4 **(a)** Distinguish between *gravitational potential energy* and *electric potential energy*.

....

....

.... [2]

(b) A body of mass *m* moves vertically through a distance *h* near the Earth's surface.
the defining equation for work done to derive an expression for the gravitational potential
energy change of the body.

[2]

(c) Water flows down a stream from a reservoir and then causes a water wheel to rotate, as
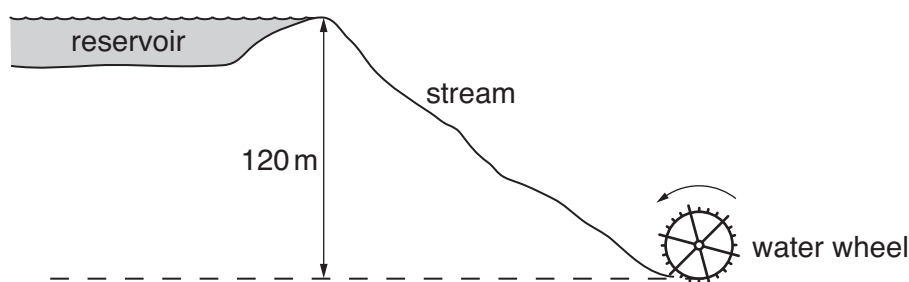shown in Fig. 4.1.

Fig. 4.1

As the water falls through a vertical height of 120 m, gravitational potential energy is
converted to different forms of energy, including kinetic energy of the water. At the water
wheel, the kinetic energy of the water is only 10% of its gravitational potential energy at
the reservoir.

(i) Show that the speed of the water as it reaches the wheel is 15 m s^{-1}.

[2]

(ii) The rotating water wheel is used to produce 110 kW of electrical power. Calculate the mass of water flowing per second through the wheel, assuming that the production of electric energy from the kinetic energy of the water is 25% efficient.

mass of water per second = ... $kg\,s^{-1}$ [3]