

Homework 1: Energy Changers

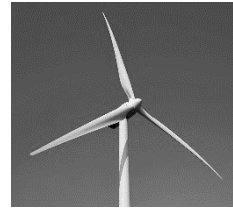
Name : _____

1. List the eight different types of energy.

1.	2.
3.	4.
5.	6.
7.	8.

2. What form of energy do the following have:

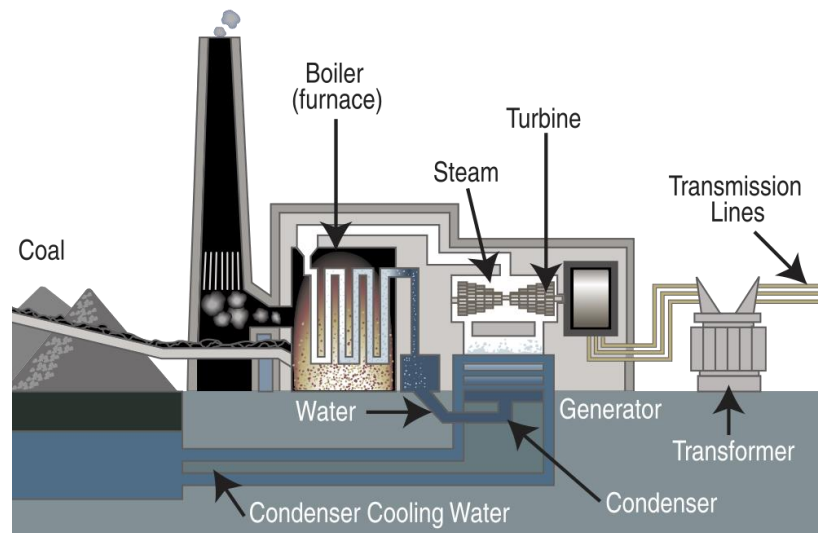
- (a) A spinning wind turbine has _____.
- (b) Water stored behind a dam has _____.
- (c) Water flowing down a hill has _____.



3. Complete the sentences below.

- (a) An electric oven changes electrical energy to _____.
- (b) A light bulb changes electrical energy into _____ and _____.
- (c) A loudspeaker changes _____ energy to _____ energy.
- (d) The energy change in a solar cell is _____ to _____.

4. Coal is being burned in the thermal power station shown below.



- (a) In the boiler chemical energy changes to _____.
- (b) In a generator _____ energy changes to _____ energy.

Homework 2: Energy Generation

Name : _____

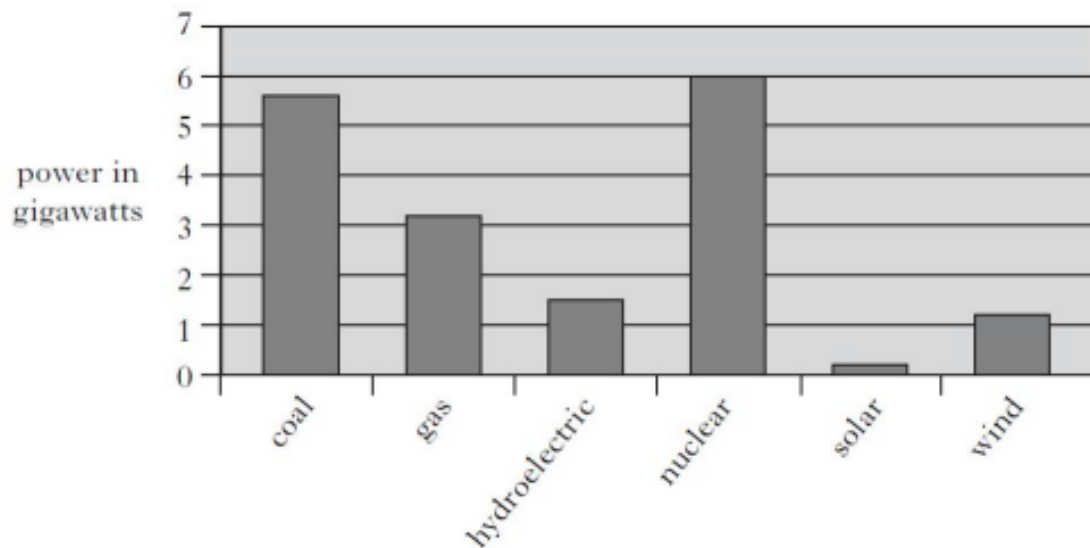
1. Energy sources can be classified as renewable or non-renewable.

gas wind oil solar wave hydro coal

Use the energy sources above to complete the table below.

