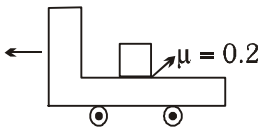
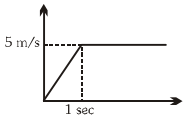
CLASS TEST

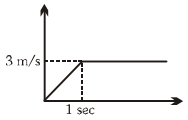
SECTION-I

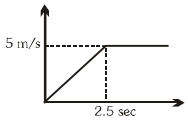
Single Correct Answer Type **5 Q. [3 M (–1)]**

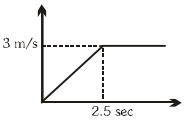
1. A truck starting from rest moves with an acceleration of 5 m/s^2 for 1 sec and then moves with constant velocity. The velocity w.r.t ground v/s time graph for block in truck is (Assume that block does not fall off the truck)



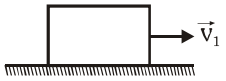
(A) 

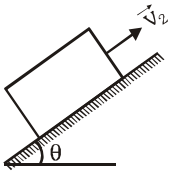
(B) 

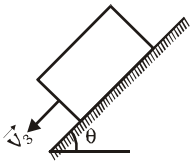
(C) 

(D) 

2. Three identical blocks move either on a horizontal surface, up a plane, or down a plane, as shown below. They start with different speeds and continue to move until brought to rest by friction. They all move the same distance. Rank the three situations according to the initial speeds, least to greatest. [Friction is same for each surface]

(1) 

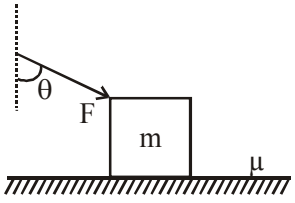
(2) 

(3) 

(A) The same for all cases (B) 1, 2, 3
(C) 3, 1, 2 (D) 2, 1, 3

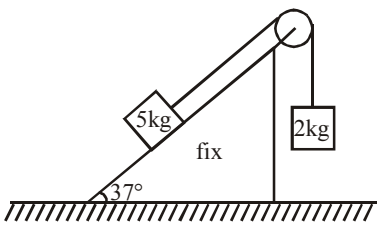
3. If μ is the coefficient of friction between the road and the tyre of a car, the minimum time in which the car can cover a distance 's', starting from rest is
(A) directly proportional to μ (B) inversely proportional to μ
(C) inversely proportional to √μ (D) directly proportional to √μ

4. A block of mass m = 1kg is placed on a horizontal surface. It is being pushed by a force F = 25 N making an angle θ = 37° with the vertical. If the friction coefficient is μ = 0.8, then the magnitude of acceleration of the block will be :-



(A) 25 m/s^2 (B) 17 m/s^2
(C) 9 m/s^2 (D) zero

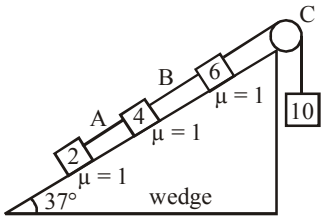
5. In the arrangement shown in figure coefficient of friction between 5kg block and incline plane is μ = 0.5. Friction force acting on the 5kg block is :-



(A) 20 N (B) 15 N (C) 10 N (D) 5N

Multiple Correct Answer Type 5 Q. [4 M (–1)]

6. Figure shows a system consisting of some blocks and wedge as shown in figure. Wedge is fixed and all block can move on the surface and mass of pulley and string are negligible. Choose the **CORRECT** statement(s).



(A) Acceleration of block of mass 10kg is zero

(B) Thrust on the pulley is $80\sqrt{5}$ N

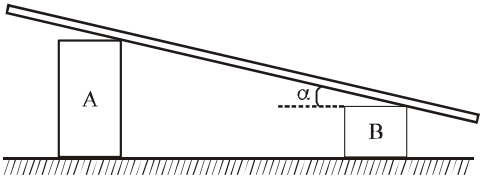
(C) The maximum mass that can be hung in place of 10kg block so that it does not move is 16 kg

(D) If the friction suddenly vanishes, the 10 kg block will move downward

7. A plank inclined at an angle of α to the horizontal lies on two supports A and B (figure), over which it can slip without friction under the action of its own weight Mg. With what acceleration and in what direction should a man of mass m move along the plank so that it should not slip ?

