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# FIITJEE

## MONTHLY ASSESSMENT TEST

### PHYSICS, CHEMISTRY & MATHEMATICS

#### Batch: CM-1820

#### QP CODE: 111503

## ANSWERS

### PHYSICS (SECTION-I)

PART – A	Concept Code
1. D	P110607
2. B	P110606
3. B	P110613
4. B	P110613
5. A	P110604

#### PART – B

6. ABC	P110612
7. BC	P110612
8. AD	P110604
9. AC	P110606
10. ABD	P110613
11. BD	P110606
12. AC	P110611
13. AD	P110610

#### PART – C

1. 3	P110604
2. 3	P110604
3. 4	P110610
4. 2	P110608
5. 4	P110607

**CHEMISTRY (SECTION-II)****PART – A**                      **Concept Code**

- |    |   |         |
|----|---|---------|
| 1. | A | C113104 |
| 2. | B | C113104 |
| 3. | C | C113104 |
| 4. | B | C113106 |
| 5. | D | C113104 |

**PART – B**

- |     |     |         |
|-----|-----|---------|
| 6.  | AC  | C113107 |
| 7.  | BC  | C113107 |
| 8.  | BCD | C113106 |
| 9.  | ACD | C113107 |
| 10. | BD  | C113104 |
| 11. | AD  | C113107 |
| 12. | AD  | C113101 |
| 13. | ACD | C113107 |

**PART – C**

- |    |   |         |
|----|---|---------|
| 1. | 1 | C113104 |
| 2. | 8 | C113104 |
| 3. | 6 | C113104 |
| 4. | 2 | C113104 |
| 5. | 8 | C113104 |

**MATHEMATICS (SECTION-III)****PART – A**                      **Concept Code**

- |      |         |
|------|---------|
| 1. C | M110920 |
| 2. A | M110915 |
| 3. B | M110931 |
| 4. C | M110905 |
| 5. C | M110904 |

**PART – B**

- |          |         |
|----------|---------|
| 6. AC    | M110902 |
| 7. ABCD  | M110926 |
| 8. AB    | M110909 |
| 9. AC    | M110903 |
| 10. ABC  | M110902 |
| 11. AD   | M110909 |
| 12. ABCD | M110909 |
| 13. AB   | M110931 |

**PART – C**

- |      |         |
|------|---------|
| 1. 3 | M110915 |
| 2. 4 | M110909 |
| 3. 6 | M110903 |
| 4. 2 | M110909 |
| 5. 9 | M110917 |

## Hints & Solutions

### PHYSICS (SECTION-I)

#### PART – A

1. (D)

Let  $v_1$  and  $v_2$  be the speed of the bodies before and after striking.

$$v_1 \sin \alpha = v_2 \cos \alpha \quad (\text{as there is no friction})$$

$$e v_1 \cos \alpha = v_2 \cos \left( \frac{\pi}{2} - \alpha \right)$$

$$\Rightarrow e = \frac{v_2 \sin \alpha}{v_1 \cos \alpha} = \tan^2 \alpha$$

2. (B)

When the two marbles strikes the system of marbles, by head on elastic collisions of identical spherical bodies we can say that these two marbles will come to rest and next two will be set in motion and same phenomenon happens for next set of marbles hence (B) is correct.

3. (B)

Choosing the positive X-Y axis as shown in the figure, the momentum of the bead at A is  $\vec{p}_i = +m\vec{v}$ . The momentum of the bead at B is  $= \vec{p}_f = -m\vec{v}$ .

Therefore, the magnitude of the change in momentum between A and B is

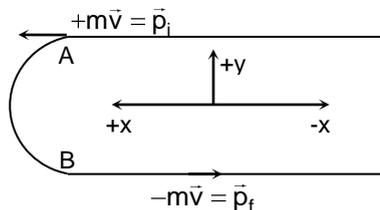
$$\Delta \vec{p} = \vec{p}_f - \vec{p}_i = -2m\vec{v}$$

The time interval taken by the bead to reach from A to B is

$$\Delta t = \frac{\pi \cdot d / 2}{v} = \frac{\pi d}{2v}$$

Therefore, the average force

$$F_{av} = \frac{\Delta p}{\Delta t} \\ = \left( 2mv / \frac{\pi d}{2v} \right) = \frac{4mv^2}{\pi d}$$



