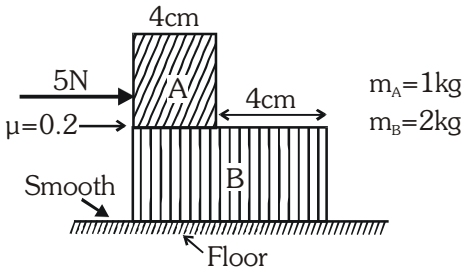
CLASS TEST

SECTION-I

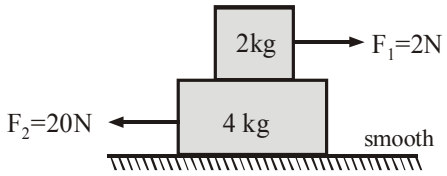
Single Correct Answer Type **7 Q. [3 M (–1)]**

1. For shown situation in figure (Assume : $g = 10\ ms^{-2}$) –



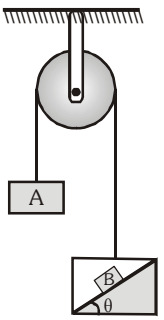
(A) The acceleration of the block A is $1m/s^2$
(B) The acceleration of the block B is $3m/s^2$
(C) The time taken for the front face of A lining up with the front face of B is 0.2 sec
(D) The time taken for the front face of A lining up with the front face of B is 0.50 sec

2. In the arrangement shown in figure, coefficient of friction between the two blocks is μ = 1/2. The force of friction acting between the two blocks is



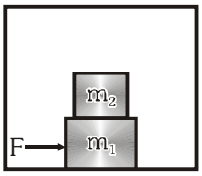
(A) 8 N (B) 10 N (C) 6 N (D) 4 N

3. String is massless and pulley is smooth in the adjoining figure. Total mass on left hand side of the pulley is m_1 and on right hand side is m_2. Friction coefficient between block B and the wedge is $\mu = \frac{1}{2}$ and $\theta = 30°$. Select the wrong option



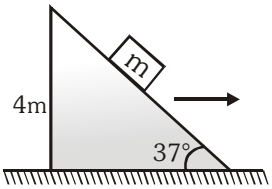
(A) block B will slide down if $m_1 = m_2$
(B) block B may remain stationary with respect to wedge for suitable values of m_1 and m_2 with $m_2 > m_1$
(C) block B can not remains stationary with respect to wedge in any case
(D) block B will slide down if $m_1 > m_2$

4. A plank of mass $m_1 = 8kg$ with a bar of mass $m_2 = 2kg$ placed on its rough surface, lie on a smooth floor of elevator ascending with an acceleration g/4. The coefficient of friction is $\mu = 1/5$ between m_1 and m_2. A horizontal force F = 30N is applied to the plank. Then the acceleration of bar and the plank in the reference frame of elevator are:–



(A) 3.5 m/s², 5m/s² (B) 5m/s², $\frac{50}{8}$m/s² (C) 2.5 m/s², $\frac{25}{8}$m/s² (D) 4.5 m/s², 4.5 m/s²

5. If the coefficient of friction between block & wedge is μ, then the maximum horizontal acceleration of the wedge for which block will remain at rest w.r.t. the wedge is-

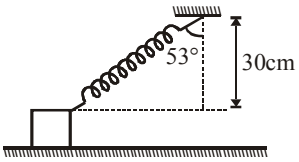


(A) $\left(\frac{3-4\mu}{4+3\mu}\right)g$ (B) $\left(\frac{1+\mu}{1-\mu}\right)g$ (C) $\left(\frac{1-\mu}{1+\mu}\right)g$ (D) $\left(\frac{3+4\mu}{4-3\mu}\right)g$

6. A smooth block is released at rest on a 45° incline and then slides a distance d. The time taken to slide on rough incline is n times as much to slide on a smooth incline. The coefficient of friction is-

