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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electric Circuits

Paper 2 — Theory Worksheet (topical compilation)

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The City School

PAF CHAPTER

D.C. CIRCUITS P2

Prepared by:
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QUESTION # 1: M/J 2007 P2 Q7

7 Fig. 7.1 shows an electrical circuit containing a 12V power supply and a number of resistors.

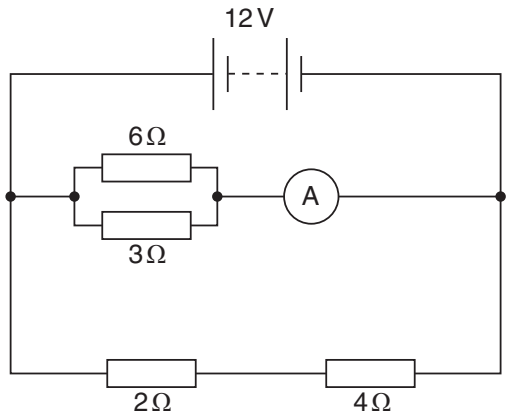


Fig. 7.1

(a) Calculate the combined resistance of

(i) the 2 Ω and 4 Ω resistors in series,

resistance = ... [1]

(ii) the 3 Ω and 6 Ω resistors in parallel.

resistance = ... [2]

(b) Calculate the reading of the ammeter in Fig. 7.1.

ammeter reading = ... [2]

(c) Determine the potential difference across the 4 Ω resistor.

p.d. = ... [2]

QUESTION # 2: M/J 2011 P22 Q5

5 Fig. 5.1 shows part of a low-voltage lighting circuit.

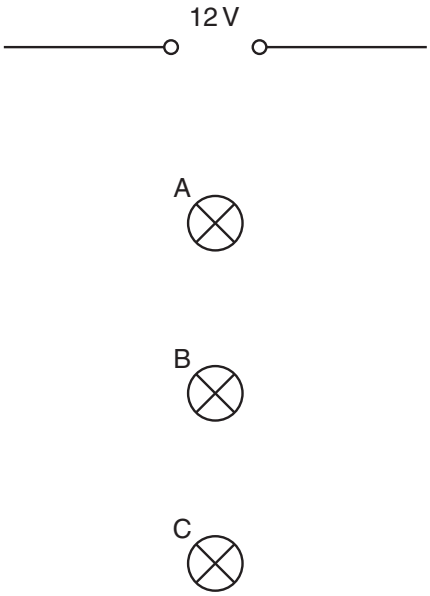


Fig. 5.1

The power supply voltage is 12 V.

(a) On Fig. 5.1, complete the circuit, adding components as necessary, so that:

- the total current in the circuit can be measured,
- lamp A is on all the time,
- lamps B and C are in series with each other and are switched on or off together.

[3]

(b) All the lamps are on. The potential difference (p.d.) across lamp B is 8.0 V and the current in lamp B is 50 mA.

(i) Calculate the resistance of lamp B.

resistance = ... [2]

(ii) State the current in lamp C.

current = ... [1]

QUESTION # 3: M/J 2014 P22 Q3

11 A student sets up the circuit shown in Fig. 11.1.

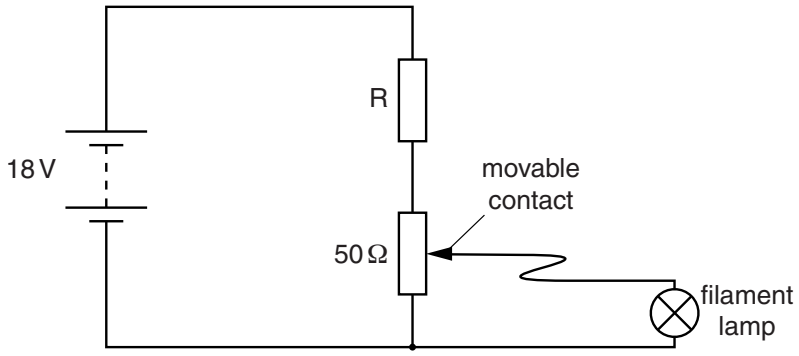


Fig. 11.1

R is a fixed resistor in the circuit. The filament lamp is marked 12 V, 0.25 A.

The circuit is used to produce a current/voltage graph for the filament lamp. The ammeter and voltmeter needed are not shown.

