CBSE

LAWS OF MOTION WS 5

Class 11 - Physics

Section A

1. If the normal force is doubled, then the coefficient of friction is **[1]**

   a) not changed
   b) doubled
   c) tripled
   d) halved

2. **Assertion (A):** A rocket moves forward by pushing the surrounding air backwards. **[1]**
   Reason (R): It derives the necessary thrust to move forward, according to Newton's third law of motion.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

3. **Assertion (A):** Two teams having a tug-of-war always pull equally hard on one another. **[1]**
   Reason (R): The team, that pushes harder against the ground, in a tug-of-war, wins.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

4. **Assertion (A):** Action and Reaction forces do not cancel out each other. **[1]**
   Reason (R): It is because both do not act on the same body.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

5. **Assertion (A):** Force of action and reaction do not cancel each other. **[1]**
   Reason (R): Forces of action and reaction are equal in magnitude and opposite in direction.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

6. **Assertion:** Pseudo force is an imaginary force which is recognized only by a non-inertial observer to explain the physical situation according to Newton’s laws. **[1]**
   Reason: Pseudo force has no physical origin, that is it is not caused by one of the basic interactions in nature. It does not exist in the action- reaction pair.

   a) If both assertion and reason are true and reason is the correct explanation of assertion.
   b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.
d) If both assertion and reason are false.

7. **Assertion (A):** Pulling a lawn roller is easier than pushing it. **[1]**
Reason (R): Pushing increases the apparent weight and hence friction.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

8. **Assertion:** A cloth covers a table, some dishes are kept on it, the cloth can be pulled out without dislodging the dishes from the table. **[1]**
Reason: For every action, there is an equal and opposite reaction.

a) If both assertion and reason are true and the reason is the correct explanation of assertion.
b) If both assertion and reason are true but the reason is not the correct explanation of assertion.
c) If the assertion is true but the reason is false.
d) If both assertion and reason are false.

9. **Assertion (A):** A player lowers his hands while catching a cricket ball. **[1]**
Reason (R): The time of catch increases when cricketer lowers its hand while catching a ball.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

10. **Assertion (A):** Newton's third law of motion is applicable only when bodies are in motion. **[1]**
Reason (R): Newton's third law applies to all types of forces, e.g., gravitational, electric or magnetic forces, etc.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

11. **Assertion (A):** According to Newton's third law of motion to every action, there is always an equal and opposite reaction. **[1]**
Reason (R): Forces always occur in pairs.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

12. **Assertion (A):** Aeroplanes always fly at low altitudes. **[1]**
Reason (R): According to Newton’s Illrd law of motion, for every action, there is an equal and opposite reaction.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

13. **Assertion (A):** Pseudo force is an imaginary force that is recognized only by a non-inertial observer to explain the physical situation according to Newton's laws. **[1]**

Reason (R): Pseudo force has no physical origin, i.e., it is not caused by one of the basic interactions in nature. It does not exist in the action-reaction pair.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

14. **Assertion (A):** In order to swim, a person pushes the water backward. **[1]**
Reason (R): To every action, there is an equal and opposite reaction.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

15. **Fill in the blanks:** **[1]**
(a) Action and reaction always act on two _____ bodies. **[1]**

16. Will the momentum remain conserved if some external force acts on the system? **[1]**

17. Can a sailboat be propelled by air blown at the sails from a fan attached to the boat? **[1]**

18. A brick can be pushed gently on the smooth floor by applying force with our foot. But if we kick the brick, the foot is hurt. Why? **[1]**

19. How does friction help us in walking? **[1]**

20. A 30 g bullet leaves a rifle with a velocity of 300 ms^{-1} and the rifle recoils with a velocity of 0.60 ms^{-1}. Find the mass of the rifle. **[1]**

21. It is easier to roll a barrel than to pull it along the road. Why? **[1]**

22. A force of 49 N is just sufficient to pull a block of wood weighing 10 kg on a rough horizontal surface. Calculate the coefficient of friction and angle of friction. **[1]**

23. A passenger sitting in a carriage at rest pushes it from within. Will the carriage move? **[1]**

24. Explain how the use of parachute helps a person jumping from an aeroplane. **[1]**

25. Why does a heavy rifle not kick as strongly as a light rifle using the same cartridge? **[1]**

26. A machine gun has a mass of 20 kg. It fires 30 g bullets at the rate of 400 bullets per second with a speed of 400 ms^{-1}. What force must be applied to the gun to keep it in position? **[1]**

Section B

27. Explain why a horse cannot pull a cart and run in empty space? **[2]**

28. A hammer weighing 1 kg moving with the speed of 10 ms^{-1} strikes the head of a nail driving it 10 cm into a wall. Neglecting the mass of the nail, calculate **[2]**

i. the acceleration during impact
ii. the time interval of the impact and
iii. the impulse.

Section C

29. **State True or False:** **[4]**
(a) Action and reaction acts on the same body. **[1]**
(b) A rocket moves forward by pushing the surrounding air backward. **[1]**
(c) Action and reaction are equal and opposite. They cannot cancel each other. **[1]**
(d) The action and reaction always occur simultaneously to provide equilibrium of the body. **[1]**

Section D

30. a. State three basic laws of motion. Show that the first law of motion gives the definition of force and the second law of motion gives the measure of force. **[5]**

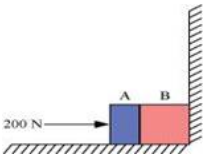
b. A truck starts from rest and accelerates uniformly at 2.0 ms^{-2}. At t = 10 s, a stone is dropped by a person standing on the top of the truck (the height of the top of the truck is 6 m from the ground). What are the magnitudes and directions of velocity, and acceleration of the stone at t = 11 s? (Neglect air resistance.)

31. Two bodies A and B of masses 5 kg and 10 kg in contact with each other rest on a table against a rigid wall. The coefficient of static friction, μ_s between the bodies and the table is 0.15. A force of 200 N is applied horizontally to A. What are **[5]**

a. the reaction of the partition

b. the action-reaction forces between A and B?

What happens when the wall is removed? Does the answer to (b) change, when the bodies are in motion? Ignore the difference between μ_s and μ_k.(Given, g = 10 m/s^2)



32. Why does a gun recoil on firing? What is recoil velocity? Find an expression for it. **[5]**

33. a. A person of mass m is standing in a lift. Find his apparent weight when the lift is: **[5]**

i. moving upward with uniform acceleration a.

ii. moving downward with uniform acceleration a(< g).

iii. falls freely.

b. Explain why, it is easier to pull a lawn mover than to push it.