Renewable	Non-renewable

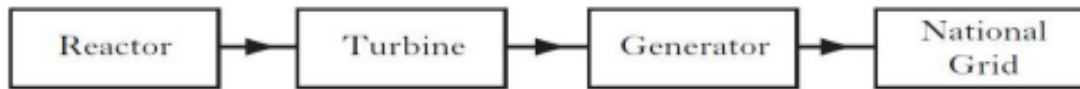
2. The bar chart shows the main energy sources used in Scotland.



- (a) Which energy source provides the most power in gigawatts?

- (b) How much power does hydroelectricity produce?

3. The stages in a nuclear power station are shown below.

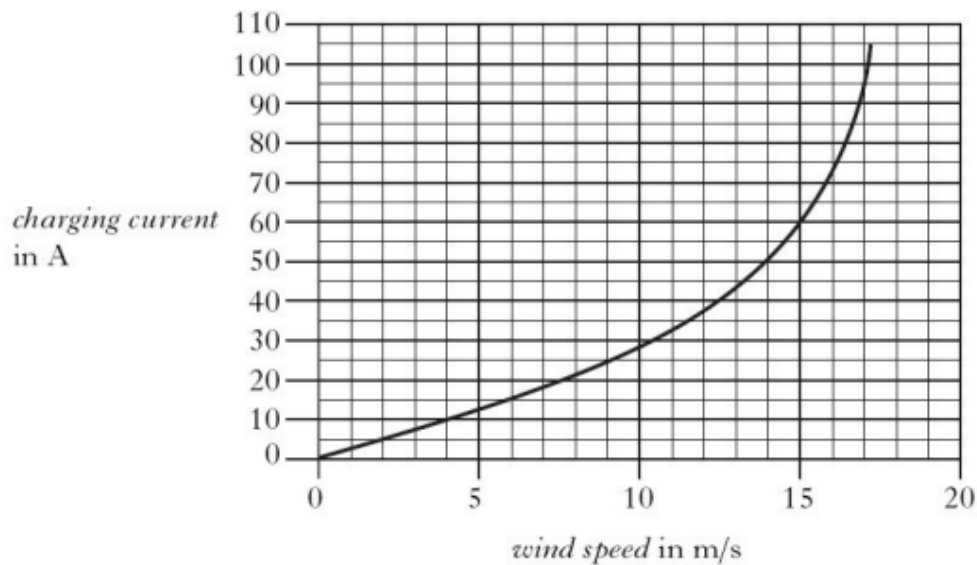


Complete the following sentences using the information in the diagram above.

- (a) In the _____ kinetic energy is changed to electrical energy.
- (b) In the _____ nuclear energy is changed to heat energy.

4. A wind turbine is used to charge a battery.
The charging current depends on the wind speed.

The graph below shows the charging current at different wind speeds.



- (a) What happens to the charging current as the wind speed increases?

- (b) What is the charging current at 15 m/s?

Homework 3: Energy Efficiency

Name : _____

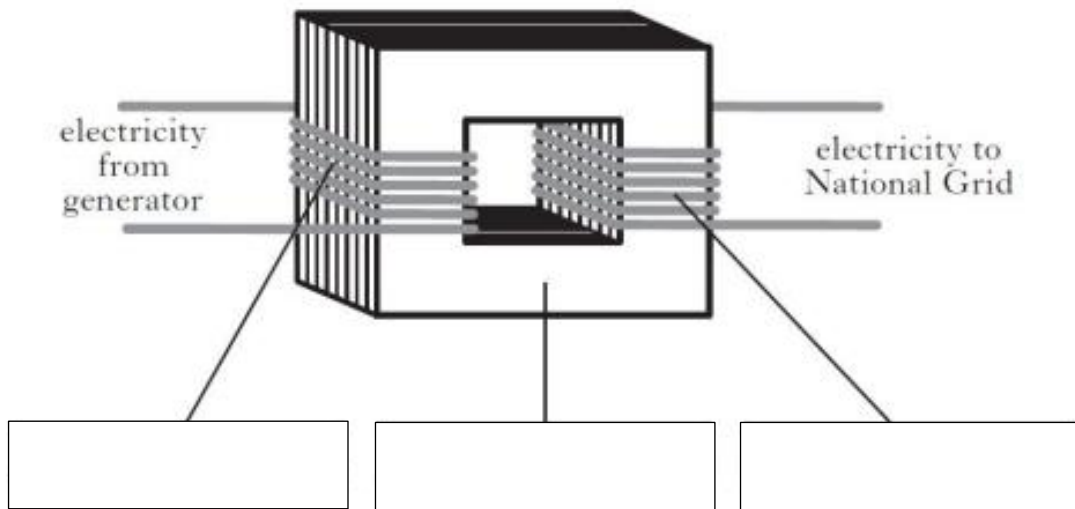
1. A transformer consists of three parts.

Label each of the three parts using the names below:

core

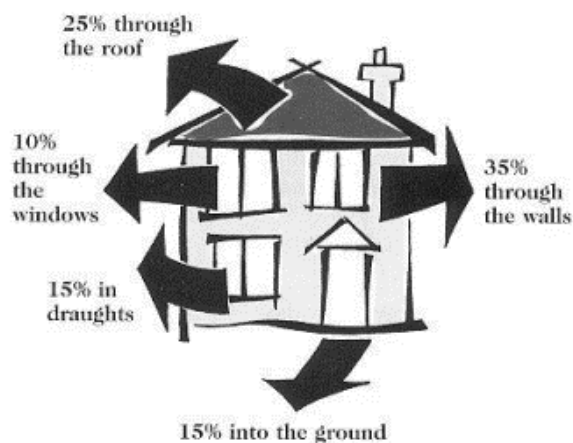
secondary coil

primary coil



2. Explain why transformers are used in the transmission of electrical energy.

3. The diagram below shows the areas through which heat is lost from the home.



Give one way heat loss may be reduced from each of the following areas of the house:

(a) windows

(b) walls

Homework 4: Power & Efficiency

Name : _____

1. Calculate the power rating of a bulb which uses 4 000 J of energy in 40 s?

2. A firework rocket gains 135 joules of energy in 4 seconds.
Calculate the power of the rocket motor.

3. Calculate the energy a 20 W electric motor produces in 2 minutes.

4. Calculate the efficiency of a machine which has a power input of 1 kW and a power output of 750 W.

5. A power station produces 1 800 000 kW of heat, which gives 450 000 kW of electrical power. Calculate its efficiency.

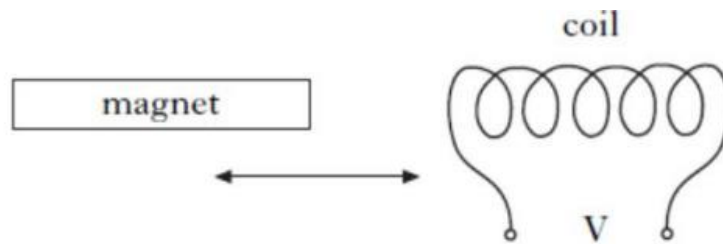
6. A turbine converts 75 000 J of heat energy into 15 000 J of kinetic energy. Calculate the efficiency of the turbine.

7. Students investigating the efficiency of an electric kettle find that it uses 2200 J of electrical energy every second, of which 1870 J is converted to heat energy. Calculate the efficiency of the kettle.

Homework 5: Electromagnetism

Name : _____

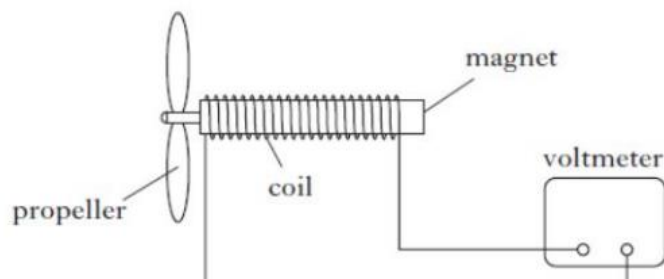
1. When a magnet is pushed into or pulled out of a coil of wire, a voltage is induced across the ends of the coil.



Which of the following produces the greatest induced voltage?

	<i>Strength of magnet</i>	<i>Speed of magnet</i>	<i>Number of turns in a coil</i>
A	weak	slow	20
B	weak	fast	40
C	strong	slow	20
D	strong	fast	20
E	strong	fast	40

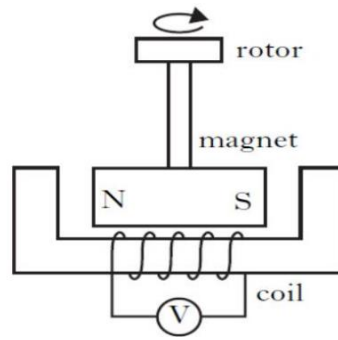
2. A wind speed meter is designed as shown.



Air blows across the propeller causing the magnet to rotate. A voltage is induced across the coil. Circle the changes suggested below that will result in an increase in the induced voltage.

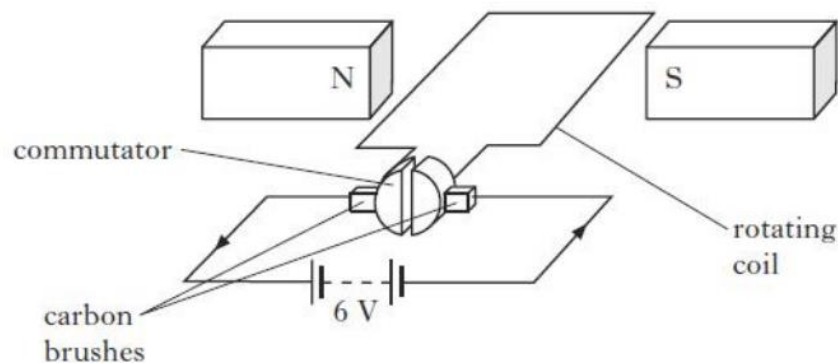
- I Replacing the magnet with one of greater field strength.
- II Spinning the propeller faster.
- III Reducing the number of turns on the coil.