4. (B)

Average force =  $\frac{\text{change in momentum at support}}{\text{time between two collisions at support}}$

$$\langle F \rangle = \frac{2mv}{\left( \frac{L-10r}{v} \times 2 \right)} = \frac{mv^2}{L-10r}$$

5. (A)

When the car C accelerates to a velocity  $v_0$  relative to the double-boat system, the two boats accelerate to the left  $V_C(\text{to right}) + v_A(\text{to left}) = v_0$

$$mv_C = 2Mv_A$$

$$\text{Solving, we find } v_A = \frac{mv_0}{m+2M}, v_C = \frac{2Mv_0}{m+2M}$$

After the car brakes to a stop, the tension in the string connecting A, B becomes zero. Applying conservation of momentum to A and C

$$mv_C - Mv_A = (m+M)v_A'$$

We find the velocity of A (to right)

$$\Rightarrow v'_A = \frac{mMv_0}{(m+M)(m+2M)}$$

**PART – B**

6. (ABC)

7. (BC)

8. (AD)

As no external force is present on system, total momentum remain conserved (zero) hence final momentum of all particles must be in a plane so that their vector sum remain zero.

9. (AC)

Velocity of COM which will be common in both bodies at minimum separation is

$$v_0 = \frac{3 \times 2}{1+3} = 1.5 \text{ m/s}$$

As time t we use

$$\Rightarrow 6t = 2 - 2t$$

$$\Rightarrow t = 0.25 \text{ sec}$$

$$\Delta E = \frac{1}{2}(3)(2)^2 - \frac{1}{2}(1+3)(1.3)^2 = 1.5 \text{ J}$$

$$\Rightarrow \Delta s = \frac{1.5}{6} = 0.25 \text{ m}$$

$$\text{Minimum distance} = 1 - 0.25 = 0.75 \text{ m}$$

10. (ABD)

Using conservation of linear momentum,

$$\frac{m}{2}u = \left(m + \frac{m}{2}\right)v$$

$$v = \frac{u}{3}$$

Initial kinetic energy of

$$K_B = \frac{1}{2} \left(\frac{m}{2}\right) u^2$$

$$k_B = \frac{1}{4} mu^2$$

$$\frac{1}{2} \frac{mu^2}{2} - w_f = \frac{1}{2} \left(\frac{3m}{2}\right) \frac{u^2}{9}$$

$$\frac{1}{4} mu^2 - \frac{1}{12} mu^2 = w_f$$

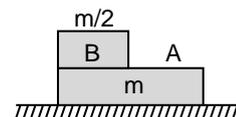
$$w_f = \frac{3mu^2 - mu^2}{12} = \frac{mu^2}{6}$$

$$= \frac{2}{3} \times \frac{1}{4} mu^2$$

$$w_f = \frac{2}{3} k_B$$

Force of friction between blocks,

$$f = \mu \left(\frac{m}{2}\right) g$$



Acceleration of A to right,

$$a_A = \frac{\mu mg}{2(m)} = \frac{\mu g}{2}$$

Acceleration of B to left,

$$a_B = \frac{\mu mg}{2\left(\frac{m}{2}\right)} = \mu g$$

Acceleration of A relative to B,

$$a_{AB} = a_A - (-a_B)$$

$$a_{AB} = \frac{\mu g}{2} + \mu g$$

$$a_{AB} = \frac{3\mu g}{2}$$

### 11. (BD)

Since the collision between A and C is perfectly elastic, velocity of A after collision is  $v$  and C comes to rest  
Applying conservation of linear momentum,

$$mv = 2mv'$$

$$v' = \frac{v}{2}$$

where  $v'$  is common velocity of system after maximum compression in spring

Kinetic energy of system at maximum compression,

$$K_{AB} = \frac{1}{2}(2m)v'^2 = \frac{1}{2}(2m)\frac{v^2}{4} = \frac{mv^2}{4}$$

Applying energy conservation,

$$\frac{1}{2}mv^2 - \frac{1}{2}kx^2 = \frac{1}{2}(2m)\left(\frac{v}{2}\right)^2$$

