

- 1 The Earth may be considered to be a uniform sphere with its mass M concentrated at its centre.

A satellite of mass m orbits the Earth such that the radius of the circular orbit is r .

- (a) Show that the linear speed v of the satellite is given by the expression

$$v = \sqrt{\left(\frac{GM}{r}\right)}.$$

[2]

- (b) For this satellite, write down expressions, in terms of G , M , m and r , for

- (i) its kinetic energy,

kinetic energy = [1]

- (ii) its gravitational potential energy,

potential energy = [1]

- (iii) its total energy.

total energy =

[2]

- (c) The total energy of the satellite gradually decreases.

State and explain the effect of this decrease on

- (i) the radius r of the orbit,

.....
.....
..... [2]

- (ii) the linear speed v of the satellite.

.....
.....
..... [2]