8.1 Motion in the Universe

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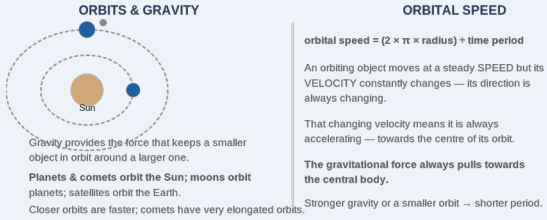
1. KEY VOCABULARY

TERM	MEANING
Orbit	The curved path of one object around another.
Gravity	The attractive force between any two masses.
Satellite	An object that orbits a planet (natural or artificial).
Solar System	The Sun and everything that orbits it.
Galaxy	A huge collection of billions of stars.

2. ORBITS & GRAVITY



3. WHAT KEEPS THINGS IN ORBIT

Gravity provides the force that keeps a smaller object orbiting a larger one.
Planets and comets orbit the Sun; moons orbit planets; satellites orbit the Earth.
Comets have very elongated (stretched) orbits.

4. ORBITAL SPEED

orbital speed = (2 × π × orbital radius) ÷ time period
Objects in smaller orbits travel faster and have shorter time periods.

5. SPEED, VELOCITY & ACCELERATION

An orbiting object moves at a steady SPEED — but its VELOCITY is always changing because its direction changes.
A changing velocity means it is always accelerating, towards the centre of its orbit.

6. THE WHY

Why an orbiting object is always accelerating: its direction is constantly changing, and any change of velocity (even just direction) is an acceleration.
Why closer orbits are faster: gravity is stronger closer in, so the object must move faster to stay in orbit.

7. COMMON EXAM MISTAKES

✗ "An orbiting object moves at constant velocity."
✓ Constant SPEED, but changing velocity (direction changes).
✗ "There is no force on an object in orbit."
✓ Gravity acts all the time, pulling it towards the centre.
✗ "All orbits are perfect circles."
✓ Comets, in particular, have very elongated orbits.

8. SELF-CHECK · cover & quiz

Can you…

1. Explain what keeps an object in orbit?
2. Give examples of what orbits the Sun, planets and Earth?
3. Use the orbital speed equation?
4. Explain why orbital velocity changes but speed can be steady?
5. Explain why closer orbits are faster?