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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

PHYSICS

Wednesday 8 June 2011

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.
- A protractor may be helpful.
- Calculators may be required.

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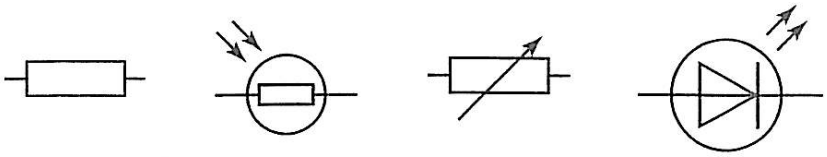
1. Underline the option which best completes each of the following:

(a) Your mass is about

5 g **5 kg** **50 kg** **500 kg**

(b) The symbol which does not represent a kind of resistor is



(c) When the Sun shines on a tree, a shadow of the tree is formed on the ground. This shadow will be at its shortest at midday in the

autumn **spring** **summer** **winter**

(d) When an aeroplane comes in to land, its speed and height both decrease. The two forms of energy which are decreasing are

gravitational and kinetic **gravitational and thermal**

kinetic and elastic **kinetic and thermal**

(4)

2. Draw lines to link each of the names on the left with a statement on the right.

the Sun	is a galaxy
the Moon	is a planet
the Milky Way	is a star
Jupiter	orbits the Earth

(2)

3. John decides to find the density of a small stone by measuring its mass and volume.

(a) State the name of the apparatus he should use to measure its mass.

..... (1)

(b) (i) Explain how he could find the volume of the stone.

.....

.....

.....

.....

..... (3)

(ii) Explain one precaution he should take in order to make his answer accurate.

.....

.....

..... (2)

He finds the volume to be 12 cm^3 and the mass to be 33.6 g.

(c) (i) Write down the formula which relates density to mass and volume.

.....

..... (1)

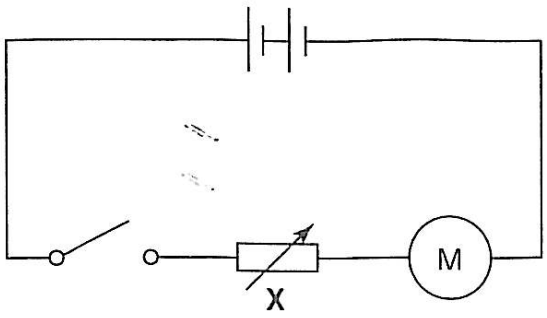
(ii) Calculate the density of the stone.

Give the correct unit.

.....

..... (2)

4.



The diagram shows a motor connected in series with component **X**.

(a) Name component **X**.

..... (1)

(b) Suggest the purpose of component **X** in this circuit.

.....

..... (1)

The switch is now closed.

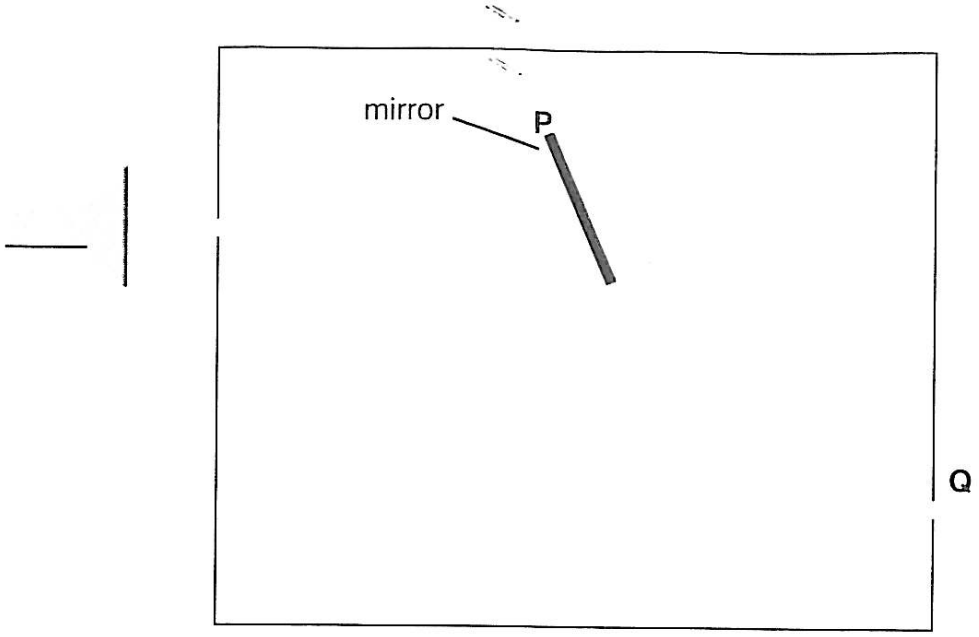
The current through component **X** is 0.4 A.

(c) What will be the current through the motor?

