INDIAN SCHOOL AL WADI AL KABIR

CLASS: XI	**DEPARTMENT: SCIENCE 2025 – 2026** **SUBJECT: PHYSICS**	**DATE: 11/08/2025**
WORKSHEET NO: 04	**TOPIC: LAWS OF MOTION**	**NOTE: A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

OBJECTIVE TYPE QUESTIONS [1 MARK]

1. A ball is travelling with uniform translatory motion. This means that
   a. It is at rest.
   b. The path can be a straight line or circular and the ball travels with uniform speed.
   c. All parts of the ball have the same velocity (magnitude and direction) and the velocity is constant.
   d. The centre of the ball moves with constant velocity and the ball spins about its centre uniformly.

2. A metre scale is moving with uniform velocity. This implies
   a. The force acting on the scale is zero, but a torque about the centre of mass can act on the scale.
   b. The force acting on the scale is zero and the torque acting about centre of mass of the scale is also zero.
   c. The total force acting on it need not be zero but the torque on it is zero.
   d. Neither the force nor the torque need to be zero.

3. Conservation of momentum in a collision between particles can be understood from
   a. Conservation of energy.
   b. Newton's first law only.
   c. Newton's second law only.
   d. Both Newton's second and third law.

4. The forces, which meet at one point but their lines of action do not lie in one plane

are called

a. Coplanar concurrent forces.
b. Coplanar non-concurrent forces.
c. Non coplanar concurrent forces.
d. non coplanar non concurrent forces.

5. In ordinary terrestrial experiments, the observer is in an inertial frame in the following cases
   a. A child revolving in a giant wheel.
   b. a driver in a sports car moving with a constant high speed on a straight road
   c. a pilot on an aeroplane, which is taking off
   d. a cyclist negotiating a sharp turn.

6. Rocket engines lift a rocket from the earth surface, because hot gases with high velocity
   a. Push against the air
   b. push against the earth
   c. react against the rocket and push it up
   d. heat up the air which lifts the rocket.

7. If two forces of equal magnitude act simultaneously on a body in the east and the north direction, then
   a. The body will get displaced in the north direction.
   b. The body will get displaced in the east direction.
   c. The body will get displaced in the north-east direction.
   d. The body will remain at rest.

8. The motion of the rocket is based on
   a. The principle of conservation of angular momentum.
   b. The principle of conservation of kinetic energy.
   c. The principle of conservation of mass.

d. The principle of conservation of linear momentum.

9. A person is standing in an elevator. In which situation he finds himself weightless

   a. When the elevator moves upwards with constant acceleration.

   b. When the elevator moves upwards with constant velocity.

   c. When the elevator moves downward with acceleration due to gravity.

   d. When the elevator moves downward with constant velocity.

10. Which of the following is a non- conservative force?

   a. Interatomic force

   b. Gravitational force

   c. Electrostatic force

   d. Viscous for

Read the Assertion and Reason carefully to mark the correct option out of the options given
below :
(a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
(b) If both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
(c) If Assertion is true but Reason is false.
(d) If the Assertion and Reason both are false.

11. **Assertion :** Inertia is the property by virtue of which the body is unable to change by itself the state of rest only.
Reason : The bodies do not change their state unless acted upon by an unbalanced external force.
12. **Assertion :** If the net external force on the body is zero, then its acceleration is zero.
Reason : Acceleration does not depend on force.

SHORT ANSWER QUESTIONS [2 MARKS]

13. Two billiard balls each of mass 0.05kg moving in opposite directions with speed 6m/s collide and rebound with the same speed. What is the impulse imparted to each ball due to other?

14. A bullet mass 10gm is fired from a gun of mass 8kg with a velocity 160m/s. Find the

velocity of recoil of the gun.

15.Show that if the force acting on a particle is zero, its momentum will remain unchanged.

16.Why the wheels of the vehicles are provided with mudguards?

17.Why are the wheels of the automobiles made circular?

18.A bullet of mass 0.01kg moving with a velocity 100m/s strikes a wooden plank of thickness 0.5 m, emerges with a velocity 30m/s. Find the resistance offered by the plank, assuming it to be uniform.

19.Force of 16N and 12N are acting on a mass of 200kg in mutually perpendicular directions. Find the magnitude of the acceleration produced?

SHORT ANSWER QUESTIONS[3 MARKS]

20.A horizontal force of 500N pulls 2 masses 10kgand 20kg [lying on a frictionless table] connected by a light string. What is the tension in the string? Does the answer depend on which mass the pull is being applied?

21.A jet of water issuing horizontally at the rate of 10kg/s strikes a vertical wall with a velocity of 10m/s and rebounds with half the original velocity. what is the force exerted on the wall?

22. A car of mass 1500kg is moving with a speed of 12.5m/s on a circular path of radius 20m on a level road. What should be the frictional force between the car and the road so that the car does not slip? What should be the value of the coefficient of friction to attain this force?

23.A circular race track of radius 300m is banked at an angle of 15°. If the coefficient of friction between the wheels of a race car and the road is 0.2, what is the

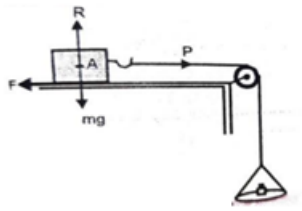
(i) Optimum speed of the race car to avoid wear and tear on its tyres

(ii) Maximum permissible speed to avoid slipping?

