Laws of motion

Objective : Learn to use the Newton's laws of motion for simple problems

Only one option correct

1. A force F_1 acting on a body of mass 2 kg produces an acceleration of 2.5 ms^{-2} Another force F_2 acting on another body of mass 5 kg produces an acceleration of 2 $ms^{-b)}$ Ratio of F_1 to F_2 is
   a) 1:2 b) 4:1 c) 6:1 d) 8:1

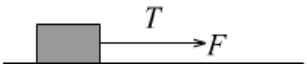
2. A feather of mass 20 g is dropped from a certain height. If it falls down with constant velocity, the net force acting on it is
   a) 200 N b) 0.2 N c) 0.02 N d) zero

3. If a constant force acts on a body, initially at rest, the distance covered by the body in a time interval t is proportional to
   a) t b) t^2 c) $1/t$ d) $\sqrt{t}$

4. A wagon, initially at rest, is pushed on a frictionless surface with a force of 60N for 14s. It then enters a rough region and comes to rest in 0.15 s. Average force exerted by the rough region on the wagon is
   a) 6000 N b) 5600 N c) 4500 N d) 4000 N

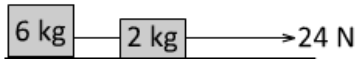
5. Initial momentum of a body is 20 kg ms^{-1} If a force of 10 N acts on the body, in the direction of its motion, for 0.2 s its final momentum will be
   a) 10 kg ms^{-1} b) 2 kg ms^{-1} c) 18 kg ms^{-1} d) 22 kg ms^{-1}

6. A body of mass 12 kg moves with an acceleration of 3 ms^{-2} on a smooth table under the application of an external force. The tension in the string is



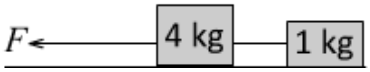
   a) 12 N b) 4 N c) 15 N d) 36 N

7. Two bodies of mass 2 kg and 6 kg are connected using a light inextensible string. If the 2 kg mass is pulled by a force of 24 N, the acceleration of the system is



   a) 3 ms^{-2} b) 16 ms^{-2} c) 2 ms^{-2} d) 6 ms^{-2}

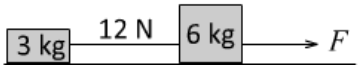
8. The common acceleration of two bodies connected as shown in the figure is 2 ms^{-2}. The applied force (F) is



   a) 2.5 N b) 5 N c) 7.5 N d) 10 N

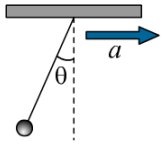
9. Two bodies, having masses in the ratio of 3:5 are connected by a light inextensible string. If a force of 16N causes an acceleration of 0.5 ms^{-2}, the masses are
   a) 3 kg and 5 kg b) 6 kg and 10 kg c) 9 kg and 15 kg d) 12 kg and 20 kg

10. If tension in the string connecting two bodies of masses 3 kg and 6 kg is 12 N then the force (F) applied on the system is

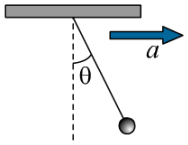


   a) 12 N b) 36 N c) 72 N d) 108 N

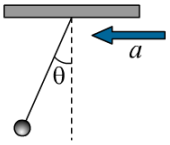
11. A metal bob is suspended by a light inextensible string. This set up is placed in a box moving on a horizontal surface with uniform acceleration a as indicated in the figure. Choose the correct orientation of the bob and the angle made by the string

a) 

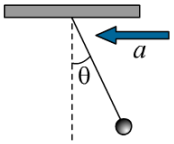
$\tan(\theta) = a/g$

b) 

$\tan(\theta) = g/a$

c) 

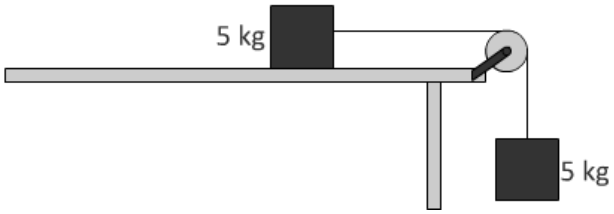
$\tan(\theta) = a/g$

d) 

$\tan(\theta) = g/a$

12. A body of mass 8 kg, placed on a smooth horizontal table, is connected to another body of mass 2 kg suspended using a light inextensible string passing over a pulley. Common acceleration of the system is (g = 10 ms^{-2})
    a) 3 ms^{-2} b) 16 ms^{-2} c) 2 ms^{-2} d) 6 ms^{-2}

13. In the figure given below the tension in the string is (g = 10 ms^{-2})



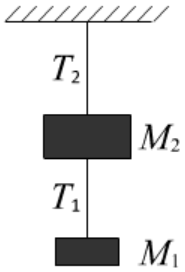
    a) 5 N b) 10 N c) 25 N d) 50 N

14. In an Atwood's machine, two bodies each of mass 3 kg are connected by a light inextensible string. Force exerted on the pulley by the clamp holding it is (g = 10 ms^{-2})
    a) 60N b) 30 N c) 15 N d) zero

15. A person of mass 60 kg is in a lift moving up with acceleration of 2 $ms^{-b)}$ His apparent weight is (g = 10ms^{-2})
    a) 600 N as observed by him and 720 N as observed by a person on ground
    b) 720 N as observed by him and 600 N as observed by a person on ground
    c) 720 N as observed by him and by a person on ground
    d) 600 N as observed by him and by a person on ground

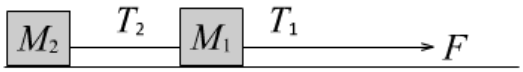
[redacted]

16. Two bodies are suspended from a rigid support as shown in the figure.



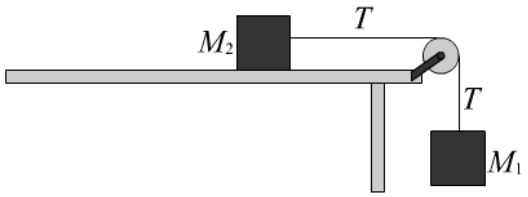
    a) Net force acting on both the blocks is zero
    b) $T_2 > T_1$ only if $M_2 > M_1$
    c) $T_2 = T_1$ only if $M_2 = M_1$
    d) $T_2 > T_1$ even if $M_2 < M_1$

17. Two bodies, placed on a smooth horizontal table, are connected by light inextensible string as shown in the figure.



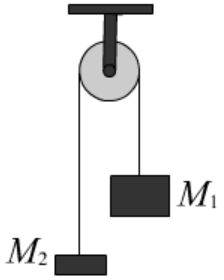
a) As the F is increased, T_1 and T_2 increase.
b) If M_1 is doubled while and F and M_2 are constant, then T_1 remains constant while T_2 increases
c) If M_2 is doubled while and F and M_1 are constant, then T_1 remains constant while T_2 increases
d) If F is doubled while and M_1 and M_2 are constant, then the ratio of T_1 to T_2 remains constant

18. Two bodies are connected as shown in the figure.



a) If M_1 is doubled while M_2 is constant, then T and the common acceleration of the system increases by two times
b) If M_2 is doubled while M_1 is constant, then T and the common acceleration of the system increases by two times
c) If both M_2 and M_1 are doubled, then T increases by four times while the common acceleration of the system increases by two times
d) If M_2 is equal to M_1 then T is not equal to zero but acceleration is zero

19. Two bodies are connected to each other as in an Atwood's machine as shown in the figure. In this situation



a) Tension in the string is equal to zero only if $M_1 = M_2$
b) Net force acting on the pulley is zero even if M_1 is not equal to M_2
c) Magnitude of net force acting M_2 is equal to the net force acting on M_1 only if $M_1 = M_2$
d) Magnitude of net force acting M_2 is always equal to the net force acting on M_1

20. Consider a person in an elevator. Weight of the person when elevator is stationary is W.
a) Weight of the person when elevator is moving up with acceleration is greater than W.
b) Weight of the person when elevator is moving up with deceleration is less than W.
c) Weight of the person when elevator is moving down with acceleration is greater than W.
d) Weight of the person when elevator is moving down with deceleration is less than W.

Answers

1. a
2. d
3. b
4. b
5. d
6. d
7. a
8. d
9. d
10. b
11. a
12. c
13. c
14. a
15. c
16. a, d
17. a, c, d
18. a
19. b, c
20. a, b