CLASS TEST

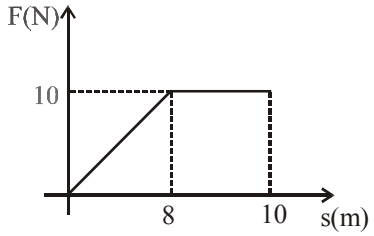
SECTION-I

Single Correct Answer Type **10 Q. [3 M (–1)]**

1. A force F = –5x Newton is acting on a particle and particle goes from x = 5m to x = 1m the work done by this force will be :

(A) +60 joule (B) –60 joule (C) +75 joule (D) –75 joule

2. A force is applied on the body of mass 2 kg which varies with displacement of body according to the given graph. If initial speed is 2 m/s, find the final speed of the body :-



(A) 8 m/s (B) 6 m/s (C) 4 m/s (D) 10 m/s

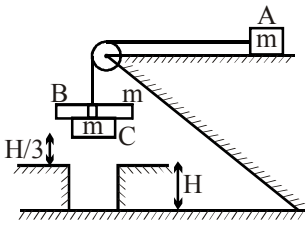
3. The K.E. of a particle moving in circle of radius R depends on distance covered as $E = as^2$, where a is constant & S is distance. The net force act at an angle θ to the tangent of the circle. Then θ is given by

(A) $\theta = \tan^{-1} S/R$ (B) $\theta = \tan^{-1} R/S$ (C) $\theta = \cot^{-1} R/2S$ (D) None of these

4. The system in figure is released from rest from the position shown. After blocks have moved distance H/3, collar B is removed and block A and C continue to move. What is the speed of C just before it strikes the ground. There is no friction anywhere. Neglect any impulse on string when B is stopped. Neglect size of collar and blocks.

(A) $\sqrt{\frac{13gH}{9}}$ (B) $\frac{4}{3}\sqrt{gH}$

(C) $2\sqrt{\frac{gH}{3}}$ (D) $\frac{\sqrt{10gH}}{3}$



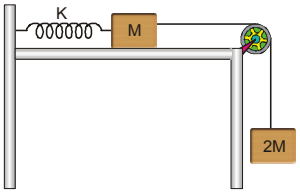
5. Two blocks, of masses M and 2M, are connected to a light spring of spring constant K that has one end fixed, as shown in figure. The horizontal surface and the pulley are frictionless. The blocks are released from rest when the spring is non deformed. The string is light.

(I) Maximum extension in the spring is $\frac{4Mg}{K}$.

(II) Maximum kinetic energy of the system is $\frac{2M^2g^2}{K}$.

(III) Maximum extension in the spring is $\frac{2Mg}{K}$.

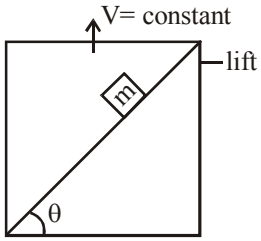
(IV) Maximum kinetic energy of the system is $\frac{4M^2g^2}{K}$.



Then which of the following option is correct?

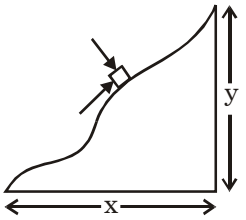
(A) I & IV (B) I & II (C) III & IV (D) None of these

6. A block of mass m is at rest on an inclined plane. w.r.t. lift. Work done by net reaction force on the block by the plane in t time is :



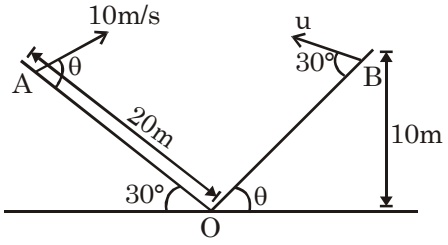
(A) $mgvt\cos^2\theta$ (B) $mgvt\sin^2\theta$ (C) $mgvt$ (D) $mg\cos\theta\, vt$

