Electricity 2

1. Fig.1 shows a lamp connected to a battery.

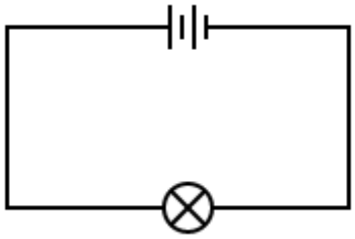
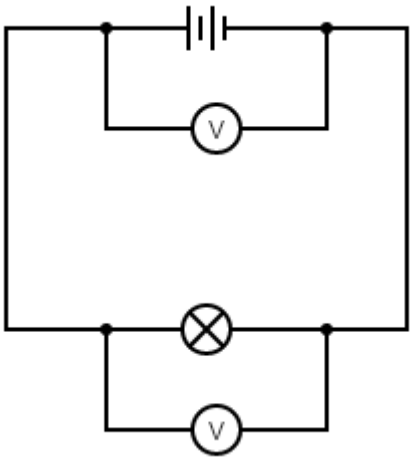


Fig. 1

On a copy of Fig.1, draw an ammeter and a voltmeter to show how these instruments can be connected in the ciruit to measure the current through the lamp and the voltage across the lamp.

2. Fig. 2 shows a battery connected to a lamp. Two voltmeters are also connected in the circuit as shown in the figure. The battery has a voltage of 6V.



A real battery has something called an internal resistance. Due to this internal resistance, when the battery supplies a current, the voltage across the battery will be less than the stated voltage of the battery. However, we ignore this internal resistance and its effect in GCSE physics.

Fig. 2

(a) State the reading on the voltmeter connected across the battery.

(b) State the reading on the voltmeter connected across the lamp.

3. Fig. 3 shows a 12V battery connected to a lamp of resistance 24 Ω.

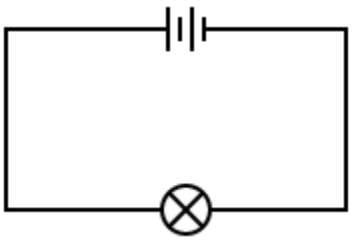


Fig. 3

(a) State the voltage applied by the battery across the lamp.

(b) Calculate the current flowing through the lamp.

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4. A battery is connected to an ammeter and a lamp as shown in fig.4.

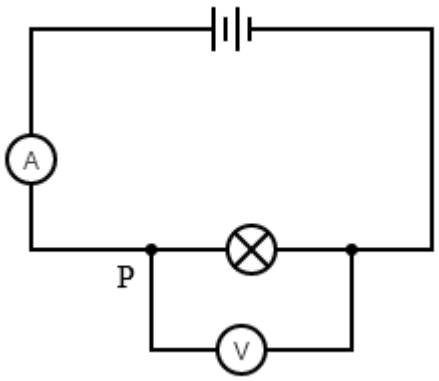

Fig. 4

The reading on the ammeter is 3A.

The reading on the voltmeter is 12V.

(a) It is generally assumed that the current reaching junction P on Fig.4 doesn't split at that junction. Based on this, we say that the current flowing through the lamp is the same as the current reading on the ammeter.

Why is this assumption justified?

(b) Caculate the amount of charge passing through the lamp in 5 minutes.

(c) Determine the number of electrons passing through the lamp in 5minutes. (Each electron has a negative charge of 1.6×10^{-19} C of charge.)

(d) Find the resistance of the lamp.

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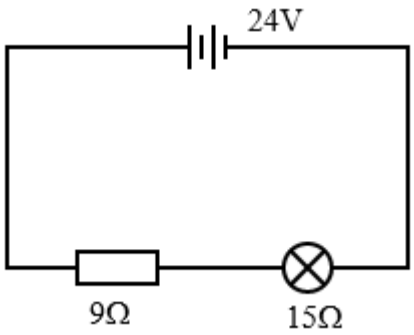
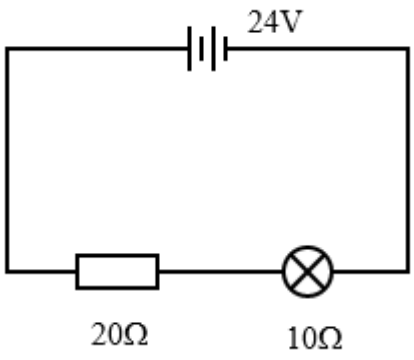
5. In each of the following circuits, a resitor and a lamp are connected in series to a battery.
For ecah circuit, calculate the voltage (potential difference) across,
(i) the resistor
(ii) the lamp.

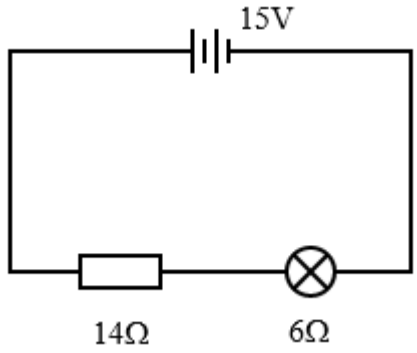
(a)



(b)



(c)



6. In each of the circuits in question 5 above, calculate the current flowing through the lamp.

7. Fig. 5 shows a battery of voltage 12V connected to a lamp and a resistor.

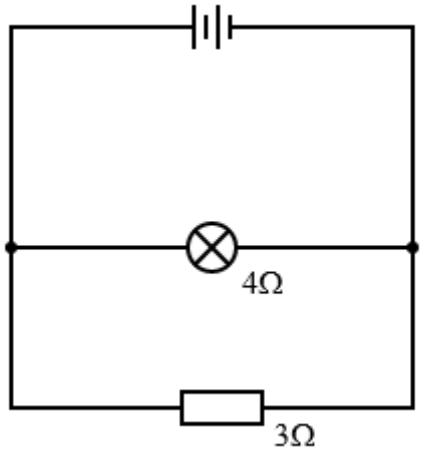


Fig. 5

State the voltage across the,

(i) lamp

(ii) resistor

8. In question 7 above, calculate the current flowing through the,

(i) lamp

(ii) resistor

9. Sam connects a 36V battery to two lamps and a resistor in two different ways as shown in Fig. 6 and Fig. 7.

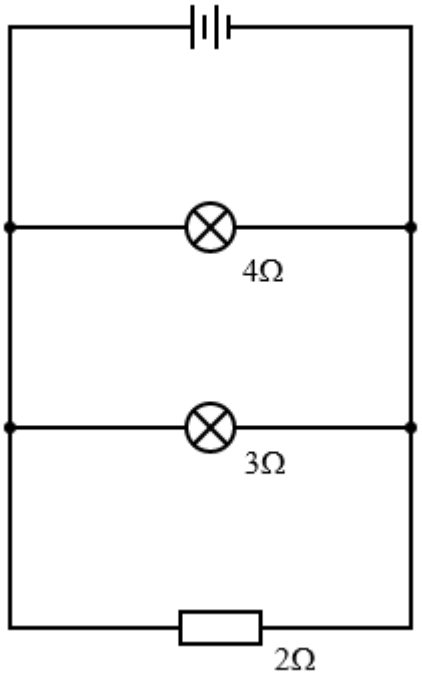


Fig. 6

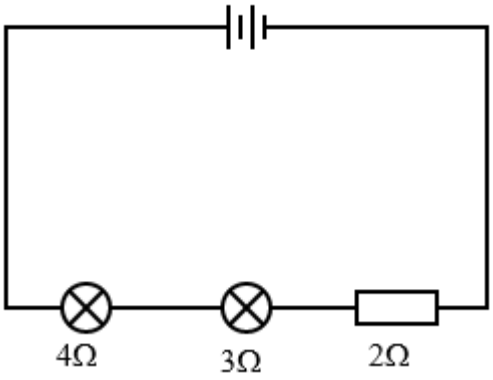


Fig. 7

(a) For each circuit, determine the voltage across the,

(i) 4Ω lamp

(ii) 3Ω lamp

(iii) resistor

(b) Calculate the current through the 4Ω lamp in each of the circuits. Use your answer to state the circuit in which the 4Ω lamp will be brighter.

10. Fig. 8 and Fig 9 show a 24V battery connected to a lamp and a variable resistor in two different ways. The lamp has a fixed resistance of 4Ω .

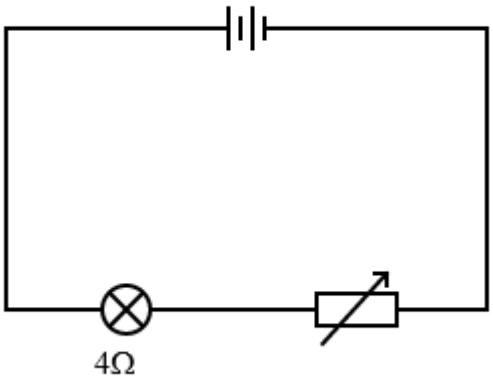


Fig. 8

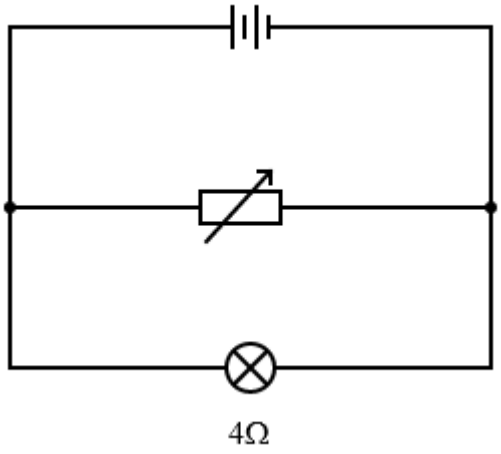


Fig. 9

(a) The resistance of the variable resistor is set at 8Ω in both circuits.

(i) Calculate the potential differences across the lamp and the variable resistors in the two circuits.

(ii) Determine the current through the lamp in the circuits.

(b) The resistance of the variable resistor is changed to 12Ω in both circuits. Without any calculations, state whether the brightness of the lamp will change in the two circuits.