	INDIAN SCHOOL AL WADI AL KABIR	
Class: IX	**DEPARTMENT OF SCIENCE -2025-26** **SUBJECT: PHYSICS**	**Date: 07/11/2025**
Worksheet No: 3 **With answers**	**Topic: GRAVITATION**	**Note: A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

I. OBJECTIVE TYPE QUESTIONS (1 MARK)

1. Which of the following statements is true of the value of acceleration due to gravity?

   a) The value is the same on the equator and poles
   b) The value is least on the pole
   c) The value is least on the equator
   d) The value increases from pole to equator

2. The law of gravitation describes the gravitational force between
   a) Any two bodies having mass
   b) Earth and point mass only
   c) Earth and Sun only
   d) Two charged bodies only

3. The Earth's atmosphere is held by the
   a) Wind
   b) Clouds
   c) Earth's magnetic field
   d) Gravity

4. Which of the following factors does the acceleration due to gravity on the Earth depend upon?

   a) Mass of the Body
   b) Mass of the Earth
   c) The volume of the Body
   d) Shape and Size of the Body

5. The weight of an object on the Moon's surface is

   a) 1/3 rd of the weight on Earth
   b) 1/5 th of the weight on Earth
   c) 1/6 th of the weight on Earth
   d) 1/2 nd of the weight on Earth

6.The acceleration due to gravity of the Earth increases with
   a) decrease in the height from the surface of the Earth

b) an increase in the height from the surface of the Earth.
c) increase in the depth from the surface of the Earth.
d) increase in the temperature of the Earth.

7. The weight of an object at the centre of the Earth of radius R is (NCERT Exemplar)
   a) zero
   b) infinite
   c) R times the weight at the surface of the Earth
   d) $1/R^2$ times the weight at the surface of the Earth
8. The ball is thrown up, the value of 'g' will be
   a) Zero
   b) positive
   c) negative
   d) negligible
9. The gravitational force between two objects is F. If the masses of both objects are halved without altering the distance between them, then the gravitational force would become
   a) F/4
   b) F/2
   c) F
   d) 2F
10. In the relation $F = GM\ m/r^2$, the quantity G
    a) depends on the value of g at the place of observation
    b) is used only when the Earth is one of the two masses
    c) is greatest at the surface of the Earth
    d) is a universal constant of nature
11. The SI unit of G
    a) $N\ m^2\ kg^{-2}$
    b) N m
    c) N kg
    d) k gm/s
12. The mass of the body on the moon is 40kg. What is the weight on the Earth?
    a) 240kg
    b) 392N
    c) 240N
    d) 400kg
13. What are the units of relative density?
    a) kg/m^3
    b) g/cm^3
    c) g/m^3
    d) no units
14. The gravitational force causes
    a) Tides
    b) Motion of the moon
    c) None of them
    d) Both a and b

ASSERTION REASON TYPE QUESTIONS

Directions: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer:

(a) Both assertion and reason are true, and reason is the correct explanation of the assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of the assertion.
(c) Assertion is true, but reason is false.
(d) Both Assertion and Reason are false.

15. **Assertion:** Universal gravitational constant G is a scalar quantity.
Reason: The value of G is the same throughout the universe.
16. **Assertion:** When the distance between two bodies is doubled and also mass of each body is doubled, then the gravitational force between them remains the same.
Reason: According to Newton's law of gravitation, the product of force is directly proportional to the product mass of bodies and inversely proportional to the square of the distance between them.

II. SHORT ANSWER QUESTIONS (2 MARKS)

17. Who formulated the universal law of gravitation?
18. What is freefall?
19. If the mass of a body is 9.8 kg on Earth, what would be its mass on the Moon?
20. What keeps the moon in uniform circular motion around the Earth?
21. When a body is dropped from a height, what is its initial velocity?
22. Suppose that the radius of the Earth becomes twice its original radius without any change in its mass. Then what will happen to your weight?
23. Amit buys a few grams of gold at the poles as per the instructions of one of his friends. He hands over the same when he meets him at the equator. Will the friend agree with the weight of the gold bought? If not, why?
24. State any two natural phenomena explained by the universal law of Gravitation.

