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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

PHYSICS

Wednesday 26 January 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.
- Calculators may be required.

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

(a) A unit of energy is the

joule **kilogram** **metre** **newton**

(b) You can increase the current in a series circuit by adding another

ammeter **bulb** **cell** **resistor**

(c) The symbol for a push button switch is



(d) The mass of 1 m^3 of the air in this room is about

zero **1 g** **1 kg** **1000 kg**

(e) A frequency of sound which most people can hear is

2.5 Hz **250 Hz** **25 000 Hz** **2 500 000 Hz**

(f) An eclipse of the Sun occurs

every night

when Mercury is between the Earth and the Sun

when the Earth is between the Moon and the Sun

when the Moon is between the Earth and the Sun

(g) Objects which give out their own light are said to be

luminous **opaque** **reflective** **transparent**

(h) An example of a renewable energy resource would be

coal **gas** **nuclear** **wave**

(8)

2. Travellers in ancient times sometimes constructed a simple compass using a magnetic rock, called lodestone.

They floated the rock on a piece of wood in a bowl of water.

(a) (i) Explain why they floated the lodestone.

.....

(1)

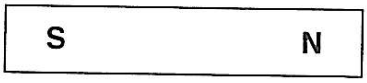
(ii) Explain how this helped them to navigate.

.....

.....

(1)

(b) Draw lines to show the magnetic field pattern round the bar magnet below.
(*Remember to add arrows to show the direction of the field.*)



(3)

(c) Complete this sentence about magnetic field lines:

At some places the lines are close together; this shows where the magnetic field is .....

(1)

A large electromagnet is made from a coil of wire wound round an iron core.
When a current flows in the coil, it forms an electromagnet.
When the current is switched off, the electromagnet loses its magnetism.

(d) (i) State one use of a large electromagnet.

.....

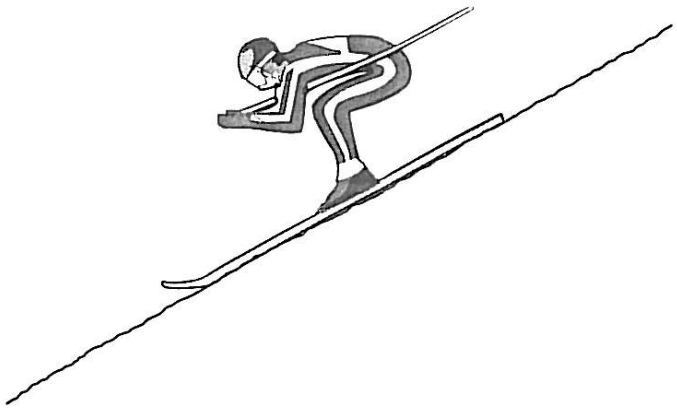
(1)

(ii) Explain the advantage of using an electromagnet rather than a bar magnet.

.....

(1)

3. Downhill racing skiers can reach speeds of over 80 km per hour.



(a) Suggest a feature of their clothing which helps racing skiers to move so fast.

..... (1)

On Earth, a gravitational force of 10 newtons acts on every kilogram.
This skier's mass is 60 kg.

(b) (i) Calculate his weight, giving the unit.

..... (2)

(ii) If each of his skis is 2 metres long by 10 cm wide, calculate the total surface area in contact with the snow.
Give your answer in cm^2.

.....

..... (2)

(iii) Write down the equation which relates area, force and pressure.

.....

..... (1)

(iv) Calculate the pressure on the snow under the skis, ignoring the weight of the skis.
Give the unit.

.....

..... (2)

(c) When the skier gets to the bottom of the slope, he removes his skis so that only his boots are in contact with the snow.

(i) Suggest how this will affect the pressure on the snow.

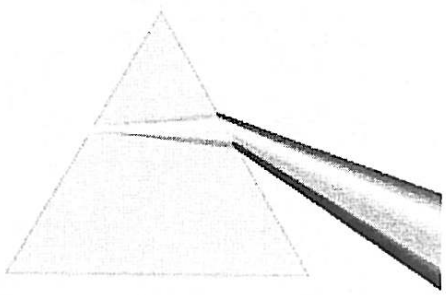
..... (1)

(ii) Explain your answer.

.....

..... (2)

4.



A ray of white light is shone into a glass prism.
The ray changes direction (refracts) as it enters and as it leaves the glass.

(a) Suggest why the ray changes direction (refracts) as it enters and leaves the glass.

..... (1)

The ray splits into several colours when it enters the prism.

(b) (i) Name this effect.

..... (1)

(ii) Give the scientific name for the range of colours produced by the prism.

