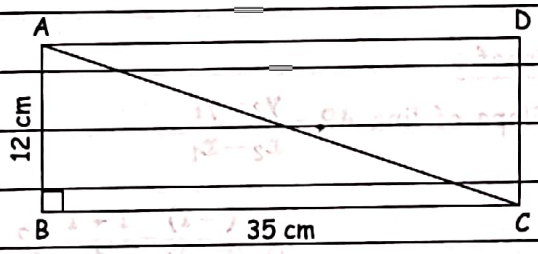
$\therefore \frac{15}{12} = \frac{BQ}{14}$ *(½ mark)*

$\therefore BQ = \frac{15 \times 14}{12}$ *(½ mark)*

$\therefore BQ = 17.5$ *(½ mark)*

Ans. The value of BQ is 17.5

(ii) **Solution :**



□ABCD is a rectangle.

$\therefore \angle ABC = 90°$ ... (Measure of an angle of a rectangle) ... (1)

In △ABC,

$\angle ABC = 90°$ ... [From (1)]

∴ by Pythagoras theorem,

$AC^2 = AB^2 + BC^2$ *(½ mark)*

प्र. क्र.
Q. No. 2 (B)

$AC^2 = (12)^2 + (35)^2$ (½ mark)

$= 144 + 1225$

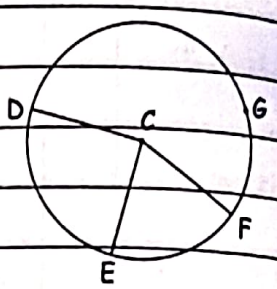
$\therefore AC^2 = 1369$ (½ mark)

$\therefore AC = 37$ ... (Taking square roots of both sides) (½ mark)

Ans. The length of the diagonal of the rectangle is 37 cm.

(iii) Solution :

$\angle ECF = 70°$, $m(\text{arc } DGF) = 200°$ ... (Given)



$m(\text{arc } EF) = \angle ECF = 70°$

... (By definition of measure of an arc)

(1) $m(\text{arc } DE) + m(\text{arc } EF) + m(\text{arc } DGF) = 360°$

... (Measure of a circle is 360°)

$\therefore m(\text{arc } DE) + 70° + 200° = 360°$ (½ mark)

$m(\text{arc } DE) = 360° - 270°$

$m(\text{arc } DE) = 90°$ (½ mark)

(2) $m(\text{arc } DEF) = m(\text{arc } DE) + m(\text{arc } EF)$

$= 90° + 70°$ (½ mark)

$= 160°$ (½ mark)

Ans. (1) $m(\text{arc } DE) = 90°$ (2) $m(\text{arc } DEF) = 160°$

(iv) Proof :

Slope of line $AB = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{1-(-1)}{0-(-1)} = \frac{1+1}{1} = 2$ (½ mark)

Slope of line $BC = \frac{y_3 - y_2}{x_3 - x_2}$

$= \frac{3-1}{1-0} = \frac{2}{1} = 2$ (½ mark)

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Q. No. **2 (B)**

Slope of line AB = Slope of line BC

∴ line AB || line BC. *(½ mark)*

But point B is common to both the lines

∴ points A, B and C are collinear. *(½ mark)*

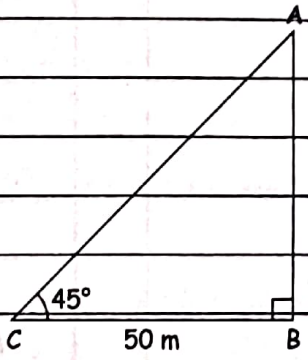
(v) Solution :

In the figure, AB represents the temple,

C is the position of the observer.

∠ACB is the angle of elevation.

∠ACB = 45°, BC = 50 m. *(½ mark)*



In right angled △ABC,

$$\tan 45° = \frac{AB}{BC}$$ *(½ mark)*

$$\therefore 1 = \frac{AB}{50}$$ *(½ mark)*

∴ AB = 50 m *(½ mark)*

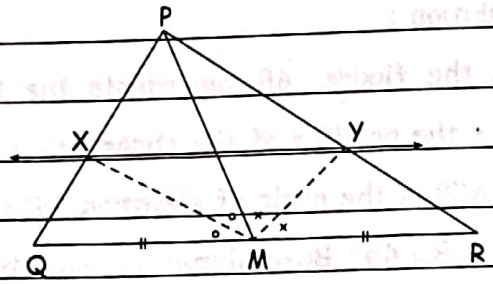
Ans. Height of the temple is 50 m.

प्र. क्र.
Q. No. **3 (A)**

Note : In this question type, students are required to attempt any 1 of 2 activities. However, solutions to both the activities are given here, for the guidance of the students.

