6 **(a)** Define the potential difference across a component.

.....

..... [1]

(b) The variation with potential difference V of the current I in a semiconductor diode is shown in Fig. 6.1.

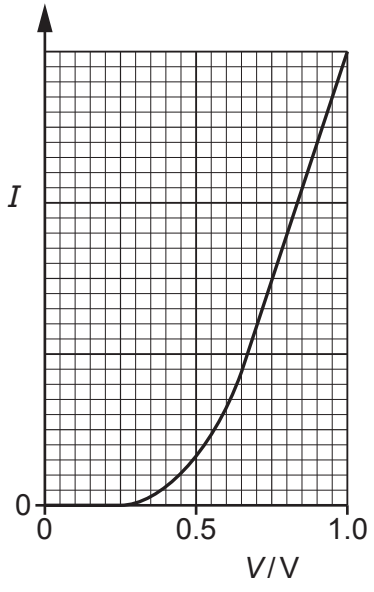

Fig. 6.1

Use Fig. 6.1 to describe qualitatively:

(i) the resistance of the diode in the range $V = 0$ to $V = 0.25\,V$

..... [1]

(ii) the variation, if any, in the resistance of the diode as V changes from $V = 0.75\,V$ to $V = 1.0\,V$.

..... [1]

(c) A battery of electromotive force (e.m.f.) 12 V and negligible internal resistance is connected to a uniform resistance wire XY, a fixed resistor and a variable resistor, as shown in Fig. 6.2.

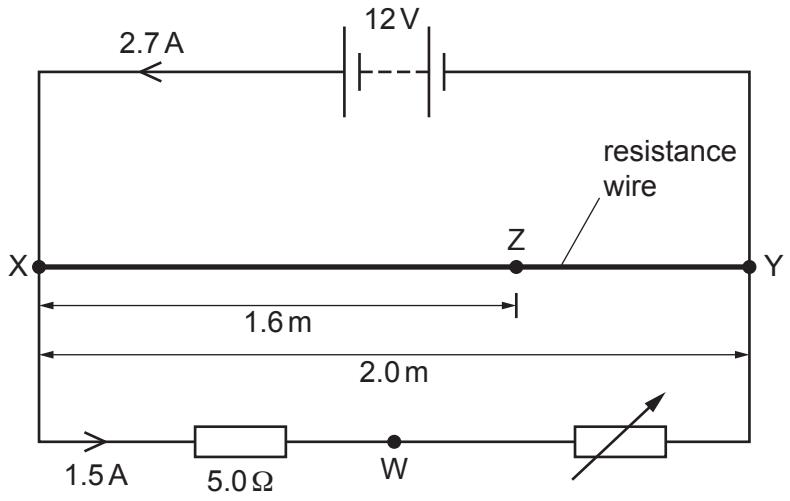

Fig. 6.2 (not to scale)

The fixed resistor has a resistance of 5.0 Ω. The current in the battery is 2.7 A and the current in the fixed resistor is 1.5 A.

(i) Calculate the current in the resistance wire.

current = ...A [1]

(ii) Determine the resistance of the variable resistor.

resistance = ... Ω [2]

(iii) Wire XY has a length of 2.0 m. Point Z on the wire is a distance of 1.6 m from point X. The fixed resistor is connected to the variable resistor at point W.

Determine the potential difference between points W and Z.

potential difference = ... V [3]

(iv) The resistance of the variable resistor is now increased.

By considering the currents in every part of the circuit, state and explain whether the total power produced by the battery decreases, increases or stays the same.

.....

.....

.....

.....

.....

..... [3]

[Total: 10]