$$\Rightarrow \frac{mv^2}{2} = kx^2$$

$$\Rightarrow x = \sqrt{\frac{mv^2}{2k}} = v\sqrt{\frac{m}{2k}}$$

### 12. (AC)

Impulse = change in momentum

$$= 2(\vec{v}_2 - \vec{v}_1)$$

$$= 2(3\hat{i} - \hat{j})$$

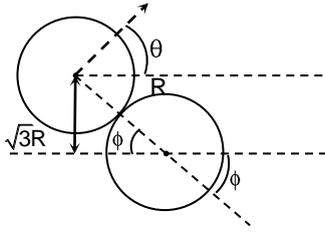
As impulse is in the normal direction of colliding surface

$$\tan\theta = \frac{1}{3}$$

$$\theta = \tan^{-1}\left(\frac{1}{3}\right)$$

$$\alpha = 90^\circ + \tan^{-1}\left(\frac{1}{3}\right)$$

13. (AD)



For elastic collision  $\theta + \phi = 90^\circ$  and from figure we use  $\sin\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 60^\circ$  hence  $\phi = 30^\circ$

**PART – C**

1. (3)

Let  $v$  = velocity of ball w.r.t. wedge

$V$  = velocity of wedge

Using conservation of linear momentum,

$$mV = m(v \cos 45^\circ - V)$$

$$V = \frac{v}{2\sqrt{2}} \Rightarrow v = 2\sqrt{2}V$$

By conservation of energy.

$$\frac{1}{2}m[(v \cos 45^\circ - V)^2] + \frac{1}{2}m(v \sin 45^\circ)^2 + \frac{1}{2}mV^2 = mgh$$

$$\left(\frac{v}{\sqrt{2}} - V\right)^2 + \left(\frac{v}{\sqrt{2}}\right)^2 + V^2 = 2gh$$

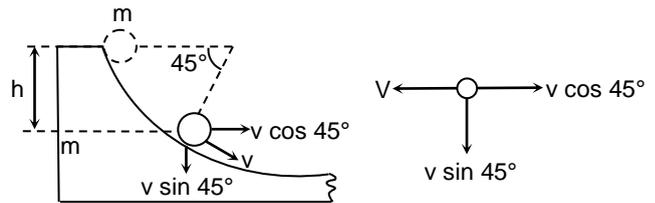
$$\left(\frac{2\sqrt{2}V}{\sqrt{2}} - V\right)^2 + \left(\frac{2\sqrt{2}V}{\sqrt{2}}\right)^2 + V^2 = 2g\left(\frac{g}{\sqrt{2}}\right)$$

$$V^2 + 4V^2 + V^2 = gR\sqrt{2}$$

$$6V^2 = gR\sqrt{2}$$

$$V = \sqrt{\frac{gR}{6}}\sqrt{2}$$

$$V = \sqrt{\frac{gR}{3\sqrt{2}}}$$



2. (3)

Acceleration of boy,

$$a_b = \frac{50}{250} = \frac{1}{5} \text{ m/s}^2$$

$$v_b = 0 + \frac{1}{5} \times 5 = 1 \text{ m/s}$$

Acceleration of box,

$$a_{\text{box}} = \frac{50}{500} = \frac{1}{10} \text{ m/s}^2$$

$$v_{\text{box}} = 0 + \frac{1}{10} \times 5 = 0.5 \text{ m/s}$$

$$v_{b,\text{box}} = 1 - (-0.5)$$

$$= 1.5 \text{ m/s}$$

3. (4)

As  $\theta + \phi = 90^\circ$

This is possible only when two bodies have equal mass

Thus, mass of nucleus = mass of  $\alpha$  - particle

$\Rightarrow$  Mass no. of nucleus = 4

4. (2)

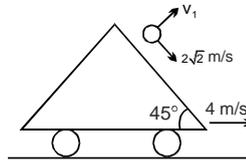
5. (4)

After collision, situation shown in figure

$$e = 1 = \frac{2\sqrt{2} - v_1}{-2\sqrt{2} - 2\sqrt{2}}$$

$$v_1 = 6\sqrt{2} \text{ m/s}$$

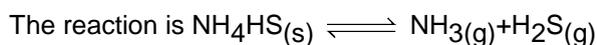
$$v = \sqrt{(2\sqrt{2})^2 + (6\sqrt{2})^2} = 4\sqrt{5} \text{ m/s}$$



