JUNIOR LYCEUM ANNUAL EXAMINATIONS 2004
Educational Assessment Unit – Education Division

FORM 4 **PHYSICS** **Time: 1 h. 30 min.**

NAME: _____ **CLASS:** _____

Answer all the questions of Section A in the spaces provided on the Examination Paper. Answer all questions in Section B on the sheets provided. All working must be shown. The use of a calculator is allowed.

Where necessary take the acceleration due to gravity, g = 10 m/s^2

You may find some of these formulae useful.

Pressure = force/area Force = mass x acceleration

$$a = \frac{v - u}{t}$$

Momentum = mass x velocity Energy = Power x Time

Heat energy = mass x specific heat capacity x temperature change

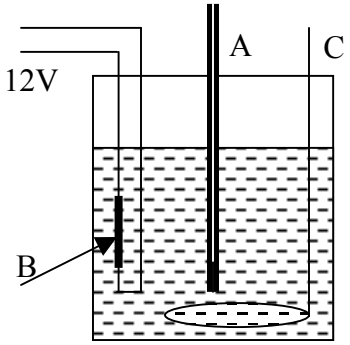
V = IR P = VI Charge = Current x time Energy = VIt

Section A: **Answer ALL questions in this section in the spaces provided. This section carries 55 marks.**

1. (a) The specific heat capacity of water is 4200J/kg^{0}C. This means that to raise the _____ of 1kg of water by _____, 4200 _____ of heat energy are needed.

(3 marks)

(b) In an experiment to find the specific heat capacity of oil, Mary used the apparatus shown below.



(i) A is a _____

(ii) B is a _____

(iii) C is a _____

(iv) To get a more accurate result, _____ is needed.

(4 marks)

2. (a) The pressure produced on the ground by a pointed heel is greater than that produced by a wider heel because _____

_____

(2 marks)

(b) A boy of mass 48 kg wears a pair of running shoes. The area of each shoe in contact with the ground is $80cm^2$. Find the pressure exerted on the ground when the boy stands

(i) on one leg _____

(ii) on two legs _____

(2,1 marks)

3. A motorist on a road travelling at 30m/s applied the brakes in front of a clothes shop and managed to bring his car to a halt in front of a coffee shop 60m away, in 10 seconds, using a breaking force of 1500N.

(a) initial velocity of car is _____

(b) final velocity of car is _____

(c) acceleration of car is _____

(d) mass of car is _____

(1,1,3,3 marks)

4. While ice-skating, Alex of mass 60 kg, holds his female partner, Mary, of the same mass, and both skate together at 20m/s.

(a) Momentum of Alex and Mary together is

_____

(2 marks)

(b) Alex suddenly stops and at the same time releases Mary, transferring all the momentum to her, so she continues to slide freely.

(i) Velocity with which Mary continues to move is

_____

(ii) Momentum of Mary is

_____

(3,2 marks)

5. (a) Louisa rubs a polythene rod with a piece of cloth. The polythene becomes _____ charged while the cloth is _____ charged. This happens because polythene _____ electrons, while the cloth _____ electrons.

(4 marks)

(b)

(i) A trailing strip attached to the back of a car and hanging so that it touches the ground, stops it from overcharging with static electricity. The strip is made of _____.

(ii) In places where it rains all the time, the strip is not needed. Why?

_____

(1,1 mark)

6. (a) In a domestic electrical appliance, the colour of:

(i) Live wire is _____

(ii) Neutral colour is _____

(iii) Earth wire is _____

(3 marks)

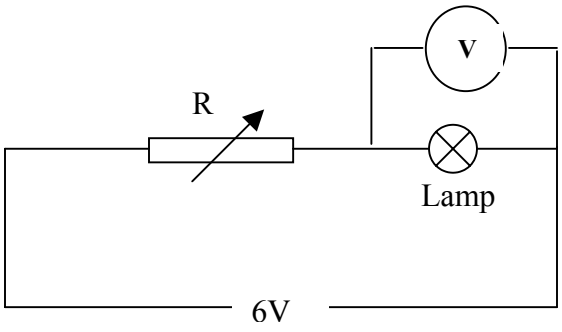
(b) A fuse protects the power circuit from burning out if a short occurs.