(A) the man should move down the plank

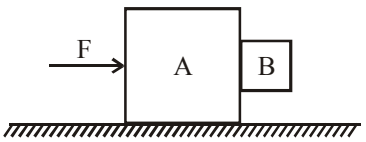
(B) the acceleration of the man should be g sin $\alpha \left(1+\frac{M}{m}\right)$



(C) the acceleration of the man should be g sin $\alpha \left(1-\frac{M}{m}\right)$

(D) the man should move up the plank

8. A constant horizontal force F is acting on block A, as shown in the figure. Friction between A & horizontal surface is negligible. But friction is present between A & B. Contact surface of A & B is vertical. Due to friction there is no slipping between A & B. Mass of A is 2m and that of B is m & value of F is 6 mg. Then :



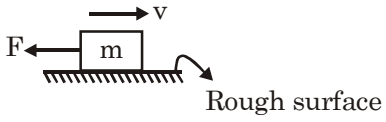
(A) Friction force on B must be greater than mg

(B) Coefficient of friction between A & B must be greater than or equal to 0.5

(C) Coefficient of friction between A & B may be 0.8

(D) Friction force on block B may be greater than mg.

9. An object of mass 'm' is moving to the right on a rough horizontal surface. At t = 0 a force F (large than the limiting friction force) is applied to the left as shown in figure. Select the **CORRECT** alternative :-



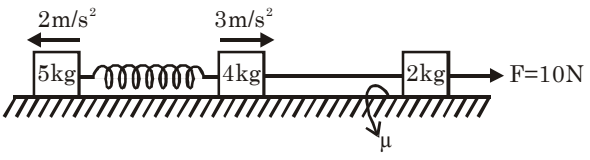
(A) Initially, force $\vec{F}$ and friction force will act in same direction.

(B) Object comes to rest for a moment and after that its motion is accelerating in direction of $\vec{F}$.

(C) Object slow down and remains at rest.

(D) Magnitude of rate of change of speed for block when it is moving to right is same as when it is moving to left.

10. System is shown at an instant. There is friction only between 2kg and ground and rest all surfaces are smooth. Then



(A) Acceleration of 2kg block at this instant is 2 m/s^2.

(B) Acceleration of 2kg block at this instant is 3 m/s^2.

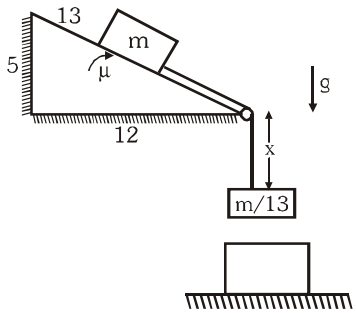
(C) Coefficient of friction between 2kg and ground is $\mu = 0.2$.

(D) Coefficient of friction between 2kg and ground is $\mu = 0.1$.

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

Paragraph for Question 11 to 13

A block of mass m slides on an inclined plane of sufficient large size with a slope of 5/12 (i.e. the slope of the hypotenuse of a 5:12:13 triangle). A massless rope, guided by a massless pulley, connects the block to a second block of mass m/13, which is hanging freely above a lower table.



11. The two block system is observed to be moving with a constant velocity v_0. What is the coefficient of sliding friction μ between block and plane?

(A) 1/3 (B) 1/4 (C) 1/2 (D) 1/5

12. After the hanging block hits the table, what is the distance s along the surface of the plane which the top block continues to slide before stopping? (Assume that the plane is long enough that the block does not fall off)

(A) $15v_0^{22}/4g$ (B) $13v_0^{22}/2g$ (C) $13v_0^{22}/3g$ (D) $15v_0^{22}/2g$

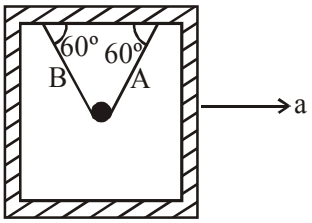
13. What will be the acceleration of blocks as a function of length x(<L and hanging from pulley towards lower block) of uniform string (mass of string in this case is m and total length of string is L). (No friction between string & incline)

