SURNAME ..... FIRST NAME .....

JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

PHYSICS

Wednesday 3 November 2010

Please read this information before the examination starts.

- This examination is 40 minutes long.
- The answers should be written on the question paper.
- Answer **all** the questions.
- Calculators may be required.

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1. Underline the option which best completes each of the following:

(a) A planet in our solar system which has rings is

Earth **Mercury** **Saturn** **Venus**

(b) A spring is stretched 5.0 cm by a weight of 1.0 N.
A weight of 2.0 N will stretch the same spring by

2.5 cm **5.0 cm** **7.0 cm** **10 cm**

(c) One end of a bar magnet is a south-seeking pole.
It will attract

a negative charge **a north-seeking pole**

another south-seeking pole **a positive charge**

(d) Friction is a force which usually acts

downwards **in the direction of motion**

in the opposite direction to motion **upwards**

(e) We can see the Moon at night because

a space mission left a reflector on the Moon

it is luminous

light from the Sun is reflected from it

light travels from our eye and is reflected back

(f) A moving car has mostly

elastic energy **gravitational potential energy**

kinetic energy **sound energy**

(g) The current in a series circuit is 0.5 A.
It could be increased by

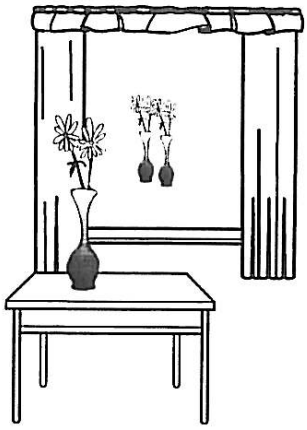
adding a cell **adding an LED**

adding a motor **reversing the cell**

(h) A stone has a density of 3 g/cm^3 and a volume of 21 cm^3.
Its mass is

7 g **18 g** **24 g** **63 g** (8)

2. The reflection of a vase of flowers in a double-glazed window shows two images, as in the picture below.

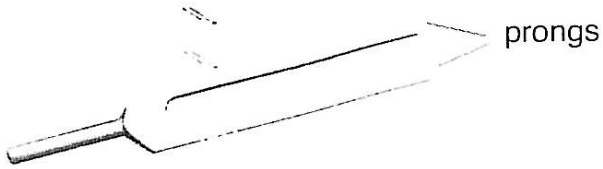


Suggest why two images are seen. .....

..... (2)

3. The diagram below shows a tuning fork.

Sound is produced when the prongs are struck gently.



(a) Explain how the tuning fork makes a sound. .....

..... (1)

(b) Explain how you can hear the sound from the tuning fork. .....

.....

..... (2)

The tuning fork is struck harder.

(c) State what difference you would expect to hear. .....

..... (1)

A second tuning fork has shorter prongs.

(d) State and explain how the pitch of the sound produced by the second tuning fork will be different from that produced by the first one.

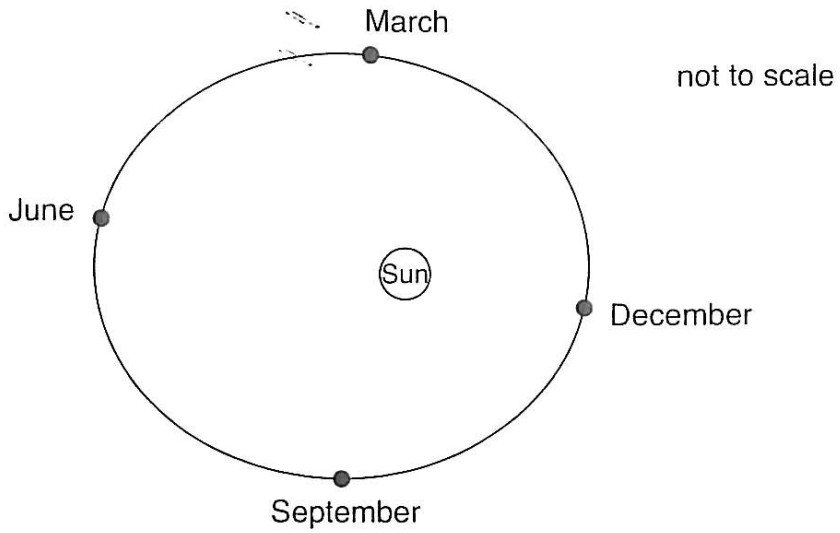
difference: ..... (1)

explanation: .....

