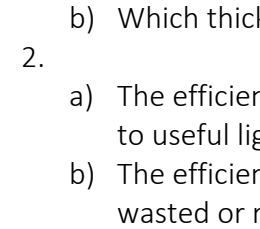
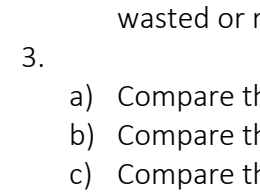
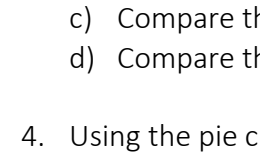
Physics: Energy and Electricity

%	I can …	Prove it!
70%+	6.1. (Required practical) use circuits to investigate resistance. (triple) 6.5. Interpret graphs to determine whether relationships are linear or non-linear. (triple) 6.6. (Required practical) Investigate V-I characteristics using circuits. (triple)	1. Explain how to complete an investigation into the factor(s) that affect the resistance of an electrical component, known as component Y. You should include: the variables you would use, the circuits you would use (shown in circuit diagrams), the results table you would need to record your data, and a step-by-step method explaining the experiment. 2. Complete this table with the name of the component that matches each I-V graph. State if the relationship show is linear or non-linear and explain why the component's I-V graph is that shape.

I-V Relationship Graph	Linear or Non-Linear?	Component Name	Explanation of the shape of the graph.
			
			
			

3. Explain how to complete an investigation into the V-I characteristics of an unknown component, called component X. You should include: the variables you would use, the circuit you would use (shown in a circuit diagram), the results table you would need to record your data, and a step-by-step method explaining the experiment.

60%	1.4. Link energy loss to insulation and thermal conductivity. 2.2. Rearrange the efficiency equations to calculate different quantities. 3.4. Compare and contrast energy resources in terms of reliability, cost, and political, social and environmental factors. 3.5. Explain patterns and trends in the use of energy resources. 4.3. Use and rearrange equations for calculating current. 4.7. Use and rearrange equations for calculating current, potential difference and resistance.	1. a) Which of these materials would be best for using in the walls of a house? Explain your answer.

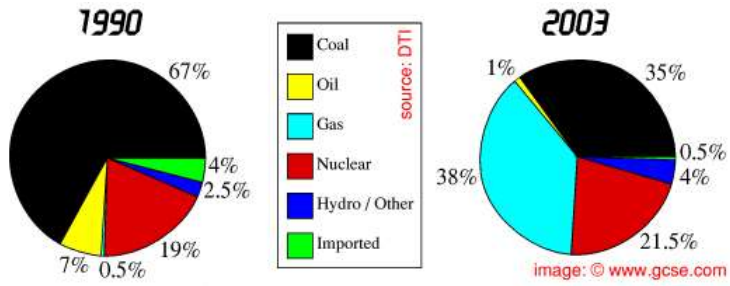
Material	Thermal Conductivity (W/mK)
A	110
B	80
C	200

b) Which thickness of wall would be better for a house – 50cm, 30cm or 90cm? Explain your answer.

2.
a) The efficiency of a lightbulb is 70%. If the bulb uses 60J of electricity how much energy is converted to useful light energy?
b) The efficiency of a solar panel is 24%. If 1000J of energy lands on the panel, how many joules are wasted or reflected by the panel?

3.
a) Compare the advantages and disadvantages of nuclear power and geothermal power.
b) Compare the advantages and disadvantages of biofuels and fossil fuels.
c) Compare the advantages and disadvantages of solar and hydroelectric power.
d) Compare the similarities and differences between tidal power and wave power.

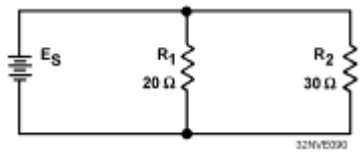
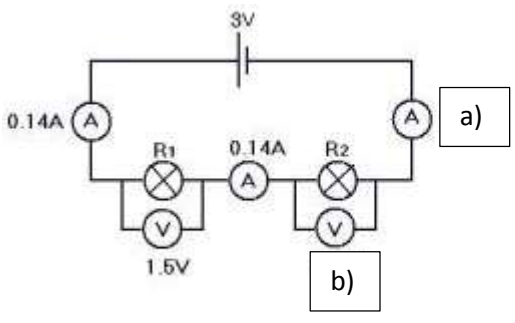
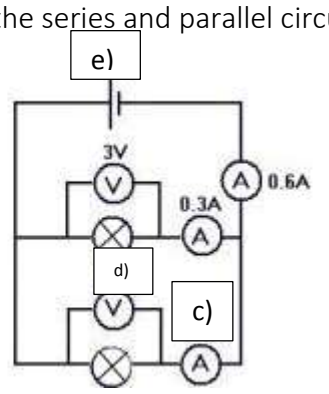
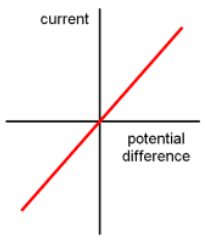
4. Using the pie charts below, describe how the uses of energy resources changed between 1990 and 2003. Explain why these changes may have occurred.



