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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

LEVEL 2

PHYSICS

Wednesday 7 November 2012

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 sentences:

(a) The mass of this examination paper is closest to

0.3 g **3 g** **30 g** **300 g**

(b) The fourth planet out from the Sun in our solar system is

Earth **Mars** **Mercury** **Venus**

(c) Energy is stored in a cell in the form of

chemical energy **electrical energy** **kinetic energy** **strain energy**

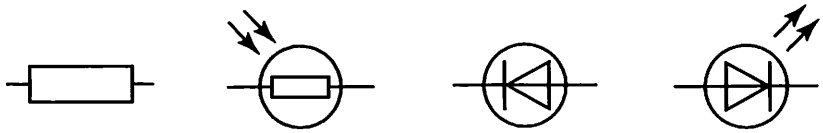
(d) A rock has a mass of 8 kg and a volume of 2000 cm^3.
Its density in g/cm^3 is

0.004 **0.25** **4** **250**

(e) A spring is 5 cm long.
A load of 1 N stretches it to 7 cm.
A load of 3 N will stretch it to a length of

6 cm **9 cm** **11 cm** **21 cm**

(f) The circuit symbol for a LED is



(g) The north-seeking pole of a magnet repels

a north-seeking pole **a south-seeking pole**

a non-magnetic material **an unmagnetised material**

(h) A sky-diver is falling at a constant speed.
The best way of describing the forces on her is that

there are no forces acting on her

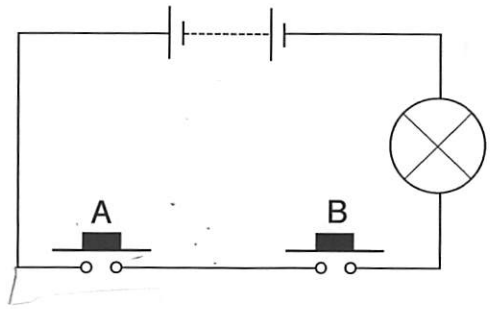
the upward force is greater than the downward force

the upward force and the downward force are balanced

her weight is greater than the upward force of air resistance

(8)

2. Two switches, a lamp and a battery are connected in a circuit as shown.



(a) State whether the switches are connected in series or parallel with each other.

..... (1)

The action of the circuit can best be described by a truth table.

switch A	switch B	lamp
open	open	off
open	closed	
closed	open	
closed	closed	

(b) Complete the truth table above by writing 'on' or 'off' in the spaces. (2)

(c) Underline the correct word in the box below.

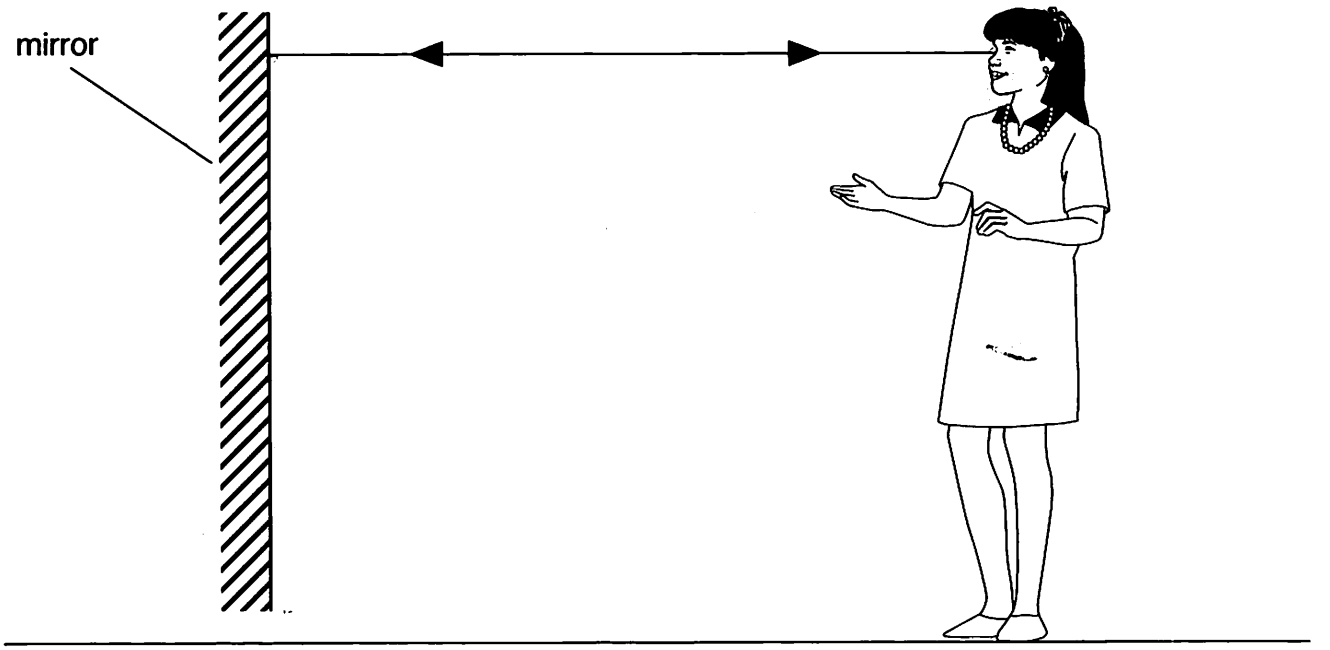
This circuit is described as an | AND / OR | circuit. (1)