(A) $\mu_k = 1 - \frac{1}{n^2}$ (B) $\mu_k = \sqrt{1-\frac{1}{n^2}}$ (C) $\mu_s = 1 - \frac{1}{n^2}$ (D) $\mu_s = \sqrt{1-\frac{1}{n^2}}$

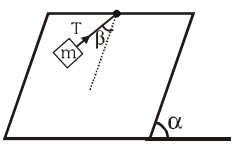
7. A block of mass 2 kg is connected with a spring of natural length 40 cm of force constant K = 200 N/m. The coefficient of friction is μ = 0.5. When released from the given position, acceleration of block will be



(A) zero (B) 2 m/s² (C) 6 m/s² (D) 8 m/s²

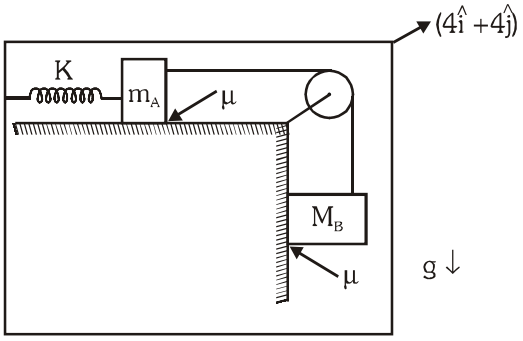
Multiple Correct Answer Type 6 Q. [4 M (–1)]

8. A block of mass m is hanged at an angle β with line of greatest slope on an incline of angle α as shown. Minimum value of μ for no sliping is, T is tension at minimum μ.



(A) $\mu_{min} = \frac{\sin\alpha\sin\beta}{\cos\alpha}$ (B) $\mu_{min} = \frac{\sin\alpha\cos\beta}{\cos\alpha}$ (C) $T = mg\sin\alpha\cos\beta$ (D) $T = mg\cos\alpha\sin\beta$

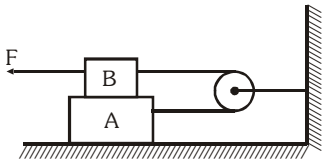
9. The arrangement shown in the diagram is moving with acceleration $\vec{a} = 4(\hat{i} + \hat{j}) m/s^2$. An ideal spring of natural length ℓ_0 having spring constant K = 50 N/m is connected to block A. Blocks A & B are connected by an ideal string passing through frictionless pulley. Mass of each block A & B is 2 kg. If the friction coefficient between all the surfaces is 5/9 then just after releasing from rest, (initially spring is in its natural length) :–



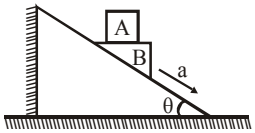
(A) spring force is equal to tension in the string. (B) force exerted by the spring will be zero
(C) the value of tension is close to 23.6 N (D) if μ = 2/3 then spring force is zero.

10. The force F_1 that is necessary to move a body up an inclined plane is double the force F_2 that is necessary to just prevent it from sliding down, then (Where ϕ = angle of friction, θ = angle of inclined plane, w = weight of the body)
(A) $F_2 = w \sin(\theta - \phi)\sec\phi$ (B) $F_1 = w \sin(\theta - \phi) \sec\phi$
(C) $\tan\phi = 3\tan\theta$ (D) $\tan\theta = 3\tan\phi$

11. Two blocks each of mass 1 kg are placed as shown. They are connected by a string which passes over a smooth (massless) pulley. There is no friction between A and the ground and the coefficient of friction between A and B is 0.2. A force F is applied to B. Which of the following statements is/are correct :-
(A) The system will be in equilibrium if F < 4N
(B) If F > 4N the tension in the string will be 4N
(C) if F > 4N the frictional force between the block will be 2N
(D) if F = 6N the tension in the string will be 3N

