



Unit 7 • Motion and Force: gravitation and gravity

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 33

1 Key words

[4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

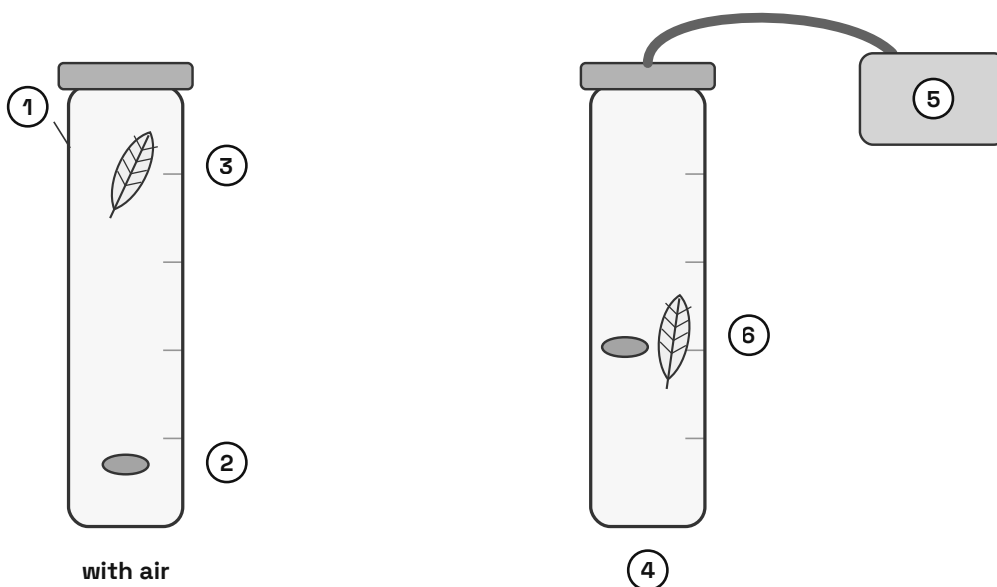
acceleration due to gravity Cavendish centers equator G gravitation gravity mass
poles radius

Every object in the universe attracts every other object, and this attraction is called _____. The pull of a planet or moon on the objects near it is called _____. The force between two masses of 1 kg each placed 1 m apart is the universal gravitational constant, _____. Its value was first measured in 1798 by Henry _____. In Newton's law, the distance is measured between the _____ of the two objects. The acceleration of a freely falling object is called the _____. It is larger at the _____ than at the equator, and it does not depend on the _____ of the falling object.

2 Label the diagram

[3]

The diagram shows the feather and coin experiment. Name the parts and write what happens at the places numbered 1 to 6. Each carries 0.5 mark.



1. _____

2. _____

3. _____

4. _____

5. _____

6. _____



3 Multiple choice

[5]

Choose the correct option for each of the following questions.

- i. What is the relation between the distance d between two objects and the gravitational force F between them? [1]
a. $F \propto 1/d^2$ b. $F \propto d^2$
c. $F \propto 1/d$ d. $F \propto d$
- ii. What happens to the gravitational force between two objects when the mass of each is doubled? [1]
a. it doubles b. it becomes four times as large
c. it becomes half as large d. it becomes a quarter as large
- iii. Which one of these statements is correct? [1]
a. The value of g increases as we go deeper below the Earth's surface.
b. The value of g decreases as the height above the Earth's surface increases.
c. The value of g is less in the polar region than in the equatorial region.
d. The value of g is highest at the highest place on the Earth.
- iv. The radius of the Earth is 6371 km and an object weighs 800 N on the Earth's surface. What does it weigh at a height of 6371 km above the surface? [1]
a. 800 N b. 1600 N
c. 200 N d. 3200 N
- v. A celestial body has twice the mass and twice the radius of the Earth. What is g on it? [1]
a. 9.8 m/s^2 b. 4.9 m/s^2
c. 19.6 m/s^2 d. 10 m/s^2

4 Very short answers

[3]

Write very short answers to the following questions.

- a. Define the gravitational constant G . [1]

- b. Write the SI unit of the gravitational constant G . [1]

- c. The acceleration due to gravity on the Earth's surface is 9.8 m/s^2 . What does this mean? [1]



5 Short answers

[6]

Write short answers to the following questions.

- a. Write any two differences between the gravitational constant G and the acceleration due to gravity g .

[2]

- b. Give a reason: the mass of Jupiter is about 319 times the Earth's, but its acceleration due to gravity is only about 2.6 times the Earth's.

[2]

- c. Give a reason: of two objects dropped from the same height, one in the polar region and one in the equatorial region, the one in the polar region falls faster.

[2]

6 Long answer

[4]

Write a long answer to the following question.

Prove that the acceleration due to gravity of a planet is inversely proportional to the square of its radius ($g \propto 1/R^2$).



[6]

Solve the following problems. Show your working. ($G = 6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2$)

- a. The masses of two objects A and B are 20 kg and 40 kg. If the distance between their centers is 5 m, calculate the gravitational force between them.

Answer:

- b. A GPS satellite orbits 20,200 km above the Earth's surface. The mass of the Earth is 5.972×10^{24} kg and its radius is 6371 km. Calculate the acceleration due to gravity at the height of the satellite.

[illegible]

Answer:

8 Think

Think, then answer.

At a point in outer space, a 1 kg object falls with an acceleration due to gravity of 2 m/s^2 . What is the acceleration due to gravity of a 10 kg object at the same point? Justify.

9 Activity: Paper, paper ball and stone (Activity 7.3)

(not marked)

Tear a sheet of paper into two equal halves. Crush one half tightly into a ball and leave the other flat. Drop each pair from the same height at the same moment, and fill in the table.

Pair dropped together	My guess: which lands first?	What I found	Why?
flat sheet and paper ball			
paper ball and small stone			
flat sheet and small stone			

What would happen to all three on the Moon?