7. A block is placed on rough hill. Block is slowly moved over the surface. One of the force of magnitude 'F' is applied perpendicular to the surface and other is always parallel to surface. Select correct statement:



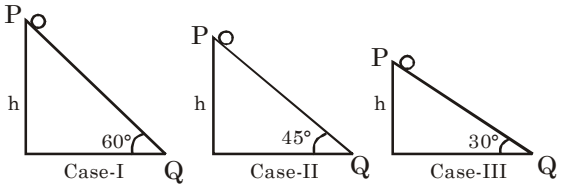
(A) Work done by the friction on the block is μmgx.
(B) Work done by friction on the block is $-\mu mgs$ where s is path length of block
(C) Work done by friction on the block is $-\mu(mgx + Fs)$, where s is path length of block
(D) Work done by friction in the round trip on the block is zero.

8. In the given diagram particles are projected from points 'A' and 'B' as shown in diagram. Distance of A from O is 20 and height of B from ground is 10. If both the particle hit 'O' with same speed. Particle from A is projected with speed of 10 m/s with what speed particle from 'B' must be projected :



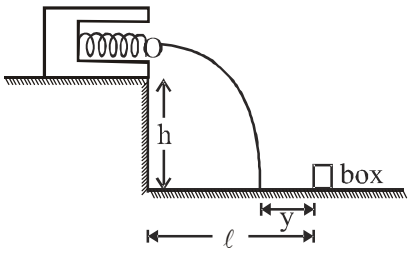
(A) 10 m/s (B) 15 m/s (C) 12 m/s (D) 12 m/s

9. A particle starts from rest from point 'P' and follow a path PQ on the three surfaces as shown in figures. If time taken by the particles in three cases are t_1, t_2 and t_3 then select **INCORRECT** statement :



(A) $t_3 > t_2 > t_1$ (B) $a_1 > a_2 > a_3$ (C) $t_1 = t_2 = t_3$ (D) $v_1 = v_2 = v_3$

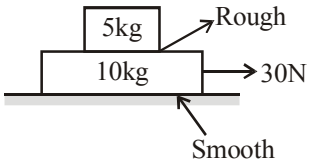
10. Two children are playing a game in which they try to hit a small box using a spring-loaded marble gun, which is fixed rigidly to a table is a height h above the top of the box. The spring has a spring constant k and the edge of the box is some unknown horizontal distance ℓ away from the table. The first child compresses the spring a distance x and finds that the marble falls short of its target by a horizontal distance y. The second child compresses the spring by an extra amount Δx so that marble lands in the box. The value of Δx is :-



(A) $\ell\sqrt{\frac{mg}{hk}}$ (B) $\ell\sqrt{\frac{2mg}{hk}}$ (C) $2y\sqrt{\frac{mg}{hk}}$ (D) $y\sqrt{\frac{mg}{2hk}}$

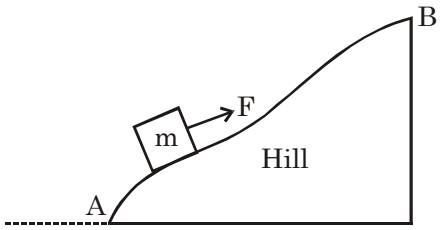
Multiple Correct Answer Type 4 Q. [4 M (–1)]

11. In the figure shown ground is smooth, whereas surface between 10 kg block and 5 kg block is rough. A force of magnitude 30 N is applied on 10 kg block, horizontally. If net work done by friction on the system (on 10 kg and 5 kg blocks) in any time frame is zero, then cofficient of friction between 10 kg and 5 kg can be :



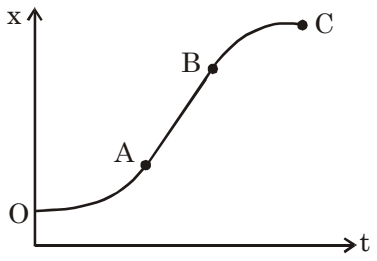
(A) 0.1 (B) 0.3 (C) 0.4 (D) 0.6

12. A body of mass 'm' is moving slowly up the rough hill from point A to point B as shown in figure by a force which is acting tangential to surface at each point on the hill. Work done by this force is :