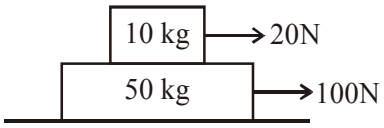


12. In the given figure, a block A rests on a smooth triangular block B and the block B is moved at an acceleration of a = 2 m/s^2 along the plane :-



(A) normal force on block A due to block B is m(g – a)
(B) Acceleration of block A relative to block B is a cos θ
(C) If friction is present between block A and B, the coefficient should be greater than $\frac{a}{g}\cos\theta$, for no relative motion between A and B
(D) If friction is present between block and A and B, the coefficient of friction should be greater than $\frac{a\cos\theta}{g - a\sin\theta}$, for no relative motion between A and B

13. Two blocks of mass 10 kg & 50 kg are placed on smooth horizontal surface. If surface between blocks is rough then choose the **CORRECT** statement(s).

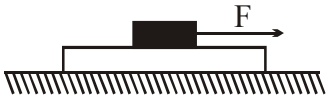


(A) Friction acts on upper block towards right & static
(B) Friction acts on lower block towards right & kinetic
(C) There is not friction between blocks
(D) Both blocks move together

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

Paragraph for Question 14 to 16

In diagram, the friction coefficient between the block of mass 1 kg and the plank of mass 2 kg is 0.4 while that between the plank and floor is 0.1. A constant force 'F' starts acting horizontally on the upper 1 kg block.



14. The acceleration of plank if F = 10 N is
(A) 2.5 m/s^2 (B) 1.5 m/s^2 (C) 0.5 m/s^2 (D) 1.0 m/s^2

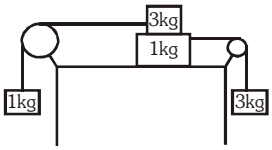
15. The friction force between plank and block if F = 2 N, is
(A) 3 N (B) 4 N (C) 2.5 N (D) 2 N

16. For what value of F will the block move with double the acceleration of that of the plank?
(A) 6 N (B) 10 N (C) 5 N (D) 12.5 N

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) 1 Q. [4 M (0)]

1. The value of the friction coefficient acting between the blocks of 1kg and 3kg, so that all the blocks move with same acceleration is μ. Find the value of 6 μ. Consider table as smooth.

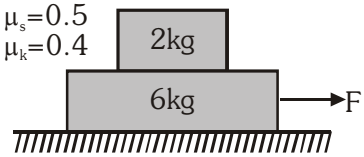


SECTION-IV

Matrix Match Type (4 × 5) 1 Q. [8 M (for each entry +2(0)]

1. All surfaces in contact have same value of friction coefficients.

Let frictional force between 2kg & 6kg be f_1 and between 6kg and ground be f_2. (g = 10 ms^{-2})



	Column–I		**Column–II**
(A)	F = 36N	(P)	f_1 = 4N, f_2 = 32N
(B)	F = 48N	(Q)	f_1 = 8N, f_2 = 32N
(C)	F = 64N	(R)	f_1 = 10N, f_2 = 32N
(D)	F = 96N	(S)	f_1 = 0, f_2 = 36N

CLASS TEST # 25 **ANSWER KEY**

SECTION-I

Single Correct Answer Type **7 Q. [3 M (–1)]**

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

5. Ans. (D) **6. Ans. (A)** **7. Ans. (C)**

Multiple Correct Answer Type **6 Q. [4 M (–1)]**

8. Ans. (A, C) **9. Ans. (B,C,D)** **10. Ans. (A, D)** **11. Ans. (A,C,D)**

12. Ans. (B,D) **13. Ans. (C,D)**

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

(Single Correct Answer Type)

14. Ans. (C) **15. Ans. (D)** **16. Ans. (C)**

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **1 Q. [4 M (0)]**

1. Ans. 4

SECTION-IV

Matrix Match Type (4 × 5) **1 Q. [8 M (for each entry +2(0)]**

1. Ans. (A) S (B) P (C) Q (D) Q