SCIENCE

PWORKSHEET_051226

CHAPTER 05 EXPLORING FORCES

(ANSWERS)

SUBJECT: SCIENCE **MAX. MARKS : 40**

CLASS : VIII **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). **Use of Calculators is not permitted**

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. A football player kicks a stationary ball, and it begins to move. Which of the following effects of force is best demonstrated in this scenario?

(a) Change in shape of an object (b) Change in speed of an object

(c) Making an object move from rest (d) Both (b) and (c)

Ans. (d) Both (b) and (c)

The act of "making an object move from rest" (c) is a specific case of a "change in speed of an object" (b). Since both are direct and immediate effects of the force, the combined option is the most accurate description of what the force achieved.

2. A person is trying to push a heavy stone but the stone does not move. Which statement best describes the forces acting on the stone?

(a) The applied muscular force is greater than the force of friction.

(b) The applied muscular force is balanced by the force of friction.

(c) There is no force of friction acting on the stone.

(d) The stone has no weight, so it doesn't move.

Ans. (b) The applied muscular force is balanced by the force of friction.

According to Newton's First Law, an object at rest will remain at rest unless acted upon by a net (unbalanced) force.

The person applies a muscular force in one direction.

Since the stone does not move, the net force must be zero. This means the force of friction exerted by the ground on the stone must be equal in magnitude and opposite in direction to the applied muscular force, thus balancing it.

3. A boy is playing with a plastic scale. He rubs the scale vigorously with a polythene sheet and then holds it near some small pieces of paper. The paper pieces are attracted to the scale. This demonstrates a force that acts:

(a) with direct physical contact. (b) without any physical contact.

(c) only when both objects are charged. (d) only when both objects are uncharged.

Ans. (b) without any physical contact.

Rubbing the scale creates static electricity, giving the scale an electric charge.

The attraction of the paper pieces by the charged scale is due to the electrostatic force.

This force, like magnetic force and gravitational force, is a non-contact force; it acts over a distance, meaning the objects do not need to physically touch for the force to be exerted.

4. A cyclist stops pedalling on a flat, smooth road. Which of the following statements correctly explains why the bicycle eventually comes to a stop?
(a) The cyclist is no longer applying muscular force.
(b) The gravitational force pulls the bicycle down.
(c) The force of friction between the tyres and the road opposes the motion.
(d) The air resistance is the only force acting on the bicycle.
Ans. (c) The force of friction between the tyres and the road opposes the motion.
When the cyclist stops applying the forward muscular force, the bicycle slows down and stops due to external opposing forces.
The primary forces resisting the motion on a flat road are the force of friction (between the tyres and the road, and internal to the moving parts) and air resistance.
Since the force of friction always acts in the direction opposite to the motion, it causes the bicycle's speed to decrease until it halts.

5. The weight of an object is 10 N on Earth. What is the approximate weight of the same object on the Moon?
(a) 10 N (b) 1.6 N (c) 3.8 N (d) 9 N
Ans. (b) 1.6 N
Weight is the force of gravity ($W = m \times g$). The mass (m) of the object remains constant everywhere, but the acceleration due to gravity (g) is different.

6. Which of the following describes the nature of electrostatic force?
(a) Always attractive and non-contact. (b) Always repulsive and non-contact.
(c) Attractive or repulsive and non-contact. (d) Attractive or repulsive and a contact force.
Ans. (c) Attractive or repulsive and non-contact.
Electrostatic force is the force between charged particles or objects.
Non-Contact: It acts over a distance (like in Question 3).
Attractive or Repulsive: The nature of the force depends on the charges:
Like charges (e.g., positive-positive) repel.
Unlike charges (e.g., positive-negative) attract.

7. A spring balance is used to measure the force with which the Earth pulls an object towards itself. What is this force called?
(a) Mass (b) Density (c) Weight (d) Gravity
Ans. (c) Weight
Gravity is the phenomenon (the force of attraction) between any two masses.
Weight is the specific force that the Earth's gravity exerts on a given object's mass.
A spring balance measures the force exerted on the spring's hook. When an object is hung, the balance measures the downward force with which the Earth pulls the object, which is the definition of the object's weight.