**CHEMISTRY (SECTION-II)****PART – A**

1. (A)

2. (B)



at equilibrium  $1-\alpha$   $\alpha$   $\alpha$

Total moles of  $\text{NH}_3 + \text{H}_2\text{S} = 2\alpha$  ( $\text{NH}_4\text{HS}$  in solid phase)

Partial pressure =  $\frac{\text{moles of substance}}{\text{total moles}} \times \text{total pressure}$

$$\therefore P_{\text{NH}_3} = \frac{\alpha}{2\alpha} \cdot p = 0.5p$$

$$P_{\text{H}_2\text{S}} = \frac{\alpha}{2\alpha} \cdot p = 0.5p$$

$$K_p = P_{\text{NH}_3} \cdot P_{\text{H}_2\text{S}} = (p \times 0.5) \times (0.5 \times p) = 0.25p^2.$$

Substituting value of  $p = 1.12$  atm

$$K_p = 0.25 \times 1.12 \times 1.12 = 0.3136$$

3. (C)

4. (B)

5. (D)

**PART – B**

6. (A,C)

7. (B,C)

The pressure of  $\text{NH}_3$  will decrease due to addition of  $\text{CO}_2$  (backward, shifting Le-chatelies's principle. The pressure of  $\text{CO}_2$  will be more than 0.1 atm.

8. (B,C,D)



t = 0    a                    0

t        a(1 -  $\alpha$ )            2a $\alpha$

$$\text{vapour density} = \frac{46}{1 + \alpha} = 30.67$$

so  $1 + \alpha = 1.5 = 0.5 = 50\%$

$$\text{Total pressure} = \frac{1.5 \times 1.5 \times 0.082 \times 300}{8.2} = 6.75 \text{ atm}$$

$$\text{so } K_p = \frac{4\alpha^2}{1 - \alpha^2} P = 9 \text{ atm}$$

$$\text{and for density of mixture} = \frac{138}{8.2} \text{ gm/L} = 16.83 \text{ gm/L}$$

9. (A,C,D)

(A) As reaction is endothermic therefore it will go in the forward direction hence moles of  $\text{CaO}$  will increase.

(C) With the increase or decrease of volume particle pressure of the gases will remain same.

(D) Due to the addition of inset gas at constant pressure reaction will proceeded in the direct in which more number of gaseous moles are formed.

10. (B, D)

$$10^{-10} \text{ atm}^5 = P_{\text{H}_2\text{O}}^5 \Rightarrow P_{\text{H}_2\text{O}} = 10^{-2} \text{ atm.} \quad n = \frac{PV}{RT} = \frac{10^{-2} \times 2.5}{\frac{1}{12} \times 300} = 10^{-3}$$

11. (A,D)

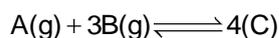
12. (A,D)

13. (A,C,D)

## PART – C

1. (1)

2. (8)



$$t = 0 \quad a \quad a \quad 0$$

$$t_{\text{eq.}} \quad a - x \quad a - 3x \quad 4x$$

$$a - x = 4x \text{ given}$$

$$a = 5x$$

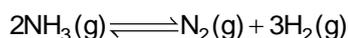
$$K_c = \frac{[C]^4}{[A][B]^3} = \frac{[4x]^4}{[4x][2x]^3} = \frac{256}{32} = 8$$

3. (6)

Pressure of  $\text{NH}_3$  at  $27^\circ\text{C} = 15 \text{ atm}$ Pressure of  $\text{NH}_3$  at  $347^\circ\text{C} = P \text{ atm}$ 

$$\frac{P}{620} = \frac{15}{300}$$

$$P = 31 \text{ atm}$$

Let  $a$  moles of ammonia be present. Total pressure at equilibrium = 50 atm

$$\text{At equilibrium} \quad (a - 2x) \quad x \quad 3x$$

$$\text{Total moles} \quad a - 2x + x + 3x = a + 2x$$

$$\frac{\text{Initial number of moles}}{\text{Moles at equilibrium}} = \frac{\text{Initial pressure}}{\text{Equilibrium pressure}}$$

$$\frac{a}{(a + 2x)} = \frac{31}{50}$$

$$x = \frac{19}{62}a$$

$$\text{Amount of ammonia decomposed} = 2x = 2 \times \frac{19}{62}a = \frac{19}{31}a$$

$$\begin{aligned} \text{\% of ammonia decomposed} &= \frac{19 \times a}{31 \times a} \times 100 \\ &= 61.3 \end{aligned}$$

