Grade 8 Natural Science Worksheet

Physical Sciences - electricity, energy 2

Electricity in our homes

Most houses in suburban environments are supplied with electricity. Electricity is generated at power stations and then supplied via the national grid to our homes. The potential difference of the electricity supplied to our homes is 220 V. Electrical appliances can be costly to run and when possible, we should ensure that all appliances are switched off when not in use.

Before considering ways and means of reducing your electricity account, one should first consider the cost of various types of electrical appliances. Consider the kilowatt rating of various household appliances listed in the table below.

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Kilowatt rating of various electrical appliances

Electrical appliance	Rating (kW)
Lamp (100 watt)	0.1
Lamp (40 watt)	0.04
Stove (small plate on high)	1.5
Stove (small plate on low)	0.357
Stove (large plate on high)	2.0
Stove (large plate on low)	0.5
Oven (at approx 200°C)	2.0
Dishwasher	1.0
Electric blanket	0.05
Electric frying pan	1.5
Fan	0.07
Geyser (25 litres = shower)	1.4
Geyser (70 litres = bath)	3.9
Hair dryer	1.2
Iron	1.2
Kettle	2.0
Microwave oven	0.7
Refrigerator	0.16
2 - bar heater	2.0
Television set	0.25
Tumble dryer	3.0
Washing machine (hot wash)	1.0
Washing machine (cold wash)	0.5

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Answer the questions using the supplied table.

1. Identify the major users of electricity.

   [3]

2. Using the information in the table, suggest FIVE appliances and for each suggest an alternative to reduce electricity consumption and therefore your electricity bill. For example: Do cold washes instead of hot washes in the washing machine.

   [10]

3. Electricity consumption is measured in units or kilowatt-hours. An analysis of the monthly cost of operating the different classes of appliances in a typical home during winter is given below.

Uses of electricity	**Units/kilowatt-hours consumed per month**	**Cost per month (R)**
Hot water	352	
Stove	104	
Heaters	200	
Appliances	104	
Lights	70	
Swimming pool	46	
Totals	876	

3. If the kilowatt-hour (unit) cost is based on an average price of 44.39 cents, the third column in the table will show the cost of each use for one month.

   3.1 Use a black pen to calculate the third column for the uses that you think are essential for basic living such as cooking, cleaning and bathing. Calculate the total. [4]

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3.2 Use a blue pen to calculate the costs of those appliances you think people could comfortably do without. Calculate the total. [4]

3.3 Draw a pie chart to represent how the essential and non-essential electricity use
make up the total cost of electricity for one month. [4]

[25 marks]

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Suggested Solutions

<table>
<tr><th>Question number</th><th>Possible marks</th><th>Solution</th></tr>
<tr><td>1</td><td>3</td><td>Cooking (stove)
Heating water (geyser and kettle)
Clothes (tumble dryer)
Heating (heaters) (any 3)</td></tr>
<tr><td>2</td><td>Any 5 appliances and 5 alternatives = 10 marks</td><td>
<table>
<tr><th>Appliance</th><th>Alternative</th></tr>
<tr><td>high energy light bulbs</td><td>low energy light bulbs</td></tr>
<tr><td>electric blanket</td><td>hot water bottle</td></tr>
<tr><td>geyser – bathing</td><td>geyser – rather shower</td></tr>
<tr><td>stove – larger plates</td><td>Stove – smaller plates</td></tr>
<tr><td>dishwasher</td><td>wash dishes by hand</td></tr>
<tr><td>tumble dryer</td><td>let clothes dry naturally</td></tr>
<tr><td>washing machine – hot wash</td><td>washing machine – cold wash</td></tr>
</table>
etc.
</td></tr>
<tr><td>3.1 and 3.2</td><td>8</td><td>
<table>
<tr><th>Uses of electricity</th><th>Units/kilowatt-hours consumed per month</th><th>Cost per month (R)</th></tr>
<tr><td>Hot water</td><td>352</td><td>3.1
156.25</td></tr>
<tr><td>Stove</td><td>104</td><td>3.1
46.16</td></tr>
<tr><td>Heaters</td><td>200</td><td>3.2
88.78</td></tr>
<tr><td>Appliances</td><td>104</td><td>3.2
46.16</td></tr>
<tr><td>Lights</td><td>70</td><td>3.1
31.07</td></tr>
<tr><td>Swimming pool</td><td>46</td><td>3.2
20.40</td></tr>
<tr><td>Totals</td><td>876</td><td>3.3
388.85</td></tr>
</table>
3.1 In black pen = essential basic living needs are hot water, stove and lights (1 mark each)
Total: R233.48 (1 mark) (Total 4)
3.2 In blue pen = non-essential uses are heaters, appliances
</td></tr>
</table>

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		and swimming pool (1 mark each) Total: R155.37 (1 mark) (Total 4)
3.3	4	1 mark for each of the following for maximum of 4 marks: Correct calculation of essential segment 233.48 x 360° = 216 ° (R 388.85) Correct calculation of non-essential segment 155.37 x 360° = 144° (R 388.85) Correctly translating onto pie chart Appropriate heading Pie chart showing the use of electricity in a typical household during winter: