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## Half Yearly Examinations

February 2010

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

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<b>NAME:</b> _____ <b>CLASS:</b> _____ <b>INDEX No:</b> _____
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### Information to Candidates

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Answer ALL questions. All working must be shown.

Calculators may be used.

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

$H = m c \Delta\theta$              $E = P t$             **Momentum =  $mv$**

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

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

$F = \frac{(mv - mu)}{t}$             **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,  $g = 10 \text{ m/s}^2$**              $g = 2s / t^2$

Question	1	2	3	4	5	6	7	8	Total Exam	Practical	Final Mark
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## Section A: Answer all questions

### Question 1:

Fill in the blanks using the following words:

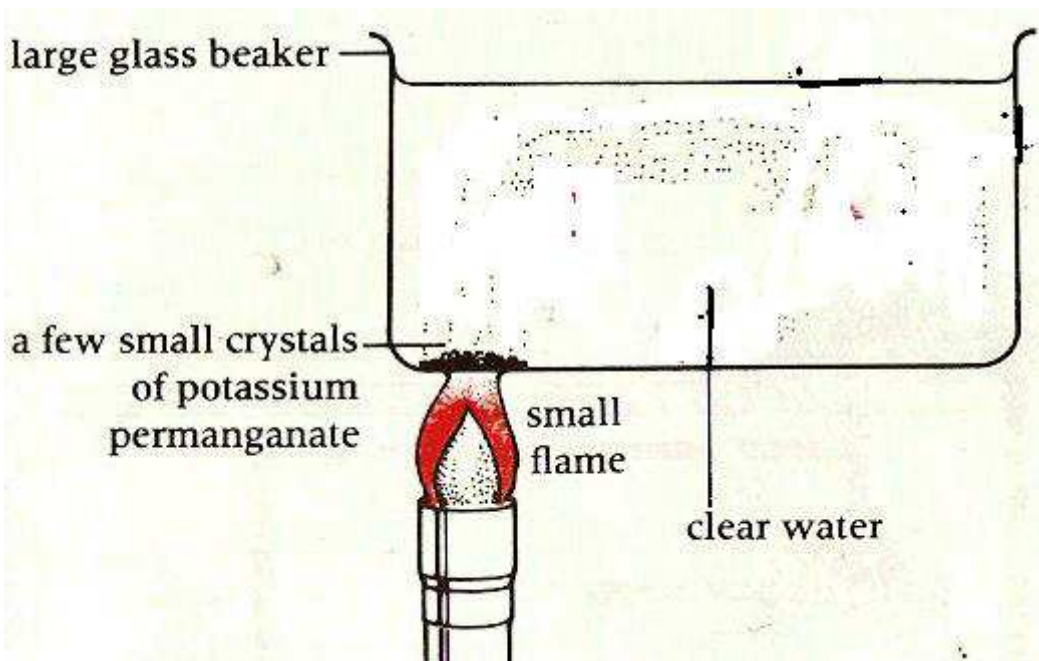
**decreases, increases, insulator, conductor, white, thermometer, 10, absorber.**

- a) A cooking pot is made of iron. Iron is a good \_\_\_\_\_ of heat and so heat energy passes quickly from the fire to the food. On the other hand, the handle of the pot is covered with plastic, because this is a/n \_\_\_\_\_ and so you do not burn your hand. [2]
- b) Hot water rises, because when heated its volume \_\_\_\_\_ and its density \_\_\_\_\_. [2]
- c) Wearing a black T-shirt is not a good idea in the summer sun because black is a good \_\_\_\_\_ of heat by radiation and you become hotter. It is better if you wear a/n \_\_\_\_\_ T-shirt. [2]
- d) Temperature is measured with a/n \_\_\_\_\_. A rise in temperature of 10°C is equal to a rise of \_\_\_\_\_ K. [2]