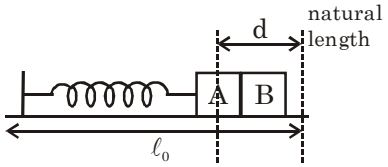
(A) Independent of shape of trajectory.
(B) Independent of horizontal component of displacement.
(C) Depends on coefficient of friction between the surfaces.
(D) Depends on the mass of the body.

13. Position-time graph of a particle moving in a straight line is as shown in figure. Select the **CORRECT** alternative(s) :



(A) Work done by all the forces in region OA and BC is positive.
(B) Work done by all the forces in region AB is zero.
(C) Work done by all the forces in region BC is negative.
(D) Work done by all the forces in region OC is zero.

14. Block A has mass m_A and is attached to a spring having block B, having mass m_B is pressed against A so that the spring deforms a distance d. Coefficient of friction between blocks and the ground is μ. x represents the elongation or compression of spring.



(A) If blocks get separated then x must be the compression of spring.

(B) Blocks get separated when x = 0.

(C) For the blocks to get separated, $d < \frac{2\mu g(m_A + m_B)}{k}$

(D) For the blocks to get separated, $d > \frac{2\mu g(m_A + m_B)}{k}$

Linked Comprehension Type (1 Para × 3Q. & 1 Para × 2Q.) [3 M (-1)]

(Single Correct Answer Type)

Paragraph for Question 15 to 17

A great basketball player throws a basketball straight upward in the air. It rises and falls back to his hand. During the catch, his hands are displaced downward a few cm as the ball slows down.

15. During the catch while the ball is in hand and is moving downward, the work done by him on the ball is

(A) positive (B) negative (C) zero (D) can't say

16. During the throw work done by gravity is

(A) positive (B) negative (C) zero (D) can't say

17. During the throw while ball is in hand and moving upward then work done by ball on hand

(A) positive (B) negative (C) zero (D) can't say

Paragraph for Question 18 & 19

A traveler at an airport takes an escalator up one floor. The moving staircase would itself carry him upward with vertical velocity component v between entry and exit points separated by height h. However, while the escalator is moving, the hurried traveler climbs the steps of the escalator at a rate of n steps/s. Assume that the height of each step is h_s.

18. Determine the amount of work done by the traveler during his escalator ride, given that his mass is m.

(A) $\frac{2mghnh_s}{(v + nh_s)}$ (B) $\frac{mghnh_s}{2(v + nh_s)}$ (C) $\frac{mghnh_s}{(2v + nh_s)}$ (D) $\frac{mghnh_s}{(v + nh_s)}$

19. Determine the work the escalator motor does on this person.

(A) $\frac{mgvh}{(v + nh_s)}$ (B) $\frac{2mgvh}{(v + nh_s)}$ (C) $\frac{mgvnh_s}{(v + nh_s)}$ (D) $\frac{mgvnh_s}{2(v + nh_s)}$

SPECIAL CLASS TEST # 06 **ANSWER KEY**

SECTION-I

Single Correct Answer Type **10 Q. [3 M (–1)]**

1. Ans. (A) **2. Ans. (A)** **3. Ans. (A)** **4. Ans. (A)**
5. Ans. (B) **6. Ans. (C)** **7. Ans. (C)** **8. Ans. (A)**
9. Ans. (C) **10. Ans. (D)**

Multiple Correct Answer Type **4 Q. [4 M (–1)]**

11. Ans. (B,C,D) **12. Ans. (A,C,D)** **13. Ans. (B,C,D)** **14. Ans. (B,D)**

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

15. Ans. (B) **16. Ans. (B)** **17. Ans. (B)** **18. Ans. (D)**
19. Ans. (A)