4. (2)

We know that,

$$Pm = dRT$$

$$1 \times m = 1.84 \times 0.0821 \times 384$$

$$m = 29 \times 2$$

Vapour density (d) at equilibrium = 29

Initial vapour density =  $M / 2 = 92 / 2 = 46$ 

$$x = \frac{D - d}{(n - 1)d} = \frac{46 - 29}{29} = 0.586$$



$$t = 0 \quad 1 \quad 0$$

$$t_{\text{eq.}} \quad 1 - x \quad 2x \quad (\text{Total moles} = 1 + x)$$

$$p_{\text{N}_2\text{O}_4} = \frac{1 - x}{1 + x} \times P; \quad p_{\text{NO}_2} = \frac{2x}{1 + x} \times P$$

$$K_p = \frac{4x^2 P}{1 - x^2} = \frac{4 \times (0.586)^2 \times 1}{1 - (0.586)^2} = 2.09 \text{ atm}$$

5. (8)

**MATHEMATICS (SECTION-III)****PART – A**

1. (C)

Let  $R \equiv t^2, 2t$  be any point on the parabola. So, perpendicular distance of R to PQ is maximum for  $t = \frac{1}{2}$ .

$$\Rightarrow \text{maximum area of S is } \frac{125}{4}$$

2. (A)

The curve is  $(y+1)^2 = 4(x-1)$

Equation of the normal to the given curve is  $y+1 = m(x-1) - 2m - m^3$   
which passes through (h,k)

$$m^3 + m(3-h) + 1 + k = 0$$

$$\Rightarrow m_1 m_2 m_3 = -1 - k$$

$$\Rightarrow m_3 = 1 + k \quad \because m_1 m_2 = -1$$

$$(1+k)^3 + (1+k)(3-h) + (1+k) = 0$$

$$(1+k)^2 = h - 4$$

$$(y+1)^2 = x - 4$$

3. (B)

Since the normal at  $ap^2, 2ap$  to  $y^2 = 4ax$  meets the parabola at  $(aq^2, 2aq)$

$$\therefore q = -p - \frac{2}{p} \quad \dots (i)$$

Since  $OP \perp OQ$

$$\therefore pq = -4 \quad \dots (ii)$$

By solving equation (i) and (ii)

$$p^2 = 2$$

4. (C)

Let  $(x_1, y_1)$  be a point on  $y^2 = -8(x+4)$ . Equation of chord of contact is

$$2x - y_1 y + 2x_1 = 0$$

and if  $P(h, k)$  is its mid point, then its equation will be

$$2x - ky + k^2 - 2h = 0$$

By comparing

$$k = y_1 \text{ and } 2x_1 = k^2 - 2h$$

$$\Rightarrow k^2 = 4(k^2 - 2h + 8)$$

$$k^2 = \frac{8}{5} h - 4$$

$$y^2 = \frac{8}{5} (x - 4)$$

$$\text{Length } k = \frac{8}{5}$$

5. (C)

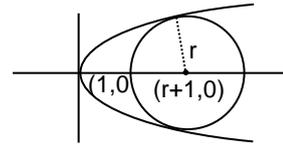
$$\text{Circle } (x - r - 1)^2 + y^2 = r^2$$

$$\text{By solving with } y^2 = 4x$$

$$x^2 + (4 - 2(r + 1))x + 2r + 1 = 0$$

$$\therefore D = 0$$

$$\Rightarrow r = 4$$

**PART - B**

6. (AC)

