

**10** The Astra satellite is in an orbit around the Earth.

(a) The satellite uses microwave signals for communication.

Microwaves are part of the electromagnetic spectrum.

(i) Which part of the electromagnetic spectrum has longer wavelengths than microwaves?

(1)

- ☐ **A** gamma rays
- ☐ **B** radio waves
- ☐ **C** ultraviolet light
- ☐ **D** visible light

(ii) Which of these statements is correct?

(1)

- ☐ **A** Microwaves always travel faster than radio waves.
- ☐ **B** Microwaves always travel slower than radio waves.
- ☐ **C** Microwaves and radio waves travel at the same speed in a vacuum.
- ☐ **D** Microwaves and radio waves travel at the same speed in all materials.

(iii) State one property of electromagnetic waves that makes microwaves suitable for communications with a satellite in space.

(1)

.....

.....



(b) The Astra satellite takes 24 hours to orbit the Earth once.

It travels at a speed of 3.1 km/s.

Calculate the orbital radius of the satellite and give the unit.

(4)

orbital radius = ..... unit .....

(c) The Astra satellite orbits above the equator and travels in the same direction as the rotation of the Earth.

Suggest why this type of 24-hour orbit is an advantage for communications.

(1)

.....

.....

.....

**(Total for Question 10 = 8 marks)**

