Chestnut Grove Academy

Physics

2. Electricity

Revisiting Booklet

Name:

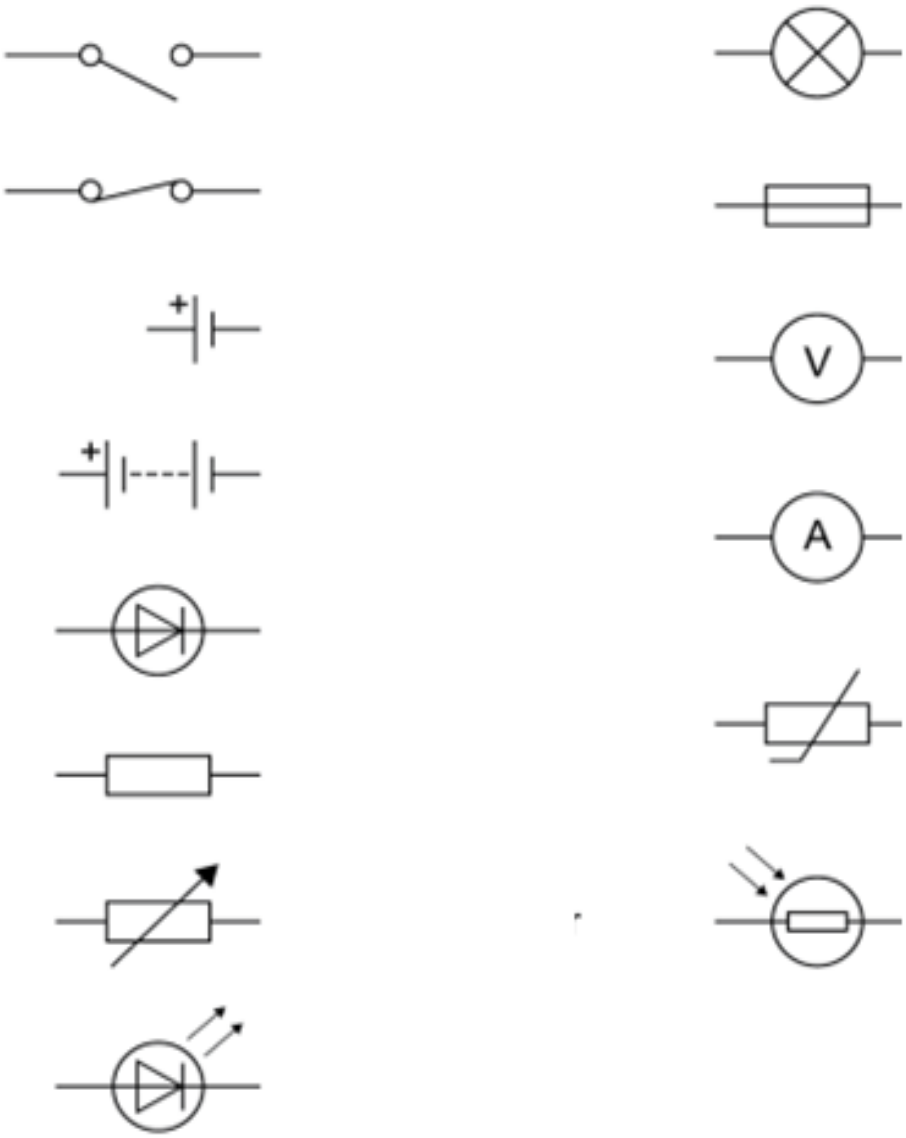
Electricity

Topics:

1. Standard circuit diagram symbols
2. Electrical charge and current
3. Current, resistance and potential difference
4. Required practical: investigate the I–V characteristics of a variety of circuit elements
5. Resistors
6. Required practical: factors affecting the resistance of electrical circuits.
7. Series and Parallel circuits
8. DC and AC
9. Mains electricity
10. Power
11. Energy transfers in appliances
12. The national grid
13. TRIPLE ONLY Static electricity
14. TRIPLE ONLY Electrical fields

Standard Circuit Diagram Symbols

1. Name and describe the function of each of these circuit symbols:



2. Using the circuit symbols draw an example of a series and parallel circuit

Electrical charge and current

Current = Amount of charge/Time

I = Q/t

Using the equation complete the table:

Charge (C)	Current (A)	Time (s)
	5	2
0.4	1	
20	0.5	
50		250
	3	60

1) A circuit is switched on for 30s with a current of 3A. How much charge flowed?

