

## S3/S4 Homework Exercises

### Electricity Homework One

1. Copy and complete the following.

a) The basic structure of an atom consists of a nucleus which is orbited by \_\_\_\_\_. Inside the nucleus there are particles called \_\_\_\_\_ and \_\_\_\_\_. A \_\_\_\_\_ atom has no overall charge because the number of \_\_\_\_\_ is equal to the number of \_\_\_\_\_.

(3)

b) \_\_\_\_\_ is the electric charge transferred per unit time.

(1)

c) \_\_\_\_\_ (voltage) of a supply is a measure of the energy given to the charge carriers in a circuit.

(1)

2. Calculate the electric current in a circuit if 8 C of charge pass a point in the circuit in a time of 32 seconds.

(3)

3. Calculate how long it would take a current of 15 A to build up 4.5 kC of charge.

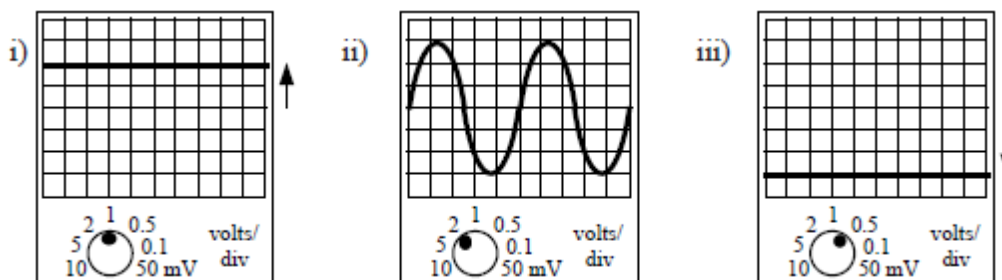
(3)

4. Explain the difference between a.c. and d.c.. Your explanation must include the terms “electron” and “direction”.

(2)

5. For each of the following traces, state if they are a.c. or d.c.

(3)



6. Draw the electric field pattern around each of the following point charges.



(4)

## Electricity Homework Two

1. Draw the circuit symbols for the following components:

- a) ammeter
- b) voltmeter
- c) ohmmeter

(3)

2. Copy and complete the following.

- a) When measuring the current in a component, the ammeter must be placed in \_\_\_\_\_ with the component.
- b) When measuring the potential difference (voltage) across a component, the voltmeter must be placed in \_\_\_\_\_ with the component.

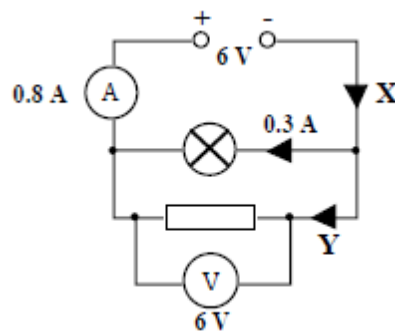
(2)

3. Which of the following circuit rules are for series and which are for parallel circuits?

- A the current is the same at all points in the circuit
- B the sum of the branch currents is equal to the current drawn from the supply
- C the potential difference (voltage) across components in this circuit is the same for all components
- D the sum of the potential differences (voltages) across the components in this circuit is equal to the potential difference (voltage) of the supply

(4)

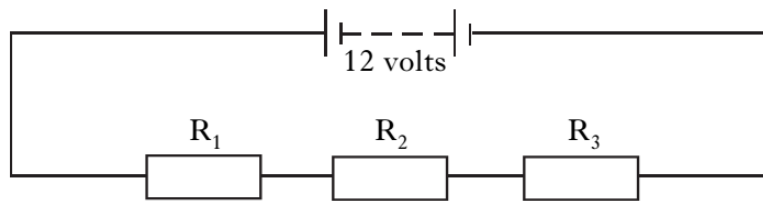
4. In the circuit below the ammeter reads 0.8 A, the current through the lamp is 0.3 A and the voltmeter reads 6 V.



- a) State the current values at X and Y.
- b) State the voltage across the lamp.

(3)

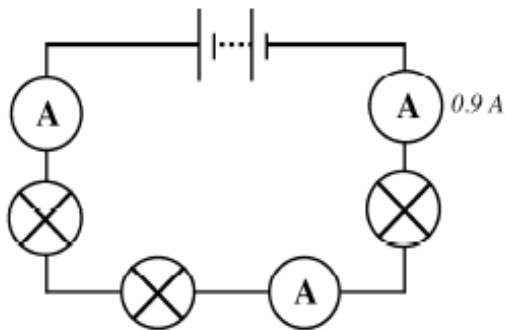
5. A circuit is set up as shown.



The potential difference (voltage) across  $R_1$  is 5 V and the potential difference (voltage) across  $R_2$  is 4 V. State the potential difference (voltage) across  $R_3$ .

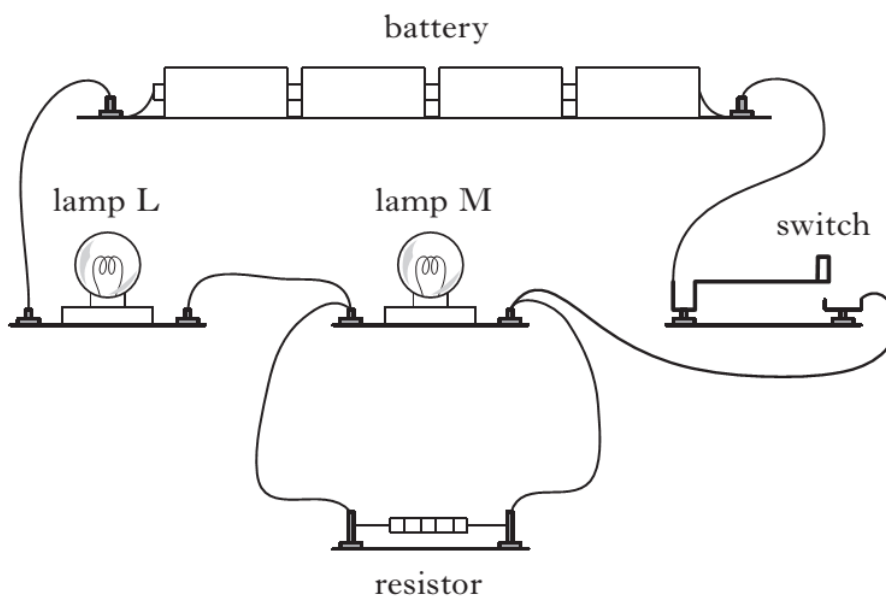
(1)

6. Redraw the circuit below and write the reading of the ammeters beside each ammeter symbol.



(2)

7. A student sets up the following circuit.



Draw a **circuit diagram** for this circuit using correct symbols for the components.

(5)

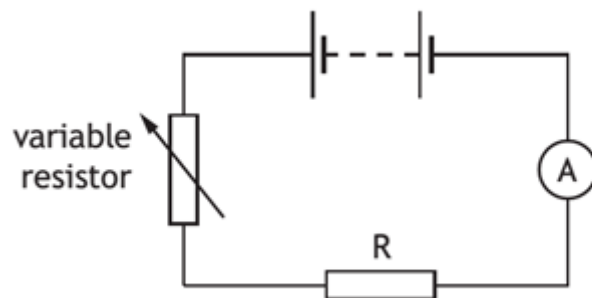
### Electricity Homework Three

1. Copy and complete the following:

Resistance is the \_\_\_\_\_ to the flow of current. Resistance is measured in units called \_\_\_\_\_.

(2)

2. A student sets up the following to investigate the properties of a resistor.



a) Redraw this circuit to show where a voltmeter would be placed to measure the potential difference (voltage) across the resistor R.

(1)

b) By adjusting the variable resistor, the following data was collected.

<i>Voltage across resistor R (V)</i>	<i>Current in resistor R (A)</i>
1.0	0.20
2.5	0.50
3.2	0.64
6.2	1.24

On the graph paper supplied, use this data to draw a line graph.

(4)

c) State the relationship between potential difference (voltage) and current that is shown by this graph.

(1)

3. Use Ohm's Law to calculate the value of a resistive component that has a potential difference (voltage) of 12 kV across it when a current of 3 mA is flowing.

(3)

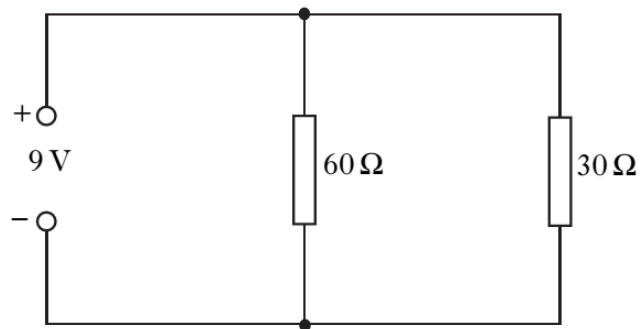
4. Copy and complete the following by choosing the correct word in the brackets.

a) Increasing the number of resistors in a series circuit will (decrease/increase) the total resistance.

b) Increasing the number of resistors in a parallel circuit will (decrease/increase) the total resistance.