(i) Activity :

In $\triangle PMQ$, ray MX is the bisector of $\angle PMQ$



$\therefore \frac{MP}{MQ} = \frac{PX}{XQ}$ ... (Theorem of angle bisector) ... (1)

(½ + ½ mark)

Similarly, in $\triangle PMR$, ray MY is the bisector of $\angle PMR$

$\therefore \frac{MP}{MR} = \frac{PY}{YR}$ ... (Theorem of angle bisector) ... (2)

(½ + ½ mark)

But $\frac{MP}{MQ} = \frac{MP}{MR}$ ... (As M is the midpoint of QR) ... (3)

Hence $MQ = MR$

$\therefore \frac{PX}{XQ} = \frac{PY}{YR}$ ... [From (1), (2) and (3)] *(½ + ½ mark)*

$\therefore XY \parallel QR$ ... (By converse of basic proportionality theorem)

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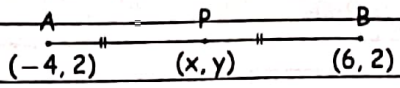
Q. No. 3 (A)

(ii) Activity :



Suppose, $(-4, 2) \equiv (x_1, y_1)$ and $(6, 2) \equiv (x_2, y_2)$

and coordinates of P are (x, y)

$\therefore$ according to midpoint theorem,

$$x = \frac{x_1 + x_2}{2} = \frac{\boxed{-4} + 6}{2} = \frac{\boxed{2}}{2} = \boxed{1}$$ *(½ + ½ + ½ mark)*

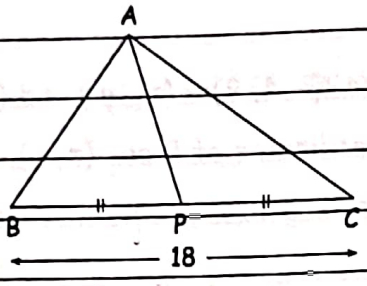
$$y = \frac{y_1 + y_2}{2} = \frac{2 + \boxed{2}}{2} = \frac{4}{2} = \boxed{2}$$ *(½ + ½ mark)*

$\therefore$ coordinates of midpoint P are $\boxed{(1, 2)}$ *(½ mark)*

प्र. क्र.
Q. No. **3 (B)**

Note : In this question type, students are required to solve any 2 of 4 subquestions. However, solutions to all 4 subquestions are given here, for the guidance of the students.

(i) Solution :



$BP = PC = \frac{1}{2} BC$ ... (P is the midpoint of BC)

$= \frac{1}{2} \times 18$

$= 9$ cm (½ mark)

In $\triangle ABC$,

seg AP is the median

$\therefore$ by Apollonius theorem,

$AB^2 + AC^2 = 2BP^2 + 2AP^2$ (½ mark)

$\therefore 260 = 2[9^2 + AP^2]$ (½ mark)

$\therefore \frac{260}{2} = 81 + AP^2$ (½ mark)

$\therefore 130 - 81 = AP^2$

$\therefore 49 = AP^2$ (½ mark)

$\therefore AP = 7$ ... (Taking square root of both the sides) (½ mark)

Ans. AP = 7.

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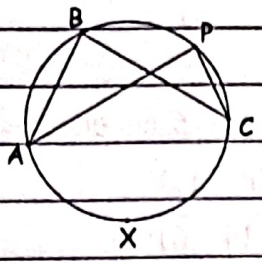
Q. No. **3 (B)**

(ii)



(½ mark)

Given : $\angle ABC$ and $\angle APC$ are inscribed in arc ABC and their intercepted arc is arc AXC *(½ mark)*

To prove : $\angle ABC \cong \angle APC$ *(½ mark)*

Proof : $\angle ABC = \frac{1}{2}$ m(arc AXC) ... (Inscribed angle theorem)

... (1) *(½ mark)*

Similarly,

$\angle APC = \frac{1}{2}$ m(arc AXC) ... (Inscribed angle theorem)

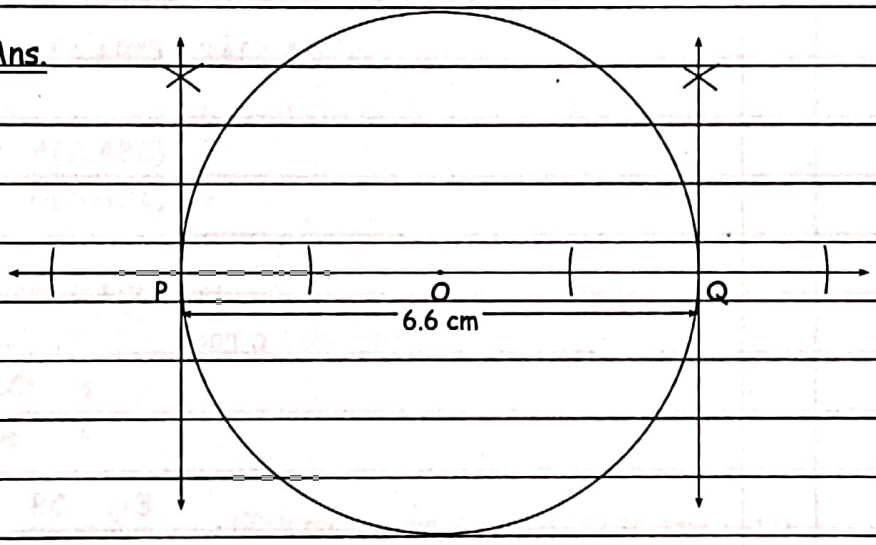
... (2) *(½ mark)*

$\therefore$ from (1) and (2),

$\angle ABC = \angle APC$

$\therefore \angle ABC \cong \angle APC$. *(½ mark)*

(iii) Ans.



[Marking scheme :

(1) To draw a circle of radius 3.3 cm *(½ mark)*

(2) To draw a chord passing through the centre of the circle. *(½ mark)*

(3) To draw tangent at point P *(1 mark)*

(4) To draw tangent at point Q *(1 mark)]*

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(iv) Solution :

$r_1 = 14$ cm, $r_2 = 6$ cm and $h = 6$ cm

$l = \sqrt{h^2 + (r_1 - r_2)^2}$ (½ mark)

$= \sqrt{6^2 + (14 - 6)^2}$ (½ mark)

$= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64}$

$= \sqrt{100}$

$= 10$ cm (½ mark)

Curved surface area of the frustum $= \pi (r_1 + r_2) l$ (½ mark)

$= 3.14 (14 + 6) \times 10$ (½ mark)

$= 31.4 \times 20$

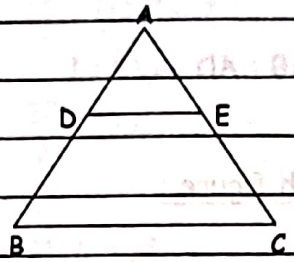
$= 628 \text{ cm}^2$ (½ mark)

Ans. The curved surface area of the frustum is 628 cm^2.

प्र. क्र.
Q. No. 4

***Note :** In this question type, students are required to attempt any 2 of 3 subquestions. However, solutions to all 3 subquestions are given here, for the guidance of the students.*

(i) Proof :



In $\triangle ABC$ and $\triangle ADE$,

$\angle BAC \cong \angle DAE$ ... (Common angle)

$\angle ABC \cong \angle ADE$ ... (Corresponding angles) } *(½ mark)*

$\therefore \triangle ABC \sim \triangle ADE$ ... (AA test of similarity) *(1 mark)*

$\therefore \frac{A(\triangle ABC)}{A(\triangle ADE)} = \frac{BC^2}{DE^2}$ ... (Theorem on areas of similar triangles)

... (1) *(½ mark)*

$A(\triangle ABC) = A(\triangle ADE) + A(\square DBCE)$ ... (Area addition postulate)

$\therefore A(\triangle ABC) = A(\triangle ADE) + 2A(\triangle ADE)$ *(½ mark)*

[Given : $2A(\triangle ADE) = A(\square DBCE)$]

$\therefore A(\triangle ABC) = 3A(\triangle ADE)$

$\therefore \frac{A(\triangle ABC)}{A(\triangle ADE)} = \frac{3}{1}$ ... (2) *(½ mark)*

From (1) and (2),

$\frac{BC^2}{DE^2} = \frac{3}{1}$

$\therefore \frac{BC}{DE} = \frac{\sqrt{3}}{1}$ ... (Taking square roots of both the side) ... (3)

i.e. $BC = \sqrt{3}\ DE$ *(½ mark)*

Now $\triangle ABC \sim \triangle ADE$ ... (Proved)