2) During electrolysis 6A was passed through some copper chloride and a charge of 1200C flowed. How long was the experiment on for?

3) A bed lamp is switched on for 10 minutes. It works on a current of 0.5A. How much charge flowed?

Current Resistance and Potential Difference

potential difference = current × resistance

V = I R

1. **What will be the potential difference across a 50Ω resistor if a current of 500A is flowing through it?**

2. **What current will be needed to produce a voltage of 5V cross a 12Ω resistor?**

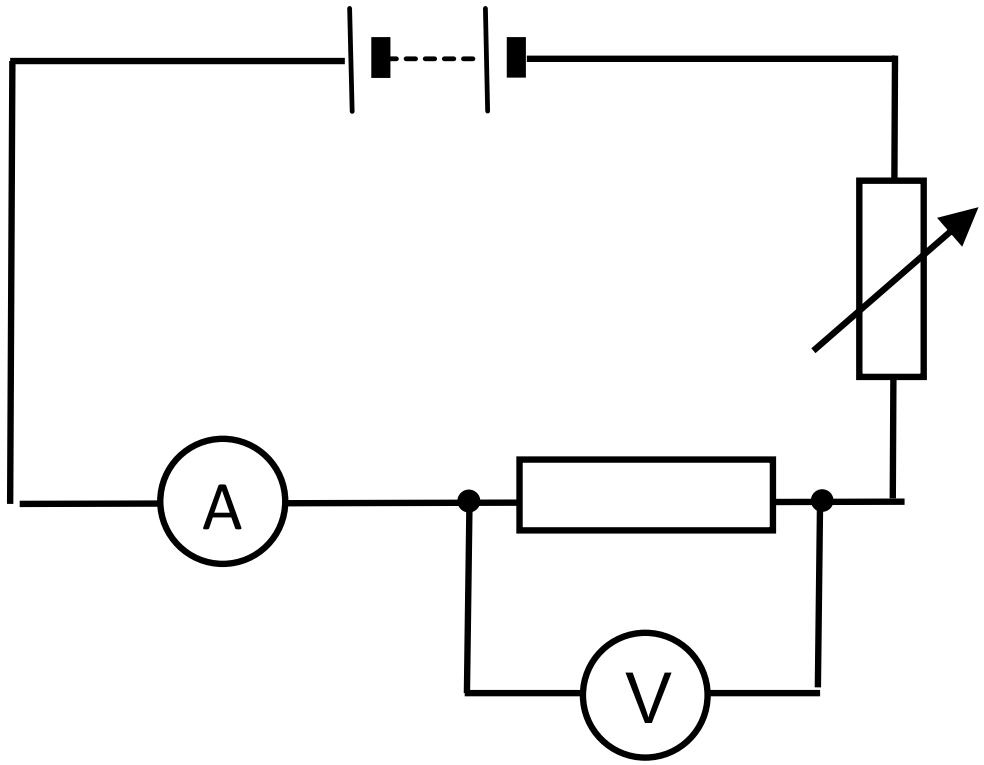
3. **What value of resistor will be needed to produce a current of 100A when a voltage of 12V is applied across the resistor?**

4. **What voltage will be developed across a 560Ω resistor if a current of 20A is flowing through it?**

5. **What current passing through 10Ω resistor will produce a voltage of 8V cross it?**

Required practical:
Factors affecting the resistance of electrical circuits.

Label the components:



Method for a filament bulb

1.

2.

3.

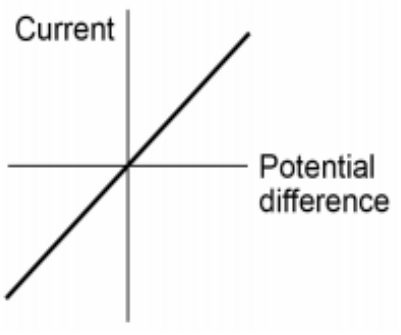
4.