(A) (5L+9x)g/27L (B) (5L+8x)g/27L (C) (5L+3x)g/27L (D) Independent of x

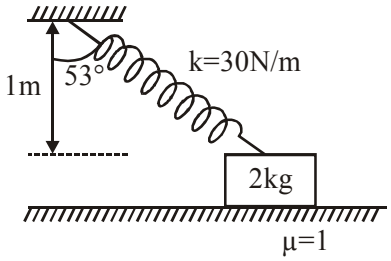
SECTION-III

Numerical Grid Type (Ranging from 0 to 9) 3 Q. [4 M (0)]

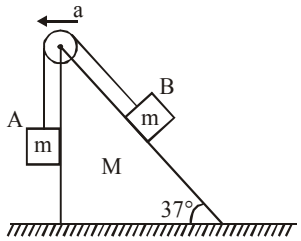
1. The steel ball is suspended in an accelerating frame by two cords A and B. If the acceleration of the frame is $a = \frac{g}{3\sqrt{3}}$, then the tension in A is x times the tension in B. Find x.



2. The spring shown in the figure has a natural length of 1m. What is the initial acceleration (in m/sec^2) of the block when released ?



3. In the given figure a wedge of mass M is kept on a horizontal smooth surface. Two blocks of equal mass m are arranged as shown in figure. All surfaces are smooth. Find the value of acceleration a (in m/s^2), so that blocks A and B do not slip over the wedge.

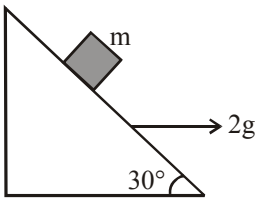


SECTION-IV

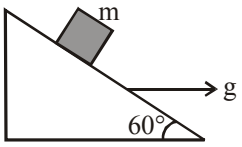
Matrix Match Type (4 × 5) 2 Q. [8 M (for each entry +2(0)]

1. In the following arrangements if $\mu = \tan\theta$ then match the situation in column-I with effect in column-II.

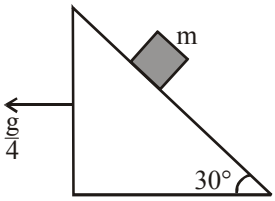
Column-I **Column-II**

(A) 

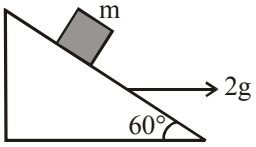
(P) Block will not slide with respect to wedge

(B) 

(Q) Block will slide upward with respect to wedge

(C) 

(R) Block will slide down ward with respect to wedge

(D) 

(S) Friction will act upward

(T) Friction will be equal to μN

2. In the following arrangement string is light and inextensible. All surfaces are smooth. Treating:
a = acceleration of wedge A b = acceleration of block B
T = tension in the string N = normal reaction on block B applied by wedge A

Column-I **Column-II**

(A) $\frac{4a}{g}$

(B) $\frac{8T}{mg}$

(C) $\frac{8N}{mg}$

(D) $\frac{3b}{a}$

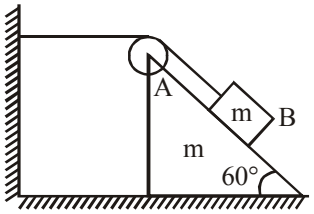
(P) $\sqrt{3}$

(Q) $3\sqrt{3}$

(R) 1

(S) 3

(T) $\frac{1}{\sqrt{3}}$



CLASS TEST # 23 **ANSWER KEY**

SECTION-I

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

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

5. Ans. (C)

Multiple Correct Answer Type **5 Q. [4 M (–1)]**

6. Ans. (A, B, D) **7. Ans. (A,B)** **8. Ans. (B,C)** **9. Ans. (A,B)**

10. Ans. (B,D)

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

(Single Correct Answer Type)

11. Ans. (C) **12. Ans. (B)** **13. Ans. (B)**

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **3 Q. [4 M (0)]**

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

SECTION-IV

Matrix Match Type (4 × 5) **2 Q. [8 M (for each entry +2(0)]**

1. Ans. (A)-Q,T; (B)-P,S; (C)-R,S,T; (D)-P **2. Ans. (A)-P; (B)-Q; (C)-R; (D)-S**