8. A book is lying on a table. According to the concepts of force, which statement is true?
(a) No forces are acting on the book.
(b) Only the gravitational force is acting on the book.
(c) The forces acting on the book are balancing one another.
(d) The book has a push force applied to it.
Ans. (c) The forces acting on the book are balancing one another.
Since the book is stationary (not moving or accelerating), the net force acting on it must be zero (Newton's First Law).
There are two main forces acting:

1. The gravitational force (weight) pulling the book down.
2. The Normal force (the table pushing back) acting up.

These two forces are equal in magnitude and opposite in direction, meaning they are balanced, resulting in no net force and no movement.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(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.

9. **Assertion (A):** The SI unit of both force and weight is Newton (N).
Reason (R): Weight is defined as the force with which the Earth pulls an object towards itself.
Ans. (a) Both A and R are true and R is the correct explanation of A.
Assertion (A): True. Both force and weight are physical quantities that are measured in **Newtons (N)**, the SI unit of force.
Reason (R): True. The definition of weight is the force due to gravity ($W=m\times g$).
Relationship: Because weight **is** a force, it must share the same unit as force. Thus, the reason (R) correctly explains why the assertion (A) is true.

10. **Assertion (A):** The force of friction always acts in the direction opposite to the direction of motion of an object.
Reason (R): Friction arises due to the irregularities in the two surfaces that are in contact.
Ans. (a) Both A and R are true and R is the correct explanation of A.
Assertion (A): True. Friction is, by definition, the force that **opposes** motion or attempted motion between two surfaces in contact.
Reason (R): True. Friction arises because all surfaces, even those that look smooth, have microscopic **irregularities** (roughness). When surfaces are pressed together, these irregularities interlock, creating resistance.
Relationship: The microscopic interlocking of surface irregularities (R) is the fundamental cause for the resulting force that acts to oppose the motion (A). Therefore, the reason (R) provides the correct explanation for the assertion (A).

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Why do objects moving through liquids and gases need a specific shape to reduce the force of friction?
Ans. Objects moving through liquids and gases, like aeroplanes and ships, are designed with specific shapes to reduce the force of friction (or drag) that is exerted by the air or water around them.

12. Explain how a spring balance works to measure the weight of an object.
Ans. A spring balance has a scale marked in newtons (N). When an object is hung from its hook, the spring inside stretches due to the gravitational force (weight) acting on the object. The amount of stretching is proportional to the object's weight, which is then indicated on the scale.

13. Differentiate between a contact force and a non-contact force with one example each from the chapter.
Ans. A contact force is a force that acts only when there is physical contact between the objects. An example is muscular force, which is applied when a person pushes a box. A non-contact force is a force whose effect can be experienced even when the objects are not in contact. An example is magnetic force, where a magnet can attract an iron object without touching it.

14. What are the two types of static charges, and what is the rule of attraction and repulsion between them?
Ans. The two types of static charges are positive and negative. The rule of attraction and repulsion is: similar (like) charges repel each other, while opposite (unlike) charges attract each other.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Describe three different effects that a force can have on an object. Provide a specific example for each effect from daily life as mentioned in the chapter.
Ans. Effects of a force:
Making an object move from rest: A person pushes a stationary cardboard box, and it starts moving.
Changing the direction of motion: A fielder stops a moving ball, or a person hits a moving ball with a bat, changing its direction.
Changing the shape of an object: Pressing an inflated balloon causes it to change shape.

16. Explain how friction is both a necessity and a problem. Give one example for each.
Ans. **Necessity:** Friction is necessary in many situations. For example, it helps us walk without slipping on the ground. It is also the reason a ball rolling on the ground eventually stops, or a bicycle comes to a stop after we stop pedalling.
Problem: Friction can be a problem as it opposes motion and causes things to slow down. The irregularities of surfaces in contact create this force. It is why a bicycle on a rough road stops sooner than on a smooth road, requiring more effort to maintain speed.

17. Explain the concept of gravitational force. Is it an attractive or repulsive force? What is the special name for the gravitational force exerted by the Earth?
Ans. Gravitational force is the force with which the Earth attracts objects towards itself. It is always an attractive force. The gravitational force exerted by the Earth is also called the force of gravity or simply gravity. Since it acts without physical contact, it is a non-contact force.