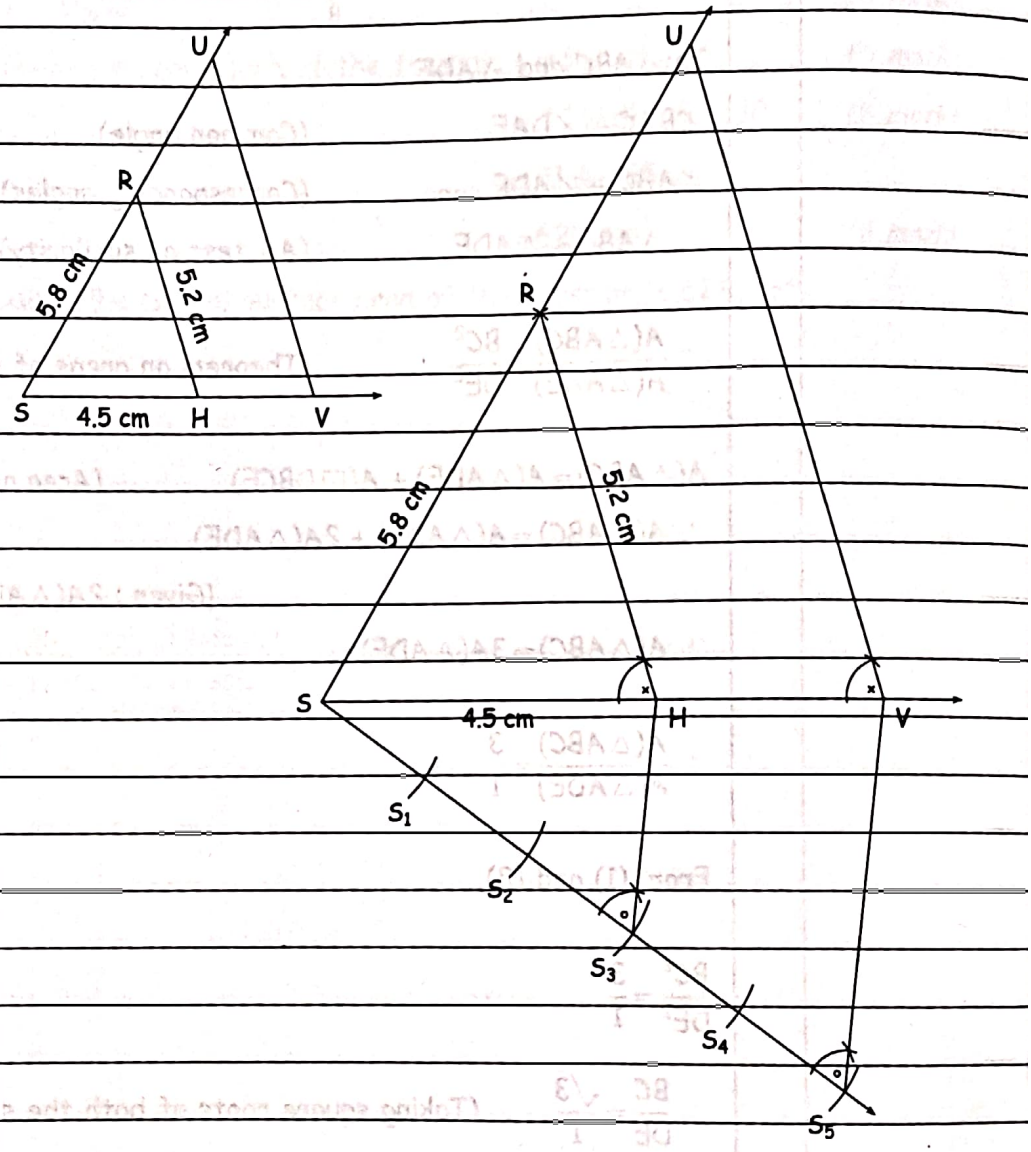
प्र. क्र. Q. No. 4

$\therefore \frac{AB}{AD} = \frac{BC}{DE}$ ...(c.s.s.t.)

$\therefore \frac{AB}{AD} = \frac{\sqrt{3}}{1}$ ...[From (3)]

i.e. AB : AD = $\sqrt{3}$: 1 *(½ mark)*

(ii) Rough figure : Ans.



[Marking scheme :

(1) For rough figure *(1 mark)*

(2) For construction of △SHR *(1 mark)*

(3) For drawing line $S_5V \parallel S_3H$ *(1 mark)*

(4) For drawing line $VU \parallel HR$ *(1 mark)]*

प्र. क्र. Q. No. 4

(iii) Solution :

Volume of cylindrical pot $= \pi r^2 h$ *(½ mark)*

$$= \frac{22}{7} \times (12)^2 \times 7$$

$$= \frac{22}{7} \times 144 \times 7$$

$$= 3168 \text{ cm}^3$$

Volume of ice cream in the pot $= 3168 \text{ cm}^3$ *(½ mark)*

Volume of each cone $= \frac{1}{3} \pi r^2 h$ *(½ mark)*

$$= \frac{1}{3} \times \frac{22}{7} \times (2)^2 \times 3.5 \quad \text{(As } d = 4 \text{ cm} \therefore r = 2 \text{ cm)}$$

$$= \frac{1}{3} \times \frac{22}{7} \times 4 \times 3.5$$

$$= \frac{44}{3} \text{ cm}^3$$ *(½ mark)*

$$\text{Number of ice-cream cones} = \frac{\text{Volume of ice cream in the pot}}{\text{Volume of ice cream in each cone}}$$

(½ mark)

$$= \frac{3168 \times 3}{44}$$ *(½ mark)*

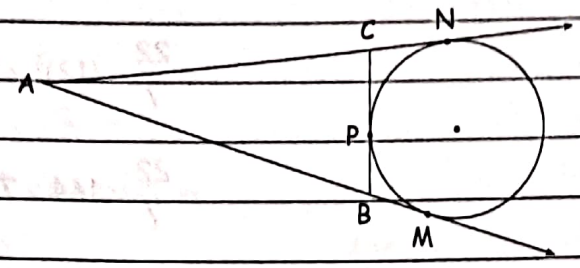
$$= 216$$ *(½ mark)*

Ans. 216 students can be served the ice-cream cones. *(½ mark)*

प्र. क्र.
Q. No. **5**

Note : In this question type, students are required to solve any 1 of 2 subquestions. However, solutions to both the subquestions are given here, for the guidance of the students.

