# GOZO COLLEGE
# KAN. G. P. AGIUS DE SOLDANIS
## Half Yearly Examinations
## 2008 – 2009

Subject: **PHYSICS**

Form: **4 Junior Lyceum**

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.

$H = m c \Delta\theta$ $\quad E = P t$ $\quad Mom = mv$

$v = u + at$ $\quad s = ut + \frac{1}{2} at^2$ $\quad s = \frac{(u + v) t}{2}$

$v^2 = u^2 + 2as$ $\quad F = ma$ $\quad W = mg$

$F = \frac{mv - mu}{t}$ $\quad$ Area of trapezium = ½ (Sum of parallel sides)× h

Area of triangle = ½ base × h

Acceleration due to gravity, $g$ = 10 m/s$^2$

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

Use this margin for rough work only

## Section A

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

1. Complete the following:
   (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. The reaction time (or thinking time) of a driver is the time between the driver deciding to stop a car and pressing the brake pedal. 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. The apparatus available included two similar metals cans (one covered with material A and the other with material B), 2 thermometers, supply of hot water and a stopwatch.
   (a) Write the method of an experiment to find out which is the better insulator.
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____[4]

Marks in this page: ☐

Use this margin for rough work only

(b) Mention two precautions taken during the experiment.

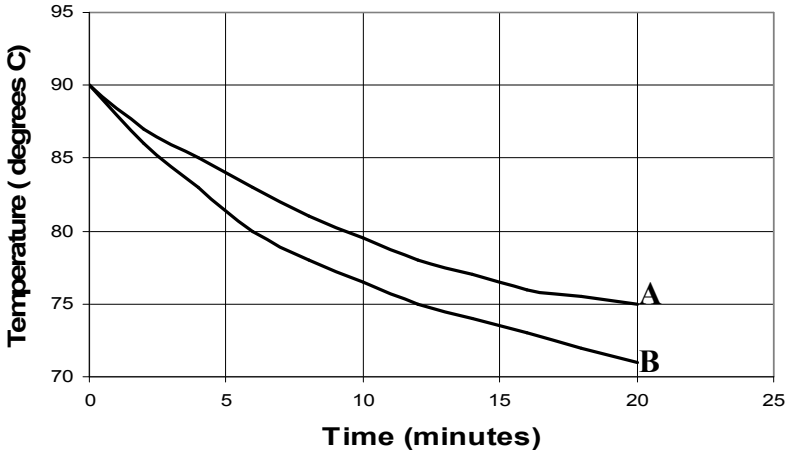
_____

_____

_____

_____[2]

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

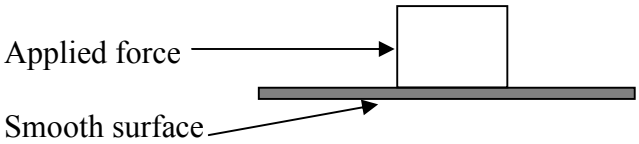



Which material do you think is the better insulator? Explain.

_____

_____ [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]

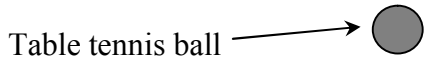
Marks in this page:

Use this margin for rough work only

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]

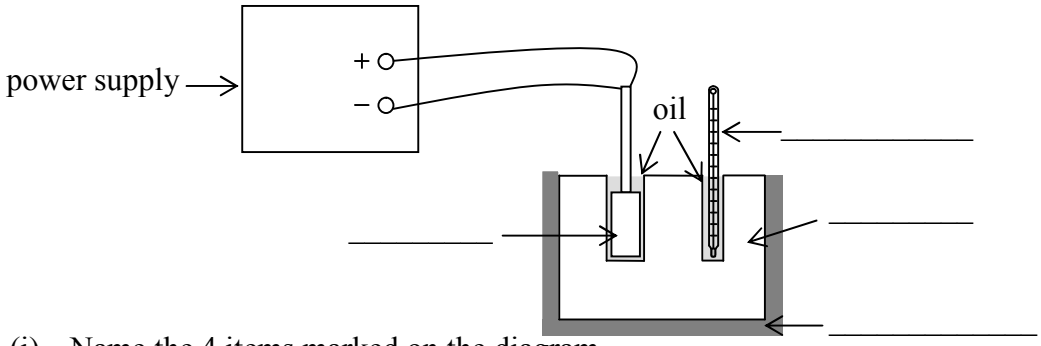
## Section B

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]

Marks in this page:

Use this margin for rough work only

(c) Describe a simple experiment with the help of a labelled diagram to show that water is a bad conductor of heat. [5]

Diagram:

