St. Ignatius College Boys' Secondary School, Ħandaq

Half-Yearly Examination 2008/2009

Form 4 **Physics** **Time: 1hr 30mins**

Name: _____ **Class:** _____

1	2	3	4	5	6	7	8	Main	Practical	Global

Useful equations: $H = m c \Delta\theta$ $P t = m c \Delta\theta$

SECTION A: This section carries 55 marks. Answer all the questions in the space provided.

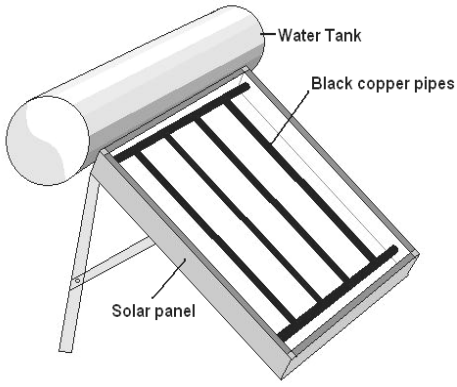
1. a. A negatively charged object _____ a positively charged object. (1)

b. When a _____ rod is rubbed with a cloth it becomes positively charged since _____ charges move to the cloth. (2)

c. _____ objects have equal positive and negative charges. (1)

d. _____ are materials that let electrons pass through them. (1)

2. Solar water heaters use the energy from the sun to heat water.



a. Explain why the copper pipes are painted black. (2)

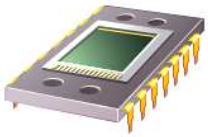
b. Explain why the water tank is made up from a shiny surface. (2)

c. Before buying a solar water heater, Anna calculates that the solar panel provides 5,250,000J of energy when heating water from 35^{o}C to 60^{o}C. Calculate the mass of water being heated if water has a Specific Heat Capacity of 4200J/Kg^{o}C. (3)

3. Walter a computer technician has to take care that static electricity does not damage components while repairing a computer.

a. He is told not to use polythene bags to store computer components since these bags get charges by rubbing. Explain what happens when polythene gets rubbed by a cloth? (2)

b. Walter tries to touch a neutral microchip while his hand is negatively charged. Draw in the diagram below how negative and positive charges are induced on the microchip. (2)



Microchip

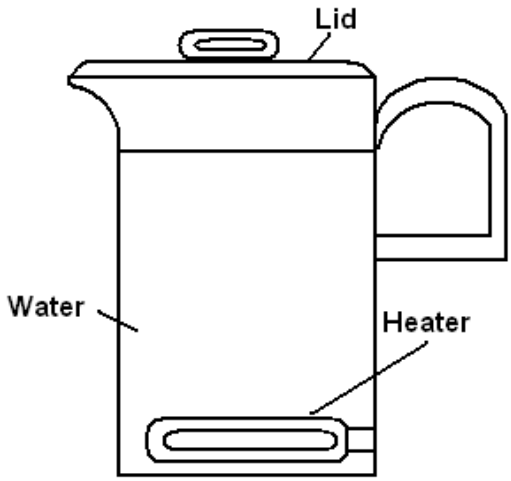
c. The microchip is damaged when Walter touches it since it becomes charged. To avoid damaging other components, Walters buys an antistatic mat that conducts static electricity to Earth.

i. Explain why the mat should be made from a conductive material. (2)

ii. When repairing another computer, Walter now touches a computer tower that was positively charged. What is the overall charge on the tower after Walter touched it? (1)

iii. Explain in terms of charges how the tower gains the charge mentioned in question c (ii). (3)

4. Rachel bought a new electric kettle.



a. She noticed that the kettle's handle is made from plastic. Explain why a handle is ideally made from plastic. (2)

b. When Rachel switches on the kettle, she notices that there are convectional currents in the water. Draw in the diagram how convectional currents are created. (2)

c. Explain how these convectional currents are caused in the water. (2)