(i)



Proof ;

Tangent segments drawn from an exterior point to the circle are congruent *(½ mark)*

$\therefore BP = BM$ ... (1)

$CP = CN$ ... (2) *(½ mark)*

$AM = AN$ ... (3)

$AB + BC + AC =$ Perimeter of $\triangle ABC$ *(½ mark)*

$\therefore AB + BP + PC + AC =$ Perimeter of $\triangle ABC$ ... [B-P-C]

$\therefore AB + BM + CN + AC =$ Perimeter of $\triangle ABC$

... [From (1) and (2)] *(½ mark)*

$AM + AN =$ Perimeter of $\triangle ABC$ ... (A-B-M and A-C-N) *(½ mark)*

$AM + AM =$ Perimeter of $\triangle ABC$ ... [From (3)]

$\therefore 2AM =$ Perimeter of $\triangle ABC$

$\therefore AM = \frac{1}{2}$ (Perimeter of $\triangle ABC$) *(½ mark)*

प्र. क्र.
Q. No. 5

(ii) Solution :

$x = r \cdot \cos\theta$ ... (Given)

$\therefore \cos\theta = \frac{x}{r}$ ... (1) *(½ mark)*

$y = r \cdot \sin\theta$ ... (Given)

$\therefore \sin\theta = \frac{y}{r}$ ... (2) *(½ mark)*

Now, $\sin^2\theta + \cos^2\theta = 1$ *(½ mark)*

$\therefore \left(\frac{x}{r}\right)^2 + \left(\frac{y}{r}\right)^2 = 1$ *(½ mark)*

$\therefore \frac{x^2}{r^2} + \frac{y^2}{r^2} = 1$

$\therefore \frac{x^2 + y^2}{r^2} = 1$ *(½ mark)*

$\therefore x^2 + y^2 = r^2$ *(½ mark)*

Ans. $x^2 + y^2 = r^2$

SCIENCE & TECHNOLOGY (PART 1)
BOARD'S ACTIVITY SHEET (MARCH 2023)

(With Full Solution & Marking Scheme)

Time : 2 Hours] **[Total Marks : 40**

Note : *(i) All questions are compulsory.*

(ii) Use of a calculator is not allowed.

(iii) The numbers to the right of the questions indicate full marks.

(iv) In case of MCQs (Q. No. 1 (A)), only the first attempt will be evaluated and will be given credit.

(v) For each MCQ, the correct alternative (A), (B), (C) or (D) with subquestion number is to be written as an answer.

E.g. : *(i) (A), (ii) (B), (iii) (C)*

(vi) Scientifically correct, labelled diagrams should be drawn wherever necessary.

Q. 1. (A) Choose the *correct* alternative : **5**

(i) The device used for producing current is called ..... .

(A) a voltmeter *(B) an ammeter*

(C) a galvanometer *(D) a generator*

(ii) If a ray of light passes from a denser medium to a rarer medium in a straight line, the angle of incidence must be ..... .

(A) 0° *(B) 30°* *(C) 60°* *(D) 90°*

(iii) The power of a convex lens of focal length 20 cm is ..... .

(A) +5.0 D *(B) 0.20 D*

(C) −5.0 D *(D) 0.5 D*

(iv) Good conductor of electricity is ..... .

(A) bromine *(B) iodine*

(C) graphite *(D) sulphur*

(v) The height of a medium earth orbit above the surface of the earth is ..... .

(A) 1500 km *(B) 250 km*

(C) 45000 km *(D) 25000 km*

Q. 1. (B) Answer the following questions : **5**

(i) Find the odd one out :

Loudspeaker, Microphone, Electric motor, Magnet.

(ii) Complete the correlation :

CuI_2 : Brown : : AgCl : ..... .

(iii) Match the pair :

Group A (Substance)	Group B (Refractive index)
Air	(a) 1.33
	(b) 1.46
	(c) 1.0003

(iv) State True or False :

Wavelength of red light is close to 700 nm.

(v) Write the name of the small satellite made by a group of students from COEP (College of Engineering, Pune) sent to the space through ISRO in 2016.

Q. 2. (A) Give scientific reasons : *(Any two)* **4**

(i) For electric power transmission, copper or aluminium wire is used.

(ii) Lemon or tamarind is used for cleaning copper vessels turned greenish.

(iii) Elements belonging to the same group have the same valency.

Q. 2. (B) Answer the following questions : *(Any three)* **6**

(i) How do we feel about air in each of the following conditions?

(a) Relative humidity is more than 60%.

(b) Relative humidity is less than 60%.

(ii) Complete the following reaction :

$C_{12}H_{22}O_{11} \xrightarrow{\text{heat}}$ ------ + ------ .

(iii) Distinguish between mass and weight.

(iv) Complete the following table :

Type of satellite	The names of Indian satellite and launcher
(1) Navigational satellite	Satellite : ..... Launcher : .....
(2) Earth observation satellite	Satellite : ..... Launcher : .....

(v) Define period and group of the modern periodic table.

Q. 3. Answer the following questions : *(Any five)* **15**

(i) Calculate the escape velocity on the surface of the moon given the mass and radius of the moon to be 7.34×10^{22} kg and 1.74×10^{6} m respectively.