(2)

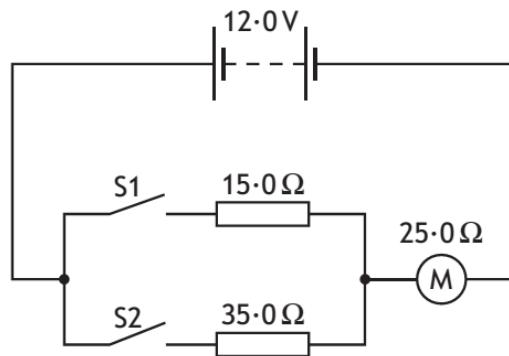
5. Two resistors are connected in parallel as shown.



Calculate the resistance of this circuit.

(3)

6. A student sets up the following circuit.



The student closes switch  $S2$ . Calculate the current following in the circuit.

(4)

## Electricity Homework Four

1. Copy and complete the following:

Electrical and electronic systems can be split into three parts:

- \_\_\_\_\_ - this part always sends an electrical signal to the next part
- \_\_\_\_\_ - in this part some changes are made to the signal
- \_\_\_\_\_ - this part changes the electrical signal into a useful energy

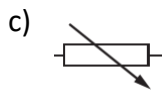
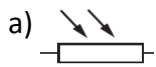
(3)

2. Copy and complete the following table by deciding if the action is digital or analogue.

Action	Digital or Analogue?
Turn a light on and off	
Playing music	
Press a doorbell	
Dim a light	
Operate an electric motor	

(3)

3. Name the components represented by the following symbols.



(3)

4. Draw the symbols for the following devices.

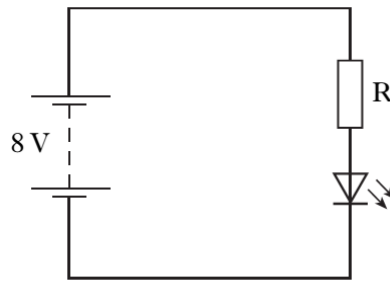
a) Motor

b) Loudspeaker

c) Relay

(3)

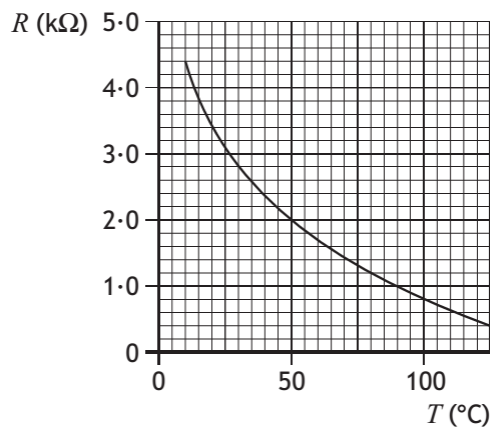
5. In the following circuit the LED has an operating voltage of 1.5 V and an operating current of 13 mA.



a) State the voltage across the resistor, R, when the LED is at its operating voltage. (1)

b) Calculate the resistance of resistor R. (3)

6. The graph shows how the resistance, R, of a thermistor varies with temperature.



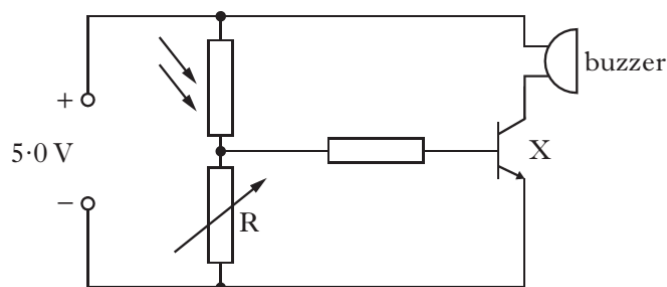
The thermistor is connected in a circuit.

a) State the value of the thermistor's resistance when the temperature is 90 °C. (1)

b) When the temperature is 90 °C, the current in the thermistor is 0.004 A. Calculate the potential difference (voltage) across the thermistor. (3)

## Electricity Homework Five

1. A photographic dark room has a buzzer that sounds when the light level in the room is too high. The circuit diagram for the buzzer system is shown below.



a) Is component X an input, process or output device?

(1)

The table shows how the resistance of the LDR varies with light.