### Question 2:

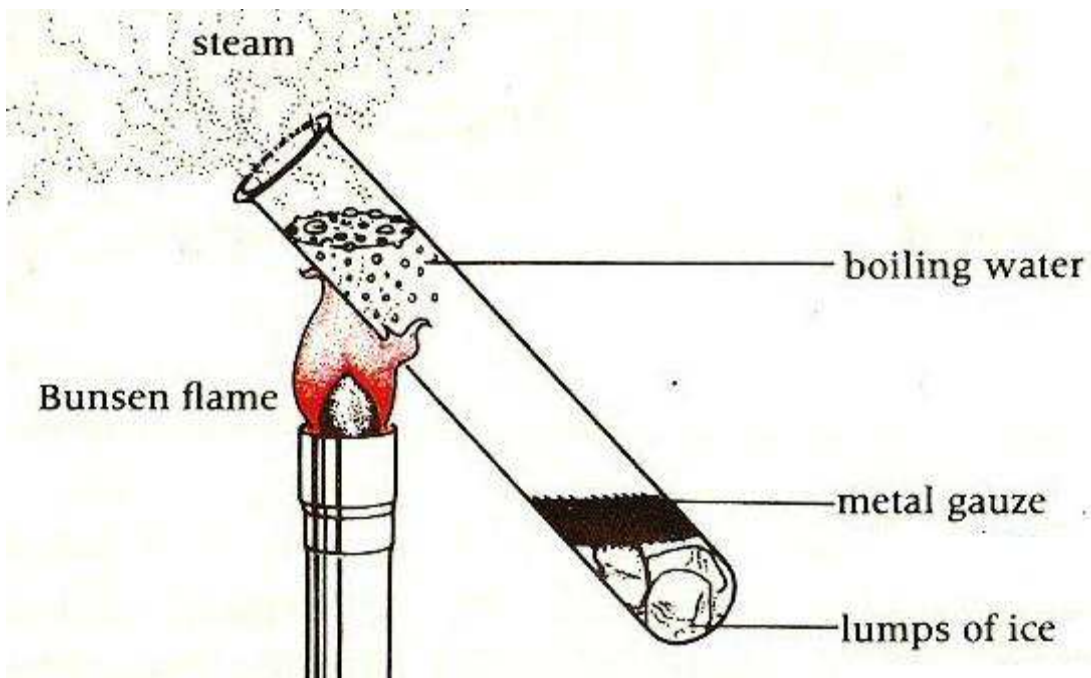
- a) We place a violet crystal at the bottom of a beaker full of water. The crystal dissolves in the water. We heat the water from underneath the crystal.
- i) Explain what would you see taking place.

\_\_\_\_\_ (1 mark)



- ii) Draw the convection currents in the water on the diagram above. (1 mark)
- iii) Does water *rise* or *fall* when heated? Explain why.

\_\_\_\_\_ (2 marks)



b) An ice cube is surrounded with a piece of wire gauze and put in a test-tube full of water. The ice cube sinks to the bottom. The test tube is heated at the top. After a while the water at the top starts boiling while the ice cube at the bottom does not melt.

i) Why was the ice cube covered in wire gauze? \_\_\_\_\_ (1 mark)

ii) Can heat reach the ice-cube by hot water moving down ( byconvection)? Why?  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

iii) What do you conclude from this experiment?  
 \_\_\_\_\_ (1)

**Question 3:**

A boy lets a stone to fall into an empty well. He hears a sound as it hits the bottom 3 seconds later.

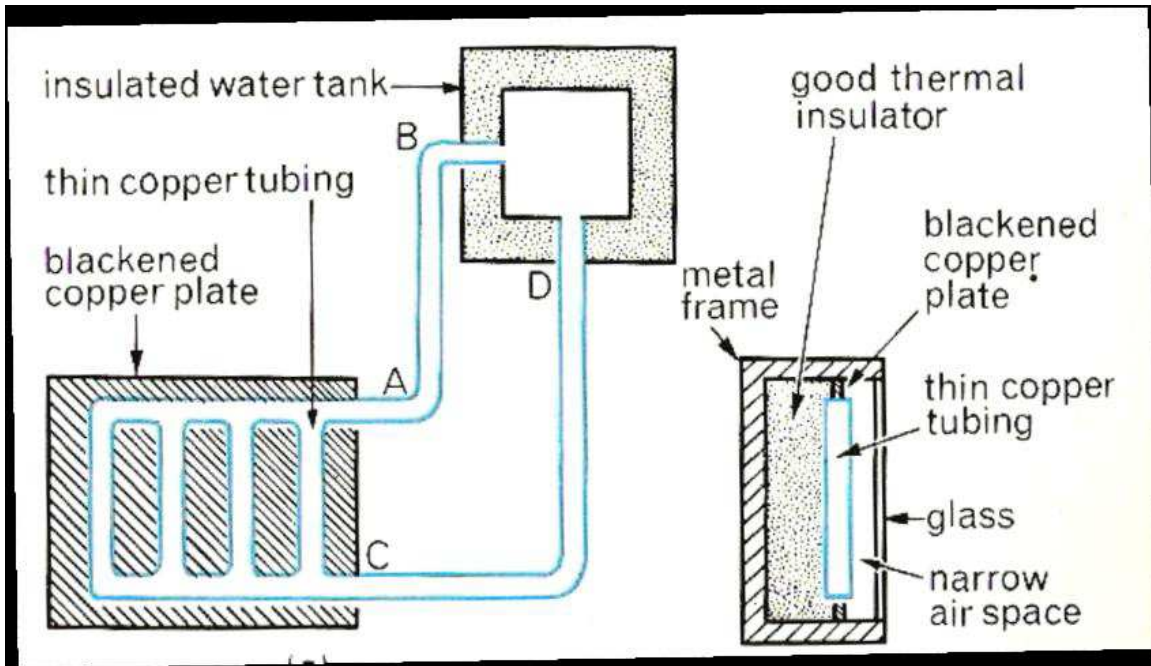
a) What is the initial velocity of the stone? \_\_\_\_\_ [1]

b) With what acceleration does the stone fall? \_\_\_\_\_ [1]

c) What is the depth of the well? (*Hint: Find the distance the stone falls*)  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

d) With what velocity does the stone hit the bottom?  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

#### Question 4:



The diagram shows the panel of a solar water heater. The design helps to heat the water quickly. In fact it is placed facing south so that it faces the sun.

Use the following words to fill in the blanks:

- The pipes are made of copper because it is a good \_\_\_\_\_.
- The pipes are painted black because this \_\_\_\_\_ more heat by \_\_\_\_\_.
- The glass pane acts like a \_\_\_\_\_. Radiation from the sun is \_\_\_\_\_ inside.
- The tank is \_\_\_\_\_ so it does not lose heat by conduction.
- Hot water from the panel \_\_\_\_\_ to the tank. Cold water \_\_\_\_\_. This is convection. ( 8 marks)

#### Question 5:

- During the day in summer, the sand on a beach is much hotter than the sea. At night the reverse is true. Explain this using the phrase "specific heat capacity".

[2]

- A teacher heated some water in the laboratory. The following were the readings noted:

☑ Mass of water = 0.26 kg

☑ Initial Temperature = 20°C

☑ Final Temperature = 32°C

☑ Power of Heater = 50 W

☑ Time heater is switched on = 300s.

i) Calculate the change in temperature of the water.

\_\_\_\_\_ [1]

i) Calculate the heat energy given to the water.

\_\_\_\_\_ [2]

ii) Calculate the specific heat capacity of the water using these readings.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

## Section B: Answer all questions

### Question 6:

a) This is an experiment to see which surface is the better emitter of heat by radiation. The following are the steps of the experiment. But they are mixed up. Put a **number(1, 2 and 3)** in the spaces below to show how they should be in order.

\_\_\_\_\_ We use thermometers to find the temperature of the cans and then switch on a stopwatch..

\_\_\_\_\_ Then we take the temperature of the cans every minute for several minutes.

\_\_\_\_\_ We have a dull black can and a shiny white. We put hot water in them. (3)

b) Write two precautions which should be taken during this experiment.

\_\_\_\_\_  
\_\_\_\_\_ (4)

c) The following table contains data obtained from a similar experiment carried out by some students:

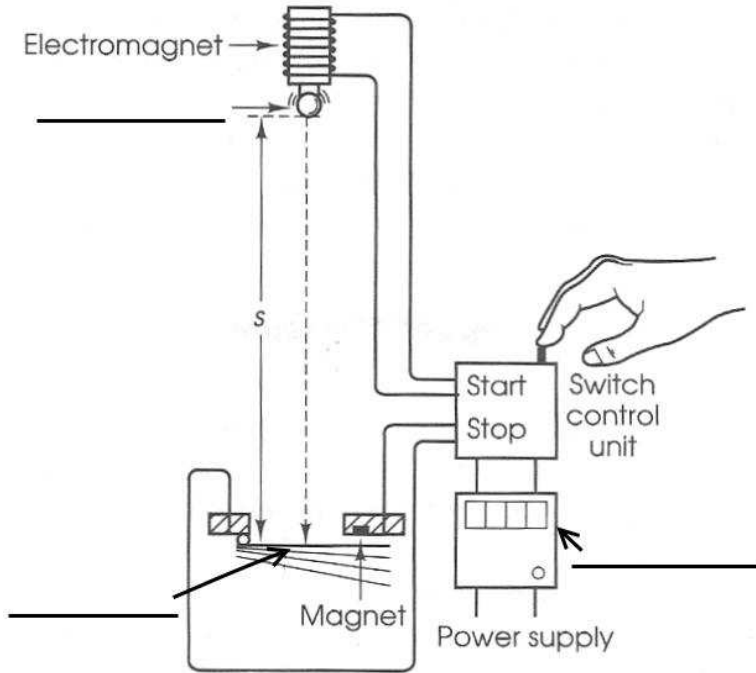
Time (min.)	Temperature (°C)	
Polished Can	Black Can	
0	80	80
2	76	74
4	72	70
6	70	68
8	68	66
10	67	64
12	66	62
14	64	60

Plot a graph of temperature on the y-axis and time on the x-axis for both cans using the same axes. Make sure to use most of the graph paper provided. (6)

d) **Underline the correct answers:** We can conclude that the black surface is a (better/ bad) emitter of heat by radiation. It loses (more/less) heat than the white surface. (2)