To obtain different readings, the student changes the position of the movable contact.

(a) On Fig. 11.1, draw the symbols for an ammeter and a voltmeter in the correct positions. [3]

(b) Explain why it is sensible to include the resistor R in this circuit.

.....

.....

..... [2]

(c) **(i)** On Fig. 11.2, sketch a current/voltage graph for the lamp.

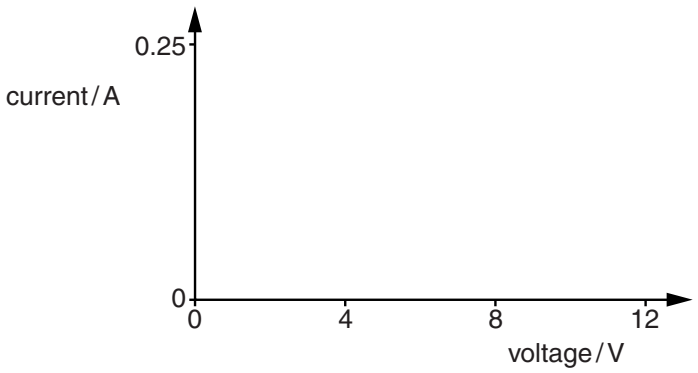


Fig. 11.2 [3]

(ii) State and explain how a current/voltage graph for a fixed resistor is different from the graph for a filament lamp.

.....

.....

..... [2]

(d) Fig. 11.3 shows the position of the movable contact when the voltage across the lamp is 12 V and the current in the lamp is 0.25 A.

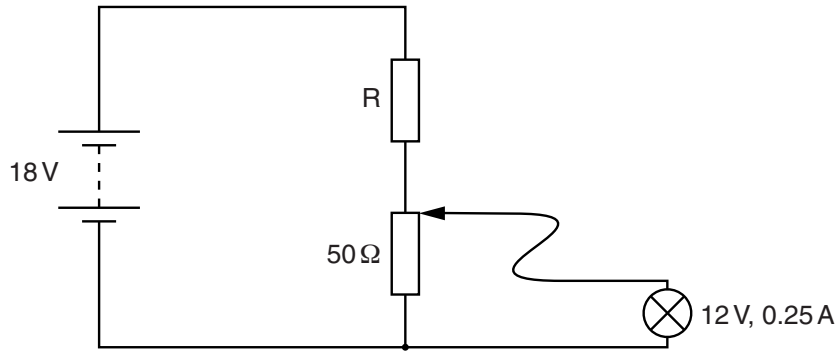


Fig. 11.3

Determine

(i) the current in the 50 Ω resistor,

current = ... [2]

(ii) the current in R,

current = ... [1]

(iii) the potential difference (p.d.) across R,

p.d. = ... [1]

(iv) the resistance of R.

resistance = ... [1]

QUESTION # 4: M/J 2015 P21 Q6

6 Fig. 6.1 shows a circuit that contains a resistor connected to a power supply of 6.0 V and a lamp L.

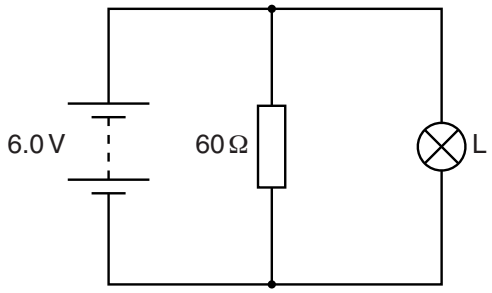


Fig. 6.1

The resistor has a resistance of 60 Ω. The lamp is marked 6.0 V, 0.90 W.

(a) Calculate

(i) the current in the resistor,

current = ...[2]

(ii) the current in the power supply.

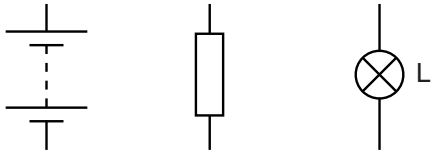
current = ...[2]

(b) A second lamp is added to the circuit shown in Fig. 6.1.

The second lamp is in series with the 60 Ω resistor, but is **not** in series with lamp L.

(i) In the space below draw a circuit diagram of this new circuit.

The power supply, 60 Ω resistor and lamp L have been drawn for you.