Foot of perpendicular from focus onto any tangent lies on tangent at vertex

$\therefore 3, 0$  and  $0, 4$  are on tangent at vertex

$$\therefore \text{equation of tangent at vertex is } \frac{x}{3} + \frac{y}{4} = 1 \Rightarrow 4x + 3y = 12$$

$$L \text{atus rectum} = 4 \times \text{distance from focus to tangent at vertex} = 4 \cdot \left( \frac{12 + 12 - 12}{\sqrt{4^2 + 3^2}} \right) = \frac{48}{5}$$

$$\text{Directrix is } 4x + 3y = 0$$

$$\text{Axis is } 3x - 4y = -7$$

7. (ABCD)

$t^2, 2t \left( \frac{1}{t^2}, \frac{-2}{t} \right)$  are the extremities of a focal chord

$$\text{Centre } \left( \frac{t^2 + \frac{1}{t^2}}{2}, \frac{2 \left( t - \frac{1}{t} \right)}{2} \right) = h, k$$

$$t^2 + \frac{1}{t^2} = 2h \quad t - \frac{1}{t} = k$$

eliminating 't'

$$k^2 + 2 = 2h$$

Locus of (h, k) is  $y^2 = 2(x - 1)$

$y = m x - 1 + \frac{1}{2m}$  is always a tangent to  $y^2 = 2(x - 1)$

8. (AB)

The focus of the parabola  $y^2 = 2px$  is  $\left( \frac{p}{2}, 0 \right)$  and its directrix is

$x = -\frac{p}{2}$ . Since the circle touches the directrix, therefore

radius = distance from the point  $\left( \frac{p}{2}, 0 \right)$  to the line

$$\Rightarrow x = -\frac{p}{2}$$

$$\Rightarrow \text{Radius} = p$$

So, the equation of the circle is

$$\left(x - \frac{p}{2}\right)^2 + y^2 = p^2$$

$$\Rightarrow x^2 + y^2 - px - \frac{3p^2}{4} = 0$$

On solving this equation with  $y^2 = 2px$ , we obtain

$$x^2 + px - \frac{3p^2}{4} = 0.$$

$$\Rightarrow 2x - p \quad 2x + 3p = 0$$

$$\Rightarrow x = \frac{p}{2}, x = -\frac{3p}{2}$$

On putting  $x = \frac{p}{2}$  in  $y^2 = 2px$ , we obtain  $y = \pm p$ .

For  $x = -\frac{3p}{2}$ ,  $y$  is imaginary. Hence, the circle and the parabola intersect at  $\left(\frac{p}{2}, p\right)$  and  $\left(\frac{p}{2}, -p\right)$ .

9. (AC)

$$m_1 = 3, \quad \theta = 45^\circ$$

$$\tan 45^\circ = \frac{|m_1 - m_2|}{1 + m_1 m_2}$$

10. (ABC)

Equation of circle with diameter  $(4, 0)$  and  $(0, 2)$  is  $x^2 + y^2 - 4x - 2y = 0$

directrix is tangent at  $(0, 0)$

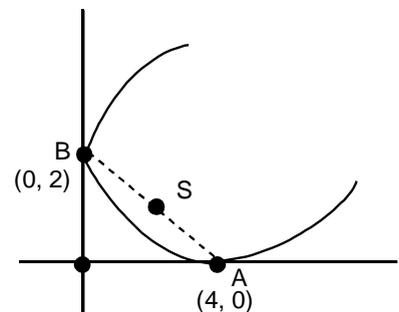
$$4x + 2y = 0 \Rightarrow 2x + y = 0$$

$$BS : SA = \frac{2}{\sqrt{5}} : \frac{8}{\sqrt{5}} = 1 : 4 \Rightarrow S = \left(\frac{4}{5}, \frac{8}{5}\right)$$

$$\text{Equation of axis is } x - 2y = \frac{-12}{5}$$

$$x\text{-intercept} = \frac{-12}{5}$$

$$\text{Latus rectum} = \frac{32}{5\sqrt{5}}$$



11. (AD)

