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

Q1.

(a) State what is represented by gravitational field lines.

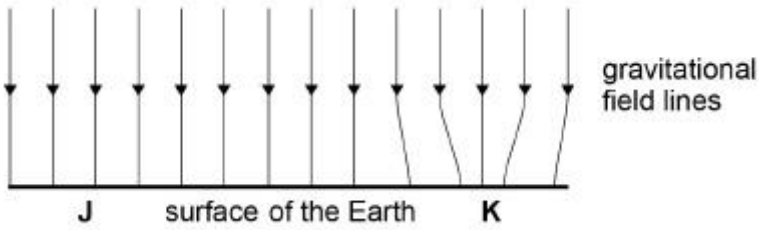
_____

_____

(1)

(b) **Figure 1** shows the gravitational field above a small horizontal region on the surface of the Earth.

Figure 1



Suggest why the field lines converge over a small area at **K**.

_____

_____

_____

_____

(2)

(c) A ball travelling at constant speed passes position **J** moving towards position **K** in **Figure 1**.

Assume friction is negligible.

Explain any change in the speed of the ball as it approaches **K**.

_____

_____

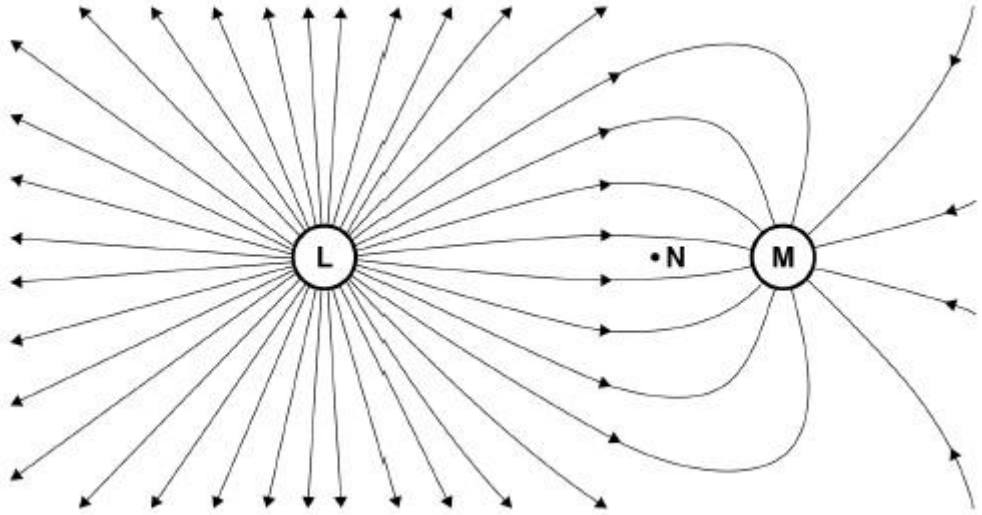
_____

_____

(2)

(d) **Figure 2** shows lines of force for the electric field surrounding two charged objects **L** and **M**.

Figure 2



Explain why the lines of force shown in **Figure 2** cannot represent a gravitational field.

_____

_____

(1)

(e) State which object **L** or **M** has a charge with the greater magnitude.

object _____

State which object **L** or **M** has a positive charge.

object _____

(1)

(f) Draw, on **Figure 2**, an equipotential line that passes through point **N**.
Do **not** extend your line beyond the given field lines.

(2)

(Total 9 marks)

Q2.

(a) Define the gravitational potential at a point.

_____

_____

_____

_____

(2)

(b) Explain why gravitational potential is always negative.

_____

_____

_____

_____

(2)

(c) Show that the magnitude of the gravitational potential at the Earth's surface due to the mass of the Earth is about 6.3×10^7 J kg^{-1}.

(2)

(d) A satellite is launched into a geostationary orbit.

Describe and explain **two** features of a geostationary orbit.

1. _____

_____

_____

2. _____

_____

_____

(2)

(e) The satellite has a mass of 1200 kg and the radius of its orbit is 4.23×10^7 m.

Calculate the gain in gravitational potential energy of the satellite when it is placed into orbit from the Earth's surface.

gain in potential energy = _____J

(3)

(f) Impulse engines are used to place the satellite into an orbit with a longer period.

Discuss any changes this makes to the orbital motion of the satellite.

_____

_____

(4)
(Total 15 marks)