WORKSHEET 2

A. Tick (✓) the correct option.

1. Two objects of different masses falling freely, near the surface of earth, will
   - a. fall with a constant velocity.
   - b. fall with a constant acceleration.
   - c. experience force of same magnitude.
   - d. undergo a change in their inertia.

2. Which of the following is not the equation of motion for a freely falling body?
   - a. $h = ut + \dfrac{1}{2} gt^2$
   - b. $u = v + gt$
   - c. $v = u + gt$
   - d. $v^2 = u^2 + 2gh$

3. What is the weight of a body whose mass is 10 kg? (Take $g = 10$ m/s^2)
   - a. 10 kg
   - b. 100 N
   - c. 10 N
   - d. 50 N

4. The mass of the object on the earth is 60 kg. What will be the mass of the same object on the moon?
   - a. 30 kg
   - b. 10 kg
   - c. 60 kg
   - d. 120 kg

5. The weight of a body on the earth is 240 N. The weight of the same body on the moon will be
   - a. 240 N.
   - b. 120 N.
   - c. 40 N.
   - d. Zero.

B. Fill in the blanks.

1. The force which is needed to make an object travel in a circular path is called _____ force.

2. Whenever objects fall towards the earth only under the gravitational force of earth, the objects are said in the state of _____

3. The quantity of matter contained in a body is called its _____

4. The _____ of a body is the force with which it is attracted towards the centre of the earth.

5. The weight of a body is measured by a _____ balance.

C. State whether the following statements are true or false.

1. Mass is a scalar quantity.

2. When a body is thrown vertically upwards its initial velocity, u becomes zero.

3. Greater is the mass of a body, lesser is its inertia.

4. The weight of a body is not constant and changes from place to place.

5. Acceleration produced in a body moving along a straight line is equal to acceleration due to gravity.

D. Match the following.

1. When a body is thrown vertically upwards its final velocity — when a body is thrown vertically upwards.

2. When a body is dropped from a certain height, its initial velocity, — is equal to the time it takes to fall from the same height.

3. g is taken as negative — becomes zero.

4. g is taken as positive — when a body is dropped from a certain height.

5. Time taken by a body to reach the highest point — is taken as zero.

Name: ....   Teacher's signature: ....

Class: .... IX ....   Date: ....

E. Answer the following questions.

Very short answer questions

1. Define the term acceleration due to gravity.

2. Define gravitation.

Short answer questions

1. Calculate the acceleration due to gravity on the surface of the moon (mass of the moon = 7.4×10^{22} kg, radius of the moon = 1.74×10^{6} m).

2. Write any two differences between gravitation and gravity.

Long answer questions

1. An object weighs 294 N on the earth. **a.** What would be its mass on the moon? **b.** What is the acceleration due to gravity on the moon?

2. Differentiate between mass and weight.

ANSWERS

WORKSHEET 2

A. Tick (✓) the correct option.

1. b   2. b   3. b   4. c   5. c

B. Fill in the blanks.

1. centripetal   2. free fall   3. mass   4. weight   5. spring

C. State whether the following statements are true or false.

1. T   2. T   3. F   4. T   5. T

D. Match the following.

1. When a body is thrown vertically upwards its final velocity   becomes zero.
2. When a body is dropped from a certain height, its initial velocity,   is taken as zero.
3. *g* is taken as negative   when a body is thrown vertically upwards.
4. *g* is taken as positive   when a body is dropped from a certain height.
5. Time taken by a body to reach the highest point   is equal to the time it takes to fall from the same height.

E. Answer the following questions.

Very short answer questions

1. The uniform acceleration produced in a body when it falls freely under the effect of gravity alone is known as acceleration due to gravity.
2. Any two particles (or objects) in the universe attract each other by a force called gravitational force. The phenomenon of attraction between different bodies in the universe is called gravitation.

Short answer questions

1.

Mass of the moon, $M = 7.4 \times 10^{22}$ kg

Radius of the moon, $R = 1.74 \times 10^6$ m

Gravitational constant, $G = 6.67 \times 10^{-11}$ N m^2/kg^2

We know, acceleration due to gravity, $g = \boxed{\dfrac{G \times M}{R^2}}$

Putting these values of *G*, *M* and *R* in the above equation, we get

$$g = \frac{6.67 \times 10^{-11} \text{N m}^2/\text{kg}^2 \times 7.4 \times 10^{22} \text{ kg}}{(1.74 \times 10^6 \text{ m})}$$

$$g = 1.63 \text{ m/s}^2$$

The value of acceleration due to gravity on the moon is 1.63 m/s^2.

2.

Parameter	Gravitation	Gravity
Definition	Any two objects in the universe attract each other with a force called gravitation.	It is a special case of gravitation in which one of the two bodies happens to be the earth (extremely large mass body). The force of gravitation exerted by the earth is called gravity.
Magnitude of force	Forces involved are very small.	Forces involved are large.

Long answer questions

1. a. Weight of the object on the earth, $\quad\quad\quad W_e = 294$ N

   Mass of the object on the earth, $\quad\quad\quad\quad m_e = ?$ $\quad\quad\quad\quad\quad\quad\quad\quad$ (to be calculated)

   Acceleration due to gravity, on the earth $\quad g_e = 9.8$ m/s^2

   We know, $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ $\boxed{W_e = m_e \times g_e}$

   By putting the values of the given physical quantities in the above formula, we get

   $$294 \text{ N} = m_e \times 9.8 \text{ m/s}^2$$

   $$m_e = \frac{294 \text{ N}}{9.8 \text{ m/s}} = 30 \text{ kg}$$

   Thus, the mass of the object on the earth is 30 kg. We know the mass of a body remains constant everywhere in the universe. So, the mass of the object will be 30 kg on the surface of moon.

   b. Now, to find acceleration due to gravity on the moon, we have to find the weight of the body on the moon.

   We know, $\quad$ $\boxed{\text{weight of an object on the moon} = \left(\frac{1}{6}\right) \times \text{its weight on the earth}}$

   $$W_m = \frac{1}{6} \times 294 \text{ N}$$

   $$W_m = 49 \text{ N}$$

   Using the formula, $\quad\quad\quad\quad\quad\quad\quad W_m = m_m \times g_m$

   $$49 \text{ N} = 30 \text{ kg} \times g_m$$

   $$g_m = \frac{49 \text{ N}}{30 \text{ kg}} = 1.63 \text{ m/s}^2$$

   Thus, the acceleration due to gravity on the moon is 1.63 m/s^2.

2.

Parameter	Mass	Weight
1. Definition	The mass of a body is the quantity of matter contained in it.	The weight of a body is the force with which it is attracted towards the centre of the earth.
2. Physical quantity	It is a scalar quantity.	It is a vector quantity.
3. Measurement	The mass of a body is measured by a physical balance.	The weight of a body is measured by a spring balance.
4. SI unit	The SI unit of mass is kg.	The SI unit of weight is newton (N).
5. Variation in value	The mass of a body is constant and does not change from place to place.	The weight of a body is not constant and changes from place to place.
6. Zero value	The mass of a body cannot be zero at any place.	The weight of a body becomes zero when it is taken to the centre of the earth.
7. Nature	Mass is a measure of a body's inertia.	The weight of a body is the gravitational force.