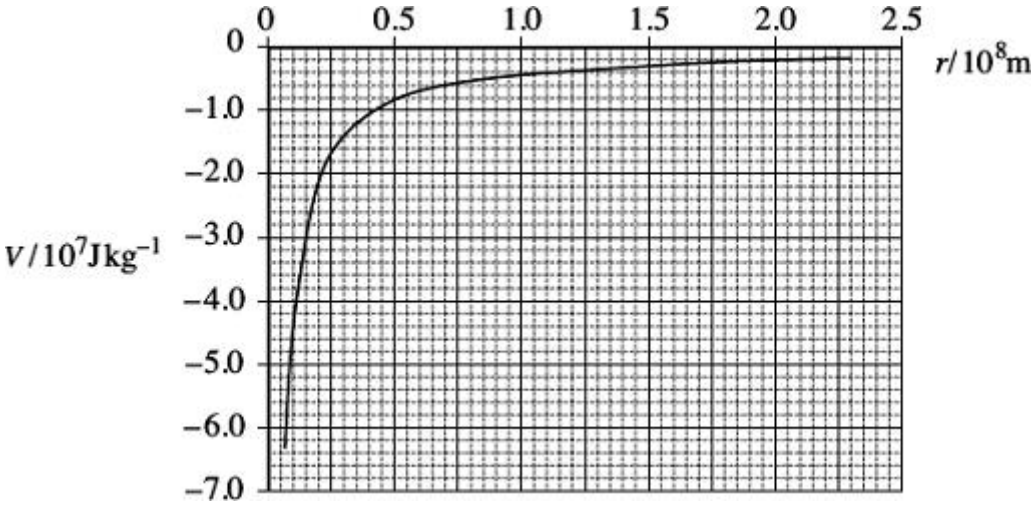
Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Q1.

The figure below shows the variation of gravitational potential, V, with distance from the centre of the Earth, r. The radius of the Earth is 6.4×10^6 m.



(a) Explain why the V values are negative.

_____

_____

_____

_____

_____

_____

(3)

(b) Use data from the graph to show that the mass of the Earth is approximately 6×10^{24} kg.

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(3)

(c) (i) Calculate the work done in raising a satellite of mass 2100 kg from the surface of the Earth to a height of 850 km above the surface of the Earth.

work done _____ J

(3)

(ii) Calculate the change in the kinetic energy of the satellite when it moves from its 850 km orbit to one at a height of 700 km above the Earth's surface. Make it clear whether the change in kinetic energy is an increase or decrease.

kinetic energy change _____ J

(4)

(iii) Without performing any further calculations explain how the change in kinetic energy relates to the change of the potential energy when the satellite's orbit alters as in part (c)(ii).

_____

_____

_____

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_____

(2)

(Total 15 marks)

Q2.

(a) State Newton's law of gravitation.

_____

_____

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(2)

(b) In 1798 Cavendish investigated Newton's law by measuring the gravitational force between two unequal uniform lead spheres. The radius of the larger sphere was 100 mm and that of the smaller sphere was 25 mm.

(i) The mass of the smaller sphere was 0.74 kg. Show that the mass of the larger sphere was about 47 kg.

density of lead = 11.3×10^3 kg m^{-3}

(2)

(ii) Calculate the gravitational force between the spheres when their surfaces were in contact.

answer = _____ N

(2)

(c) Modifications, such as increasing the size of each sphere to produce a greater force between them, were considered in order to improve the accuracy of Cavendish's experiment. Describe and explain the effect on the calculations in part (b) of doubling the radius of both spheres.

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_____

(4)

(Total 10 marks)

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