(Given : $G = 6.67 \times 10^{-11}$ N·m²/kg²)

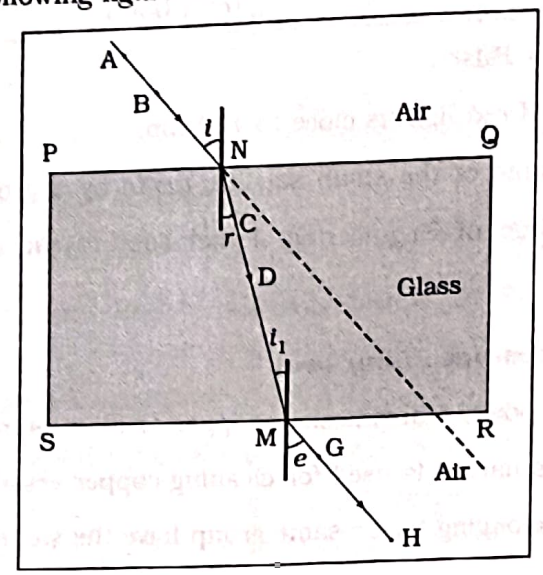
(ii) An element has its electron configuration as 2, 8, 1. Now answer the following questions :

(a) What is the atomic number of this element?

(b) What is the group of this element?

(c) To which period does this element belong?

(iii) Observe the following figure and name the ray AB, ray CD, ray GH :



(iv) Read the following sentence and answer the questions :

NaCl is an ionic compound.

(a) Why is NaCl an ionic compound?

(b) State any *two* properties of ionic compounds.

(v) Identify the physical and chemical changes from the following phenomena :

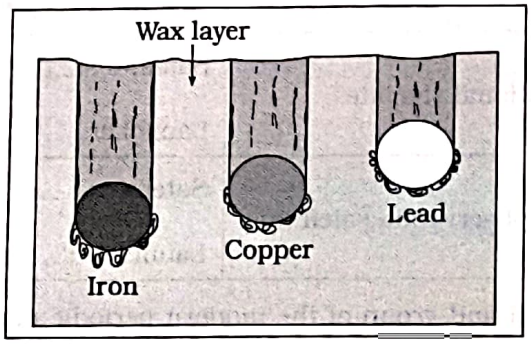
(a) Transformation of ice into water. (b) Ripening of a fruit.

(c) Milk turned into curd. (d) Evaporation of water.

(e) Digestion of food in the stomach.

(f) Iron filings get attracted towards a magnet.

(vi) Observe the following figure and answer the questions :



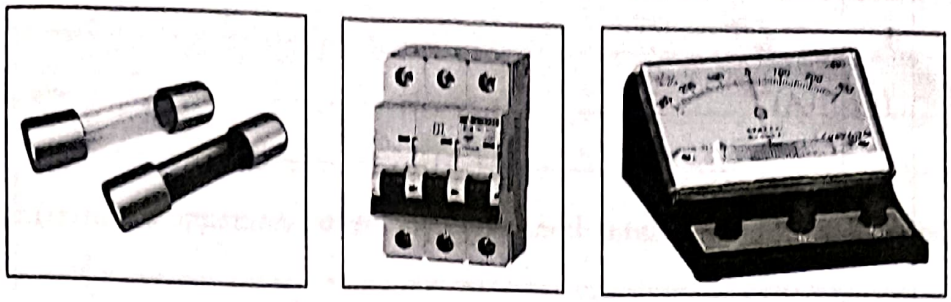
Specific heat capacity of metals

(a) Which element has maximum specific heat capacity? Justify.

(b) Which element has minimum specific heat capacity? Justify.

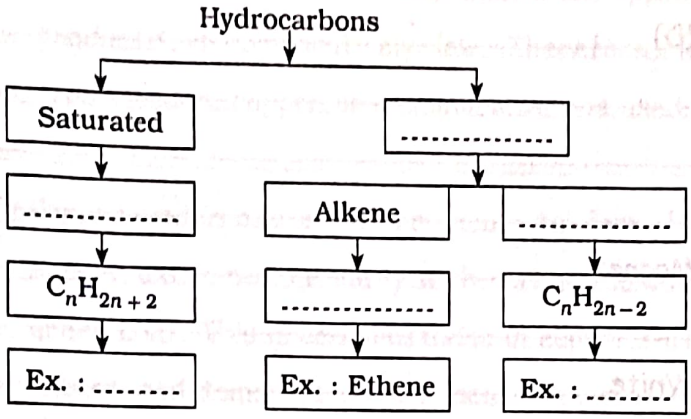
(c) Define specific heat of an object.

(vii) Identify figures A, B, C and give their uses :



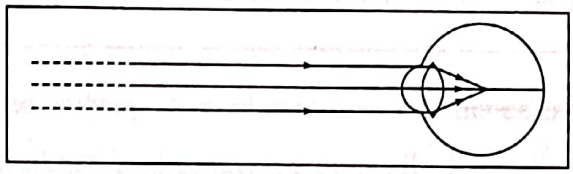
(A) (B) (C)

(viii) Complete the following flow chart :



Q. 4. Answer *any one* of the following questions : **5**

(i) Observe the figure and answer the following questions :



(a) Name the defect of vision represented in the above figure.