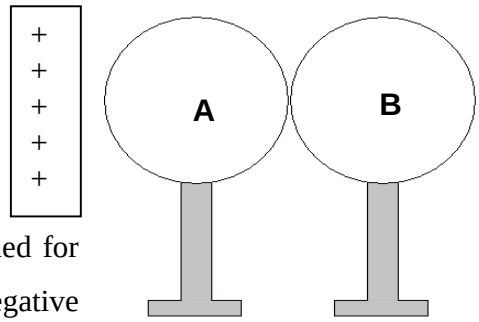
d. i. Rachel noticed a label on the side of the kettle. Which value shows the power of the heater? (1)

ii. The kettle contains 1.5Kg of water and is left switch on for 7minutes. If the Specific Heat Capacity of water is 4200J/Kg^{o}C, calculate the change in temperature as the water gets heated? (3)

iii. If the kettle is switched off at boiling point, calculate the initial temperature of the water. (1)

iv. Once the kettle has reached boiling point, Rachel takes some time before making coffee. If the temperature decreases to 70^{o}C, calculate the energy lost from the kettle as the water cools. (3)

5. The diagram shows two metal spheres held on insulated stands. A positively charged rod is brought near one of the spheres.

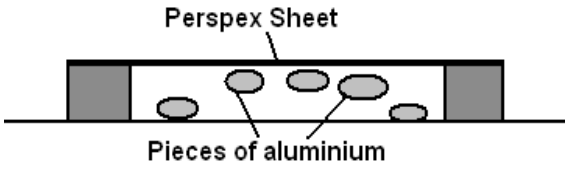


a. Draw on the two spheres how the charges are distributed. (2)

b. The positive rod is kept near sphere A and sphere B is earthed for some time. Both spheres become negative. Explain how a negative charge can be induced on the spheres? (3)

c. What will happen if the positively charged rod is removed **before** the earth is removed? (3)

d. Clare rubs the top of the Perspex sheet shown in the diagram with a cloth. Some small pieces of aluminium jumped up from the table top and got stuck to the sheet beneath the area which had been rubbed.

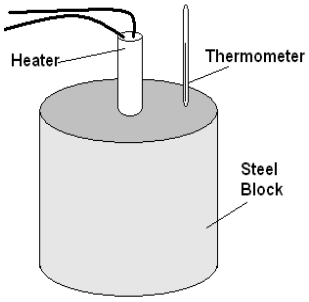


i. What charge was produced on the top surface of the Perspex sheet? (1)

ii. Explain how this charge was produced by rubbing. (2)

iii. The top surface of the sheet was touched by Clare's hand and some pieces of foil fall. Explain why? (3)

6. The diagram below shows the setup used to measure the Specific Heat Capacity of a 2Kg block of steel. The heater is switched on for 1 minute.

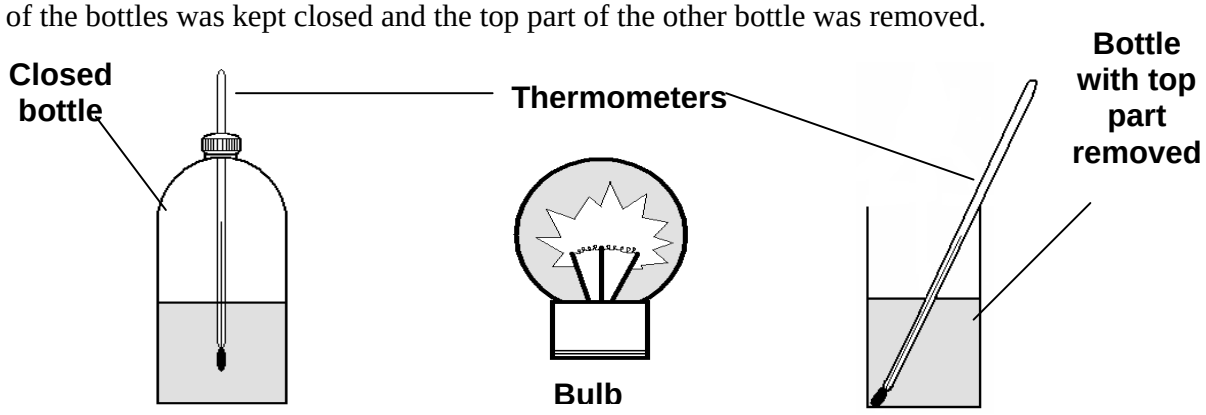


a. If 9000J of energy are supplied to the block to increase its temperature from 25^oC to 35^oC, calculate the Specific Heat Capacity of steel. (3)

b. Give two precautions used during this experiment. (2)

SECTION B: This section carries 30 marks. Attempt all questions. Answer all the questions in the space provided.

7. Martha noticed that when she left a plastic bottle in the sun, the water in the bottle warmed up quickly. To investigate this fact she sets up two plastic bottles in front of a large bulb as shown below. One of the bottles was kept closed and the top part of the other bottle was removed.



a. If Martha is also provided by a stopwatch, describe the experiment she should carry out in order to investigate which plastic bottle heats up more quickly. (5)

b. Give two precautions Martha should follow during such an experiment. (2)

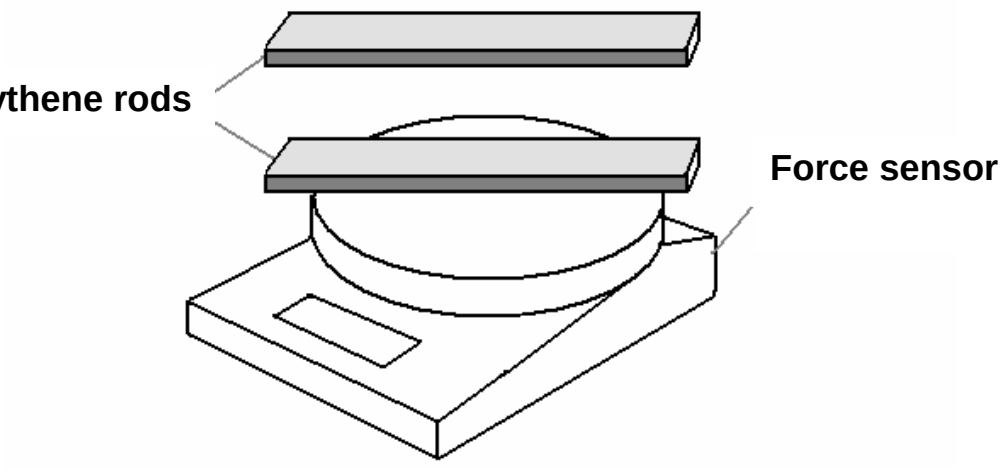
c. Fill in the table below to indicate the measurements taken during this experiment. (4)

Quantities:		
Units:		

d. Explain how heat is transferred from the bulb to each bottle? (2)

e. Martha explains to her friend that the water in closed bottle warms up because it causes a Greenhouse effect. Describe what happens when Greenhouse effect takes place. (2)

8. Peter wanted to investigate the forces produced by charged objects. He placed a charged polythene rod on a force sensor and brought a second charged polythene rod close as shown below.



a. As Peter moved the polythene rods closer to each other, he measured the distance between them and the force indicated on the sensor. The results he obtained are shown in the table below.

Force/ N	12.00	6.00	3.00	1.50	0.75	0.50	0.50	0.50
Distance/cm	1	2	3	4	5	6	7	8

i. There is a force of _____ between the two charged polythene strips. (1)

ii. Plot the graph of Force/N (y-axis) against Distance/cm (x-axis) on the graph paper provided. Draw the best curve through the points. (6)

iii. Explain what happens to the force between the rods as the distance between them decreases. (2)

iv. Use the graph to determine the force produced at a distance of 3.5cm. (2)

b. Explain why the force sensor keeps showing a force of 0.50N when the polythene rods are more than 6cm away. (2)

c. Peter repeats the experiment with two uncharged polythene rods. Explain what will Peter notice in this case. (2)