<i>Light level (units)</i>	<i>LDR Resistance (<math>\Omega</math>)</i>
20	4500
50	3500
80	2500

b) State the resistance of the LDR when the light level is 80 units.

(1)

c) When the light level is set at 80 units, the variable resistor is set to  $1500 \Omega$ . Calculate the current in the LDR.

(4)

2. Draw the circuit symbol for the following logic gates:

a) AND-gate      b) OR-gate      c) NOT-gate

(3)

3. Which logic gate has the following truth table?

Input	Input	Output
A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

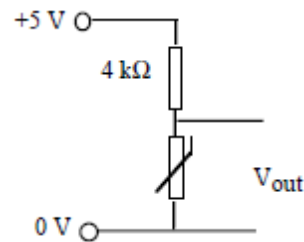
(1)



4. Which logic gate “combines the input signals so that the output is only 1 when both inputs are 1”?

(1)

5. The following circuit is set up.



a) When the temperature rises, state happens to the value of  $V_{out}$ .

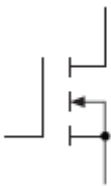
(1)

b) When the total resistance of the circuit is  $10\text{ k}\Omega$ , state the resistance value of the thermistor.

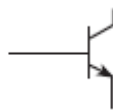
(1)

6. Name the components which have the following symbols.

a)

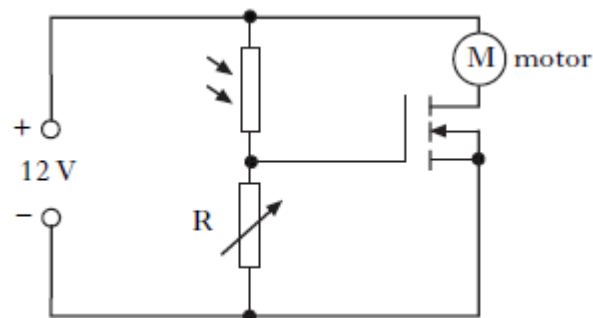


b)



(2)

7. An automatic window blind operates when the light level outside gets too high. The electronic circuit that operates the blind is shown below.



Copy and complete the following by choosing the correct word in the brackets.

“When the light level is too high the resistance of the LDR will (increase/decrease). The voltage across the LDR will (increase/decrease). The voltage across the variable resistor will (increase/decrease). The voltage across the transistor will (increase/decrease). The transistor will switch (on/off).”

(5)

## Electricity Homework Six

1. Put these appliances in order from highest power rating to lowest power rating.

1500 W hairdryer; 2 kW toaster; 800 W microwave; 0.5 kW fridge

(4)

2.

a) Draw the symbol for a fuse.

(1)

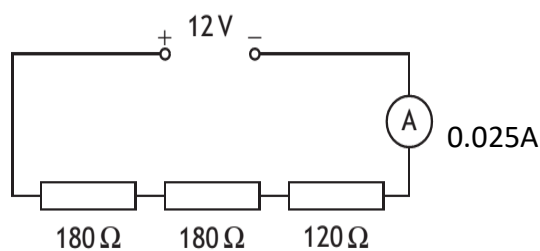
b) State the two most commonly used fuse ratings used in the UK.

(2)

c) Determine the fuse rating for a 1610 W hairdryer when it is operated from a 230 V mains supply.

(4)

3. A student sets up the following circuit.



Calculate the power dissipated in the  $120\ \Omega$  resistor.

(3)

4. A device with a resistance of  $15\ \Omega$  is operated by a 3 V battery. Calculate the power of the device.

(3)

5. If a filament lamp that uses energy at a rate of 40 Joules per second is used for 2 hours, calculate how much electrical energy will have been supplied in this time.

(3)

## Electricity Homework Seven

1. Draw a diagram of the magnetic field that surrounds a permanent magnet. Your diagram should clearly show a North Pole and a South Pole on the magnet. Make sure you include arrows on your field lines.

(5)

2. Copy and complete the following sentences.

a) When two North Poles are brought close together they will \_\_\_\_\_ each other.

b) When a North Pole and a South Pole are brought close together they will \_\_\_\_\_ each other.

c) A magnetic field can be created by passing a \_\_\_\_\_ through a wire.

(3)

3. True or False. A scrapyard magnet uses an electromagnet to move objects around. Explain your answer.

(2)

4. Explain how an electromagnet is used in an electric bell.

(3)

5. Magnetic effects are used in the production and transmission of high voltage electricity.

a) State the main useful energy change in a generator.

b) State the name of the device that “steps-up” the voltage produced from a power station.

(2)