For externally touching  $a$  &  $b$  must have the same sign

12. (ABCD)

$$R = \left(\frac{\lambda+1}{\lambda+1}, \frac{3\lambda+1}{\lambda+1}\right) = \left(1, 1 + \frac{2\lambda}{\lambda+1}\right) \Rightarrow y_1^2 - 4x_1 < 0$$

$$\Rightarrow \left(1 + \frac{2\lambda}{\lambda+1}\right)^2 - 4 < 0$$

$$\Rightarrow \left(1 + \frac{2\lambda}{\lambda+1} + 2\right) \left(1 + \frac{2\lambda}{\lambda+1} - 2\right) < 0$$

$$\Rightarrow \left(\frac{2\lambda}{\lambda+1} + 3\right) \left(\frac{2\lambda}{\lambda+1} - 1\right) < 0$$

$$\Rightarrow \frac{2\lambda}{\lambda+1} > -3 \text{ and } \frac{2\lambda}{\lambda+1} < 1$$

$$\Rightarrow 5\lambda > -3 \text{ and } \lambda < 1$$

$$\Rightarrow \lambda > -\frac{3}{5} \text{ and } \lambda < 1$$

$$\Rightarrow \lambda \in \left(-\frac{3}{5}, 1\right)$$

13. (AB)

$$\text{Slope of PV} = \frac{2t-0}{t^2-0} = \frac{2}{t},$$

$$\therefore \text{The equation of QV is } y = -\left(\frac{t}{2}\right)x$$

$$\text{On solving it with } y^2 = 4x, Q = \left(\frac{16}{t^2}, -\frac{8}{t}\right).$$

$$\text{Now, area } \Delta PVQ = \frac{1}{2} PV \cdot VQ = 20 \text{ given}$$

$$\therefore PV^2 \cdot VQ^2 = 40^2$$

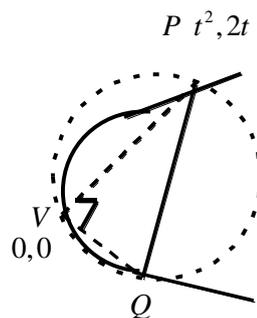
$$\Rightarrow t^2 \cdot 2t^2 \left\{ \left(\frac{16}{t^2}\right)^2 + \left(-\frac{8}{t}\right)^2 \right\} = 40^2$$

$$\Rightarrow t^2 \cdot 4 + t^2 \left(\frac{1}{t^2}\right) \left(\frac{256}{t^2} + 64\right) = 40^2$$

$$\Rightarrow \frac{256 \times 4}{t^2} + 256 + 256 + 64t^2 = 40^2$$

$$\Rightarrow t^2 - 16t^2 - 1 = 0 \Rightarrow t = \pm 4, \pm 1.$$

Hence, coordinates of P are  $16, \pm 8$  or  $1, \pm 2$ .



PART - C

1. (3)

Let Point P be  $(at^2, 2at)$

$$\Rightarrow \theta \left( \frac{a}{t^2}, \frac{-2a}{t} \right)$$

$R \left( -t - \frac{2}{1} \right)$  and  $S \left( \frac{1}{t} + 2t \right)$  are other ends of normal chords

$$\Rightarrow RS = 3a \left( 1 + \frac{1}{t} \right)^2$$

$$PQ = a \left( 1 + \frac{1}{t} \right)^2$$

$$\Rightarrow \frac{RS}{PQ} = 3$$

2. (4)

The image of (3, 2) wrt  $x + y = 7$  is (5, 4) lie on  $y = C$   
 $\Rightarrow C = 4$

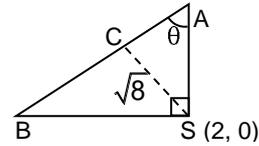
3. (6)

Circle on AB as diameter passes through the focus

$$AC = \sqrt{8} \cot \theta$$

$$BC = \sqrt{8} \tan \theta$$

$$AC \cdot BC = 8$$



4. (2)

Length of latus rectum is  $4\sqrt{2} = 4a$

$$\Rightarrow a = \sqrt{2}$$

Equation of directrix is  $x + y = \lambda$  whose distance from (4, 4) is  $2\sqrt{2}$

$$\Rightarrow 8 - \lambda = \pm 4$$

$$\lambda = 4 \text{ or } 12$$

5. (9)

$$4a = 2 \left| \frac{3 \times 3 - 4 \times (-2) - 2}{5} \right|$$

$$4a = 6$$

$$6a = 9$$