A Level · OCR · Physics

🕐 5 mins   ❓ 5 questions

Multiple Choice Questions

Planetary Motion

Kepler's Three Laws of Motion / Circular Orbits in Gravitational Fields / Geostationary Orbits

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Medium (4 questions)	/4
Hard (1 question)	/1
Total Marks	**/5**

Medium Questions

1 A student has collected some data on the Solar System.

The student plots a graph, but only two data points are shown below.
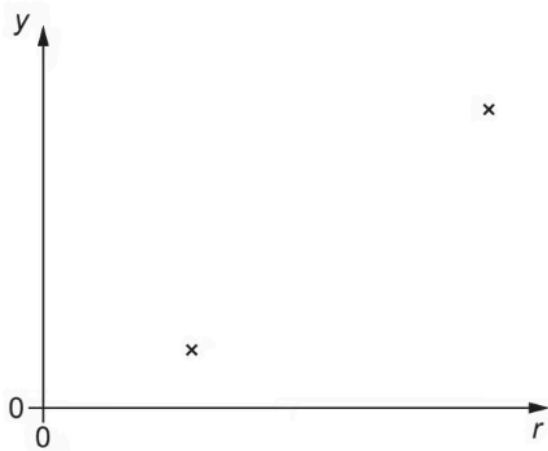
The distance from the centre of the Sun is *r*.

Which quantity *y* is represented on the vertical axis?

   A. Speed of a planet.

   B. Period of a planet.

   C. Gravitational potential of the Sun.

   D. Gravitational field strength of the Sun.

(1 mark)

2 The Star Orbiter satellite was launched in February 2019. This satellite moves around the Sun in an elliptical orbit with a period of 188 days.

The closest distance of the satellite to the Sun is 6.20×10^{10} m and its furthest distance from the Sun is 2.37×10^{11} m. The mass of the Sun is 4.0×10^{30} kg and the mass of the satellite is 409 kg.

The Earth has a mean orbital distance of 1.50×10^{11} m around the Sun and an orbital period of 365 days.

What is the mean orbital distance (m) of the satellite from the Sun?

A. 9.6×10^{10}

B. 9.0×10^{32}

C. 9.6×10^{40}

D. 9.6×10^{50}

(1 mark)

3 Alnitak-80 is a star with several planets orbiting it.The two outermost planets are Alnitak-80g and Alnitak-80h. Alnitak-80g has an orbital period of 220 days and is 0.81AU from the centre of Alnitak-80. Alnitak-80h is 1.20AU from the centre of Alnitak-80.

One of Kepler's laws of planetary motion can be applied to the planets of Alnitak-80.

What is the orbital period of Alnitak-80h?

A. 200 days

B. 300 days

C. 350 days

D. 397 days

(1 mark)

4 A student wants to explain Kepler's second law of planetary motion.

Which statement accurately describes Kepler's Second Law of Planetary Motion?

A. Planets move in elliptical orbits with the Sun at one of the foci

B. As a planet orbits the Sun, it sweeps out equal areas in equal times

C. The force of gravity between two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres.

D. The time it takes for a planet to orbit the Sun is directly proportional to its average distance from the Sun

(1 mark)

Hard Questions

1 Kepler−90 is a star with several planets orbiting it.

The two outermost planets are Kepler−90g and Kepler−90h. Kepler−90g has an orbital period of 210 days and is 0.71 AU from the centre of Kepler−90. Kepler−90h is 1.01AU from the centre of Kepler−90.

Kepler's third law of planetary motion can be applied to the planets of Kepler−90. What is the orbital period of Kepler−90h?

   A. 50 days

   B. 299 days

   C. 356 days

   D. 4350 days

(1 mark)