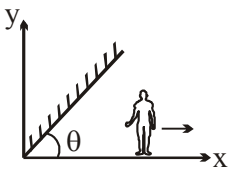
CLASS TEST

SECTION-I

Single Correct Answer Type 5 Q. [3 M (–1)]

1. A man is walking under an inclined mirror at a constant velocity V m/s along the X axis. If the mirror is inclined at an angle θ with the horizontal then what is the velocity of the image?



(A) $V\sin\theta\hat{i} + V\cos\theta\hat{j}$ (B) $V\cos\theta\hat{i} + V\sin\theta\hat{j}$

(C) $V\sin 2\theta\hat{i} + V\cos 2\theta\hat{j}$ (D) $V\cos 2\theta\hat{i} + V\sin 2\theta\hat{j}$

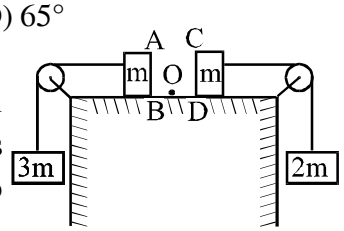
2. A ray of light is incident on a plane mirror, along the direction given by, $\vec{A} = 2\hat{i} - 3\hat{j} + 4\hat{k}$. Find the unit vector along the reflected ray. Take normal to mirror along the direction of $\vec{B} = 3\hat{i} - 6\hat{j} + 2\hat{k}$

(A) $\frac{-94\hat{i} + 237\hat{j} + 68\hat{k}}{49\sqrt{29}}$ (B) $\frac{-94\hat{i} + 68\hat{j} - 237\hat{k}}{49\sqrt{29}}$ (C) $\frac{3\hat{i} + 6\hat{j} - 2\hat{k}}{7}$ (D) None of these

3. Sunbeam makes an angle θ = 40° with the surface of the Earth. At what angle to the horizontal should we place a flat mirror so that a ray of sunlight after reflection falls on the bottom of a deep well?

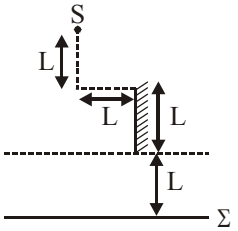
(A) 40° (B) 50° (C) 80° (D) 65°

4. Two blocks each of mass m lie on a smooth table. They are attached to two other masses as shown in the figure. The pulleys and strings are light. An object O is kept at rest on the table. The sides AB & CD of the two blocks are made reflecting. The acceleration of two images formed in those two reflecting surfaces w.r.t. each other is:



(A) 5g / 6 (B) 5g / 3 (C) g / 3 (D) 17g / 6

5. A point source of light is placed in front of a plane mirror as shown in the figure. Determine the length of reflected patch of light on the screen Σ :-



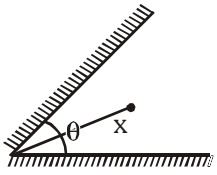
(A) L (B) $2L$

(C) $\frac{3L}{2}$ (D) $\frac{L}{2}$

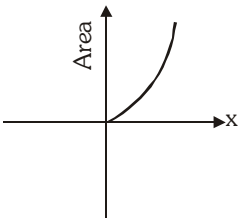
Linked Comprehension Type (2 Para × 3Q.) (1 Para × 2Q.) [3 M (–1)]
(Single Correct Answer Type)

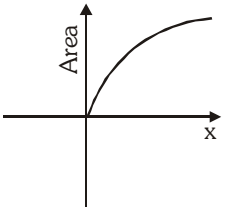
Paragraph for Questions 6 to 8

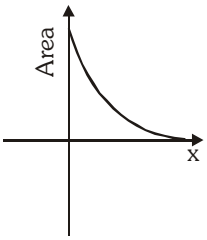
Whenever an object is placed on the bisector of two mirrors inclined at an angle θ, it forms several images which lies on a circle of radius equal to the distance between the vertex of mirror and the object