..... (1)

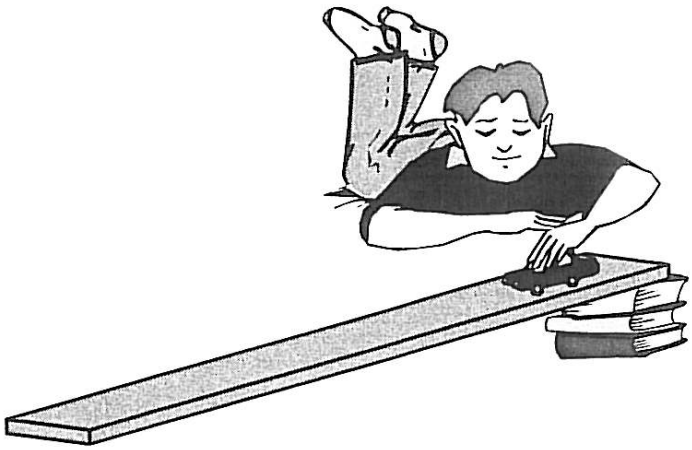
5. A class investigates the effect of different surface materials on the speed of a model car.

They place a plank on some books to make a slope.

They cover the plank with a material and release the model car from the top of the slope.

They measure how long it takes the car to roll down the slope over this material.

Then they change the material and repeat their measurement.



(a) State two factors which should be kept the same to make sure the investigation is a fair test.

1: .....

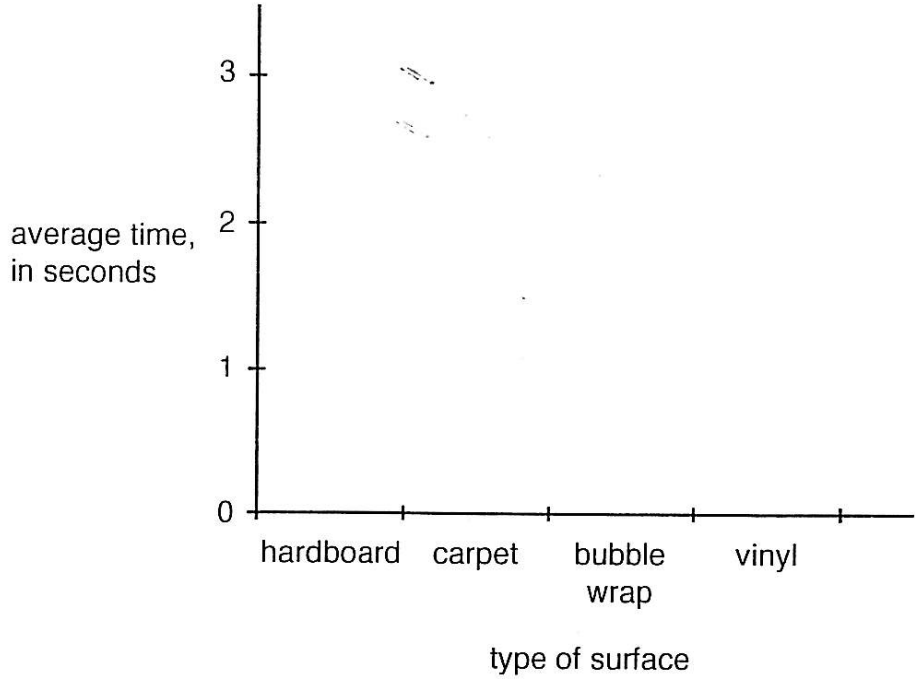
2: ..... (2)

The students test the car on each surface three times.

The average times for their car to roll down the slope are shown in the table below.

material	length, in metres	average time, in seconds
hardboard	2.00	1.2
carpet	2.00	3.0
bubble-wrap	2.00	2.5
vinyl	2.00	1.5

(b) Use the data in the table on page 6 to complete the bar chart below. (2)



One student uses a stopwatch to time the car.

Another student measures the length of the ramp.

(c) Suggest how these two measurements could be used to calculate the speed of the model car.

..... (1)

(d) Calculate the average speed of the car when rolling down the slope covered in bubble wrap.

.....

..... (2)

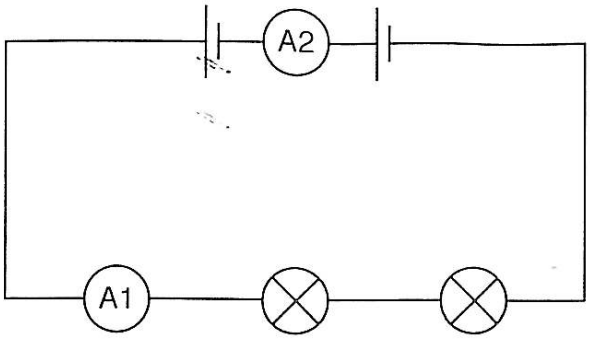
(e) (i) Name the force which causes the car to move down the ramp.

