6 A battery of electromotive force (e.m.f.) 6.0 V and negligible internal resistance is connected in series with a variable resistor and a uniform resistance wire XY, as shown in Fig. 6.1.

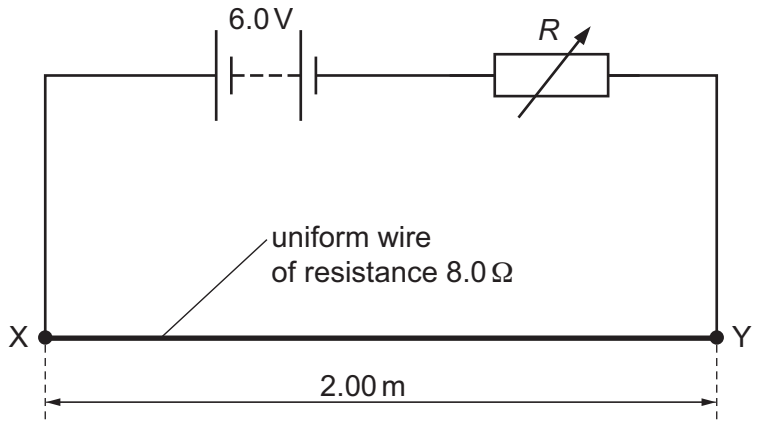

Fig. 6.1

Wire XY has length 2.00 m and resistance 8.0 Ω. The resistance R of the variable resistor is adjusted so that the potential difference across wire XY is 2.4 V.

(a) Determine R.

R = ... Ω [2]

(b) Explain why the potential difference V between any two points on wire XY is proportional to the distance L between those points.

.....

.....

.....

..... [2]

(c) A cell of e.m.f. *E* and internal resistance *r* is connected to the circuit, as shown in Fig. 6.2.

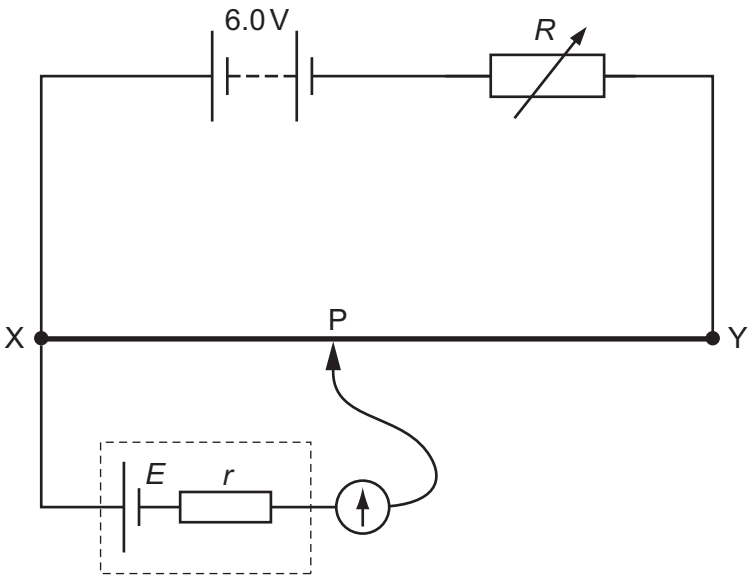

Fig. 6.2

Resistance *R* is unchanged.
The movable connection P is positioned on wire XY so that the galvanometer reading is zero.
Distance XP is 1.24 m.

(i) Calculate *E*.

E = ... V [2]

(ii) The value of *R* is now decreased.

State and explain the change that must be made to the position of P on wire XY so that the galvanometer reads zero again.

.....

.....

.....

..... [2]

[Total: 8]