(d) Suggest and explain a use for this type of circuit.

.....

..... (2)

3. The picture shows a girl looking at herself in a mirror.



A ray of light has been shown from her face to the mirror and back.

(a) (i) On the diagram, carefully draw a ray of light from her toes to the mirror and then to her eye. (2)

(ii) For the rays you have drawn on the diagram, label the following:

incident ray

reflected ray

angle of incidence (2)

(b) Explain how the girl can see her toes in the mirror.

.....

..... (1)

(c) Suggest the minimum size of a mirror needed to see the whole of your body when you stand still in front of it.

..... (1)

4. Jane saw a flash of lightning followed, a few seconds later, by the sound of thunder. Both the light and sound are produced at the same time.

(a) Explain why she heard the sound after she saw the flash.

..... (1)

Jane hears some more thunder.
This time the thunder is louder.

(b) Underline the option in the box which best completes the sentence.

This is because the | amplitude / frequency / speed | of the sound wave is greater.

(1)

5. Electricity can be produced from a number of different energy resources.

(a) Complete the table below to show the energy transformations which occur.
The first one has been done for you.

	energy input	energy output
coal-fired power station	chemical	electrical
biomass generator		electrical
hydroelectric power station		electrical
solar cell in a calculator		electrical
wind turbine		electrical
gas-fired power station		electrical

(5)

(b) State which of the above use non-renewable energy resources.

..... (2)

(c) What is the original source of all the energy inputs in your answers to (a)?

..... (1)

6. The picture shows two children sledging on snow.



The combined mass of the two children is 30 kg.
On Earth, gravity exerts a force of 10 N on each kg.

(a) Calculate the combined weight of the two children in newtons.

..... (1)

The sledge is in contact with the snow over an area of 1800 cm^2.
The sledge weighs 20 N.

(b) State the relationship between pressure, force and area.

..... (1)

(c) Calculate the pressure exerted by the sledge and children on the snow.

.....

.....

..... Pressure = ... N/cm^2 (2)

(d) Explain why the sledge does not sink into the snow but, when the children get off the sledge and stand up, they do sink into the snow.

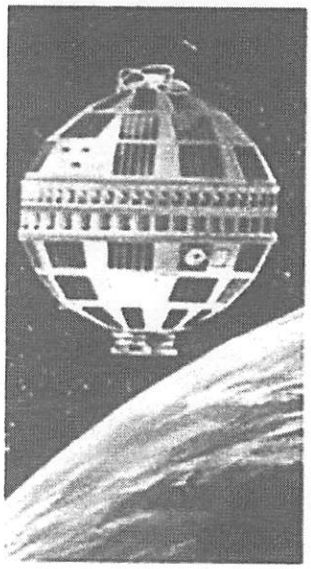
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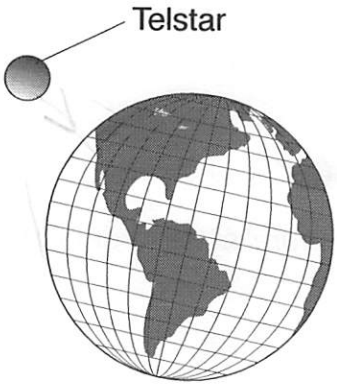
..... (2)

7. The satellite, Telstar, was launched into orbit around the Earth in 1962.

not to scale



picture of Telstar



diagram

(a) (i) Name the force which kept Telstar in orbit around the Earth.