**Question 7:**

Two students set about to find the acceleration due to gravity. Their teacher provided them with the necessary apparatus already set up as shown below:



- Label the diagram using the spaces provided.
- Fill in the blanks using the following words: **on, off, off, ruler, ball, heights, repeat**  
 Using a \_\_\_\_\_, we measure the distance that the ball falls. Then we push the switch. The electromagnet is switched \_\_\_\_\_ and releases the \_\_\_\_\_. At the same time the stopwatch is switched \_\_\_\_\_. When the ball hits and opens the trap door the stopwatch is switched \_\_\_\_\_. They \_\_\_\_\_ the experiment several times each time using a different \_\_\_\_\_. ( 7 marks)
- Why did they use an electronic stopwatch instead an ordinary stopwatch?

\_\_\_\_\_  
 \_\_\_\_\_(2)

- In one of the experiments, the distance fallen was 2 m and the time on the stopwatch was 0.65s. Using the equation  $g = 2s / t^2$ , find a value for g.

\_\_\_\_\_  
 \_\_\_\_\_(3)

- What does the symbol **g** stand for?

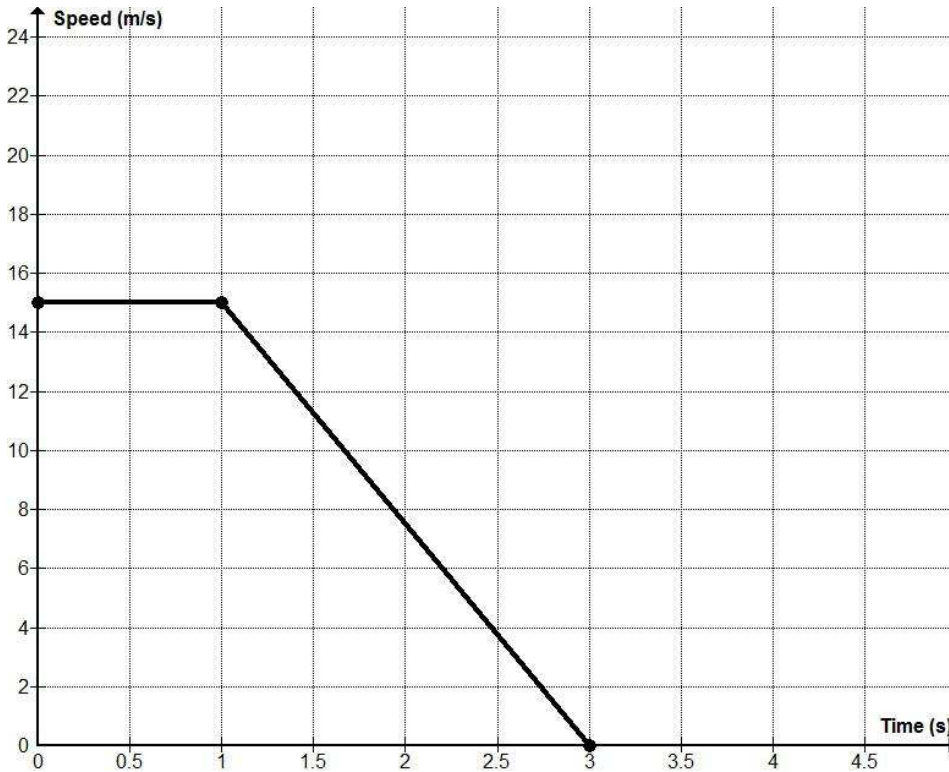
\_\_\_\_\_  
 \_\_\_\_\_(1)

- The acceleration due to gravity here on Earth is around **10 m/s<sup>2</sup>**. What does this mean?

\_\_\_\_\_  
 \_\_\_\_\_(2)

**Question 8:**

A driver is driving and sees a child crossing the street. The graph below shows how the speed of the car changes with time from the moment she sees the child crossing the street.



- a) The reaction time of the driver is \_\_\_\_\_ seconds. (1)
- b) If the driver is drunk the reaction time would be \_\_\_\_\_. (2)
- c) **Underline the correct answer:** During the first second, the car is (moving with constant speed/ decelerating). (2)
- d) During next two seconds, the car is (moving with constant speed/ decelerating).(2)
- e) Calculate the thinking distance?  
 \_\_\_\_\_  
 \_\_\_\_\_ (2)
- f) Calculate the braking distance?  
 \_\_\_\_\_  
 \_\_\_\_\_ (2)
- g) Calculate the total stopping distance?  
 \_\_\_\_\_  
 \_\_\_\_\_ (1)
- h) If the child were 20 m away when the driver saw her, would she have been hit by the car? \_\_\_\_\_ (1)
- i) Mention two other things which affect the stopping distance of a car?  
 \_\_\_\_\_  
 \_\_\_\_\_ (2)