

Orbits Satellites

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

State the force that keeps the Moon in orbit around the Earth, and describe its direction. (2 marks)

Step 1 · Force

The gravitational force (attraction) between the Earth and the Moon.

Step 2 · Direction

It acts towards the centre of the Earth, at right angles to the Moon's direction of motion.

Answer: Gravity, towards the centre of the Earth

Check: Without gravity the Moon would move off in a straight line.

2. Now try one with the steps

Explain how a satellite in a circular orbit can move at a constant speed but still be accelerating. (3 marks)

Step 1 · Velocity

Step 2 · Changing velocity

Step 3 · Acceleration

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Name the force that keeps artificial satellites in orbit around the Earth. [1]

2. Give one example of a natural satellite and one of an artificial satellite. [2]

3. State the shape of the orbits of most planets and satellites at GCSE. [1]

4. Explain how an object in a circular orbit can have a constant speed but a changing velocity. [2]
-
-
5. State the time a geostationary satellite takes to orbit the Earth. [1]
-
-
6. Give one use of a geostationary satellite and one use of a polar-orbit satellite. [2]
-
-
7. Describe how the speed and orbital period of planets change with distance from the Sun. [2]
-
-
8. The ISS orbits at a radius of about 6780 km. Calculate the distance it travels in one orbit, in km, to 3 significant figures. [2]
-
-
9. State the direction of the acceleration of an object in a circular orbit. [1]
-
-
10. Explain why a satellite closer to the Earth must travel faster than one further away. [2]
-
-
11. A satellite's speed decreases slightly (for example because of drag from the thin upper atmosphere). Describe what happens to its orbit. [2]
-
-
12. A satellite orbits at a radius of 7000 km and takes 97 minutes per orbit. Calculate its speed in km/s to 2 significant figures. [3]
-
-
-
-
13. Explain why the Moon does not fall onto the Earth even though gravity pulls it towards the Earth. [2]
-
-

14. Explain why the gravitational force needed for a circular orbit acts at right angles to the direction of motion. [2]

4. Before you hand it in

"There is no gravity in space, so astronauts float."

Astronauts appear weightless because they and the ISS are falling together around the Earth (in orbit).

"An orbiting satellite moves at constant velocity."

The speed is constant but the velocity changes, so it is accelerating towards the centre.

"Satellites further away need to go faster."

Further away gravity is weaker, so a slower speed gives a stable orbit.

"A satellite needs its engine on to keep orbiting."

With no air resistance, the satellite keeps moving; gravity just keeps changing its direction.