1 In the circuit shown in Fig. 9.1, resistors can be connected between terminals P and Q. The e.m.f. of the battery is 6.0V.

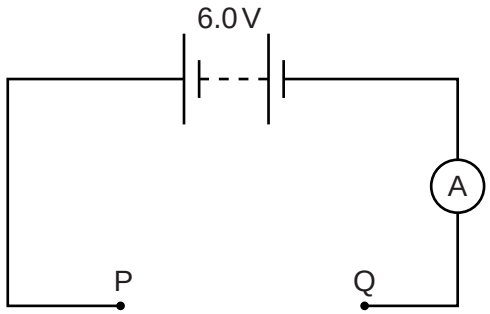

Fig. 9.1

(a) Calculate the current shown by the ammeter when a 12.0 Ω resistor and a 4.0 Ω resistor are

(i) connected in series between P and Q,

current = ... [2]

(ii) connected in parallel between P and Q.

current = ... [3]

(b) State the relationship between

(i) the resistance *R* and the length l of a wire of constant cross-sectional area,

.....

(ii) the resistance *R* and the cross-sectional area *A* of a wire of constant length.

.....
[2]

(c) The 12.0 Ω and 4.0 Ω resistors in **(a)** are wires of the same length and are made of the same alloy.

Calculate the ratio: $\frac{\text{cross-sectional area of 12.0 Ω resistor}}{\text{cross-sectional area of 4.0 Ω resistor}}$

ratio = ... [1]

[Total: 8]

2 Fig. 8.1 shows three cells each with e.m.f. 1.5 V connected in series.

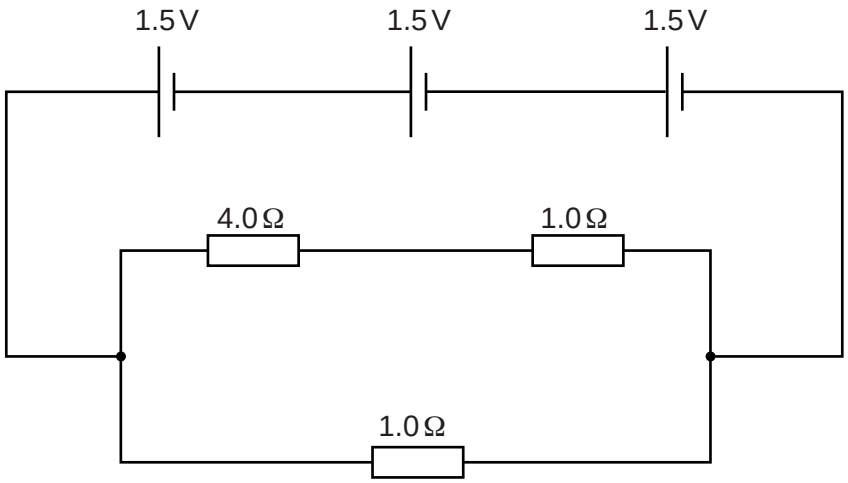

Fig. 8.1

(a) Calculate the combined e.m.f. of the cells.

e.m.f. = ... [1]

(b) Calculate the combined resistance of the three resistors shown in Fig. 8.1.

resistance = ... [2]

(c) Calculate the current in the 4.0 Ω resistor in Fig. 8.1.

current = ... [3]

(d) Calculate the combined e.m.f. of the cells if one cell is reversed.

e.m.f. = ... [1]

[Total: 7]

3 The electric circuit in a clothes dryer contains two heaters X and Y in parallel. Fig. 10.1 shows the circuit connected to a 230 V power supply.

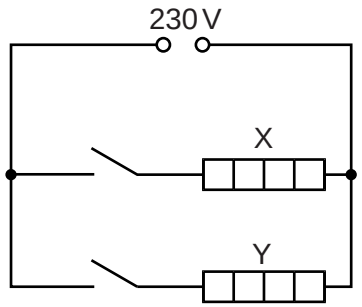

Fig. 10.1

When both switches are closed, the current in X is 3.5 A.

(a) Calculate the power developed in heater X.

power = ... [2]

(b) The resistance of X is double that of Y.

Determine the total resistance of X and Y in parallel.

resistance = ... [4]

[Total: 6]

4 **(a)** In a room in a house there are four electric lamps in parallel with each other, controlled by a single switch.

With all the lamps working, one of the lamp filaments suddenly breaks.

What, if anything happens to the remaining lamps? Explain your answer.

.....

.....

.....

.....[2]

(b) Fig. 10.1 shows the circuit diagram for the lamp in another room. X and Y are 2-way switches.

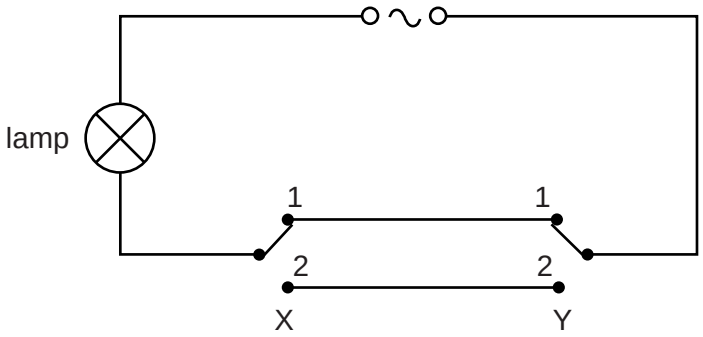

Fig. 10.1

(i) Complete the table, by indicating whether the lamp is on or off for each of the switch positions.

position of switch X	position of switch Y	state of lamp
1	1	
1	2	
2	1	
2	2	

[2]

(ii) Explain why this arrangement of switches is useful.

.....

.....[1]

[Total: 5]

5 **(a)** Fig. 8.1 shows two resistors **X** and **Y** in series.

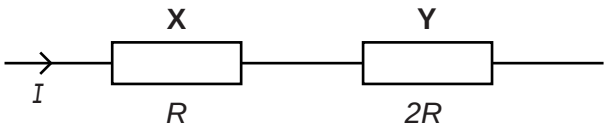

Fig. 8.1

Complete the table below, using only the symbols I and R, alone or in combination.

resistor	resistance	current	potential difference	power
X	R	I		I^2R
Y	$2R$		$2IR$	

[3]

(b) Fig. 8.2 represents the system used to transmit electricity from a power station to a factory.

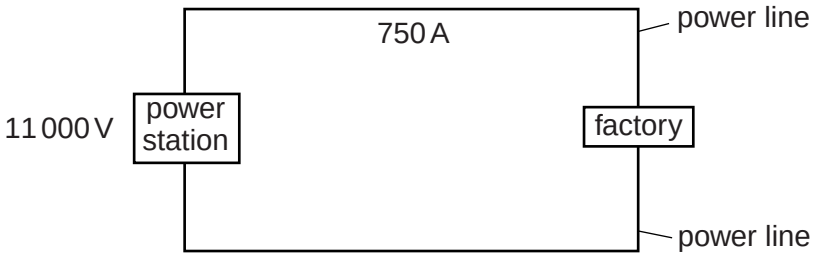

Fig. 8.2

The power station generates 11 000 V and supplies a current of 750 A. The total resistance of the power lines between the power station and the factory is 1.5 Ω.

Calculate

(i) the power output of the power station,

power = ... [1]

(ii) the potential difference across the 1.5 Ω of the power lines,

potential difference = ... [1]

(iii) the power supplied to the factory.

power = ... [3]

[Total: 8]

6 A student sets up a circuit containing three identical cells. Each cell has an e.m.f. (electromotive force) of 2.0 V.

Fig. 8.1 shows the cells in series with a length of uniform metal wire connected between two terminals K and L, an ammeter and a resistor X.