[1]

(ii) The two lamps are identical.

Explain why the second lamp is dimmer than lamp L.

A calculation is not required.

.....

.....

.....[1]

QUESTION # 5: M/J 2016 P21 Q8

8 Fig. 8.1 shows a circuit that contains a battery, a fixed resistor of resistance 1000 Ω and a variable resistor R.

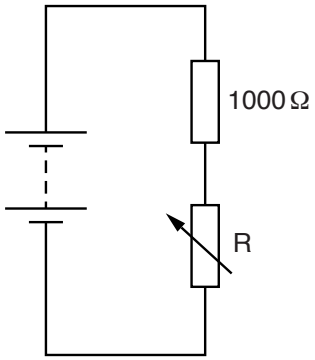


Fig. 8.1

(a) (i) State the relationship between the current I_B in the battery, the current I_1 in the fixed resistor and the current I_2 in the variable resistor.

.....

.....[1]

(ii) State an equation that relates the potential difference (p.d.) V_B across the battery, the p.d. V_1 across the fixed resistor and the p.d. V_2 across the variable resistor.

.....

.....[1]

(b) The p.d. across the battery is 9.0 V. The resistance of R is set at 500 Ω.

Calculate the current in R.

current = ...[2]

QUESTION # 6: M/J 2017 P21 Q5

5 Fig. 5.1 shows an arrangement of three resistors.

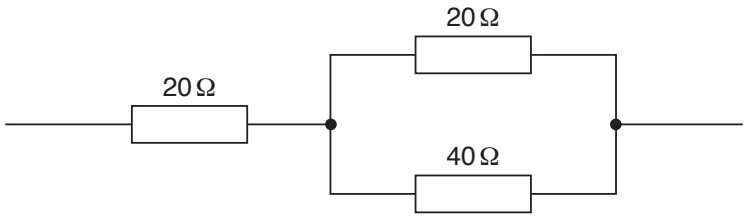


Fig. 5.1

(a) Calculate the total resistance of this arrangement.

resistance = ...[3]

(b) The arrangement is connected to a d.c. power supply.

Voltmeters are placed across the resistors, as shown in Fig. 5.2. There is a current in each resistor.

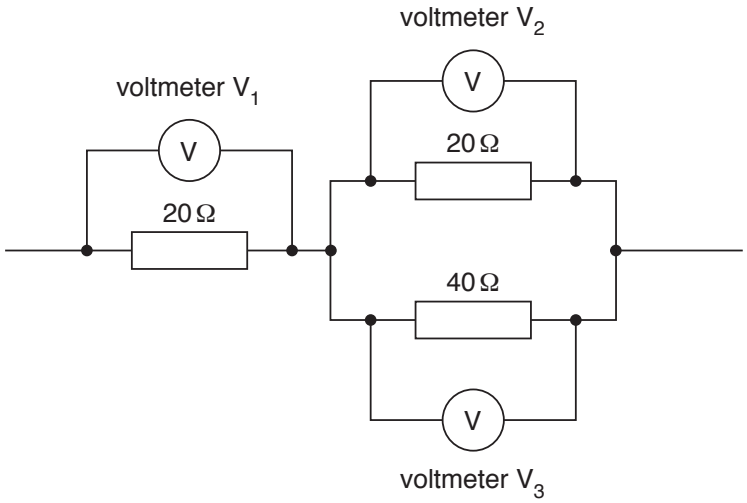


Fig. 5.2

Compare the readings on the three voltmeters. There is no need for any calculation.

.....

.....

.....[2]

QUESTION # 7: M/J 2018 P22 Q10

10 A student connects a battery to two resistors. The circuit diagram is shown in Fig. 10.1.

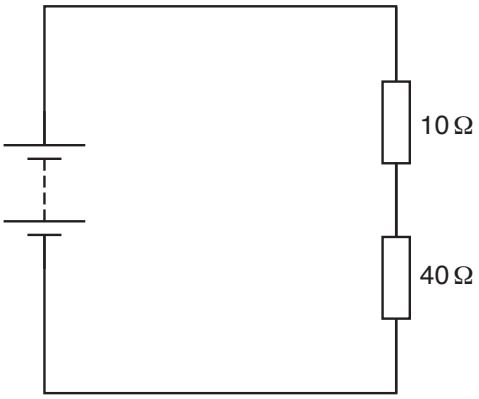


Fig. 10.1

The potential difference (p.d.) across the 40 Ω resistor is 9.6 V.