SECTION – D

Questions 18 carry 5 marks each.

18. A boy is playing with a toy car on a carpeted floor. He gives it a push, and the car moves a short distance before stopping. He then takes the same car to a polished wooden floor, gives it an identical push, and finds that it moves a much longer distance. Explain these observations in detail, defining the force responsible for the change in motion. Also, explain what causes this force to be greater on one surface compared to the other.
Ans. The boy's observations are explained by the force of friction. Friction is a contact force that comes into play when an object moves or tries to move over another surface. It always acts in a direction opposite to the direction of motion. When the toy car is pushed, the force of friction between its wheels and the floor opposes its movement.

The force of friction is greater on the carpeted floor than on the polished wooden floor. This is because friction arises due to the minute irregularities present in the two surfaces in contact. When the surfaces are in contact, these irregularities lock into each other, and an effort is required to move one surface over the other. A carpet is a much rougher surface than a polished wooden floor, meaning it has a greater number of irregularities. This causes a stronger interlocking effect, resulting in a greater force of friction that slows down the car more quickly, making it travel a shorter distance. Conversely, the polished wooden floor is smoother, with fewer irregularities, leading to a smaller force of friction and allowing the car to travel a longer distance.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case Study-1:
During a school fair, a group of students sets up a game stall. They have two trolleys, one made of wood and the other of plastic, both of the same size. The game involves players pushing a trolley over a rough surface to see how far it goes. A student, Rahul, observes that despite applying the

same amount of force, the wooden trolley moves a shorter distance than the plastic one. Puzzled, he asks his teacher for an explanation. The teacher explains that the interaction between the two surfaces is causing a force that opposes the motion. This force is different for each trolley, which is why they travel different distances.

(i) What is the name of the force that opposes the motion of the trolleys? [1]
(ii) Is this a contact force or a non-contact force? [1]
(iii) Which trolley experiences a greater force opposing its motion? [1]
(iv) Based on the information, what can be inferred about the irregularities of the surfaces of the two trolleys? [1]
Ans. (i) The force that opposes the motion of the trolleys is the force of friction.
(ii) This is a contact force because it arises due to the physical contact between the surfaces of the trolleys and the ground.
(iii) The wooden trolley experiences a greater force opposing its motion, as it travels a shorter distance, indicating that a stronger frictional force acted upon it.
(iv) It can be inferred that the surface of the wooden trolley has more irregularities, making it rougher, than the surface of the plastic trolley. This results in a greater force of friction acting on the wooden trolley.

20. Case Study-2:

An astrophysicist is studying the gravitational pull of different celestial bodies. She has a 1 kg object that she is planning to send to various planets in our solar system. She calculates the weight of the object on Earth to be 10 N. She then projects its weight on the Moon, Mars, and Venus. To her surprise, the object's weight is different on each celestial body, even though the amount of matter in the object remains constant throughout the journey. The astrophysicist concludes that the gravitational force of each planet is unique and that the weight of an object is a direct measure of this force.

(i) What is the fundamental difference between mass and weight? [1]

(ii) If the weight of the 1 kg object on Mars is 3.8 N, what can you infer about the gravitational pull of Mars compared to Earth? [1]
(iii) Does the mass of the object change as it travels from Earth to Venus? Justify your answer. [1]
(iv) Why is the SI unit of weight also Newton? [1]
Ans. (i) Mass is the amount of matter in an object, and its value remains the same at every place. Weight is the gravitational force with which a planet (like Earth) pulls an object, and its value can change from place to place.
(ii) Since the weight of the object on Mars (3.8 N) is less than its weight on Earth (10 N), it can be inferred that the gravitational pull of Mars is weaker than that of Earth.
(iii) No, the mass of the object does not change. Mass is a measure of the amount of matter, which is constant. Only the weight of the object, which is the force of gravity, changes because the gravitational pull of different planets is different.
(iv) Weight is defined as the force with which the Earth pulls an object towards itself. Since weight is a type of force, it is measured in the same SI unit as force, which is the Newton (N).