(b) State the reasons for this defect.

(c) How is it corrected?

(d) Draw the diagram to show the correction of this defect.

(ii) Complete the following table :

Sr. No.	Common name	Structural formula	IUPAC name
1.	Ethylene	$CH_2=CH_2$	.....
2.	Acetylene	.....	Ethyne
3.	Acetic acid	CH_3-COOH	.....
4.	Methyl alcohol	.....	Methanol
5.	.....	$CH_3-CO-CH_3$	Propan-2-one

प्र. क्र. Q. No.			
	1 (A)	(i)	(D) (1 mark)
		(ii)	(A) (1 mark)
		(iii)	(A) (1 mark)
		(iv)	(C) (1 mark)
		(v)	(D) (1 mark)
	1 (B)	(i)	Magnet (1 mark)
		(ii)	White (1 mark)
		(iii)	Air - 1.0003 (1 mark)
		(iv)	True (1 mark)
		(v)	Swayam (1 mark)

प्र. क्र.
Q. No. 2 (A)

Note : *In this question, students are required to write answers of any 2 questions out of 3. However, answers to all 3 questions are given here for the guidance of the students.*

(i) (1) Copper and aluminium are good conductors of electricity. **(1 mark)**

(2) Copper and aluminium have very low resistivity. Hence, when an electric current flows through a wire of copper or aluminium, heat produced is comparatively low. Therefore, for electric power transmission, copper or aluminium wire is used. **(1 mark)**

(ii) (1) Copper undergoes oxidation in air to form black copper oxide. Copper oxide reacts slowly with carbon dioxide in air and gains a green coat. This green substance is copper carbonate. **(1 mark)**

(2) Lemon and tamarind contain acid. The acid dissolves the green coating of basic copper carbonate present on the surface of a tarnished copper utensil and makes it shiny again. **(1 mark)**

(iii) (1) The valency of an element is determined by the number of valence electron in the outermost shell of an atom of an element. **(1 mark)**

(2) All the elements in a group have the same number of valence electrons. Therefore, elements in the same group should have the same valency. For example, the elements of group 1 contain only one valence electron; the valency of elements of group 1 is one. Similarly for group 2, the valency is two. **(1 mark)**

प्र. क्र.
Q. No. **2 (B)**

***Note :** In this question, students are required to write answers to any 3 questions out of 5. However, answers to all 5 questions are given here for the guidance of the students.*

(i) (a) If the relative humidity is more than 60%, we feel that air is humid. ***(1 mark)***

(b) If the relative humidity is less than 60%, we feel that air is dry. ***(1 mark)***

(ii) $C_{12}H_{22}O_{11} \xrightarrow{heat} 12C + 11H_2O$ ***(1 + 1 mark)***

(iii)

Mass	Weight
1. The mass of a body is the amount of matter present in it.	1. The weight of a body is the force with which the earth attracts it.
2. It has magnitude, but not direction.	2. It has both magnitude and direction.
3. It does not change from place to place.	3. It changes from place to place.
4. It can never be zero.	4. It is zero at the centre of the earth.

(Any two correct points; 1 mark each)

प्र. क्र.
Q. No. 2 (B)

(iv)

Type of satellite	The names of Indian satellite and launcher
(1) Navigational satellite	Satellite : IRNSS Launcher : PSLV
(2) Earth observation satellite	Satellite : IRS Launcher : PSLV

(Each correct blank ½ mark; Total 2 marks)

(v) The horizontal rows in the periodic table are called periods. ***(1 mark)***

The vertical columns in the periodic table are called groups. ***(1 mark)***

प्र. क्र. Q. No. **3**

Note : *In this question, students are required to solve any 5 questions out of 8. However, answers to all 8 questions are given here for the guidance of the students.*

(i) Solution :

Data : Mass of the moon $(M) = 7.34 \times 10^{22}$ kg

Radius of the moon $(R) = 1.74 \times 10^{6}$ m

$G = 6.67 \times 10^{-11}$ N·m^2/kg^2

Escape velocity $= v_{esc} = \sqrt{\frac{2GM}{R}}$ **(1 mark)**

$= \sqrt{\frac{2 \times 6.67 \times 10^{-11} \times 7.34 \times 10^{22}}{1.74 \times 10^{6}}}$ **(1 mark)**

$= \sqrt{\frac{13.34 \times 7.34 \times 10^{5}}{1.74}}$

$= \sqrt{\frac{1.334 \times 7.34 \times 10^{6}}{1.74}}$

$= \sqrt{\frac{1.334 \times 7.34}{1.74} \times 10^{3}}$

$= 2.372 \times 10^{3}$ m/s **(½ mark)**

$= 2.372 \times \frac{10^{3}}{10^{3}}$ km/s

$= 2.372$ km/s **(½ mark)**

Ans. Escape velocity on the surface of the moon $= 2.372$ km/s.

