1 **(a)** Define gravitational potential at a point.

……

…… [1]

(b) A satellite is orbiting the Earth with an orbital radius of 6610 km at a speed of 7780 m s^{-1}. The satellite is boosted into a higher orbit of radius 6890 km by firing its thrusters.

(i) State and explain the effect on the gravitational potential energy of the satellite.

……..

…… [1]

(ii) Show that the linear speed v of a satellite in a circular orbit of radius R about the centre of the Earth is given by

$$v = \sqrt{\frac{GM}{R}}$$

where G is the gravitational constant and M is the mass of the Earth.
Explain your working.

[1]

(iii) Show that the speed of the satellite in the new orbit is 7620 m s^{-1}.

[1]

(iv) The satellite has a mass of 120 kg. Using your result in **(b)**, calculate the **change** in

1. kinetic energy,

change in kinetic energy = ... J [2]

2. total energy.

change in total energy = ……..… J [2]

[Total: 8]