3 **(a)** A satellite of mass 6800 kg is in geostationary orbit at a height of 36 000 km above the Earth's surface.

(i) Calculate the magnitude of the force keeping the satellite in orbit.

The radius of the Earth is 6400 km and the mass of the Earth is 6.0×10^{24} kg.

force = ... N [2]

(ii) Explain whether all satellites in geostationary orbit must have a mass of 6800 kg.

Use relevant equations to support your answer.

.....

..... [1]

(b) An ion of chlorine has a charge of $-1e$, where e is the elementary charge. The ion is moving in a vacuum with a momentum of 3.4×10^{-23} Ns. It enters a uniform magnetic field of magnetic flux density 1.8 mT at 90° to the field lines.

(i) Calculate the radius of the circular path followed by the ion.

radius = ... m [2]

(ii) Explain whether all ions with a charge of $-1e$ must have the same radius of circular path in this magnetic field.

.....

..... [1]

[Total: 6]