7 **(a)** Define *electromotive force* (e.m.f.) of a cell.

.....

.....[1]

(b) A cell C of e.m.f. 1.50 V and internal resistance 0.200 Ω is connected in series with resistors X and Y, as shown in Fig. 7.1.

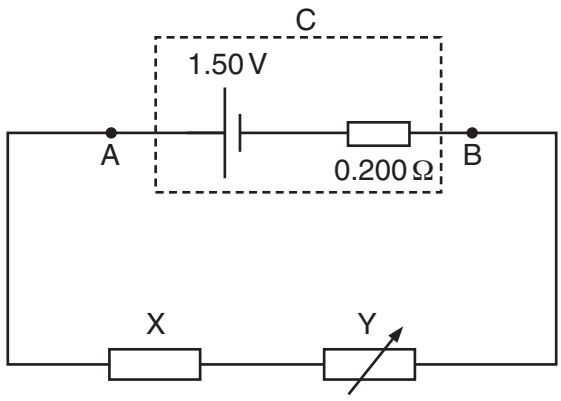

Fig. 7.1

The resistance of X is constant and the resistance of Y can be varied.

(i) The resistance of Y is varied from 0 to 8.00 Ω.

State and explain the variation in the potential difference (p.d.) between points A and B (terminal p.d. across C). Numerical values are not required.

.....

.....

.....

.....[3]

(ii) The resistance of Y is set at 6.00 Ω. The current in the circuit is 0.180 A.

Calculate

1. the resistance of X,

resistance = ... Ω [2]

2. the p.d. between points A and B,

p.d. = ... V [2]

3. the efficiency of the cell.

efficiency = ...[2]

[Total: 10]

8 **(a)** Describe **two** differences between the decay of a nucleus that emits a β^- particle and the decay of a nucleus that emits a β^+ particle.

1. .....

.....

2. .....

.....

[2]

(b) In a simple quark model there are three types of quark. State the composition of the proton and of the neutron in terms of these three quarks.

proton: .....

neutron: .....

[1]

[Total: 3]