St. Lawrence High School

A Jesuit Christian Minority Institution

Term : 1st

Work Sheet – 18

Class – XI | Subject – Physics | Date – 06.07.20

Chapter – Friction | Topic – Motion of body on rough inclined plane

---

Choose the correct option for the following questions. $1 \times 15 = 15$

1. The time taken by a body to slide down a rough 45° inclined plane is twice that required to slide down a smooth 45° inclined plane of same length. The coefficient of kinetic friction between the object and the rough plane will be –
   a. $\frac{1}{3}$
   b. $\frac{3}{4}$
   c. $\sqrt{\frac{3}{4}}$
   d. $\sqrt{\frac{2}{3}}$

2. The force required to just move a body up the inclined plane is double the force required to just prevent the body from sliding down the plane. The coefficient of friction is μ. If θ is angle of inclination of the plane, then tan θ =
   a. μ
   b. 3μ
   c. 2μ
   d. 0.5μ

3. A block of mass M is placed at rest on an inclined plane of inclination θ to the horizontal. If the coefficient of friction between the block and the rough plane is μ, then the total force the inclined plane exerts on the block is –
   a. Mg
   b. $\mu Mg\ cos\ \theta$
   c. $Mg\ sin\ \theta$
   d. $\mu Mg\ tan\ \theta$

4. A particle is placed at rest inside a hollow hemisphere of radius R. The coefficient of friction between them is $\frac{1}{\sqrt{3}}$. The maximum height up to which the particle can remain stationary is –
   a. $\frac{R}{2}$
   b. $\left(1 - \frac{\sqrt{3}}{2}\right) R$
   c. $\left(\frac{\sqrt{3}}{2}\right) R$
   d. $\frac{3}{8} R$

5. A block rests on a rough inclined plane making an angle 30° woth the horizontal. The coefficient of static friction between the block and the rough plane is 0.8. if the frictional force on the block is 10N, then the mass of the block is – ($g = 10 m/s^2$)
   a. 2 kg
   b. 4 kg
   c. 1.6 kg
   d. 2.5 kg

6. A block of mass m is placed at rest on a horizontal rough surface with angle of friction φ. The block is pulled with a force F at an angle θ with the horizontal. The minimum value of F required to move the block is –
   a. $\frac{mg \sin \varphi}{\cos(\theta - \varphi)}$
   b. $\frac{mg \cos \varphi}{\cos(\theta - \varphi)}$
   c. $mg \tan \varphi$
   d. $mg \sin \varphi$

7. A block of mass 4kg is placed on a horizontal rough surface. A time dependent horizontal force F = k.t acts on the block, k = 2N/s . The frictional force between the block and plane at time t = 2 sec is ($\mu = 0.2$) –
   a. 4 N
   b. 8 N
   c. 12 N
   d. 10N

8. A body takes time t to reach the bottom of a smooth inclined plane of angle θ with the horizontal. if the plane is made rough, time taken now is 2t. the coefficient of friction of the rough surface is –
   a. $\frac{3}{4}\tan\theta$
   b. $\frac{2}{3}\tan\theta$
   c. $\frac{1}{4}\tan\theta$
   d. $\frac{1}{2}\tan\theta$

9. A rope of mass m and length L is being pulled on a rough horizontal floor by a constant horizontal force F = mg. the force is acting at one end of the rope in the same direction as the length of the rope. The coefficient of kinetic friction between the rope and the floor is ½ . then the tension at the midpoint of the rope is –
   a. $\frac{mg}{4}$
   b. $\frac{2mg}{5}$
   c. $\frac{mg}{8}$
   d. $\frac{mg}{2}$

10. A heavy body of mass 25kg is to be dragged along a horizontal plane $\left(\mu = \frac{1}{\sqrt{3}}\right)$. The least force required is –
    a. 25 kgf
    b. 2.5 kgf
    c. 12.5 kgf
    d. 6.25 kgf

11. A block of mass 4kg is kept on ground. The coefficient of friction between the block and ground is 0.8. The external force of magnitude 30 N is applied parallel to the ground. The resultant force exerted by the ground on the block is ($g = 10 m/s^2$) –
    a. 40 N
    b. 30 N
    c. Zero
    d. 50 N

12. A horizontal force of magnitude 10N is needed to just hold a block stationary against a vertical rough wall. The coefficient of friction between the block and the wall is 0.2. The weight of the block is –
    a. 20 N
    b. 50 N
    c. 100 N
    d. 2 N

13. A body is sliding down an inclined plane (angle of inclination 45°). If the coefficient of friction is 0.5 and $g = 9.8 m/s^2$, then the downward acceleration of the body in m/s^2 is –
    a. $\frac{4.9}{\sqrt{2}}$
    b. $4.9\sqrt{2}$
    c. $19.6\sqrt{2}$
    d. 4.9

14. A block of mass 1kg is placed ($\mu = 0.6$) on the horizontal surface of a truck which is moving with acceleration $5 m/s^2$ then the frictional force on block will be –
    a. 5 N
    b. 6 N
    c. 5.88 N
    d. 8 N

15. A block has been placed on an inclined plane with the slope angle θ, the block slides down the plane at constant speed. The coefficient of kinetic friction is equal to –
    a. $\sin\theta$
    b. $\cos\theta$
    c. $\tan\theta$
    d. g

Name of the teacher – Soumitra Maity