3. The diagram shows a model bicycle dynamo.



When the rotor is turned the magnet rotates, inducing a voltage in the coil. Describe three changes which would increase the induced voltage.

4. A simple electric motor is shown below.



(a) State the purpose of the brushes in the simple electric motor.

(b) State two ways in which the direction of rotation of the motor could be reversed.

Homework 6: Charge & Circuits

Name : _____

1. Complete the sentences below

- (a) There are two types of charge, _____ and _____ .
(b) _____ charges repel each other and _____ attract.

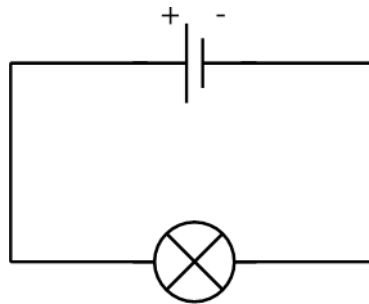
2. Materials can be classified as conductors or insulators.

gold wood iron plastic glass copper

Use the materials above to complete the table below.

Conductor	Insulator

3.

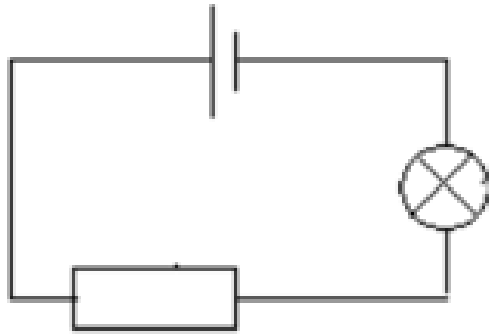


- (a) State the purpose of the cell in the circuit above

- (b) State the energy change in the bulb.

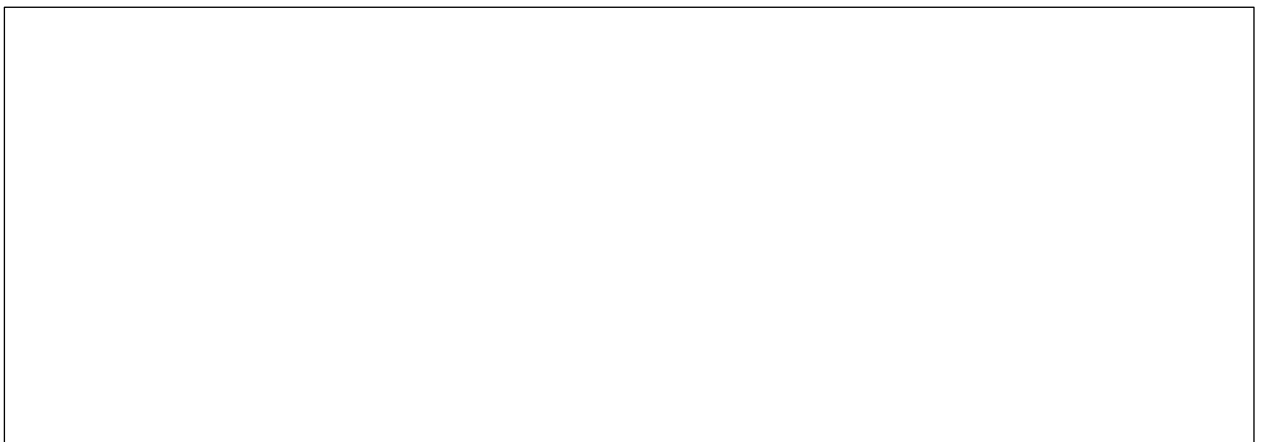
- (c) Describe what would happen to the bulb if the circuit was broken.
Explain your answer.

4.



Redraw this circuit diagram, in the space below, to show how to measure :

- (a) the voltage across the bulb
- (b) the current through the resistor.



