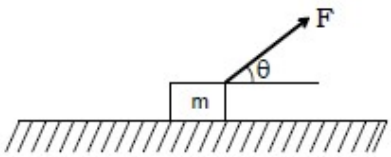
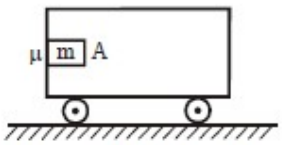
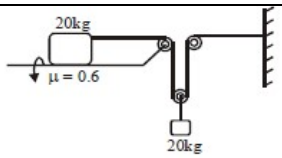
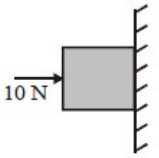
Sri Chaitanya IIT Academy, India.

Mayuri Bhavan, Vijayawada

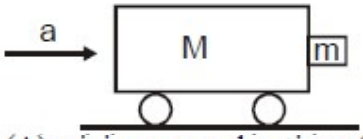
RPTM-8

Subject: Physics **Date: 21-09-2023**

PHYSICS

01.	**A block of mass m slides down an inclined plane of inclination θ with uniform speed. The coefficient of friction between the block and plane is μ. The contact force between the block and the plane is**	(A) mg (B) $mg\sin\theta\sqrt{1+\mu^2}$ (C) $mg\sin\theta$ (D) $\sqrt{(mg\sin\theta)^2+(\mu mg\cos\theta)^2}$
02.	**Two men weighing 100 kg and 50 kg run a 100 m race. The coefficient of friction between their shoes and ground is 0.5. They run with maximum possible acceleration. Who will win the race.**	(A) 100 kg man (B)50 kg man (C) Both will finish at same time (D) Data given is insufficient to answer question
03	**A force F is applied on a block of mass m as shown in the figure. What will be the maximum value of F such that the block will not move. The coefficient of friction between block and floor is μ $[\theta = constant]$** (A) $F=\frac{\mu mg}{\sin\theta}$ (C) $\frac{\mu mg}{\cos\theta}$ (B) $F=\frac{\mu mg}{\cos\theta+\mu\sin\theta}$ (D) $\frac{\mu mg}{\sin\theta+\mu\cos\theta}$	
04.	**The minimum acceleration (from the given option) that must be imparted to the cart in the figure so that the block A will not fall (given μ = 0.2 is the coefficient of friction between the surfaces of block and cart) is given by**	 (A) 25m/s^2 (B) 15 m/s^2 (C) 5.4 m/s^2 (D) 50 m/s^2
05.	**Two blocks of mass 20 kg is connected as shown in the figure then friction on the block exerted by horizontal surface is (system is released from rest)**	 (A) 140 N (B) 120 N (C) 130 N (D) 100N
06.	**A horizontal force of 10 N is necessary to just hold a block stationary against a wall the coefficient of friction between the block and the wall is 0.2. The weight of the block is**	 (A) 2 N (B) 20 N (C) 50 N (D) 100 N

07. **A cart of mass M has a block of mass m in contact with it is shown in figure. The coefficient of friction between the block and car is μ. The correct options are**



(A) minimum acceleration of car, so that block m does not fall is $\frac{g}{\mu}$

(B) Minimum acceleration is μg

(C) Normal force between block and car is μma

(D) The magnitude of friction force between block and cart is greater than mg.

08. **A body of mass M is kept on a rough horizontal surface (friction coefficient $= \mu$). A person is trying to pull the body by applying a horizontal force but the body is not moving. The force by the surface on the body is F where :**

A) $F = mg$

B) $Mg \le F \le Mg\sqrt{1+\mu^2}$

C) $F = \mu Mg$

D) $Mg \ge F \ge Mg\sqrt{1-\mu^2}$

09. **A body of mass 2 kg is held at rest against a rough vertical wall by passing a horizontal (nomal) force of 45 N. Coefficient of friction between wall and the block is equal to 0.5. Now a horizontal force of 15 N (tangential to wall) is also applied on the block. Then the block will :**

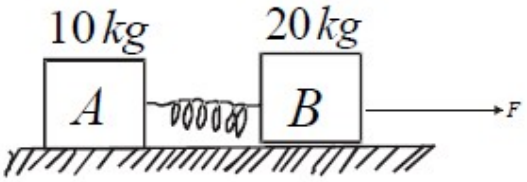
A) Move horizontally with acceleration of $5\ m/s^2$