_____

_____

_____

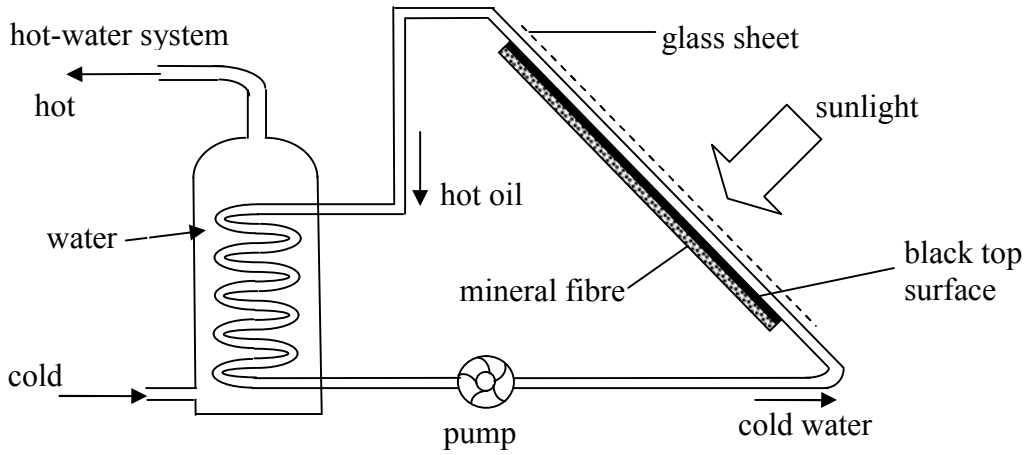
_____

_____

_____

_____

7. This question is about heat transfers.
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 (°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]

b. The top surface is blackened because black surfaces are good _____ [1]

Marks in this page:

Use this margin for rough work only

c. The mineral fibre at the back of the panel reduces heat loss by _____. [1]

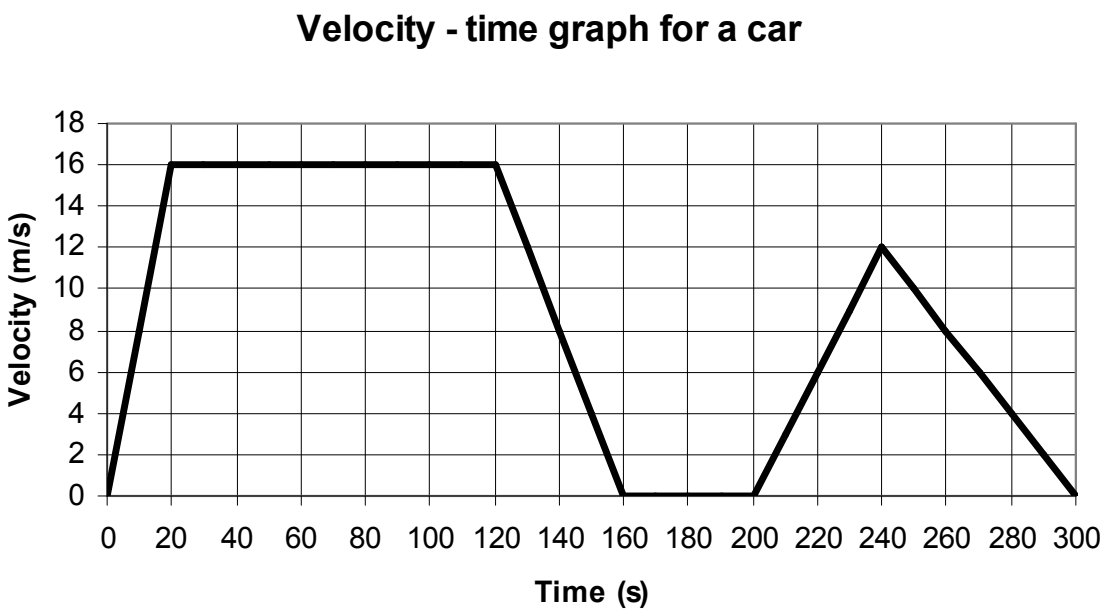
d. In the tank, hot water rises and cold water falls by _____ because the _____ of cold water is larger than that of hot water. [2]

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. Explain this effect.

_____
_____
_____
_____
_____
_____
_____ [3]

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




a. From the graph find:

(i) the highest speed of the car.

_____ [1]

(ii) the total time of the whole journey.

_____[1]

(iii) the acceleration during the first 20 s.

_____
_____
_____[2]

Marks in this page:

Use this margin for rough work only

(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 it was decelerating during the last 60 s of the journey.

_____

_____

_____

_____[2]

Marks in this page: ☐

Use this margin for rough work only

Marks in this page: