Section B

Answer **one** question from this section.

7 The Earth's orbit can be considered to be a circular orbit around the Sun with a period of 365.3 days. The distance from the centre of the Earth to the centre of the Sun is 1.496×10^{11} m.

(a) Calculate,

(i) the angular velocity of the Earth in its orbit around the Sun,

angular velocity = ... unit ..... [3]

(ii) the speed of the Earth in its orbit,

speed = ... $m s^{-1}$ [2]

(iii) the centripetal acceleration of the Earth.

centripetal acceleration = ... $m s^{-2}$ [3]

(b) (i) The mass of the Earth is 5.972×10^{24} kg.

Calculate the gravitational force of attraction of the Sun on the Earth.

force = ... N [2]

(ii) Use Newton's law of gravitation to determine the mass of the Sun.

mass = ... kg [2]

(c) The distance from the Sun to Jupiter is 5.203 times further than from the Sun than the Earth. Calculate the orbital period of Jupiter around the Sun.

period = ... years [4]

(d) (i) Describe what is meant by a geostationary satellite and describe its orbit relative to the Earth.

You may use a diagram to illustrate your answer.

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.....[3]

(ii) Give an example of a practical use of a geostationary satellite.

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.....[1]

[Total: 20]