24.What is impulse and show that impulse = change in momentum.

CASE STUDY [4 MARKS]

25. To verify the laws of limiting friction, We take a wooden block A of weight 2N. This block is placed on a horizontal table provided with a frictionless pulley on one side. One end of a string is attached to the hook of the block. The string is then passed over the pulley and a pan is attached to the free end of the string. Any number of weights can be added to the pan. We added the weight one by one like 4N,8N and 10N ,14N --- and when the weight added is 10N, the body just begins to move.



[i] Laws of friction states that
[a] limiting friction is neither created nor destroyed [b] limiting friction is directly proportional to normal reaction [c] friction is inversely proportional to normal reaction[d] limiting friction does not depends on normal reaction
[ii] In the above experiment, what is the magnitude of limiting friction ?
[a] 8N [b] 10N [c] 14N [d] 4N

[iv]A body of mass 50kg is kept on a horizontal surface of coefficient of static friction 0.5. Find the least horizontal force required to just start the motion.[g = 10 $\frac{m}{s^2}$]
[a] 210N [b] 198 N [c] 250N [d] 225N

[v] Which one is easier ? To pull a lawn mover or to push a lawn mover by applying same force 'F' in both the cases.
[a] pull , because the frictional force acting is μ{ mg- FsinΘ}
[b] pull , because the frictional force acting is μ FcosΘ
[c] push , because the frictional force acting is μ mg
[d] push , because the frictional force acting is μ R

LONG ANSWER QUESTIONS 5 MARKS]

26.Derive an expression for the maximum velocity of a vehicle while taking a curve of radius 'r'[i] on a level road [ii] on a banked road

27.It is easier to push an object than to pull. Explain with the help of a diagram
28.State and prove the law of conservation of momentum

29. A bullet of mass 0.01 kg is fired horizontally into a 4kg wooden block at rest on a horizontal surface. The coefficient of the kinetic friction between the block and the surface is 0.25. The bullet gets embedded in the block and the combination moves 20m before coming to rest. With what speed did the bullet strike the block?

ANSWERS

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1.[c]
2.[b]
3.[d]
4.[c]
5.[b]
6.[c]
7.[c]
8.[d]
9.[c]
10.[d]
11. [e]

12 [c]

13. (Ans: - Impulse = change in momentum = mv-mu = -mv-[-mu]

Impulse = 0.6 kg m/s)

14. . (Ans. V = - m x v/M = -0.01x 160/8 = -0.2m/s)

15. REFER NOTES

16. REFER NOTES

17. REFER NOTES

18. $v^2 - u^2/2s$ Ans-91N]

19.F1 =16N and F2 = 12N ,m = 200kg, θ = 90

F = ma

And

$F = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$, $a = 0.1 m/s^2$)

20. a = 50/3 m/s^2

For 20kg mass,

500 -T = 20 x50/3

Or T = 166.7N

For 20 kg,

500-T = 10 x 50/3

Or T = 333.3N

21. m=10kg, t=1s, u=10m/s,v=-5m/s

F = m[v-u]/t

F =150N

22.Frictional force = centripetal force.

$mv^2/r = \mu mg$

μ =0.8

23. optimum speed , V = $\sqrt{rgtan\theta}$

V = $\sqrt{789}$ = 28.1 m/s

V = $\sqrt{\frac{rg[\mu_s + tan\theta\}}{1 - \mu_s Tan\theta}}$

V = 38.1m/s

[24] REFER NOTES

[25] [i] [b] limiting friction is directly proportional to normal reaction

[ii] [b] 10N
[iii] [c] 250N
[iv] [a] pull , because the frictional force acting is μ{ mg- FsinΘ}
[26] REFER NOTES

[27] REFER NOTES

[28] REFER NOTES

$f_k = \mu_k \cdot N$

where N is the normal force. Since the system is on a horizontal surface, $N = (M + m)g$, where $g \approx 10\,\text{m/s}^2$.

Calculating N:

$N = (4\,\text{kg} + 0.01\,\text{kg}) \cdot 10\,\text{m/s}^2 = 40.1\,\text{N}$

Now, calculating f_k:

[29] $f_k = 0.25 \cdot 40.1\,\text{N} = 10.025\,\text{N}$

$$f_k = (M + m)a \implies a = \frac{f_k}{M + m}$$

Substituting the values:

$$a = \frac{10.025\,\text{N}}{4.01\,\text{kg}} \approx 2.5\,\text{m/s}^2$$

$v^2 = u^2 + 2as$

Here, $u = 0$ (initial speed before coming to rest), $a = -2.5\,\text{m/s}^2$ (retardation), and $s = 20\,\text{m}$

$0 = v^2 - 2 \cdot 2.5 \cdot 20$

$v^2 = 100 \implies v = 10\,\text{m/s}$

$m \cdot u = (M + m) \cdot v$

Substituting the known values:

$0.01 \cdot u = (4 + 0.01) \cdot 10$

$$0.01 \cdot u = 40.1 \implies u = \frac{40.1}{0.01} = 4010\,\text{m/s}$$

Hint- Find normal reaction R = Mg, F = μR, FS = 1/2mv^2, v = 198.24m/s)

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