5. Identify the following circuit symbols:

(a)



(b)



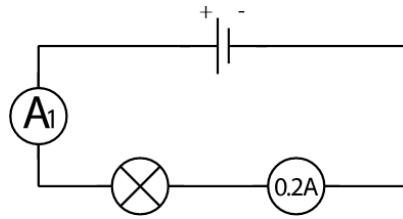
(c)



Homework 7: Series Circuit Rules

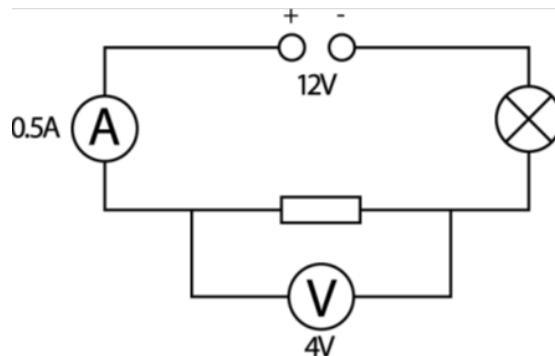
Name : _____

1.



What is the reading on ammeter A_1 in the circuit above?

2. In the circuit opposite the ammeter reading is 0.5 A and the voltmeter reading is 4 V .

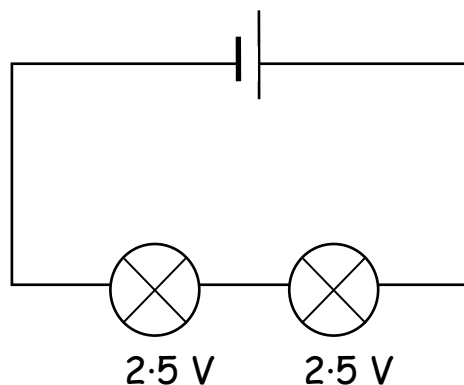


(a) State whether this is a series or parallel circuit.

(b)(i) What is the current through the lamp?

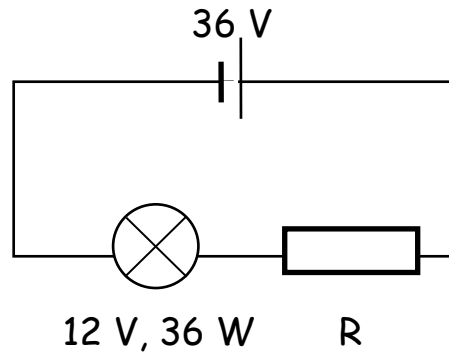
(ii) What is the voltage across the lamp?

3. Two identical 2.5 V bulbs are connected to a supply as shown below.



What is the voltage of the supply?

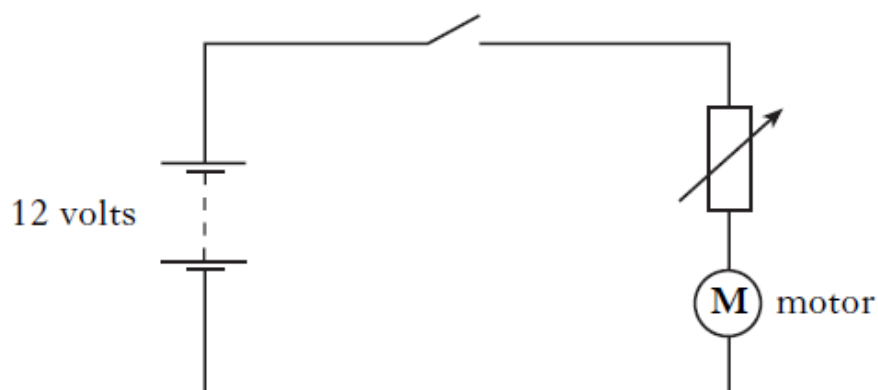
4. A simple circuit with a bulb and resistor in series is shown below.



- (a) If the bulb is operating at its correct voltage and power rating, what is the voltage across the resistor R?

- (b) The current in the bulb is 3 A.
What current flows through the resistor?

5. When the switch is closed in the circuit below, a current of 0.5 A flows from the battery and the voltage across the variable resistor is 3 V.



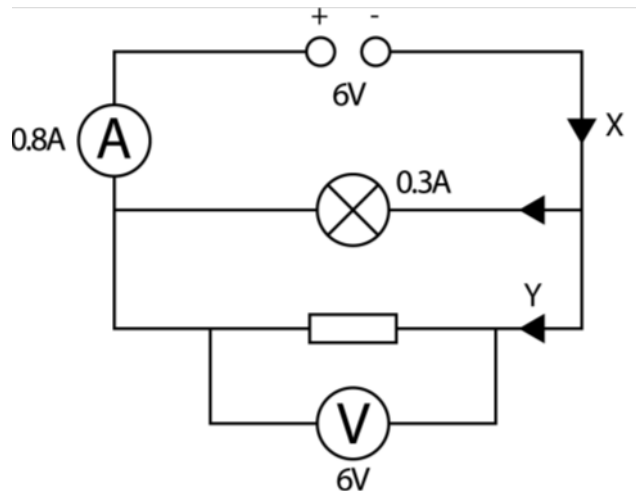
- (a) What is the current through the motor?