..... (1)

(ii) Name the main force which opposes the motion of the car.

..... (1)

6. Sara investigates the current in a series circuit and sets up this circuit:



The two lamps in the circuit are similar.

Ammeter A1 reads 0.2 A.

(a) State the reading on Ammeter A2.

..... (1)

One of the lamps breaks and goes out.

(b) Explain why the other lamp also goes out.

..... (1)

(c) Sara wants to connect a new circuit which has two cells, a motor and a lamp.

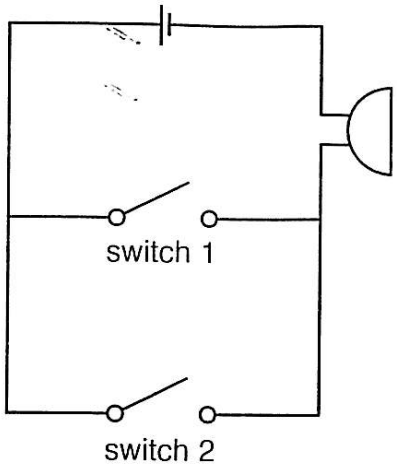
She includes two switches so that the motor and lamp can be switched on and off separately.

In the space below, draw the circuit which she should use.

Use the correct symbols.

(3)

Sara connects a new circuit in which two switches control a buzzer, as shown in the diagram below.



(d) (i) She records whether the switches are open or closed and the action of the buzzer.

Complete the table below with the correct outcomes for the buzzer.

switch 1	switch 2	buzzer
closed	closed	on
open	closed	
closed	open	
open	open	

(2)

(ii) Complete the following sentence:

This kind of table is called a ..... (1)

(e) Complete the following sentences:

The cells transform chemical energy into ..... energy.

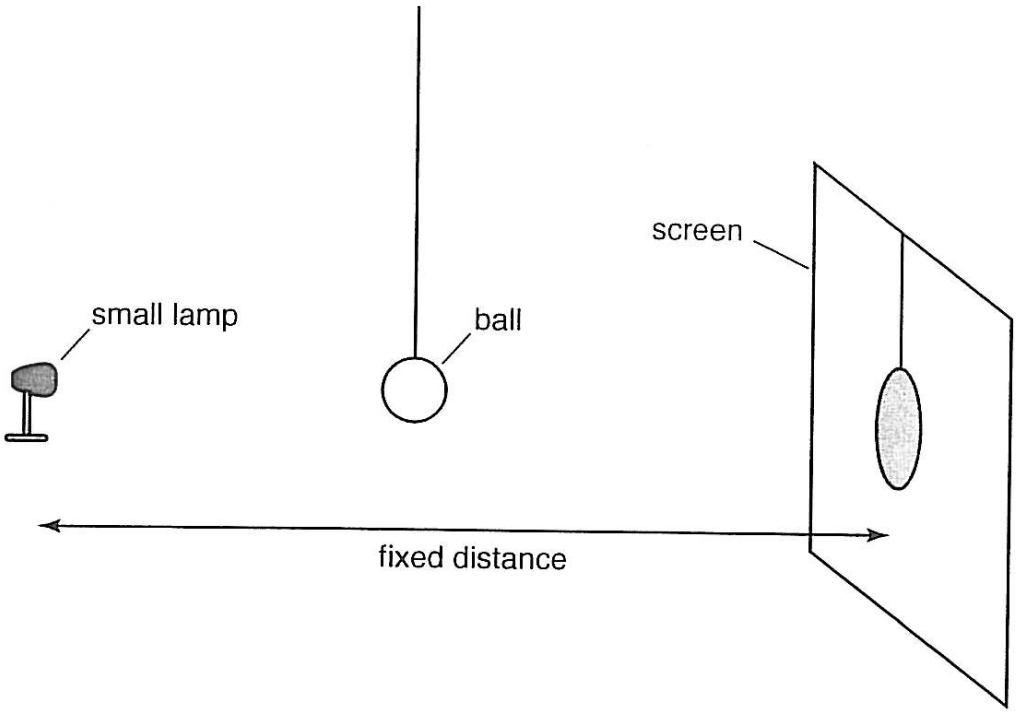
The buzzer transforms this into ..... energy. (2)