III. SHORT ANSWER QUESTIONS (3 MARKS)

25. A stone is dropped from the top of a 40 m high tower. Calculate its speed after 2 s. Also, find the speed with which the stone strikes the ground.
26. The earth attracts an apple. Does the apple also attract the earth? If it does, why does the Earth not move towards the apple?
27. Give three differences between acceleration due to gravity (g) and the universal gravitational constant (G).
28. The Weight of the body at a certain place is 30 N. The acceleration due to gravity at that point is 10 m/s^2. Find out the mass and weight of the object at the place where the acceleration due to gravity is zero?

IV. LONG ANSWER TYPE QUESTIONS (5 MARKS)

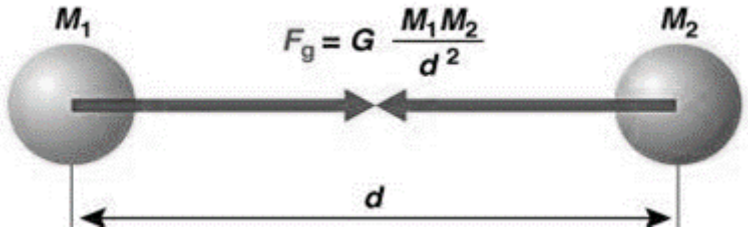
29. a. Write the difference between mass and weight.
b. A ball thrown up vertically returns to the thrower after 6s. Find
i) the velocity with which it was thrown up
ii) the maximum height it reaches.

c. A stone dropped from the roof of a building takes 4s to reach the ground. Calculate the height of the building.

30. a. The gravitational force between two identical bodies is 200 N. The Mass of both bodies becomes twice, and the separation becomes half. What will be the new force between them?
    b. What is the distance covered by a freely falling body during the first three seconds of its motion? (g =10 m/ s^2)
    c. A toy car falls to the ground in 0.4 s. Calculate its speed just before striking the ground. (g = 10 m/s^2)

V. CASE STUDY-BASED QUESTIONS

31. Every object in the universe attracts every other object with a force which is proportional to the product of their masses ($m_1 x m_2$) and inversely proportional to the square of the distance (d^2) between them. The force is along the line joining the centres of two objects.



a. Find the force between Earth and an object of 1 kg placed on the surface of the Earth.
b. What will happen to the gravitational force between two bodies if the mass of one body is doubled?
c. How is gravitation different from gravity?

Or

d. Why can one jump higher on the surface of the moon than on Earth?

Q. No.	ANSWERS
1.	c) The value is least on the equator
2.	a) any two bodies having mass
3.	d) gravity
4.	b) Mass of the Earth
5.	c) 1/6th of the weight on Earth
6.	a) decrease in the height from the surface of the Earth
7.	a) zero
8.	c) negative
9.	a) F/4
10.	d) is a universal constant of nature
11.	a) $Nm^2 kg^{-2}$
12.	b) 392 N
13.	d) No units
14.	d) both a and b
15.	a) Both assertion and reason are true, and reason is the correct explanation of the assertion.
16.	a) Both assertion and reason are true, and reason is the correct explanation of the assertion.
17.	Isaac Newton
18.	When an object falls from any height under the influence of gravitational force only.
19.	It will remain the same on the moon, i.e., 9.8 kg.
20.	The gravitational force between the moon and the Earth keeps the moon in uniform circular motion around the Earth.
21.	Zero
22.	We know that $F = GMm/r^2$, as the weight of a body is the force with which a body is attracted towards the Earth,