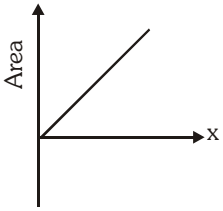


6. Draw graph between the area formed by joining all the images and object and the distance between the vertex and object

(A) 

(B) 

(C) 

(D) 

7. If the angle between the two mirror is 60°. Find the area of regular polygon bounded by the images and the object

(A) $\frac{x^2\left(4\sqrt{3}+1\right)}{4}$ (B) $\sqrt{\left(\frac{4\sqrt{3}+1}{4}\right)}\,x$ (C) $\frac{3\sqrt{3}x^2}{2}$ (D) $\frac{5\sqrt{3}x^2}{4}$

8. If an object is placed between more than two mirror then the locus of a point going through all the images and object will be

(A) Equation of sphere

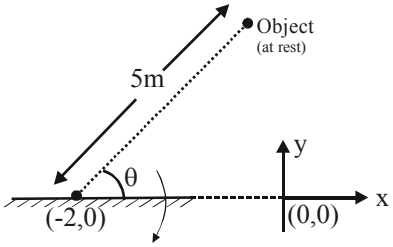
(B) Family of concentric circle

(C) Family of a circle passing through one common point

(D) None of these

Paragraph for Questions no. 9 to 11

The figure shows time varying angle θ which is given by equation $\theta = (2 + 6t^2)$. The mirror is rotating about a horizontal axis in clockwise direction.



9. Locus of the image is :-

(A) $x^2 + y^2 = 5^2$ (B) $(x + 2)^2 + y^2 = 5^2$ (C) $(x - 2)^2 + y^2 = 5^2$ (D) $x^2 + (y - 2)^2 = 5^2$

10. Angular velocity of the image at t = 2 s :-

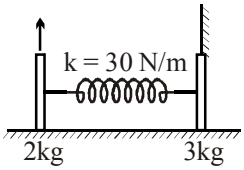
(A) 12 rad/s (B) 24 rad/s (C) 36 rad/s (D) 48 rad/s

11. Velocity of the image at t = 1 s :-

(A) 20 m/s (B) 40 m/s (C) 60 m/s (D) 120 m/s

Paragraph for Question no. 12 and 13

A mirror is mounted on a stand as shown. The mirror has negligible mass. On the other side, massless arrow is mounted. The natural length of the spring is 1m. The whole system is on frictionless surface. The two bodies are pulled out such that spring is extended by 10 cm and released.



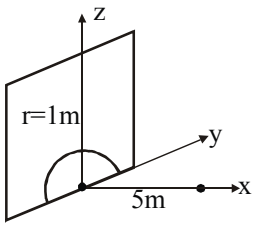
12. What is the minimum distance between arrow and its image during subsequent motion ?
(A) 1.6 m (B) 1.8 m (C) 2 m (D) 1.85 m

13. What is the maximum velocity of the image of the arrow as seen by a person on the ground ?
(A) 70 cm/s (B) 40 cm/s (C) 35 cm/s (D) 28 cm/s

SECTION-III

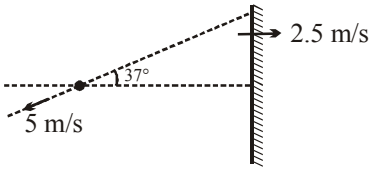
Numerical Grid Type (Ranging from 0 to 9) 5 Q. [4 M (0)]

1. A plane mirror of semicircular shape (radius = 1m) is placed in y-z plane with its diameter along y-axis and centre at origin. An object is placed on the axis of mirror at point (5, 0, 0). At a distance of 10 m from plane mirror there is a wall also parallel to y-z plane. The ratio of area of spot of light on wall to that of mirror is

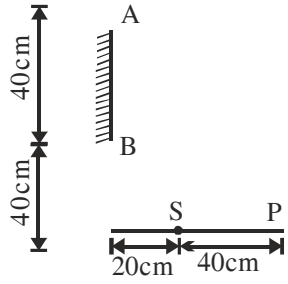


2. A plane mirror is placed such that it passes through points (0, 0, a), (0, a, 0) and (a, 0, 0). A light ray traveling along negative x-axis is incident on it. After reflection, this ray makes an angle $\cos^{-1}\left(\frac{1}{n}\right)$ with x axis. Find n.