..... (1)

(ii) Add an arrow to the diagram to show the direction of this force. (1)

Telstar was the first satellite to enable television pictures to be transmitted across the Atlantic.

It was in a low orbit and so was constantly moving across the sky.

This meant that it was only visible for about 20 minutes each time it passed overhead.

(b) Explain why it was a problem that Telstar was only visible for 20 minutes at a time.

.....

.....

..... (2)

(c) Describe ONE use for satellites other than for transmitting television pictures.

.....

.....

..... (2)

If you look up into a clear night sky, you can sometimes see a bright light moving across the sky.

This may be a satellite.

(d) How can you see a satellite even though it is not a luminous object?

.....

..... (1)

Telstar was an artificial satellite.

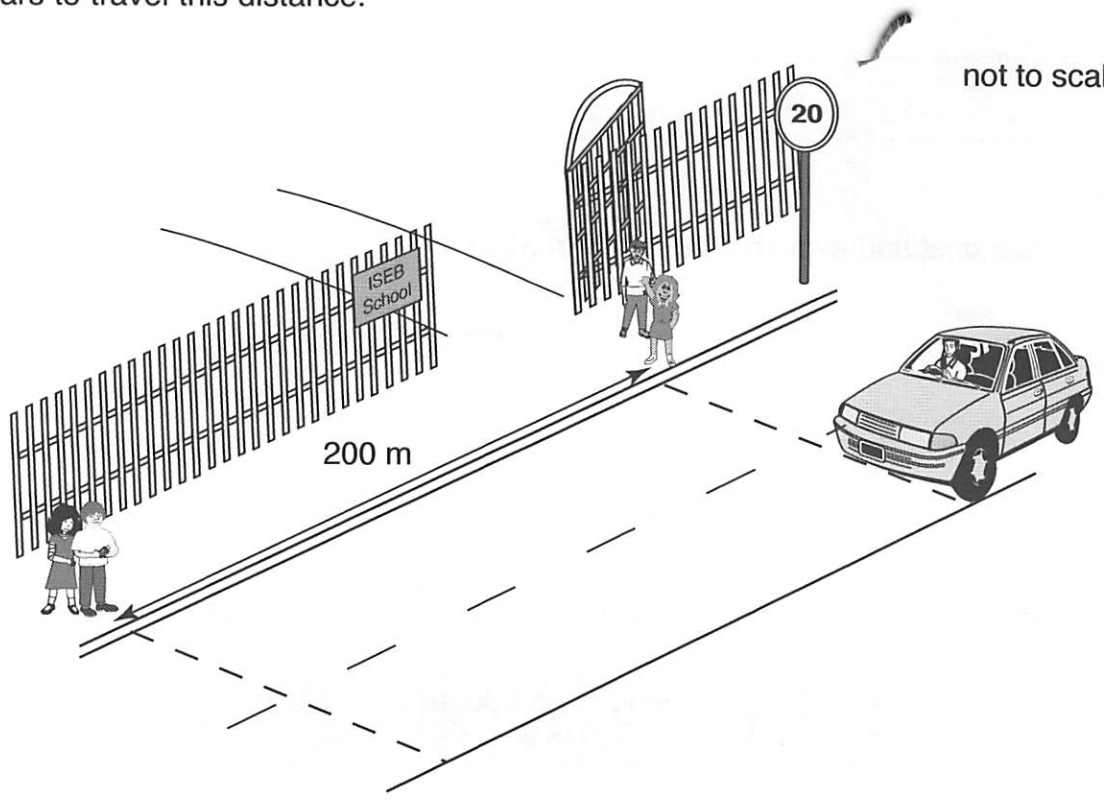
(e) Name a *natural* satellite of the Earth.

..... (1)

8. A group of pupils measured the speed of cars outside their school.

The speed limit was 20 mph, which is about 9.0 m/s.

They measured a distance of 200 m and used a stopwatch to measure the time taken for cars to travel this distance.



(a) Suggest why the pupils decided to use a distance of 200 m rather than 100 m for their timing.

.....

..... (1)

The pupils used a trundle wheel to measure the 200 m.

(b) (i) Explain one difficulty of using this measuring instrument accurately.

.....

..... (1)

(ii) Explain how they could make the measurement of 200 m more accurate.

.....

.....

..... (2)

One pupil suggested making a loud sound as the cars passed the start of the 200 m so that the pupils at the end of the 200 m distance knew when to start their stopwatches.

(c) (i) Explain why this method would be inaccurate.

.....