7. Peter places a small light source a fixed distance from a screen.

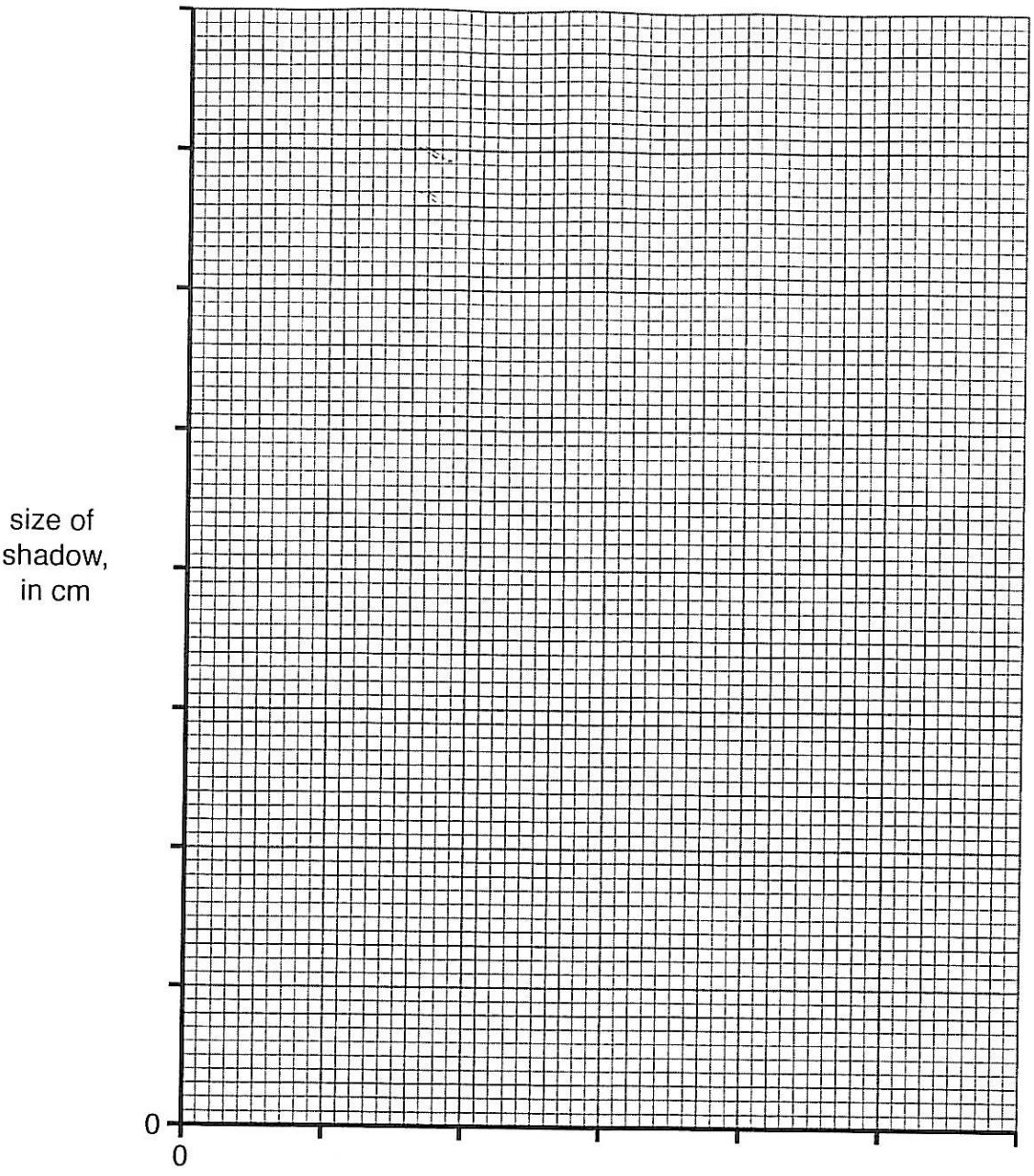
He puts an opaque ball between the two so that a shadow of the ball is cast on the screen.

He varies the distance of the ball from the lamp to see how this affects the size of the shadow.

His results are shown in the table below.



distance of ball from lamp, in cm	size of shadow, in cm
5	20.0
10	12.0
15	9.3
20	8.0
25	7.2
30	6.7



(a) On the graph grid above

(i) add sensible scale values to both axes (1)

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

(iii) draw a suitable graph line or curve (2)

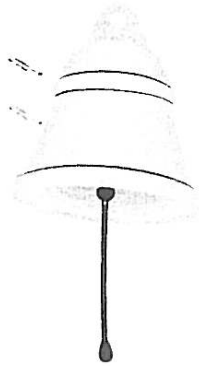
(b) Describe how the size of the shadow is affected by the distance of the lamp from the ball.

.....

.....

..... (2)

8. The picture below shows a ship's bell.



(a) The bell is rung twice, but the second sound is louder than the first.

Both sounds have the same pitch.

(i) Compare the amplitudes of the two sounds.

..... (1)

(ii) Compare the frequencies of the two sounds.

..... (1)

A sailor on a nearby ship sees the bell being rung but hears the sound at a different time.

(b) (i) Will he hear the sound before or after he sees the bell being rung?

..... (1)

(ii) Explain why.

.....

..... (1)

(Total marks: 60)