Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

(a) State the law that governs the magnitude of the force between two point masses.

_____

_____

_____

_____

(2)

(b) The table shows how the gravitational potential varies for three points above the centre of the Sun.

distance from centre of Sun/10^8 m	**gravitational potential/10^{10} J kg^{-1}**
7.0 (surface of Sun)	–19
16	–8.3
35	–3.8

(i) Show that the data suggest that the potential is inversely proportional to the distance from the centre of the Sun.

(2)

(ii) Use the data to determine the gravitational field strength near the surface of the Sun.

Downloaded from www.merit-minds.com

(3)

(iii) Calculate the change in gravitational potential energy needed for the Earth to escape from the gravitational attraction of the Sun.

mass of the Earth = 6.0×10^{24} kg
distance of Earth from centre of Sun = 1.5×10^{11} m

(3)

(iv) Calculate the kinetic energy of the Earth due to its orbital speed around the Sun and hence find the minimum energy that would be needed for the Earth to escape from its orbit. Assume that the Earth moves in a circular orbit.

(3)
(Total 13 marks)

Q2.

(a) State the factors that affect the gravitational field strength at the surface of a planet.

_____

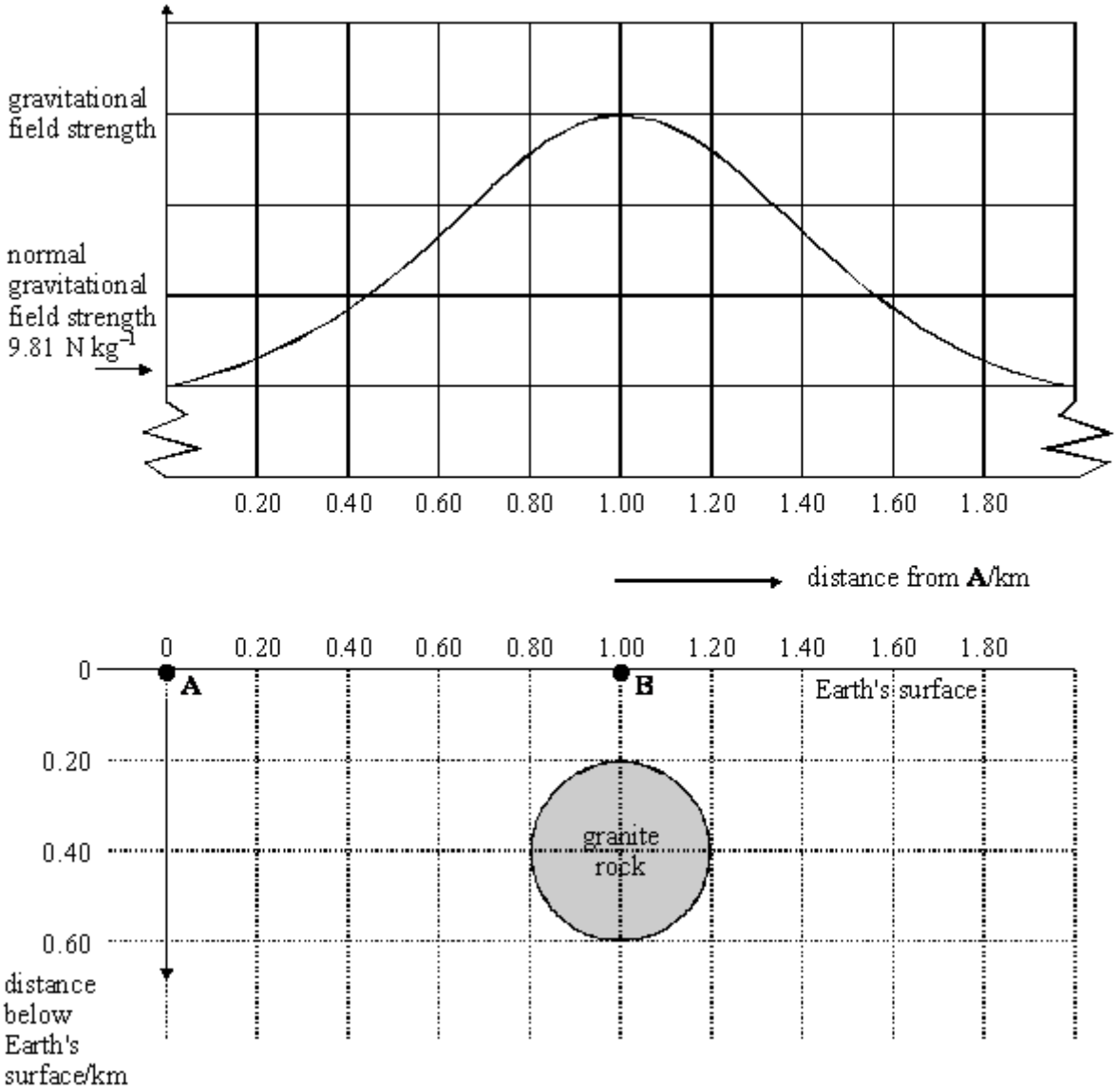
_____

(2)

(b) The diagram below shows the variation, called an anomaly, of gravitational field strength at the Earth's surface in a region where there is a large spherical granite rock buried in the Earth's

Downloaded from www.merit-minds.com

crust.



The density of the granite rock is 3700 kg m^{-3} and the mean density of the surrounding material is 2200 kg m^{-3}.

(i) Show that the difference between the mass of the granite rock and the mass of an equivalent volume of the surrounding material is 5.0×10^{10} kg.

(4)

(ii) The universal gravitational constant $G = 6.7 \times 10^{-11}$ N m^2 kg^{-2}. Calculate the difference between the gravitational field strength at **B** and that at point **A** on the Earth's surface that is a long way from the granite rock.

Downloaded from www.merit-minds.com

(4)

(iii) Add to the diagram above a graph to show how the variation in gravitational field strength would change if the granite rock were buried deeper in the Earth's crust.

(1)

(Total 11 marks)

Downloaded from www.merit-minds.com