(a) State what is meant by the *potential difference* across a resistor.

.....

.....[2]

(b) **(i)** Calculate the current in the 40 Ω resistor.

current = ...[2]

(ii) Calculate the electromotive force (e.m.f.) of the battery.

e.m.f. = ...[2]

(c) The student has three different voltmeters to measure the p.d. across the 40 Ω resistor. These are labelled 0–2 V, 0–20 V and 0–200 V. Each has a pointer that shows the p.d. on a scale.

State and explain which of the three voltmeters is best to measure this p.d.

.....

.....

.....

.....[2]

(d) **(i)** Calculate the power *P* produced in the 10 Ω resistor.

P = ...[2]

(ii) The student has available two 10 Ω resistors, with power ratings of $\frac{1}{2}P$ and $2P$.

Suggest why a resistor with a power rating of $\frac{1}{2}P$ is not suitable for the circuit in Fig. 10.1.

.....

.....[1]

(e) The student adds a resistor R to the circuit, to make the circuit shown in Fig. 10.2.

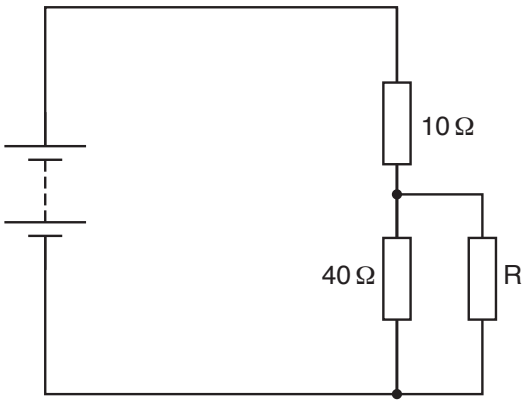


Fig. 10.2

Complete the table in Fig. 10.3 to show what happens as resistor R is connected.

You should state whether each quantity increases, decreases or stays the same and give a brief explanation of why any change occurs. Calculations are not required.

quantity	increases, decreases or stays the same as resistor R is added	brief explanation of why the change occurs
current in 10 Ω resistor	increases	
p.d. across 10 Ω resistor		
p.d. across 40 Ω resistor		

[4]

Fig. 10.3

QUESTION # 8: O/N 2008 P2 Q7

7 A motorcycle battery consists of six 2.0 V cells in series. The battery supplies energy to the headlight.

(a) State the total electromotive force (e.m.f.) of the battery.

..... [1]

(b) The motorcycle headlight contains two identical filament lamps F and G. Filament lamp F is always lit but filament lamp G is turned on and off by switch D.
Fig. 7.1 is the circuit diagram.

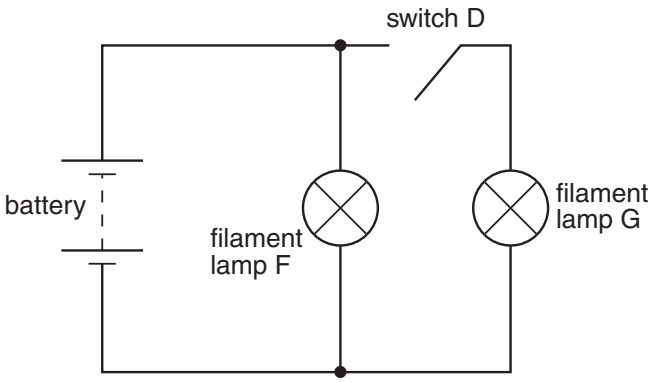


Fig. 7.1

When switch D is open, the battery supplies a current of 4.6 A.

Complete the table of Fig. 7.2.

	current supplied by battery / A	current in filament lamp F / A	current in filament lamp G / A
switch D open	4.6		
switch D closed			

Fig. 7.2 [3]

(c) Calculate the energy supplied by the battery as an electric charge of 200 C moves through the circuit.

energy supplied = ... [2]

QUESTION # 9: O/N 2012 P21 Q8

8 A 600 Ω resistor and a thermistor are connected in series with an ammeter and a 20 V d.c. (direct current) power supply. A voltmeter is in parallel with the resistor.

Fig. 8.1 is the circuit diagram.