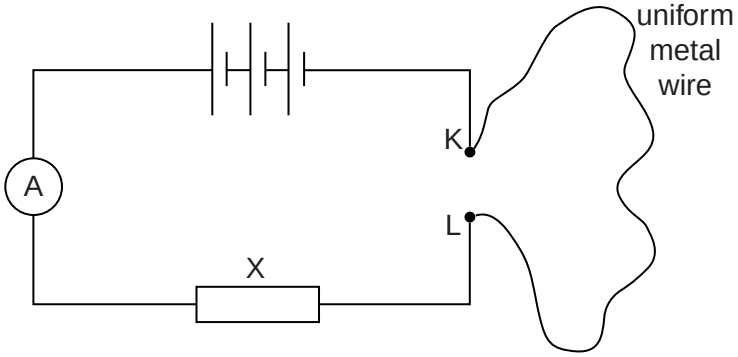

Fig. 8.1

(a) State the total e.m.f. of the three cells in series.

total e.m.f. = ... [1]

(b) The ammeter reading is 0.25 A.

(i) State the name of the unit in which electric charge is measured.

.....[1]

(ii) Calculate the charge that flows through the circuit in twelve minutes.

charge = ... [2]

(iii) The metal wire has a resistance of 16 Ω.

Calculate the resistance of resistor X.

resistance = ... [2]

(c) The student removes the 16 Ω wire from the circuit and cuts it into two equal lengths.

He then connects the two lengths in parallel between K and L, as shown in Fig. 8.2.

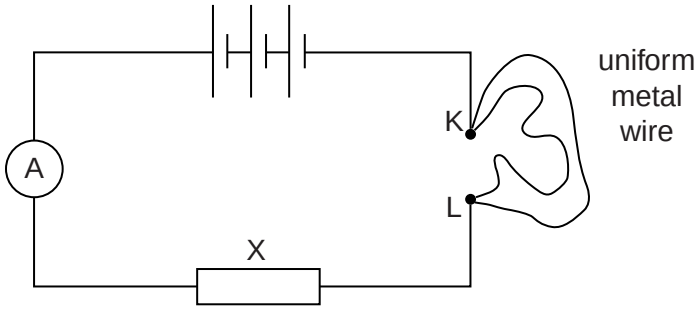

Fig. 8.2

Calculate the resistance of the two lengths of wire in parallel.

resistance = ... [3]

[Total: 9]

7 Fig. 9.1 shows the circuit that operates the two headlights and the two sidelights of a car.

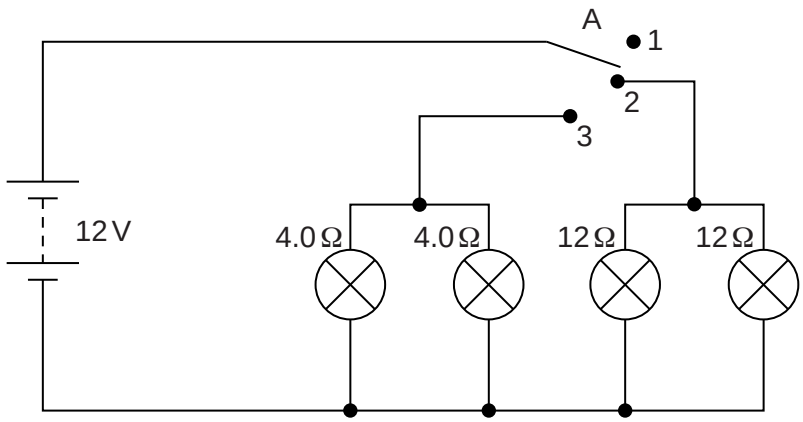

Fig. 9.1

Two of the lamps have resistances of 4.0 Ω when lit. The other two lamps have resistances of 12 Ω when lit. Switch A can be connected to positions 1, 2 or 3.

(a) State what happens when switch A is connected to

(i) position 1, ...

(ii) position 2, ...

(iii) position 3. .....

[1]

(b) **(i)** State the potential difference across each lamp when lit.

potential difference = ... [1]

(ii) Calculate the current in each 12 Ω lamp when lit.

current = ... [2]

(c) Show, with reasons for your answer, which type of lamp, 4.0 Ω or 12 Ω, has the higher power.

.....

.....

.....

.....[3]

[Total: 7]