- (b) What is the voltage across the lamp?

Homework 8: Parallel Circuit Rules

Name : _____

1. 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 .



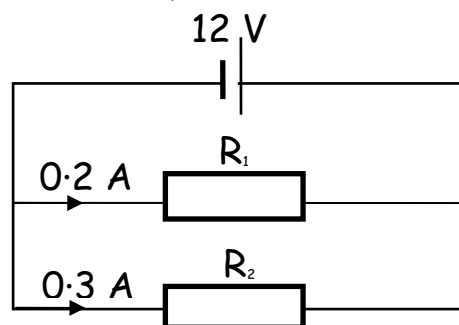
- (a) State whether this is a series or parallel circuit.

- (b) (i) What is the current at X?

- (ii) What is the current at Y?

- (iii) What is the voltage across the lamp?

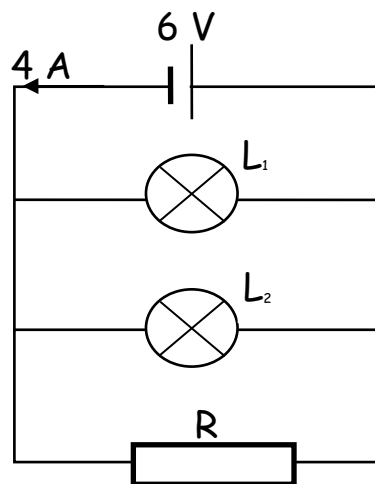
2. Two resistors are connected in parallel to a 12 V battery as shown below.



- (a) What is the voltage across R_1 and R_2 ?

- (b) What size of current is drawn from the battery?

3. Two identical bulbs and a resistor are connected in parallel to a 6 V supply.

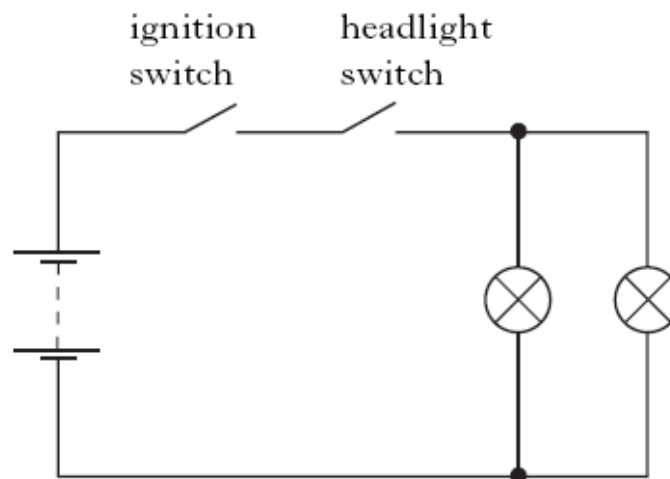


- (a) What is the voltage across L_2 ?

- (b) A current of 1.8 A flows through each of the bulbs.

What is the current flowing through the resistor?

4. The circuit below shows how car headlights are connected.



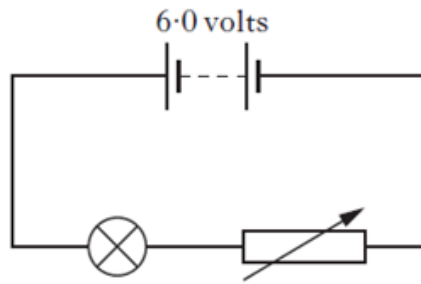
When the headlights are operating normally, the current in each lamp is 4.5 A.

Determine the current from the battery when both headlights are on.

Homework 9: Resistance

Name : _____

1. A student is investigating the operation of a lamp using the following circuit.



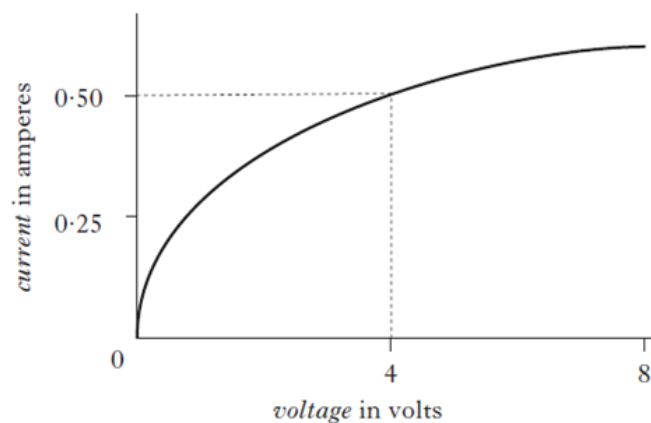
- (a) When the voltage across the lamp is 2 V and the current through the lamp is 0.2 A. Calculate the resistance of the lamp.

- (b) What is the voltage across the variable resistor?