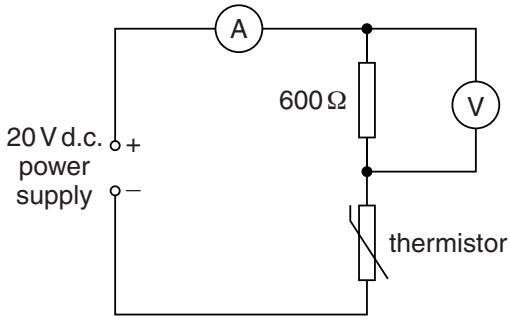


Fig. 8.1

The ammeter reads 0.025 A.

(a) Calculate

(i) the reading on the voltmeter,

reading = ... [2]

(ii) the resistance of the thermistor.

resistance = ... [2]

(b) The temperature of the thermistor increases.

State what, if anything, happens to

(i) the resistance of the thermistor,

..... [1]

(ii) the ammeter reading and to the voltmeter reading.

ammeter reading: .....

voltmeter reading: .....
[1]

QUESTION # 10: O/N 2014 P21 Q11

11 A student makes a 2.0V battery by connecting two cells of electromotive force (e.m.f.) 2.0V in parallel. The battery, an ammeter with different ranges and three different resistors are used to set up the circuit shown in Fig. 11.1.

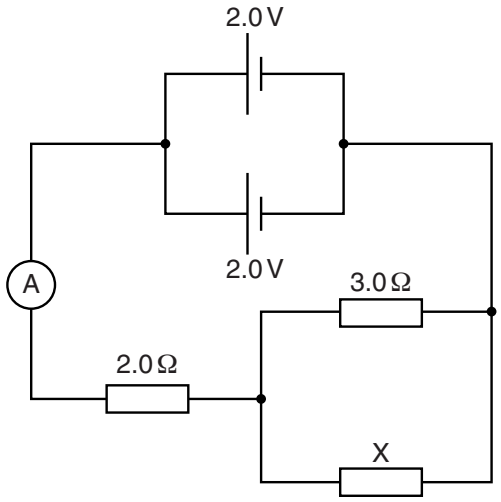


Fig. 11.1

(a) (i) Explain what is meant by *electromotive force*.

.....

.....

.....[2]

(ii) State one advantage of using two cells in parallel rather than using a single 2.0V cell.

.....

.....[1]

(b) Resistor X and the 3.0Ω resistor have a combined resistance that is equal to 2.0Ω.

Calculate

(i) the total resistance of the circuit,

total resistance = ...[1]

(ii) the resistance of X.

resistance of X = ...[2]

(c) **(i)** Determine the reading of the ammeter.

reading = ...[2]

(ii) Suggest a suitable range for the ammeter.

.....[1]

(d) The current in the 2.0 Ω resistor is I_2.
The current in the 3.0 Ω resistor is I_3.
The current in X is I_X.

State the equation that relates I_2, I_3 and I_X.

.....[1]

(e) State the potential difference (p.d.) across

(i) the 2.0 Ω resistor,

p.d. = ...[1]

(ii) the 3.0 Ω resistor.

p.d. = ...[1]

(f) The student sets up a second circuit using a variable d.c. power supply, an ammeter and a 12V metal filament lamp. The circuit is shown in Fig. 11. 2.

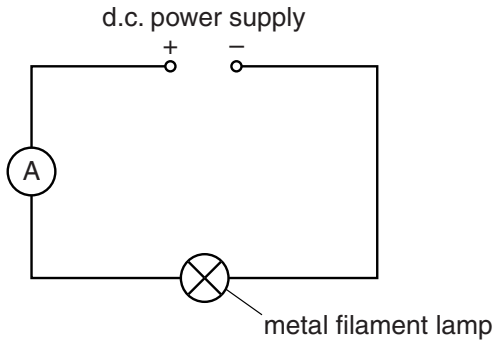


Fig. 11.2

The d.c. power supply is set to 12V and the ammeter reading is 1.5A.

The student changes the e.m.f. of the d.c. power supply to 6.0V. The lamp dims and the ammeter reading changes.

(i) State and explain what happens to the resistance of the metal filament of the lamp.

.....

.....

.....[2]

(ii) State whether the new ammeter reading is less than, equal to or greater than 0.75A.

.....[1]