B) Start to move with an acceleration of magnitude $1.25\ m/s^2$

C) Remain stationary

D) Start to move horizontally with acceleration greater than $5\ m/s^2$

10. **Two blocks A & B attached to each other by a mass-less spring , are kept on a rough horizontal surface $\mu = 0.1 \& a$ constant force $F = 200N$ is applied on block B horizon tally as shown below. If at some instant the acceleration of 10 kg mass is $12\ m/s^2$, then the acceleration of 20 kg mass is :**



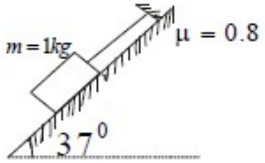
A) $2.5\ m/s^2$ *or* $15.5\ m/s^2$

B) $4\ m/s^2$ *or* $10\ m/s^2$

C) $3.6\ m/s^2$ *or* $4.1\ m/s^2$

D) $1.2\ m/s^2$ *or* $1.3\ m/s^2$

11. **For the arrangement shown in figure, the maximum tension in the string (the block does not accelerate) is :**



A) $6N$

B) $6.4\ N$

C) $12.4\ N$

D) None of these

12. **The force F_1 required to just moving a body up an inclined plane is double the force F_2 required to just prevent the body from sliding down the plane. The coefficient of friction is μ. the inclination θ of the plane is :**

A) $\tan^{-1}\mu$ B) $\tan^{-1}\frac{\mu}{2}$ C) $\tan^{-1}2\mu$ D) $\tan^{-1}3\mu$

13. Match the column $-\left(g=10\ m/s^2\right)$

Column-I

A) Block of mass 2 kg on a rough horizontal surface pulled by a horizontal force of 20 N, $\mu_s = 0.5$

B) Block of mass 2kg pulled with constant speed up an incline of inclination 30^0 and coefficient of friction $1/\sqrt{3}$

C) Block of mass 0.75 kg pulled by a constant force of ,7.5N upon incline of inclination 30^0 and coefficient of friction $1/\sqrt{3}$

D) Block of mass 2 kg pulled vertically by a force 20N

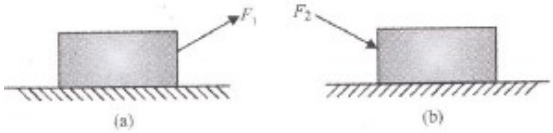
Colmun-II

p) Tension at the mid point of block is 10N
q) Acceleration of block is 5
r) Force of friction acting is N
s) Resultant force on the block is zero
t) Force of friction is 10N

14. **Statement-I:** Coefficient of friction can be greater thatn unity
Statement-II: Force of friction is dependent on normal reaction and ratio of force of friction and normal reaction cannot exceed unity

A) Statement-I is true, Statmement-II is true Statmement-II is a correct explanation for Statmement-I
B) Statmement-I is true, Statmement-II is true Statmement-II is not a correct explanation for Statmement-I
C) Statmement-I is true, Statmement-II is false
D) Statmement-I is false,Statmement-II is true

15. **Statement-I**: Pulling [fig (a)] is easier than pushing [Fig.(b)] on a rough surface
Statement-II: Normal reaction is less in pulling than in pushing



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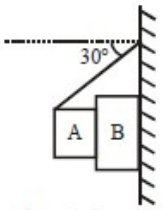
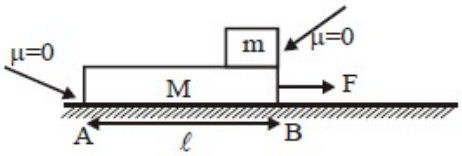
D) Statmement-I is false,Statmement-II is true

16. **Two blocks A and B of mass 10 kg and 20 kg respectively are placed as shwon in figure. Coefficient of friction between all the surfaces is 0.2 (g = 10 m/s^2). Then**



(A) tension in the string is 306 N
(B) tension in the string is 132 N
(C) acceleration of block B is 2.6 m/s^2
(D) acceleration of block B is 4.7 m/s^2

17. **In the figure small block is kept on m then**



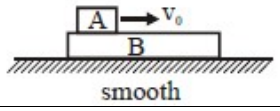
(A) the acceleration of m w.r.t. ground is $\frac{F}{m}$.