..... (1)

4. The picture shows the orbit of the Earth round the Sun.

The orbit is not quite circular and the Earth is further from the Sun in June and closer in December.



(a) (i) Name the force which acts on the Earth to keep it in orbit round the Sun.

..... (1)

(ii) In which month will this force be greatest? ..... (1)

(b) Explain why the northern hemisphere is coldest in December even though the Earth is closest to the Sun.

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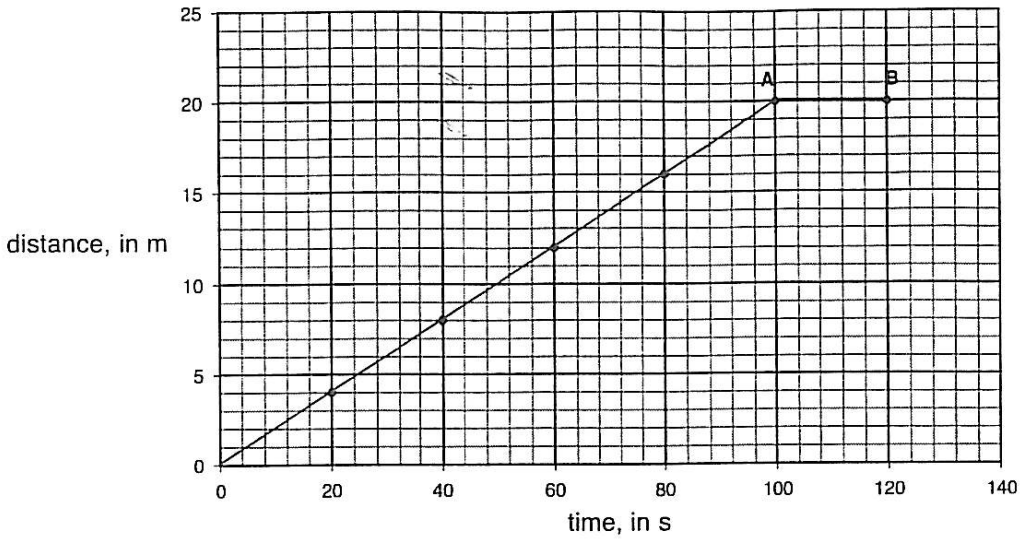
..... (2)

(c) Mark on the diagram a possible position for the planet Venus. (1)

(d) In each of the following boxes, draw a ring round the correct word. (2)

The Sun is a	The Milky Way is a
satellite	satellite
moon	moon
planet	planet
star	star
galaxy	galaxy

5. The graph shows the motion of a model car over a period of 120 seconds.



(a) Write down the formula which relates speed to distance and time.

..... (1)

(b) Using the graph, write down the distance travelled by the car in the first 100 s.

..... (1)

(c) Calculate the speed of the car during the first 100 s.
Give the correct unit.

.....

.....

..... (3)

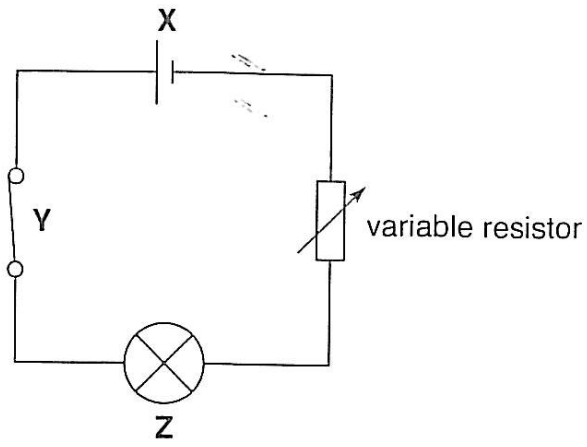
(d) State whether the speed of the car between points **A** and **B** is increasing, decreasing, constant or zero.

..... (1)

(e) State the total distance travelled by the car in 2 minutes.

..... (1)

6. The circuit below shows three components (**X**, **Y** and **Z**) in series with a variable resistor.



(a) State the names of the three components, **X**, **Y** and **Z**.

X: .....

Y: .....

Z: ..... (3)

Jonathan wants to measure the current through component **Z**.