..... (1)

(ii) Suggest and explain a better alternative.

.....

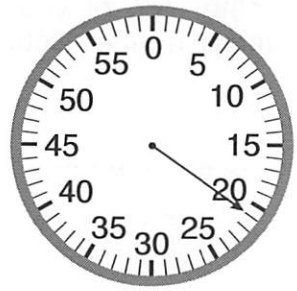
.....

..... (2)

The pupils timed 12 cars passing and recorded their results in a table.

car	time to go 200 m, in s	speed, in m/s
1	21	9.5
2	22	9.1
3	25	8.0
4	23	8.7
5	24	8.3
6	23	8.7
7	24	8.3
8	24	8.3
9	23	8.7
10	24	8.3
11	25	8.0
12	27	7.4

The diagram shows the measurement of the time for car 1, in seconds.



(d) Write down in the table the value for the time shown on the diagram for car 1. (1)

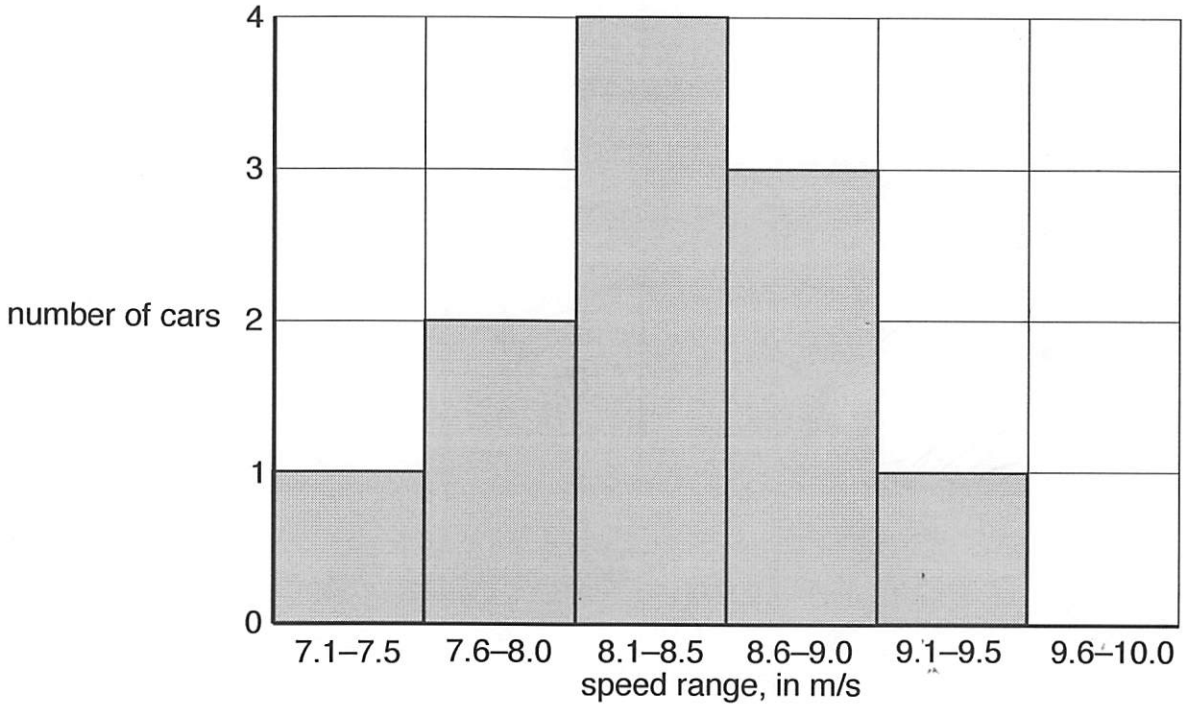
(e) (i) State the relationship between speed, distance and time

..... (1)

(ii) Complete the table to give the speed of the first car in m/s (2)

The chart below shows the number of cars measured with particular speeds within 0.5 m/s ranges, excluding the result for car 1.

For example, four cars had speeds in the range between 8.1 m/s and 8.5 m/s.



(f) Add to the bar chart above the result for car 1. (1)

(g) State the number of cars which were breaking the speed limit of 9.0 m/s.

..... (1)

TURN OVER FOR PART (h)

The stopwatch was only able to measure to the nearest second.

(h) Suggest, giving a reason, whether or not you think that a stopwatch able to measure to 0.1 s would have improved the accuracy of their measurement of the speed of each car.

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..... (3)

(Total marks: 60)