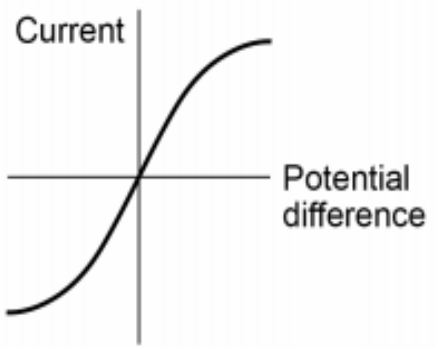
5.

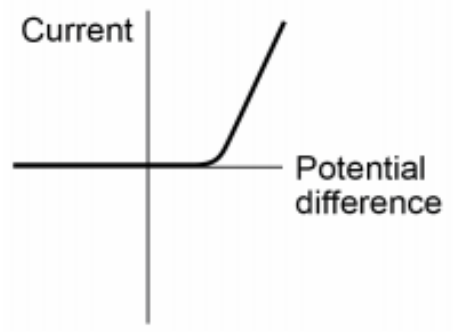
6.

Resistors

State the type of resistor and describe what each of these graphs show.
i.e. As potential difference increases, current .....







Series and Parallel circuits

Define:

1. Series circuit:

2. Parallel circuit:

Complete the sentences:

1. In a SERIES circuit:

Current is _____ at any point

Potential difference _____ over each component

2. In a PARALLEL circuit:

Current _____ down each "path"

Potential difference is _____ across each "path"

Summarise the rules using equations for

a) **potential difference**
b) **current**
c) **resistance**

in a series and parallel circuits

a)

b)

c)

Find Someone Who…

Your task is to fill in your sheet by asking your classmates the answers to the questions below.

The rules:

1. You can't answer any of the questions on your sheet yourself
2. You can only ask a person once
3. You can't ask the teacher

1. What is wrong with this circuit?

Who:

2. What is resistance?

Who:

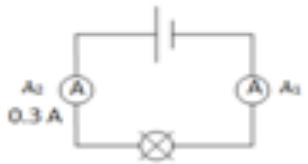
3. Can you find out 3 circuit symbols?

Who:

4. What does a voltmeter measure?

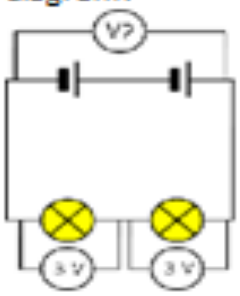
Who:

5. What will be the missing current value in this circuit diagram?



Who:

6. What is the missing voltage value in this circuit diagram?



Who:

7. What is current and what is it measured in?

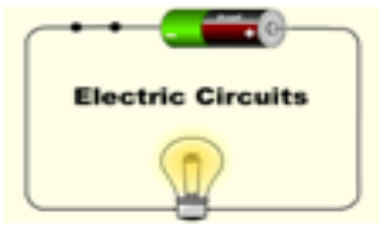
Who:

8. What are the 2 types of circuit called?

Who:

9. Name one household item that uses electricity

Who:



10. In a series circuit does the bulb get brighter or dimmer if you another bulb.

Who:

Required practical: factors affecting the resistance of electrical circuits.

Task: Investigate which has a higher resistance two resistors in series or two resistors in parallel:

Discuss in your group:

1. How can you calculate the total resistance of series and parallel circuit?
2. How will you calculate resistance for a series circuit/parrallel circuit?

Draw the circuits you will use and annotate how you will calculate resistance:

Draw a table for your results:

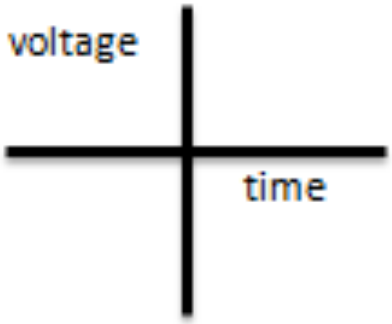
Which circuit has a higher total resistance? Explain your answer.

DC and AC

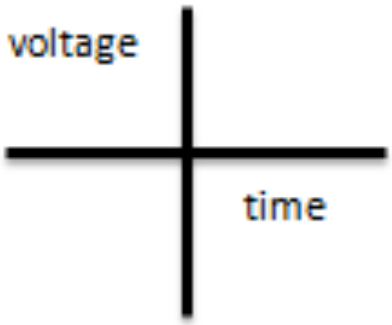
What is DC?

What is AC?

What would a **DC graph** look like?



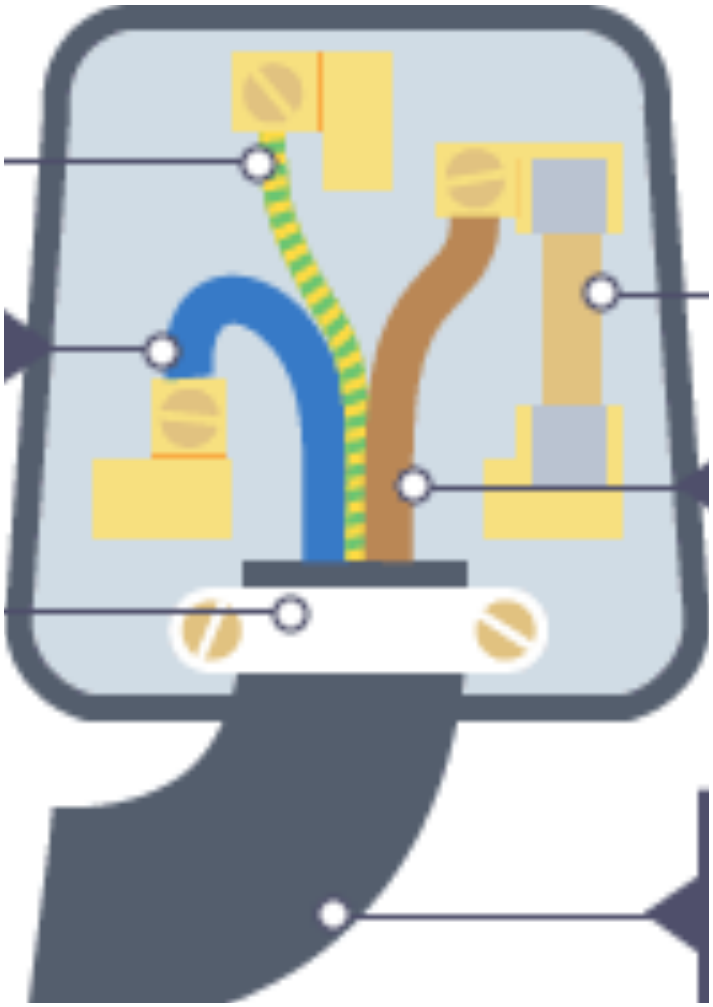
What would an **AC graph** look like?



Describe with a diagram how to calculate the frequency of AC using a graph of potential difference against time.

Mains Electricity

Colour in your plug and label the parts



Describe how a plug prevents the metal case of a device becoming live if there is a fault

Power

Write down the equations for power:

1. Complete the fuse column by choosing from either 3A, 5A or an 11A fuse.

Appliance	Power rating	Power in W	Voltage in V	Current (A)	Fuse needed
a Computer	67 W	67 W	7		
b Fridge	63 W	63 W	7		
c Fridge-freezer	100 W	100 W	6		
d Lawnmower	900 W	900 W	6		
e Toaster	850 W	850 W	8		
f TV	90 W	90 W	8		
g Hair dryer	1 kW		7		
h Electric fire (2 bars)	2 kW		7		
i Tumble dryer	1.5 kW		5		
j Kettle	2.5 kW		5		

Energy transfer in appliances

Energy transferred = Power × Time

$$E = P\,t$$

1) **What is the energy transferred if a 50Watt bulb is left on for 90 seconds?**

