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Half Yearly Examinations

2008 – 2009



Subject: **PHYSICS**
Form: **4 Secondary**
Time: **1 hr 30 min**

NAME: _____
CLASS: _____ INDEX NO: _____

Instructions to Candidates

Answer ALL questions.

ALL WORKING MUST BE SHOWN

Information to Candidates

Calculators may be used.

The following is a set of equations and some data that you may find useful.

$H = m c \Delta\theta$	$E = P t$	$Mom = mv$
$v = u + at$	$s = ut + \frac{1}{2} at^2$	$s = \frac{(u + v) t}{2}$
$v^2 = u^2 + 2as$	$F = ma$	$W = mg$
$F = \frac{mv - mu}{t}$	Area of trapezium = $\frac{1}{2}$ (Sum of parallel sides) \times h	
	Area of triangle = $\frac{1}{2}$ base \times h	
Acceleration due to gravity, $g = 10 \text{ m/s}^2$		

Question	1	2	3	4	5	6	7	8	Total Exam	Practical	Final Mark
Marks											

Section A

Answer all questions in this section. This section carries 40 marks

1. Complete the following by using these words: *insulators, infra-red, conductors, 273, radiation, thermometer, convection, conduction*.

- (a) A _____ is used to measure the temperature of a substance.
- (b) Absolute zero, the lowest possible temperature is – _____°C.
- (c) Heat energy can travel through a solid by _____, it travels through a fluid by _____ while it travels through a vacuum by _____.
- (d) Metals are good _____ of heat while wool is a good _____ of heat.
- (e) Radiation is the flow of heat from one place to another by means of _____ waves. [8]

2. **Total stopping distance = Thinking distance + Braking distance**

A car is travelling at a speed of 30m/s and its driver, who has a reaction time of 0.7s, decides to stop. The car decelerates uniformly and stops 4.0s after the driver applies the brakes.

- (a) Calculate the distance covered by the car during the thinking time. _____ [1]
- (b) Calculate the distance covered by the car during braking. _____ [2]
- (c) Calculate the total distance covered by the car, between the driver deciding to stop the car and the car finally coming to rest. _____ [1]
- (d) Name 2 factors which can increase the thinking distance of the car. _____ [2]
- (e) Name 2 factors which can increase the braking distance of the car. _____ [2]

3. Two investigators working for a company producing insulators were asked to decide if a material A is a better insulator than a material B. The two materials were solids in the form of sheets.

- (a) Fill in the missing words from below to complete the method of an experiment to find out which is the better insulator:

thermometer, two, liquid, hot, temperature

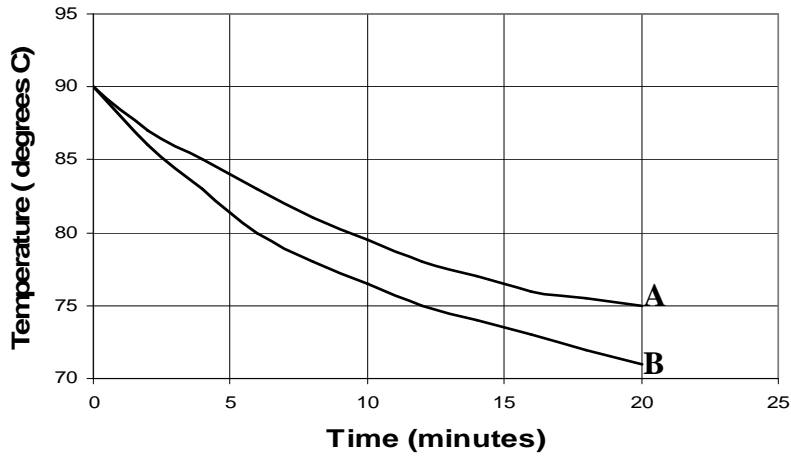
Two similar cans, one covered with material A and the other with material B, are filled with _____ water. A _____ is inserted in each can and the initial temperature of both cans is noted down. The _____ of water in each can is taken every _____ minutes for five times. Data obtained is then tabulated and a graph is plotted to compare the results of both cans. It is made sure that the _____ is stirred continuously so as to have the same temperature throughout the liquid during the entire experiment. [5]

Marks in this page:

- (b) Mention one precaution taken during the experiment that is not already mentioned in the method above.

[1]

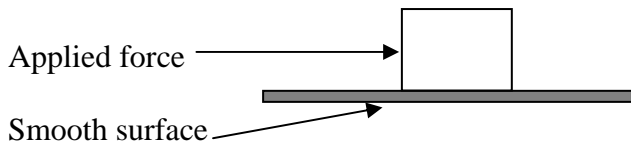
- (c) The following is a graph of the results obtained:



Which material do you think is the better insulator? Explain

[2]

4. An object has a mass of 6 kg and is placed at rest on a smooth horizontal surface as shown in the diagram. A force of 30 N is applied on the object for 3 seconds.



- (a) Draw an arrow on the diagram to show the direction of the object's weight [1]
 (b) Find the weight of the object.

[1]

- (c) What is the initial velocity of the object before the force is applied?

[1]

- (d) Calculate the acceleration produced by the force if there is a constant frictional force of 9 N.

[3]

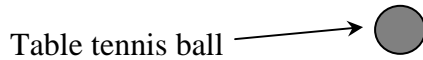
- (e) What is the velocity of the object after 3 seconds?

[2]

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5. When an object falls freely its motion changes.

- (a) A table-tennis ball is dropped from the top of a high building on a day without wind.
(i) On the diagram below draw and label two forces acting on the ball as it falls [2]



- (ii) What is the acceleration of the ball just after it has been dropped?

_____ [1]

- (iii) After some time the forces on the ball become equal. What is the final velocity of the ball called?

_____ [1]

- (b) A stone is dropped from the same building and takes 4.2 s to reach the ground.

Calculate:

- (i) the height of the building

_____ [2]

- (ii) the velocity with which the stone hits the ground.

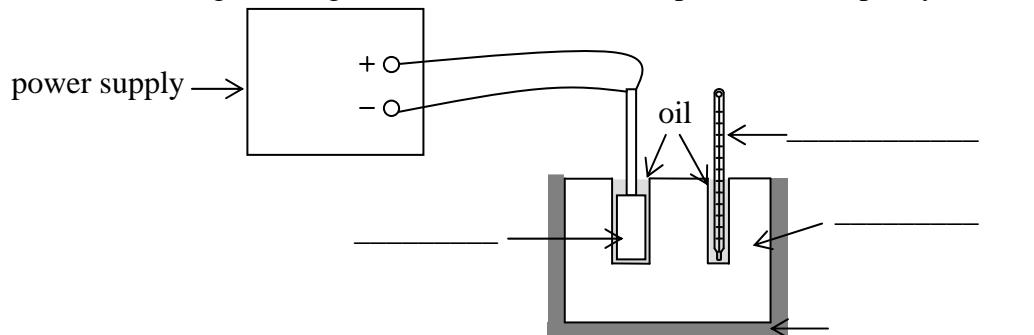
_____ [2]

Section B

Answer all questions in this section. This section carries 45 marks.

6. *This question is about Specific Heat Capacity and Heat Transfer.*

- (a) The specific heat capacity of a substance is the amount of _____ that is needed to raise the temperature of 1 kg of the substance by _____. [2]
(b) The following is a diagram used to measure the specific heat capacity of a metal.



- (i) Name the 4 items marked on the diagram. [4]
(ii) 500 g of the metal were heated from 20°C to 35°C using a heater of power 50 W for 2 minutes. How much energy was supplied by the heater? [1]

- (iii) Find the specific heat capacity of the metal.

_____ [3]

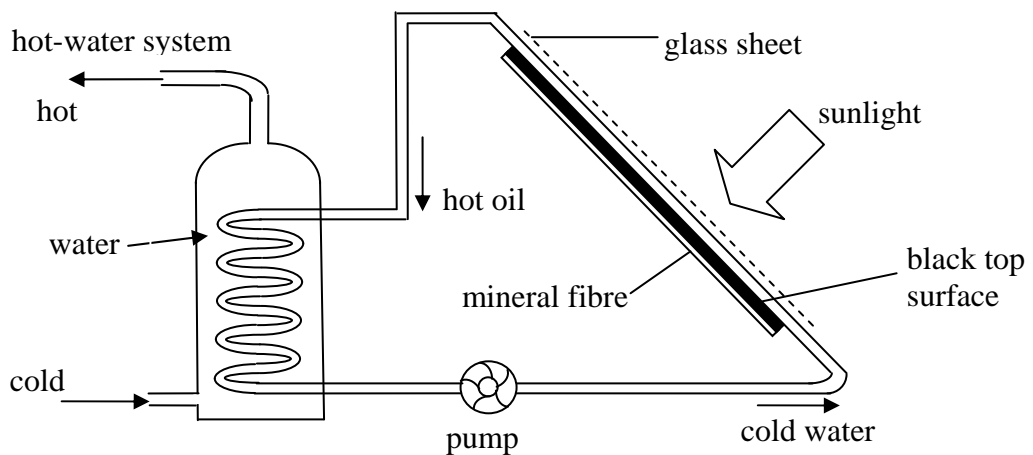
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- (c) Describe a simple experiment with the help of a labelled diagram to show that water is a bad conductor of heat. The apparatus available to be used is a test tube, ice, supply of water, wire gauze and a bunsen burner. [5]

Diagram:

7. This question is about Heat Transfer.

In Malta water is usually heated using an electric water heating tank. Today many people are making use of solar panels to provide heated water. The diagram below shows the main features of a solar heater. A small electric pump circulates the oil through the pipe.