- (c) (i) The resistance of the variable resistor is increased.
What happens to the brightness of the lamp?

- (ii) Explain your answer.

2. The results of an investigation are shown in the graph below.



Calculate the resistance when the voltage is 4 volts.

3. A resistor is labelled: $10\ \Omega$.

- (a) Draw a circuit diagram (which includes a 6 V battery, a voltmeter and an ammeter) for a circuit the student could use to check the value of the resistor.

- (b) Readings from the circuit give the voltage across the resistor as 5.7 V and the current in the resistor as 0.60 A.

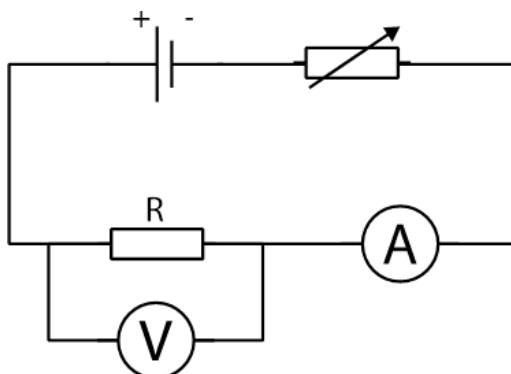
Use these values to calculate the resistance.

4. A student sets up an experiment to investigate the current in and the voltage across two different resistors. The results obtained for each resistor are shown in the table below.

Resistor	Current (A)	Voltage (V)
X	0.6	1.5
Y	7.5	1.5

Use the information in the table to calculate the resistance of both resistors, X and Y.

5. This circuit below was set up.

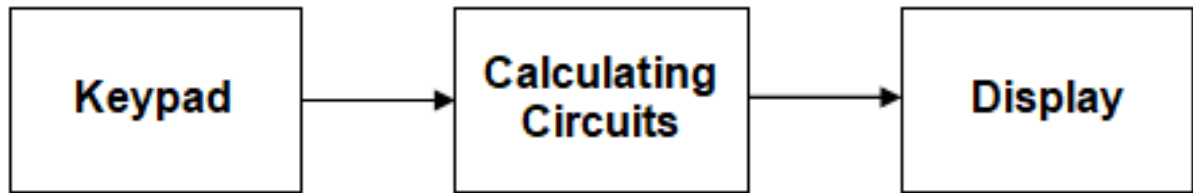


The current through and voltage across R were varied and the following results were taken:

Voltage (V)	2	4	6	8	10	12
Current (A)	0.4	0.78	1.22	1.64	2.02	2.35

- (a) Draw a line graph of voltage against current. **(USE GRAPH PAPER)**
- (b) Use the results to write a conclusion.

1. The block diagram for a calculator is shown below.



Copy the block diagram and identify the input, process and output subsystems.

2. Draw a block diagram for a public address system in an airport, showing the input, process and output subsystems on each diagram.

3. What is form of energy is sensed by each of the following input devices?

(a) microphone

(b) thermistor

(c) light dependent resistor.

4. State what happens to the resistance of:

(a) A thermistor if the temperature increases.

(b) An LDR if the light level decreases.

5. A number of input devices are shown in the list below:

microphone, thermocouple, solar cell, LDR

From this list, choose an input device to complete the sentences below:

- (a) A _____ can be used to charge batteries during the day.
- (b) A _____ can be used to adjust the brightness of a television to suit the light level in the room.
- (c) A _____ can be used to measure the temperature of a Bunsen burner flame.
- (d) A _____ can be used to allow sound to be observed on an oscilloscope.

6. For each application listed below identify the most suitable output device.

(a) A radio.

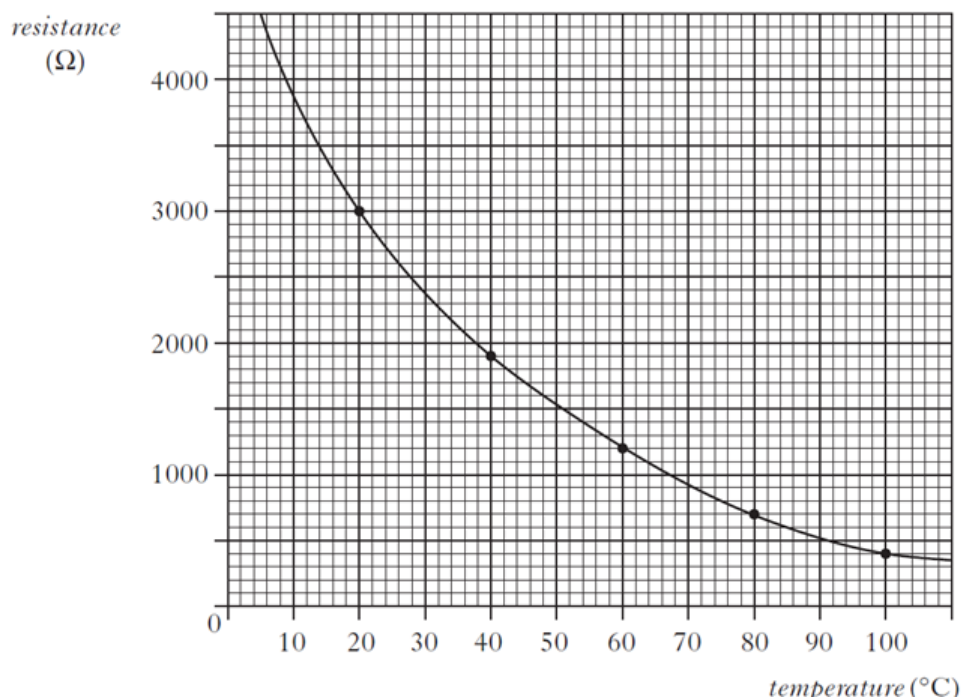
(b) A standby indicator on a television.

