Autumn Term

P5 Electricity in the home

Aiming for Grade 6

Extended Homework Assignment

Name: _____

Set: _____

Instructions

A printed copy should be handed into your teacher.

The knowledge required to complete this assignment will be supported in class in lessons of the half term.

Task

Electrical safety

Write a leaflet about electrical safety for primary school students. The leaflet should include information about the devices you have learnt about which:

a protect appliances (fuses, circuit breakers)

b protect people (plastic casing, earthing, fuses).

Appliances, cost, and efficiency

In the table below is a list of some of the electrical appliances that you might find in a home, along with their power ratings. All these appliances plug into the mains electricity, which has a p.d. of 230 V.

Complete the table below by:

- calculating the resistance of each appliance
- calculating the current flowing through each appliance
- writing down the fuse that you would expect to find in each plug (available fuses are 3A, 5A, and 13A)
- calculating the number of units of electricity consumed per month by each device (remember power is in kW).

Appliance	Power	Power in W	Current in A	Resistance in Ω	Fuse rating in A	Time used per month in hours	Units per month
low-energy light bulb	11 W					300	
hair drier	1.5 kW					50	
iron	1.1 kW					240	
kettle	2 kW					5	
laptop	40 W					120	
microwave oven	800 W					7	
oven	3.5 kW					30	
TV	100 W					150	
vacuum cleaner	500 W					4	
washing machine	500 W					8	

Questions

Electrical safety

1 Compare a fuse and an earth wire.

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..... (*3 marks*)

2 Explain why electricians use wires of different thickness depending on the power of an appliance.

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..... (*4 marks*)

3 Suggest and explain the odd one out in your table in Part 3 of the Task.

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..... (*2 marks*)

4 **a** Compare direct and alternating current.

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..... (*1 mark*)

b Use the diagram on the next page to calculate the peak potential difference. Show your method.

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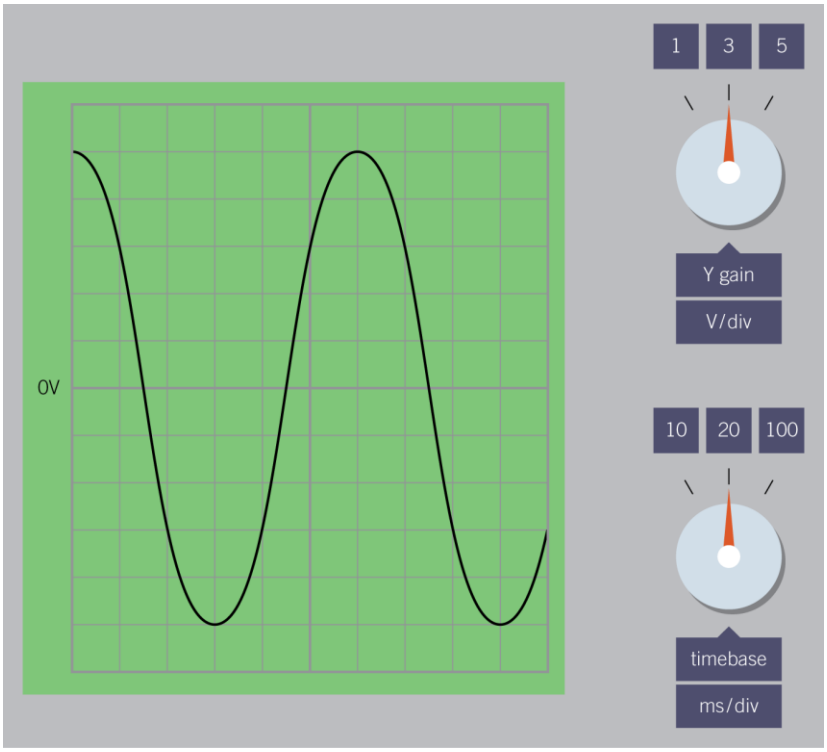
..... (*3 marks*)



c Use the same diagram to calculate the frequency of the alternating current. Show your method.

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..... (*5 marks*)

Part 2: Power and resistance

5 Explain in terms of electrons what happens when you heat water with the metal element of a kettle.

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..... (*4 marks*)

6 Explain how two lamps can work from the same potential difference but not be the same brightness.

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..... (*4 marks*)

7 Complete the table with the values of p.d. and resistance. Try to fill in as much as you can without using your calculator. (*4 marks*)

Current	Resistance	p.d. in V	Power in W
1 A	1 Ω		
	0.1 Ω	0.2	
100 mA		1.0	
	1 kΩ		9000

8 One equation for power is:

power P (W) = (current I (A))^2 × resistance R (Ω)

Beginning with the equation that you used to fill in the first row of the table, explain why this second equation is true.

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..... (*2 marks*)

9 Explain the link between power, current, p.d., and the energy transferred by each charge flowing in a circuit.

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..... (*4 marks*)

Appliances, cost, and efficiency

10 **a** Use the table above of the Task to calculate the total number of units used per month.

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b Calculate the number of kWh you would 'save' per month if each appliance was 10% more efficient.

..... (*1 mark*)

c Calculate your monthly saving if each appliance was 10% more efficient and each unit costs 11p.

..... (*1 mark*)

11 Describe one way that energy is wasted in an electric motor, but is not the case for a car engine.

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(*1 mark*)

12 **a** Use the table from Part 3 of the Task to work out the most expensive and least expensive appliance to run annually.

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(*2 marks*)

b Work out the cost of running each of those appliances annually if one unit costs 11p.

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(*4 marks*)

c Explain why electricity companies charge per kWh and not per joule.

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(*2 marks*)