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

.....

.....

..... [2]

(b) The Earth may be considered to be a uniform sphere of radius 6.4×10^6 m with its mass of 6.0×10^{24} kg concentrated at its centre.

A satellite of mass 2.4×10^3 kg is launched from the Equator. It is placed in an equatorial orbit at a height of 5.6×10^6 m above the Earth's surface.

(i) Calculate the change ΔE_P in gravitational potential energy of the satellite for its movement from the surface of the Earth to its position in the equatorial orbit.

ΔE_P = ... J [3]

(ii) Determine the speed of the satellite when in orbit.

speed = ... $m\,s^{-1}$ [3]

(c) Before the satellite in **(b)** is launched, its speed at the Equator due to the Earth's rotation is $470\,m\,s^{-1}$.

Suggest why the energy required to launch the satellite depends on whether the satellite, in its orbit, is travelling from west to east or from east to west.

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..... [1]