..... (1)

(d) Draw on the diagram to show how you could connect an LED which will light when the motor is running. (2)

5. Kim uses a large torch to shine a beam of light at a cardboard box.
The box has two small holes in it.
Inside the box is a mirror, as shown below.



(a) Underline the word which best completes the sentence below.

No light reaches the end of the mirror at **P** because cardboard is

luminous **opaque** **transparent** (1)

(b) Draw carefully on the diagram to show:

(i) the path of the light ray which reaches the mirror

(ii) the path of the light ray which leaves the mirror (3)

(c) State the name of the process which occurs when light strikes the mirror.

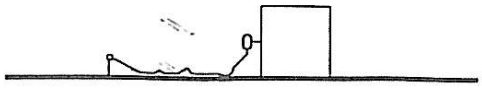
..... (1)

Kim wants the light to come out of the other hole in the box, at **Q**.

(d) (i) Draw a second mirror inside the box at the correct angle, so that the light will come out through the hole at **Q**. (1)

(ii) Show the path which this light takes. (1)

6. A metal cube is attached to a hook in a table by a short length of string as shown in the diagram below.

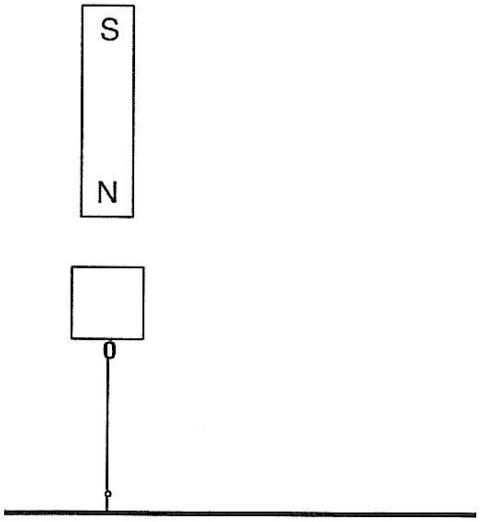


(a) If the cube is raised vertically and then released, it will fall to the table.
Explain why it falls.

.....

(1)

A magnet is then clamped above the table.
When the cube is lifted and released, it stays there, as shown below.



(b) (i) What can you conclude about the material from which the cube is made?

.....

(1)

(ii) Explain why the cube does not fall when it is released.

.....

.....

(2)

The magnet is then turned round so that the south-seeking pole is facing downwards.

The cube is again lifted towards it and released.

(c) (i) State and explain what will happen to the cube if it is made of iron.

.....

..... (2)

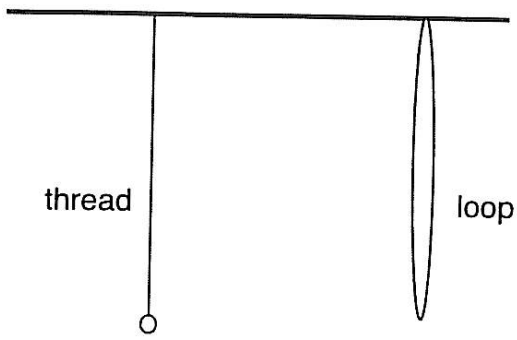
(ii) State and explain what may happen to the cube if it is a magnet.

.....

..... (2)

7. The diagram below shows an elastic thread and a loop made of the same material, hanging from a bar.

They are the same length.



A weight of 2 N is now hung on both of them.

(a) State the form of energy stored in the stretched material.

..... (1)

(b) State which one will stretch more.

..... (1)

(c) Explain your answer to part (b).

.....

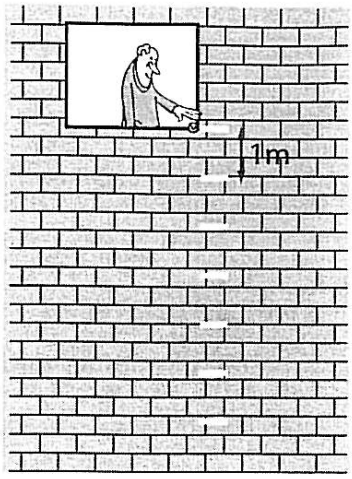
..... (2)

8. A teacher asks some students to investigate how a tennis ball falls.

His classroom window is on the top floor.

He paints a vertical set of marks on the outside wall of the building.

These marks are 1 m apart and the first one is level with his windowsill.



When he drops the ball from the window, each of the students in one group notes how long it takes to fall 1 m.

Each member of another group notes how long it takes to fall 2 m, and so on.

Each group averages its results.

These are shown in the table below.

distance fallen, in m	average time taken, in s
1	0.45
2	0.65
3	0.80
4	0.94
5	
6	1.16

(a) Name the two main forces which act on the ball as it falls.