(B) the acceleration of m w.r.t. ground is zero

(C) the time taken by m to separate from M is $\sqrt{\frac{2\ell m}{F}}$

(D) the time taken by m to separate from M is $\sqrt{\frac{2\ell M}{F}}$

18. **A block A of mass m is placed over a plank B of mass 2 m. Plank B is placed over a smooth horizontal surface. The coefficient of friction between A and B is $\frac{1}{2}$. Block A is given a velocity v_0 towards right. Then**



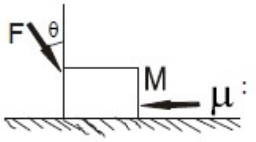
(A) Acceleration of A is $\frac{g}{2}$

(B) Acceleration of A is g

(C) Acceleration of B relative to A is $\frac{3}{4}$g 3

(D) Acceleration of A is zero

19. **In the situation shown in the figure the friction coefficient between M and the horizontal surface is μ. The force F is applied at an angle θ with vertical. The correct statements are**



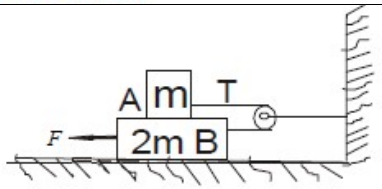
A) If $\theta > \tan^{-1}\mu$ the block cannot be pushed forward for any value of F

B) If $\theta < \tan^{-1}\mu$ the block cannot be pushed forward for any value of F

C) As θ decreases the magnitude of force needed to just push the block M forward increases

D) None of these

20. **In the arrangement shown coefficient of friction for all the surfaces is μ and blocks are moving with constant speeds, then :**



A) $T_1 = \mu mg$ B) $F = 3\mu mg$

C) $T_1 = 2\mu mg$ D) $F = 5\mu mg$

21. A Body of mass 5Kg is under the action of 50N on the horizontal surface. If coefficient of friction in between the surface is one, the distance it travels in 3 s is

22. A block of weight 100N is pushed by a force F on a horizontal rough plane move with an acceleration 1 m/s^2, when force is doubled its acceleration becomes 10 m/s^2. The coefficient of friction is ($g = 10ms^{-2}$)

23. A person of mass 72 kg sitting on ice pushes a block of mass of 30kg on ice horizontally with a speed of $12ms^{-1}$. The coefficient of friction between the man and ice and between block and ice in 0.02. If g = 10 ms^{-2}, the distances between man and the block, when they come to rest is

24.	When a car of mass 1200 kg is moving with a velocity of $15ms^{-1}$ on a rough horizontal road, its engine is switched off. How far does the car travel before it comes to rest if the coefficient of kinetic friction between the road and tyres of the car is 0.5? ($g=10ms^{-1}$)
25.	An eraser weighing 2N is pressed against the black board with a force of 5N. If the co-efficient of friction is 0.4. How much force parallel to the black board is required to slide the eraser upwards.
26.	A block B is mass 5kg is placed on a slab A of mass 20 kg which lies on a frictionless surface as shown in the figure. The coefficient of satic friction between the block and the slab is 0.4 and that of kinetic friction is 0.2. If a force F = 25N acts on B, the acceleration of the slab will be ($g = 10ms^{-2}$)
27.	A block slides down a slope of angle θ with constant velocity. It is then projected up with a velocity of $10ms^{-1}$, $g = 10ms^{-2}$ & $\theta = 30^{o}$. The maximum distance it can go up the plane before coming tostop is
28.	An engine of one metric ton is going up an inclined plane, 1 in 2 at the rate of 36 kmph. If the coefficient of friction is $1/\sqrt{3}$, the power of engine is
29.	The minimum force required to move a body up an inclined plane is three times the minimum force required to prevent it from sliding down the plane. If co-efficient of friction between the body and inclined plane.
30.	A body of mass 10kg is on a rough inclined plane having an inclination of 30^{o} with the horizontal. If coefficient of friction between the surfaces of contact of the body and the plane is 0.5. The least force required to put the body up the plane is

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1)	2)	3)	4)	5)	6)
7)	8)	9)	10)	11)	12)
13)	14)	15)	16)	17)	18)
19)	20)	21)	22)	23)	24)
25)	26)	27)	28)	29)	30)