<table>
<tr><td></td><td>W = GMm /$(2r)^2$
= G Mm/$4r^2$ = W/4
i.e., weight will be reduced to one-fourth of the original.</td></tr>
<tr><td>23</td><td>The value of g is greater at the poles than at the equator.</td></tr>
<tr><td>24</td><td>(i) The revolution of the Moon around the Earth
(ii) The force that binds us to the Earth</td></tr>
<tr><td>25.</td><td>(i) As v = u + gt
∴ v = 0 + (-10) × 2 = -20 ms^{-1}
(ii) As $v = u^2 + 2$ gs
or, $v^2 - 0^2 = 2(-10) \times (-40)$
or, v = √800
= 20√2 ms^{-1} =28.3 m/s</td></tr>
<tr><td>26.</td><td>According to Newton's third law of motion, action and reaction are equal and opposite. It means that the force on the apple due to Earth's attraction is equal to that on the Earth due to the apple's attraction. But we know, acceleration ∝ 1/m.
As the mass of the Earth is very large compared to that of the apple, the acceleration experienced by the Earth will be so small that it will not be noticeable.</td></tr>
<tr><td>27.</td><td>
<table>
<tr><th>Acceleration due to gravity (g)</th><th>Universal gravitational constant (G)</th></tr>
<tr><td>1. Acceleration due to gravity is the acceleration acquired by a body due to the earth's gravitational pull on it.</td><td>1. Gravitational constant is numerically equal to the force of attraction between two masses of 1 kg that are separated by a distance of 1 m.</td></tr>
<tr><td>2. g is a vector quantity.</td><td>2. G is a scalar quantity.</td></tr>
<tr><td>3. It is different at different places on the surface of the earth. Its value also varies from one celestial body to another.</td><td>3. The 'G' is a universal constant, i.e., its value is the same (i.e. 6.7 × 10^{-11} Nm^2 kg^{-2}) everywhere in the universe.</td></tr>
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28.

Given:

Weight on Earth, $W = 30\,\text{N}$

Acceleration due to gravity, $g = 10\,\text{m/s}^2$

We know,

$$W = m \times g$$

$$m = \frac{W}{g} = \frac{30}{10} = 3\,\text{kg}$$

At a place where $g = 0$,

$$W' = m \times g' = 3 \times 0 = 0\,\text{N}$$

29.

a.

Sl. No.	Mass	Weight
1.	The mass is a scalar quantity.	The weight is a vector quantity.
2.	Mass of a rigid body is regular everywhere in the universe.	The weight of a rigid body alters from place to place and inclines zero at the center of the earth.
3.	Mass can be resulted by a traditional balance.	Weight can be defined as spring balance
4.	The unit of mass is kg or g.	The unit of weight is Newton.
5.	Mass can never be zero.	Weight can be zero based on the gravity acting upon it.
6.	Mass does not change based on location.	Weight changes based on location, depending on the gravity it experiences.
7.	Mass is measured using an ordinary weighing scale.	Weight is measured using spring balance.

b. v=u+gt, u=29.4m/s ii) $s=ut+1/2gt^2 = 44.1$m

c. Here, initial velocity, u = 0

Time taken to reach the ground, t = 4 s

Acceleration, a = g = 9.8 m/s^2

Height of the building, h = ?

Using the equation of motion, $h = ut + \frac{1}{2}gt^2 = 0 + \frac{1}{2}gt^2$

$$h = \frac{1}{2} \times 9.8\,\text{m/s}^2 \times (4\text{s})^2$$

$$= \frac{1}{2} \times 9.8 \times 16\,\text{m} = 78.4\,\text{m}$$

$h = \mathbf{78.4\ m}$

30.	a. Given, Force between two bodies, F = 200 N Force between two identical bodies, $F = Gm^2/r^2$ $F = Gm_1m_{2/}r^2$ Now the mass of both bodies becomes twice, and the separation becomes half, the New force. $F' = G(2m)(2m)/(r/2)^2 = Gm^2/r^2 = 16\ F$ Force becomes sixteen times. New force, F' = 16 x 200 = 3200 N b. $S = ut + ½\ at^2$ $S = 0 + ½ \times 10 \times (3)^2$ = 45 m c. t= 0.4 s , u= 0 v= u + gt = 0+10 x 0.4 = 4 m/s
31.	a. 9.8 N b. will be doubled. c. Gravitation is the force of attraction between any two bodies, while gravity refers to the attraction between any body and the Earth. Or d. Because the value of acceleration due to gravity (g) on the moon's surface is nearly l/6th to that of the surface of the Earth.

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