2) **What is the energy transferred if you a 200W oven is left on for 3 hours?**

3) **What is the power used by a phone that uses 3000J in 10 hours?**

4) **In kW what is the power used by a 5000W electric car over 10 seconds?**

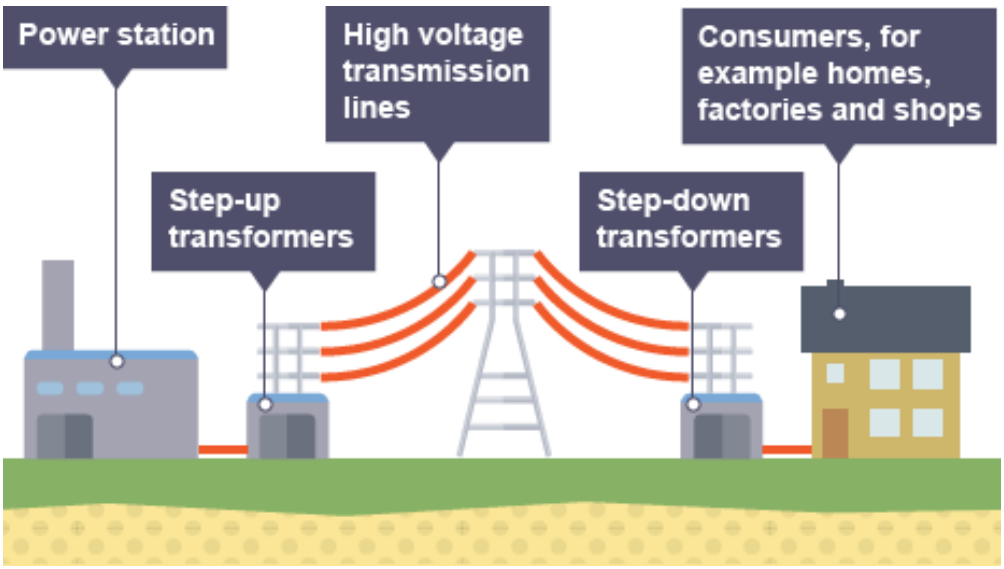
Ext: What is the energy transferred by a 6V power pack supplying 0.5A of current over an hour?

Design a question and answer using

Energy transferred = Charge flow × Potential difference

The National Grid

Using the textbook or revision guide, annotate the diagram of the parts of the national grid:



Describe why transformers are used in the national grid

Static Electricity

Q1.Figure 1 shows a Van de Graaff generator that is used to investigate static electricity.

Before it is switched on, the metal dome has no net charge. After it is switched on, the metal dome becomes positively charged.

Figure 1

(a) Explain how an uncharged object may become positively charged.

.....

.....

.....

.....

.....

.....

(3)

(b) **Figure 2** shows a plan view of the positively charged metal dome of a Van de Graaff generator.

Draw the electric field pattern around the metal dome when it is isolated from its surroundings.

Use arrows to show the direction of the electric field.

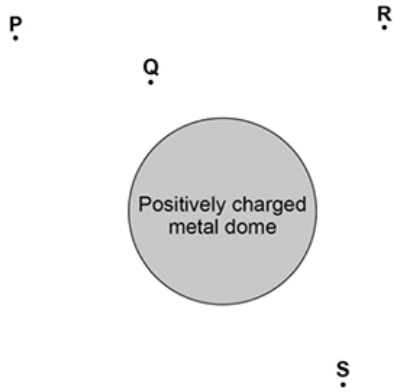
Figure 2

(2)

(c) Another positively charged object is placed in the electric field.

Look at **Figure 3**.

Figure 3



In which position would the object experience the greatest force?

Tick **one** box.

P ☐

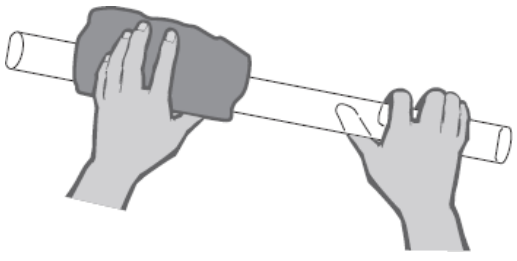
Q ☐

R ☐

S ☐

(1)
(Total 6 marks)

Q2.(a) The diagram shows a polythene rod being rubbed with a woollen cloth.



The polythene rod becomes negatively charged.

Explain how this happens.

.....

.....

.....

Electrical Fields

1) Describe how the strength of an electric field changes with distance from a charged object

2) Draw the electrical field around a proton

3) Describe what happens when two protons approach each other
keyword: force