5.

6. Calculate the missing values in this table using Ohm's Law.

Potential Difference (V)	Current (A)	Resistance (Ω)
	8	6
90	30	
1.2		0.2
7	3.5	
	3	2

	5.2. Calculate resistance in series and parallel circuits. 5.3. Explain patterns in resistance using words. 6.3. Explain how resistances change in thermistors and LDRs. (triple)	7. The total resistance of this parallel circuits is:  Select your answer from: o Less than 30Ω because… o More than 30Ω because… o Less than 20Ω because… o More than 20Ω because… 8. Explain how the total resistance is calculated differently in series and parallel circuits. 9. a) Explain how the resistance of a thermistor changes with temperature. b) Explain how the resistance of an LDR changes with light intensity.
50%	1.1. Explain the law of conservation of energy. 1.2. Describe the concepts of open and closed systems. 2.1. Calculate efficiency. 3.3. Explain how energy resources are used. 4.4. Predict the current at given points within a series and parallel circuit. 4.5. Predict the potential difference (voltage) at given points within a series and parallel circuit. 5.1. Compare and contrast series and parallel circuits. 6.2. Describe the relationship between current and potential difference in ohmic conductors. (triple)	1. Define the law of conservation of energy. 2. Is a bicycle an open or closed energy system? Explain why. 3. Calculate the efficiency of these devices: **Device** / **Useful Energy Output (J)** / **Total Energy Input (J)** / **Efficiency (%)** Kettle / 20 / 80 / Bulb / 5 / 25 / Speaker / 64 / 80 / Washing Machine / 2500 / 3600 / 4. Explain how these energy resources work to generate electricity: a) Geothermal energy. b) Biofuel energy. c) Nuclear power. d) Fossil fuels. e) Solar power. f) Hydroelectric power. g) Tidal power. h) Wave power. 5. State the missing voltages and currents in the series and parallel circuits.   a) A b) V c) A d) V e) V 6. Explain the difference between series and parallel circuits. 7. Explain how current and potential difference are linked in conductors that obey Ohm's Law, such as in this fixed resistor. 

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40%

1.3. Describe ways to reduce unwanted energy transfers.
6.4. List the applications of thermistors and LDRs. (triple)
4.2. Define current, charge and potential difference.
4.6. Describe the relationship between current, potential difference and resistance.

1.
   a) Describe one way to reduce the amount of wasted energy produced from a bicycle.
   b) Describe two ways to reduce the amount of wasted energy released from a house.

2. Match up the use to the component:

Thermostat to control heating in a house.	LDR
Volume control on headphones.	Thermistor
Car headlights that switch on automatically when it gets dark.	Variable Resistor

3. Write definitions for these words:
   a) Current.
   b) Charge.
   c) Potential difference.

4.
   a) Write down Ohm's law in a sentence
   b) Write down the Ohm's law equation. Describe what each of the symbols means.

20%

3.1. Describe the main energy resources on Earth.
3.2. Define renewable and non-renewable resources.
4.1. Identify the key circuit symbols.
4.8. Recall units for current, potential difference and resistance.

1. Name five energy resources that can be used to make electricity.

2. Write definitions for:
   i) Renewable resources.
   ii) Non-renewable resources.

3. Draw diagrams to show these circuit symbols:
   a) Variable resistor
   b) LED
   c) Diode
   d) Thermistor
   e) Cell
   f) Battery
   g) LDR
   h) Voltmeter
   i) Ammeter
   j) Fuse
   k) Bulb
   l) Resistor
   m) Switch

4. Complete the table to show the symbols and units for these quantities.

Quantity	Symbol	Unit	Symbol for the Unit
Current			
Potential Difference			
Resistance			

Key Terms

thermal conductivity insulator conductor renewable non-renewable solar
geothermal biofuel hydroelectric nuclear fossil fuel coal oil gas
wave power tidal power efficiency variable resistor LED diode thermistor
cell battery LDR voltmeter ammeter fuse bulb resistor switch
current potential difference Volts Amperes Amps charge Coulombs
resistance Ohms Ohm's Law thermostat component circuit diagram series
parallel fixed resistor linear non-linear directly proportional