The temperature of the black top surface was recorded in a research and development centre when it was left in the sun for 9 minutes. The following is a table obtained by a thermometer able to read up to 0.1°C .

Time (minutes)	0	1	2	3	4	5	6	7	8	9
Temperature ($^{\circ}\text{C}$)	21	23.9	26.3	28.1	29.4	30.4	31.3	32.1	32.6	33

- a. Plot a graph of temperature (y-axis) against time (x-axis) for the black surface. On the y-axis start your scale from 20°C . [7]

For questions *b* to *f* use the following words to fill in the blanks:

conduction, density, sun, longer, absorbed, absorbers, convection, emitter

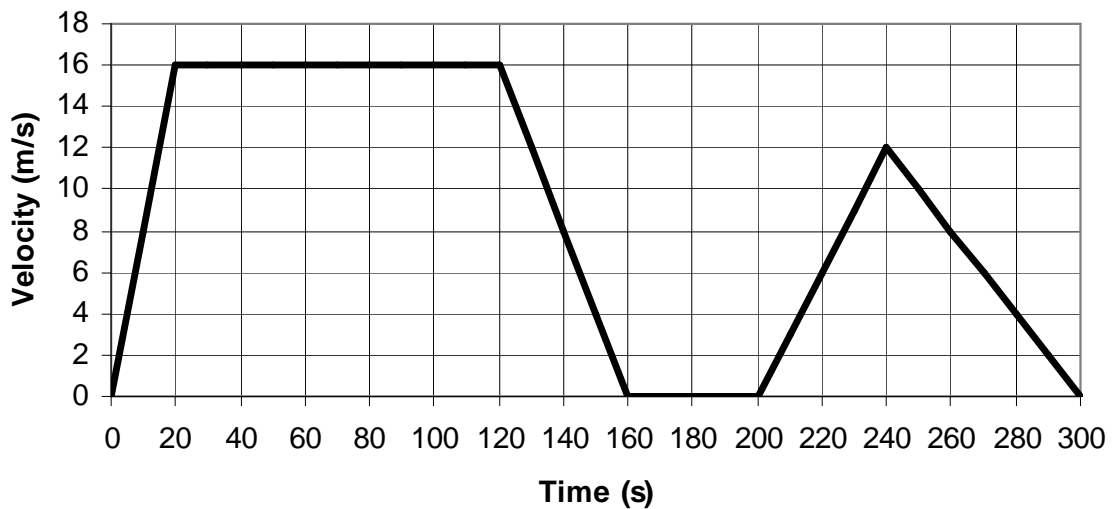
- b. The top surface is blackened because black surfaces are good _____. [1]
- c. The mineral fibre at the back of the panel reduces heat loss by _____. [1]
- d. In the tank, hot water rises and cold water falls by _____ because the _____ of cold water is larger than that of hot water. [2]
- e. At night the black surface loses heat since it is a good _____. [1]
- f. The glass sheet increases the heat energy collected by the panel because of the greenhouse effect. Fill in the missing words to explain this effect.

Short wavelength infrared radiation from the _____ passes easily through the glass of the greenhouse. These rays are _____ by the plants and soil. The heated plants and soil also radiate heat but since the wavelength is _____, it cannot get through the glass. So heat energy is radiated in, but cannot radiate out again, therefore there is a build up of heat in the greenhouse. [3]

8. *This question is about Linear Motion and Momentum.*

The graph below shows how the velocity of a car changes with time during its journey.

Velocity - time graph for a car



a. From the graph find:

- (i) the highest speed of the car.

_____ [1]

- (ii) the total time of the whole journey.

_____ [1]

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(iii) the acceleration during the first 20 s.

[2]

(iv) the deceleration during the last 60 s

[2]

b. The car moved at a constant speed for some time

(i) What was this constant speed?

[1]

(ii) For how long did the car travel at this speed?

[1]

c. What do you think happened to the motion of the car between 160 and 200 s from the start?

[1]

d. Calculate the distance covered by the car during its first 160 s.

[2]

e. The car and its driver have a total mass of 2000 kg.

(i) Calculate the momentum of the car when it was moving at a velocity of 10 m/s?

[2]

(ii) Calculate the braking force acting on the car when has an acceleration of 0.5m/s^2 .

[2]

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