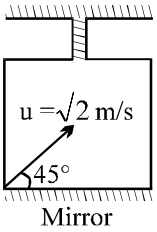
3. A point object is moving with a speed of 5 m/s infront of a mirror moving with a speed of 2.5 m/s as shown in figure. The velocity of image of the object with respect to ground is $\sqrt{10x}$ m/s, then x is



4. In figure shown AB is a plane mirror of length 40cm placed at a height 40cm from ground. There is a light source S at a point on the ground. The minimum height and maximum height of a man (eye height) required to see the image of the source if he is standing at a point P on ground shown in figure are x and y respectively then find 3x + y (in meters).



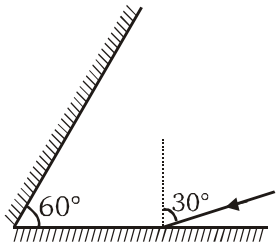
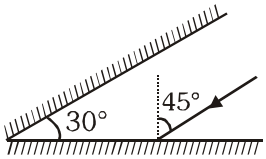
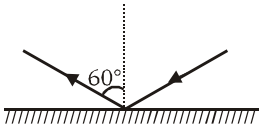
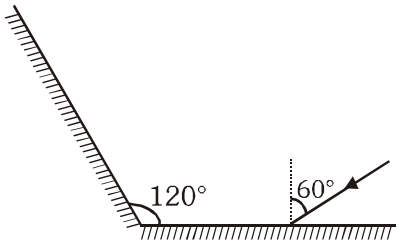
5. An elevator at rest which is at 10^{th} floor of a building is having a plane mirror fixed to its floor. A particle is projected with a speed $\sqrt{2}$ m/s and at 45° with the horizontal as shown in the figure. At the very instant of projection, the cable of the elevator breaks and the elevator starts falling freely. What will be the separation between the particle and its image 0.5 second after the instant of projection ?



SECTION-IV

Matrix Match Type (4 × 4) **1 Q. [8 M (for each entry +2(0)]**

1. Different arrangement of two mirror with incident light are shown in column-I and in column II corresponding deviations are given.

Column I		**Column II**	
(A)		(P)	Total deviation after two reflection is 240° clockwise
(B)		(Q)	Total deviation after three reflection is 180°
(C)		(R)	Total deviation after two reflection is 60° anticlockwise
(D)		(S)	Total deviation after one reflection is 60° clockwise

CLASS TEST # 03 (TNAS) **ANSWER KEY**

SECTION-I

Single Correct Answer Type **5 Q. [3 M (–1)]**

1. Ans. (D) **2. Ans. (A)** **3. Ans. (D)** **4. Ans. (D)** **5. Ans. (C)**

Linked Comprehension Type (2 Para × 3Q.) (1 Para × 2Q.) [3 M (–1)]
(Single Correct Answer Type)

6. Ans. (A) **7. Ans. (C)** **8. Ans. (C)** **9. Ans. (B)** **10. Ans. (D)** **11. Ans. (D)**
12. Ans. (B) **13. Ans. (A)**

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **5 Q. [4 M (0)]**

1. Ans. 9 **2. Ans. 3** **3. Ans. 9** **4. Ans. 8** **5. Ans. 1**

SECTION-IV

Matrix Match Type (4 × 4) **1 Q. [8 M (for each entry +2(0)]**

1. Ans. (A) → (P); (B) → (R); (C) → (S); (D) → (S)