(i) A short circuit occurs when _____

(ii) The fuse wire must be fitted on the _____ wire.

(2,1 marks)

7.



The above circuit can be used to vary the brightness of the lamp

(i) Component R is called _____ (1 mark)

(ii) R is used to _____ (2 marks)

(iii) Draw an ammeter on the circuit to measure the current flowing through the lamp. (1 mark)

(iv) If the ammeter reads 1.0 amperes, what charge passes through the lamp in 10 seconds?

_____

_____ (3 marks)

(v) When the voltmeter in the circuit reads 5V and the ammeter reads 1A, the electrical energy changed to light and heat by the lamp in 10 seconds is

_____

_____ (3 marks)

8 A 2kW electric kettle is switched on for 3 minutes every day for 30 days to heat water for tea. Electricity costs 6c per unit.

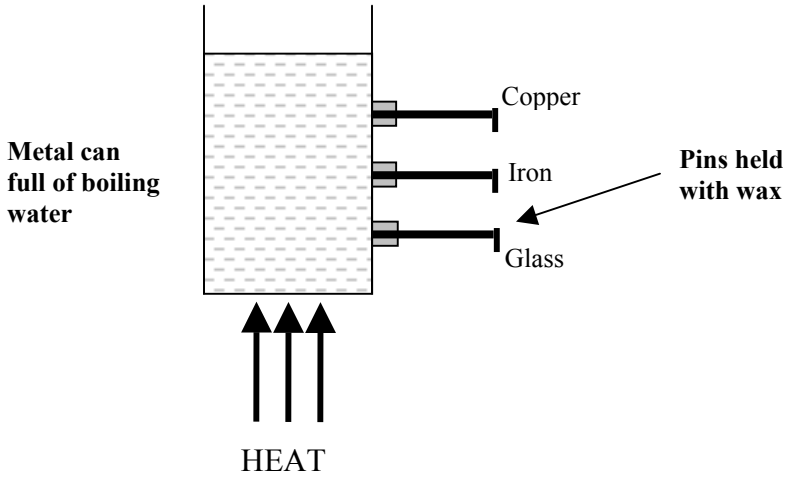
(i) the kettle is switched on for a total time of _____ hours. (2 mark)

(ii) the number of units of electrical energy used is _____ (2 marks)

(iii) the total cost of running kettle is _____ (2 marks)

Section B: **Answer ALL questions in this section on the foolscaps provided. This section carries 45 marks.**

9 The apparatus below can be used to test the conductivity of different materials



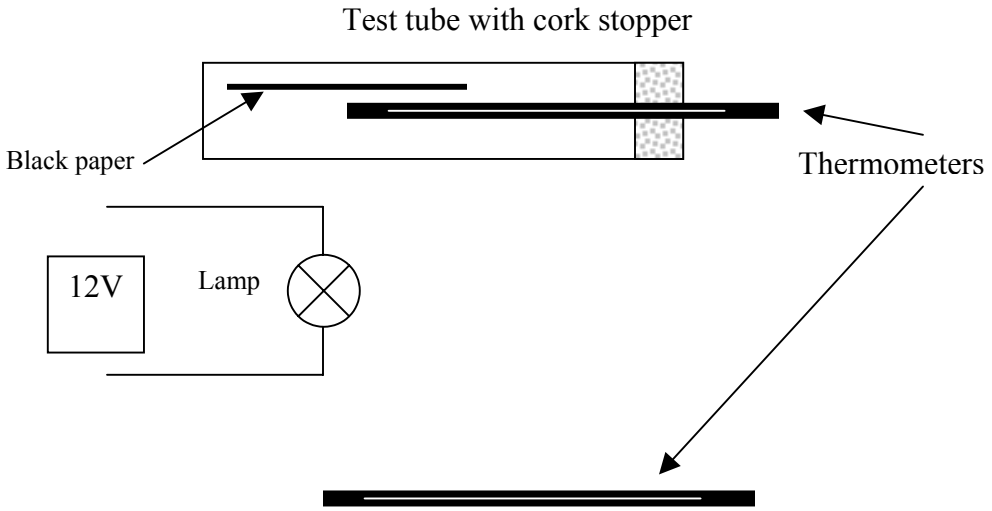
(a) Explain briefly how the experiment is carried out, and which of the three materials would you expect to be the best conductor of heat. (4 marks)

(b) What method of heat transfer is used when heat energy travels:

(i) through the metal can to heat the water, (1 mark)
(ii) through the water to the surface? (1 mark)

(c) In another experiment, a student was asked to investigate the 'greenhouse effect'. Apparatus available was:

test tube fitted with cork and a thermometer
a similar thermometer
black paper
12V lamp connected to a dc supply
a ruler



(i) Explain briefly how the experiment is carried out (4 marks)

(ii) Which thermometer would you expect to show the higher temperature? (1 mark)

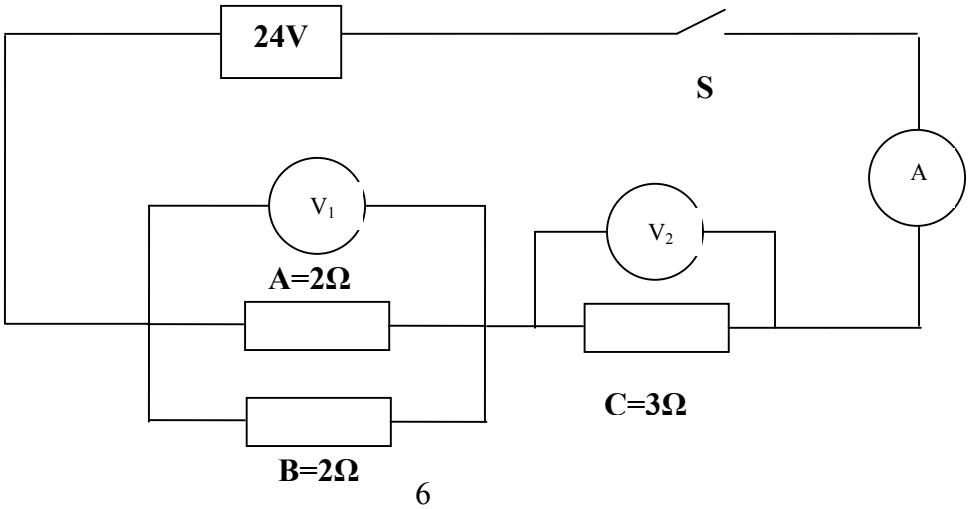
(iii) Why is the heat trapped in the glass tube? (2 marks)

(iv) What method of heat transfer is used from the lamp to the thermometers? (2 marks)

10 (a) 20 lamps are connected in series in a festa decoration circuit. Explain why all the lamps switch off when one lamp goes out. (2 marks)

(b) How must the 20 lamps be connected so that the remaining 19 lamps continue to light when one lamp burns out? (2 marks)

(c) The circuit below is connected to a 24V supply.



When switch S is closed, V_1 reads 6V. Calculate,

(i) current in resistor **A** (2 marks)

(ii) current in resistor **B** (2 marks)

(iii) current in resistor **C** (2 marks)

(iv) current passing through ammeter A (2 marks)

(v) voltage across the resistor **C** (2 marks)

(d) Explain why the voltmeter does not produce a short circuit.
(1 mark)

11 This question is about thermistors.

(a) Draw the symbol for a thermistor. (1 mark)

(b) A thermistor is heated from a temperature of 0^0C to 80^0C while its resistance is measured. The table below records these measurements

Resistance (Ω)	276	125	63	28	25
Temperature (^{0}C)	0	20	40	60	80

(i) Draw a graph of resistance (on the Y-axis) against the temperature (on the X-axis).
(6 marks)

(ii) What is the resistance of the thermistor when held in a room at a temperature of 25^0C?
(2 marks)

(iii) What temperature change increases the resistance from 100Ω to 200Ω ?
(2 marks)

(c) Explain briefly how you would use a 6V battery and an ammeter to find the resistance of the thermistor.
(4 marks)