(ii) (a) Atomic number of this element is 11. **(1 mark)**

(b) It belongs to 1st group. **(1 mark)**

(c) It belongs to 3rd period. **(1 mark)**

(iii) Ray AB - Incident ray **(1 mark)**

Ray CD - Refracted ray **(1 mark)**

Ray GH - Emergent ray **(1 mark)**

प्र. क्र. Q. No. 3

(iv) (a) (1) The compounds formed from two units namely cation and anion are called ionic compounds. *(½ mark)*

(2) The cation and anion being oppositely charged has an electrostatic force of attraction called ionic bond. *(½ mark)*

(3) Sodium ion has a positive charge while chlorine ion has negative charge. These ions are attracted to each other and form ionic bond. *(½ mark)*

(4) Since NaCl possesses ionic bond, hence it is called an ionic compound. *(½ mark)*

(b) Two properties of ionic compound :

(1) Ionic compound conduct electricity in molten state and also in an aqueous solution. *(½ mark)*

(2) They are soluble in water and insoluble in solvents such as kerosine and petrol. *(½ mark)*

(v) Physical changes :

(a) Transformation of ice into water. *(½ mark)*

(d) Evaporation of water. *(½ mark)*

(f) Iron filings get attracted towards the magnet. *(½ mark)*

Chemical changes :

(b) Ripening of a fruit. *(½ mark)*

(c) Milk turned into curd. *(½ mark)*

(e) Digestion of food in the stomach. *(½ mark)*

(vi) (a) Iron has maximum specific heat capacity. The amount of wax melted shows that for a given mass of the element and fall in temperature, iron element (metal in this case) absorbs more heat than copper and lead and thus has maximum specific heat capacity. *(1 mark)*

(b) Lead has minimum specific heat capacity. This can be seen from the amount of wax melted in this case. *(1 mark)*

प्र. क्र. Q. No. 3

(c) Specific heat of an object : The amount of heat energy required to raise the temperature of a unit mass of an object by 1°C is called the specific heat of the object. *(1 mark)*

(vii) (a) Figure A → Fuse *(½ mark)*

Use : It melts and thereby protects the electrical circuits and appliances by stopping the flow of electric current when it exceeds a specific value. *(½ mark)*

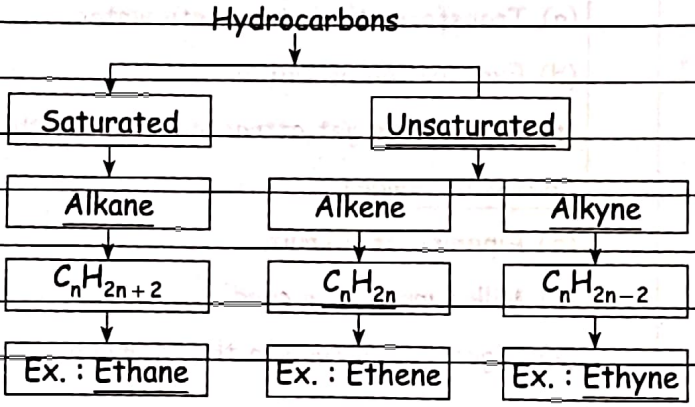
(b) Figure B → Miniature circuit breakers (MCB) switches. *(½ mark)*

Use : When the current in the circuit suddenly increases, this switch opens and current stops. *(½ mark)*

(c) Figure C → Galvanometer. *(½ mark)*

Use : It detects the presence of current in an electric circuit. *(½ mark)*

(viii)



(Each correct blank ½ mark; Total 3 marks)

प्र. क्र. Q. No. **4**

Note : *Students are required to solve any one question out of two. However, here both questions have been solved for the guidance of the students.*

(i) (a) Defect Myopia or Nearsightedness of vision is represented in the figure. ***(1 mark)***

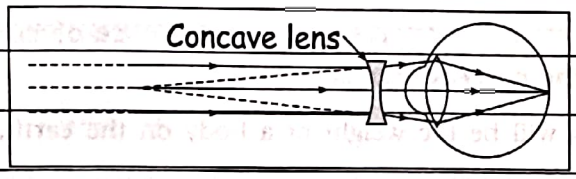
(b) Reasons :

(1) The curvature of the cornea and the eye lens increases. The muscles near the lens cannot relax so that the converging power of the lens remains large. ***(1 mark)***

(2) The eyeball elongates so that the distance between the lens and the retina increases. ***(1 mark)***

(c) This defect can be corrected by using a concave lens of proper focal length. ***(1 mark)***

(d)



Correction of myopic eye or nearsightedenss ***(1 mark)***

(ii)

Sr. No.	Common Name	Structural Formula	IUPAC Name
1.	Ethylene	$CH_2=CH_2$	Ethene
2.	Acetylene	$HC\equiv CH$	Ethyne
3.	Acetic acid	CH_3-COOH	Ethanoic acid
4.	Methyl alcohol	CH_3-OH	Methanol
5.	Acetone	$CH_3-CO-CH_3$	Propan-2-one

(Each correct blank 1 mark; Total 5 marks)