

- 4 (a) A mass m moves a vertical distance Δh in a uniform gravitational field and gains gravitational potential energy ΔE_p . The acceleration of free fall is g .

Use the concept of work done to show that

$$\Delta E_p = mg\Delta h.$$

[2]

- (b) A 0.60 kg mass is attached to a string which is wrapped around the wheel of a generator, as shown in Fig. 4.1.

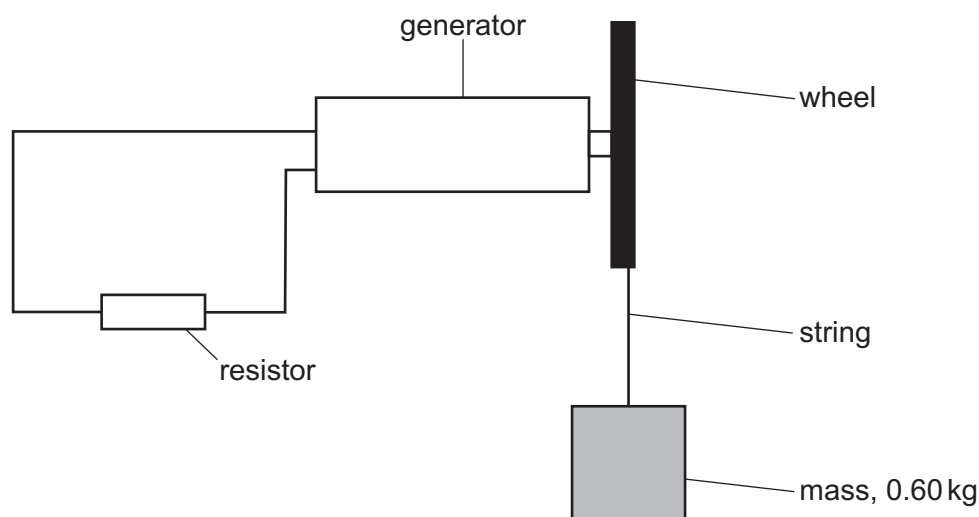


Fig. 4.1

The mass is held stationary above the floor. When released, the mass initially accelerates and then falls at a steady speed and spins the wheel. The generator causes a current in a resistor. Air resistance is negligible.

State the main energy change when the mass is falling at a steady speed.

..... energy to energy.

[1]

- (c) When falling at a steady speed, the mass in (b) falls through a vertical distance of 1.4 m in a time of 4.0 s. This causes a current of 90 mA in the resistor. The resistance of the resistor is $47\ \Omega$.

Calculate:

- (i) the rate of work done by the falling mass

rate of work done = W [2]

- (ii) the power dissipated in the resistor

power = W [2]

- (iii) the efficiency of the generator.

efficiency = [2]

[Total: 9]