(c) A car headlamp.

7. Complete the table below:

Device	Symbol	Input or Output	Energy Change
Bulb			
L.E.D			
Microphone			
Loudspeaker			
Thermocouple			
Buzzer			
Solar cell			

8. The graph below shows how the resistance of a thermistor changes with temperature.

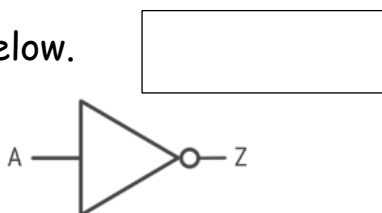


What is the **change** in resistance of the thermistor when its temperature rises from 20°C to 100°C ?

Homework 11: Logic Gates

Name : _____

1. (a) Name the logic gate shown below.

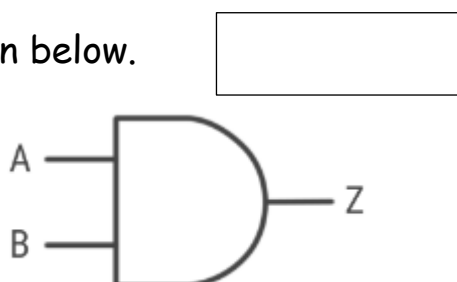


(b) Complete the truth table for this gate.

Input A	Output Z
0	
1	

(c) Describe the operation of the gate in words.

2. (a) Name the logic gate shown below.

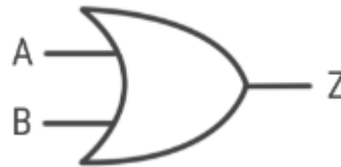


(b) Complete the truth table for this gate.

Input A	Input B	Output Z
0	0	
0	1	
1	0	
1	1	

(c) Describe the operation of the gate in words.

3. (a) Name the logic gate shown below.



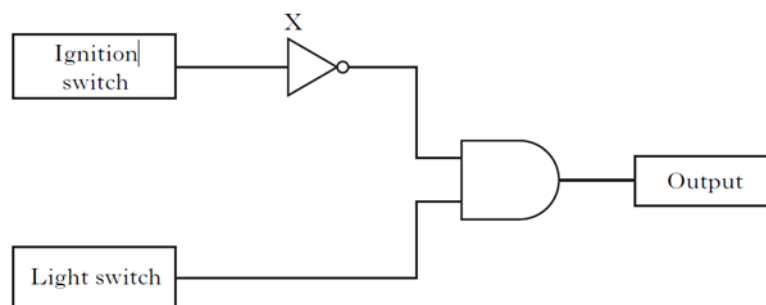
(b) Complete the truth table for this gate.

Input A	Input B	Output Z
0	0	
0	1	
1	0	
1	1	

(c) Describe the operation of the gate in words.

4. In a car, a warning sounds if the lights are left on after the ignition switch is turned off.

The system has two inputs, one from the ignition switch and the other from the light switch.

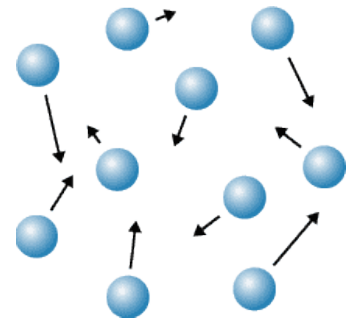


Explain why the output device is **on** when the ignition switch is **off** but the lights are **on**.

Homework 12: Kinetic Theory

Name : _____

1. Describe the kinetic model for gases.



2. Define pressure.

3. Explain why tractors have big tyres.

4. A sealed syringe containing air is placed in a large beaker of boiling water.

Why does the plunger move as the air takes up a greater volume within the syringe?