(b) Using the correct symbol, add a component to the circuit diagram which would enable him to do this. (2)

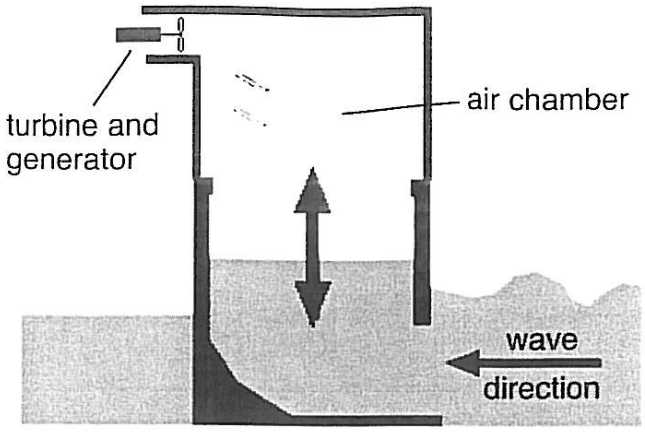
Jonathan decreases the resistance of the variable resistor.

(c) State two effects which will be observed in the circuit.

1: .....

2: ..... (2)

7. This picture shows one method of generating electricity from waves:



This energy resource is described as *renewable*.

(a) Explain what is meant by a *renewable energy resource*.

.....

.....

..... (2)

(b) State two forms of wasted energy which are produced by the turbine and generator.

1: .....

2: ..... (2)

(c) Suggest why this device will not produce electrical energy at a constant rate.

..... (1)

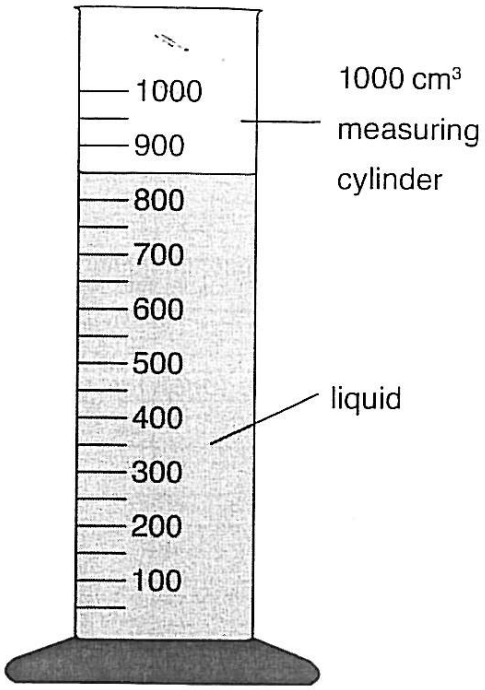
(d) State and explain one advantage to the environment of generating electricity in this way.

.....

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..... (2)

8. Matthew wants to find out what affects the way in which objects fall through a liquid.
He sets up the apparatus shown below.



(a) Write down the volume of liquid in the measuring cylinder. ..... (1)

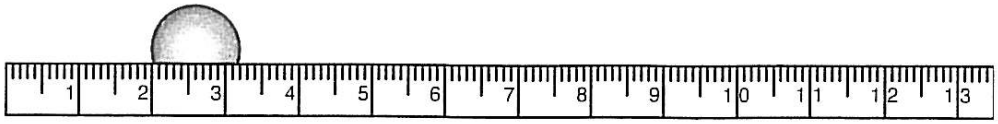
TURN OVER FOR THE REST OF QUESTION 8

Matthew drops different metal spheres into the liquid and measures the time taken for the spheres to fall to the bottom of the cylinder.

He measures the diameter of each sphere before dropping it.

The picture shows one of the metal spheres and a ruler.

(b) Write down the diameter of the metal sphere in the blank space in the first column of the table below. (1)



He measures the time taken for each sphere to fall through the liquid, and repeats this measurement twice more.

The results are shown below.

	time, in s			
diameter, in mm	test 1	test 2	test 3	average
5	17.0	18.3	17.5	17.6
8	7.2	7.1	6.3	
10	4.0	5.0	9.0	
	3.5	2.6	3.1	
15	1.7	2.2	2.0	2.0

(c) Explain why he repeats the measurements.