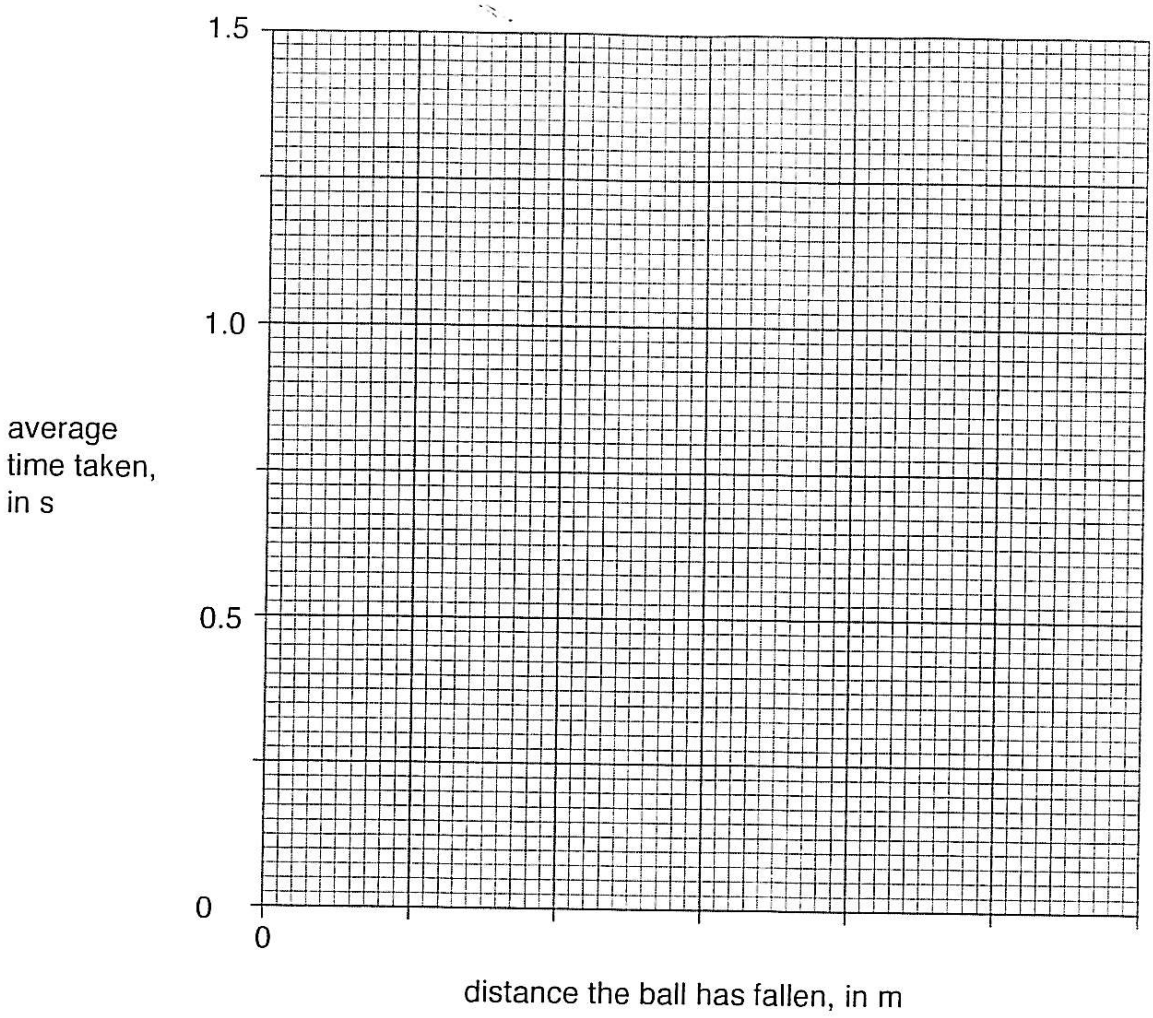
1: .....

2: ..... (2)

(b) The group which timed the ball falling to the 5 m mark have not worked out their average.

Their times were 1.01 s, 1.04 s and 1.10 s.

Calculate their average time and write it in the table. (2)



(c) On the graph grid

(i) add sensible scale values to the distance axis (1)

(ii) plot the data from the table (2)

(iii) draw an appropriate graph line or curve (2)

(d) Use the data to calculate the average speed of the ball as it falls from the 3 m mark to the 4 m mark.

(Make your working clear.)

.....

.....

..... (3)

(e) The ball gets faster as it falls.

(i) Explain how you can tell this from the data.

.....

..... (2)

(ii) What does this suggest about the sizes of the two forces which you mentioned in part (a)?

..... (1)

(f) Give two reasons why it was sensible to have three students in each group doing the timing.

1: .....

.....

2: .....

..... (2)

The teacher asks his students which of the average values they think is the least accurate.

(g) (i) Polly thinks that it is the time for the ball to fall 1 m.

Explain why this is a sensible suggestion.

.....

.....

..... (2)

(ii) James thinks that the measurement of the time for it to fall 6 m is the least accurate.

Explain why this is also a sensible suggestion.

.....

.....

..... (2)

(Total marks: 60)