FREEDOM INTERNATIONAL SCHOOL

WORKSHEET- MCQ (SOLUTIONS)

PHYSICS

CLASS XI

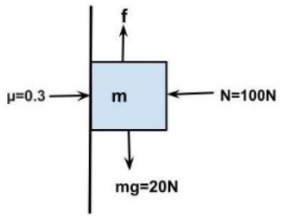
LAWS OF MOTION

---

1. A person sitting in an open car moving at constant velocity throws a ball vertically into air, the ball falls
   (a) exactly into the hand of thrower (b) outside the car
   (b) in the car ahead of the person (d) in the car behind the person
   Ans: (a) exactly into the hand of thrower
   Both the person and the ball share the horizontal velocity of the car
2. The force acting on a body of mass 10 kg is $(2\hat{\imath} + \hat{\jmath} - \hat{k})$ N. If the body is initially at rest, then the velocity at the end of 20 s will be
   (a) $2\sqrt{6}$ (b) $3\sqrt{2}$ (c) $6\sqrt{2}$ (d) $2\sqrt{3}$
   Ans: (a) $2\sqrt{6}$
   $\vec{v} = \vec{u} + \frac{\vec{F}}{m}t = (4\hat{\imath} + 2\hat{\jmath} - 2\hat{k})$
   Magnitude of velocity= $\sqrt{16 + 4 + 4}$
3. A body of mass 1 kg tied to one end of a string is revolved in a horizontal circle of radius 0.1 m with a speed of 3 revolutions per second, assuming the effect of gravity is negligible, then linear velocity, acceleration and tension in the string will be
   (a) 2.88 m/s, 45.5 m/s^2, 45.5 N (b) 1.88 m/s, 35.5 m/s^2, 35.5 N
   (c) 3.88 m/s, 55.5 m/s^2, 55.5 N (d) 4.88 m/s, 25.5 m/s^2, 25.5 N
   Ans: (b) 1.88 m/s, 35.5 m/s^2, 35.5 N
   v= $2\pi\upsilon r = 2\pi$ x 3 x 0.1 = 1.88 m/s
   a= $4\pi^2\upsilon^2 r = 4\pi^2$ x 3^2x 0.1 = 35.5 m/s^2
   T= Centripetal force= ma = 1 x 35.5 = 35.5 N
4. A mass of 2 kg is moving with a string in a horizontal circular path with angular velocity 5 cycle/ min. Keeping the radius constant, tension in the string is doubled. Now, the angular velocity of the mass will be
   (a) 14 cycles/ min (b) 10 cycles/min
   (c) 2.25 cycles/min (d) 7 cycles/min
   Ans: (d) 7 cycles/min
   T= $mr\omega^2$
   $\omega \alpha \sqrt{T}$; $\frac{\omega_2}{\omega_1} = \sqrt{\frac{T_2}{T_1}}$
5. If μ_s is coefficient of static friction and μ_k is coefficient of kinetic friction, then
   (a) there is no relation between μ_s and μ_k (b) generally $\mu_s > \mu_k$
   (c) generally $\mu_s = \mu_k$ (d) generally $\mu_s < \mu_k$

Ans: (b) generally $\mu_s > \mu_k$

6. An iron block of sides 5 cm x 8 cm x 15 cm has to be pushed along the floor. The force required will be minimum when the surface in contact with ground is
   (a) 8 cm x 15 cm surface (b) 8 cm x 5 cm surface
   (c) 5 cm x 15 cm surface (d) the same force for all surfaces
   Ans: (d) the same force for all surfaces
7. A body of mass 2 kg is kept stationary by pressing to a vertical wall by a force of 100 N. The coefficient of friction between the wall and body is 0.3. Then the frictional force is equal to
   (a) 6 N (b) 20 N (c) 600 N (d) 700 N
   Ans: (b) 20 N



8. A force of 6 N acts on a body at rest and of mass 1 kg. During this time, the body attains a velocity of 30 m/s. The time for which the force acts on the body is
   (a) 7 s (b) 5 s (c) 10 s (d) 8 s
   Ans: (b) 5 s

$$F = \frac{\Delta P}{\Delta t} = \frac{m(V_2 - V_1)}{\Delta t}$$

$\Delta t = 1\,(30)/6 = 5$ s

9. A gun fires a bullet of mass 50 g with a velocity of 30 m/s. Because of this, the gun is pushed back with a velocity of 1 m/s. The mass of the gun is
   (a) 5.5 kg (b) 3.5 kg (c) 1.5 kg (d) 0.5 kg

   Ans: (c) 1.5 kg

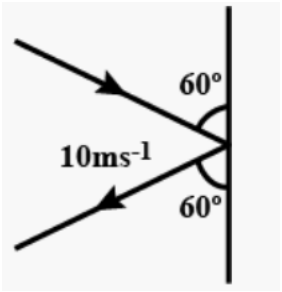
$$V = \frac{M_{bullet} u_{bullet}}{M_{gun}}$$

$$\therefore 1 = \frac{0.05 \times 30}{M_{gun}}$$

$$\Rightarrow M_{gun} = 1.5 \text{ kg}$$

10. A body of mass 3 kg hits a wall at an angle of 60^0 and returns at the same angle. The impact time was 0.2 s. The force exerted on the wall is
    (a) $150\sqrt{3}$ N (b) $50\sqrt{3}$ N
    (c) 100 N (d) $75\sqrt{3}$ N

    Ans: (a) $150\sqrt{3}$ N



Change in momentum along vertical direction

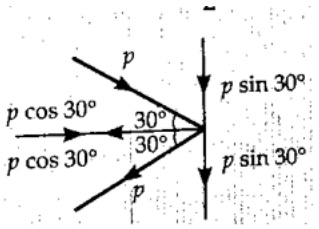
$= p\sin 30° - p\sin 30° = 0$

Change in momentum along horizontal direction

$= -p\cos 30° - p\cos 30°$

$= -2p\cos 30° = -2mv\cos 30°.$

$= -2 \times 3 \times 10 \times \frac{\sqrt{3}}{2} = -30\sqrt{3}$ kg ms^{-1}



Force= Change in momentum/ Time of impact

$= 30\sqrt{3}$ /0.2

For questions 11 to 15, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the options as given below.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
C. Assertion is true but Reason is false.
D. Both Assertion and Reason are false.

11. **Assertion:** It is difficult to move a cycle along the road with its breaks on.
Reason: Sliding friction is less than rolling friction.
Ans: C
12. **Assertion:** A body can be at rest even when it is under the action of any number of external forces.
Reason: Vector sum of all the external forces is zero.
Ans: A
13. **Assertion:** Centripetal force is always required for motion in a curved path.
Reason: On a banked curved track, vertical component of normal reaction provides the necessary centripetal force.
Ans: C
14. **Assertion:** A horse cannot run a cart in empty space.
Reason: A cart runs only on account of the reaction of the ground on the feet of the horse.
Ans: A
15. **Assertion:** Mass is a measure of inertia of the body in linear motion.
Reason: Greater the mass, greater is the force required to change its state of rest or of uniform motion.
Ans: A