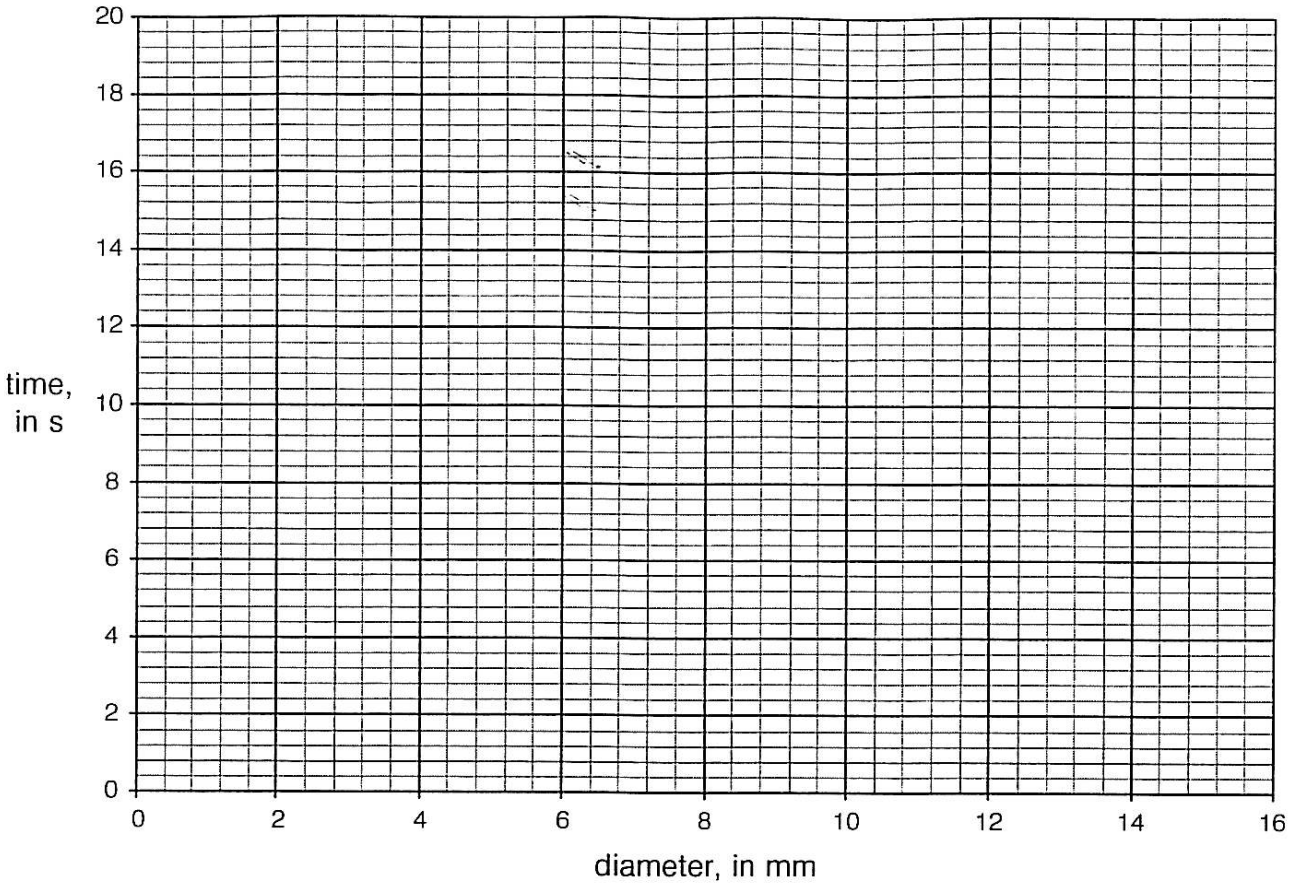
.....

..... (2)

One of the measurements could be an error.

(d) Circle the measurement you think is an error. (1)

(e) Complete the final column by calculating the average time for each sphere.
(Two of these have been done for you.) (2)



(f) On the graph grid above, plot the average time to fall against the diameter of the sphere. (2)

(g) Complete the graph with a smooth curve. (1)

(h) Use the graph to estimate the time it would take for a metal sphere with a diameter of 6 mm to fall through the oil.

..... (1)

(i) Describe the pattern of results which the graph is showing.

.....

.....

..... (2)

TURN OVER FOR THE REST OF QUESTION 8

Matthew is surprised by the results, as he thought that the larger spheres would take longer to fall through the liquid.

(j) By considering the forces acting, suggest and explain why he was incorrect.

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..... (3)

(Total marks: 60)