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

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

ISEB

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

LEVEL 2

PHYSICS

Wednesday 28 January 2015

Please read this information before the examination starts.

- This examination is 40 minutes long.
- Answer **all** the questions.
- Calculators may be required.

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

(a) An instrument for measuring electric current is called

an ammeter **a current meter**

a newton meter **a voltmeter**

(b) The unit in which weight is measured is the

A **J** **kg** **N**

(c) The effect of a mirror on a beam of light is called

diffraction **dispersion** **reflection** **refraction**

(d) A sound wave cannot travel through

air **glass** **a vacuum** **water**

(e)

A galaxy	B solar system	C planet	D universe

In order of increasing size, the objects in the table are

A, B, C, D **B, C, D, A** **C, B, A, D** **D, A, B, C**

(f) A renewable energy resource is

coal **oil** **uranium** **wind**

(g) The north-seeking pole of a magnet

is always attracted to another north-seeking pole

is always repelled by a south-seeking pole

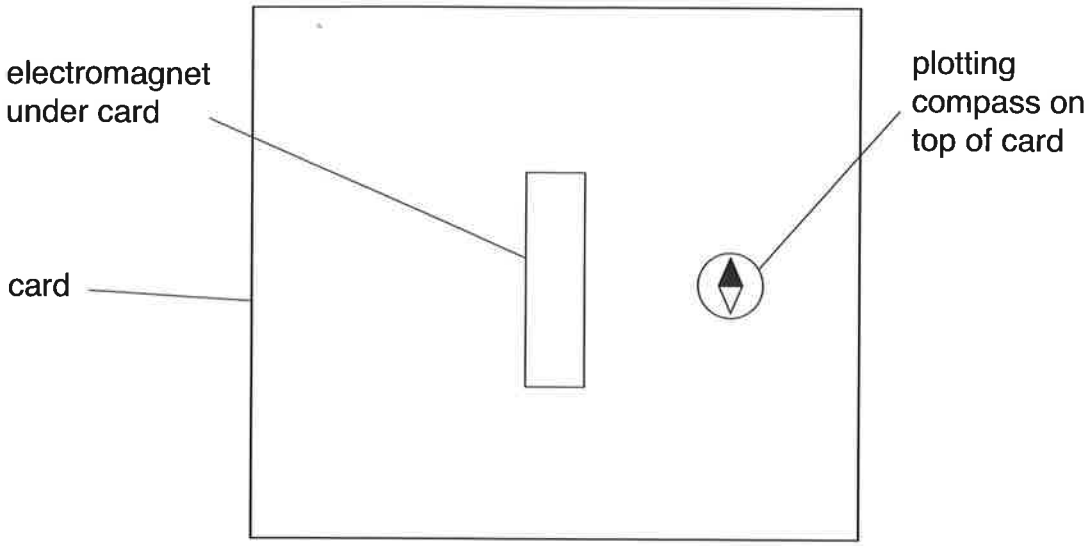
is always attracted to a piece of unmagnetised iron

is always repelled by a piece of unmagnetised iron

(7)

2. An electromagnet is placed under a piece of card.

The electromagnet is connected to a battery and iron filings are sprinkled onto the card.



(a) On the diagram above, sketch the iron-filing pattern you might see after the card has been tapped gently. (2)

The electromagnet connections to the battery are reversed.

(b) State and explain the changes, if any, you might observe in

(i) the iron-filing pattern

.....

..... (2)

(ii) the direction in which the plotting compass needle points

.....

..... (2)

(c) Suggest one change to the method which would make the iron-filing pattern clearer.

.....

..... (1)

3. In August 2012, Usain Bolt won the Olympic gold medal in the men's 100 m final in a time of 9.63 seconds.



(a) Write down the relationship between speed, time and distance.

..... (1)

(b) Calculate his average speed over the 100 m race.
Give the correct unit.

.....

.....

speed = ... unit ..... (2)

His motion in the race is shown in the graph on the next page.

(c) Using the graph

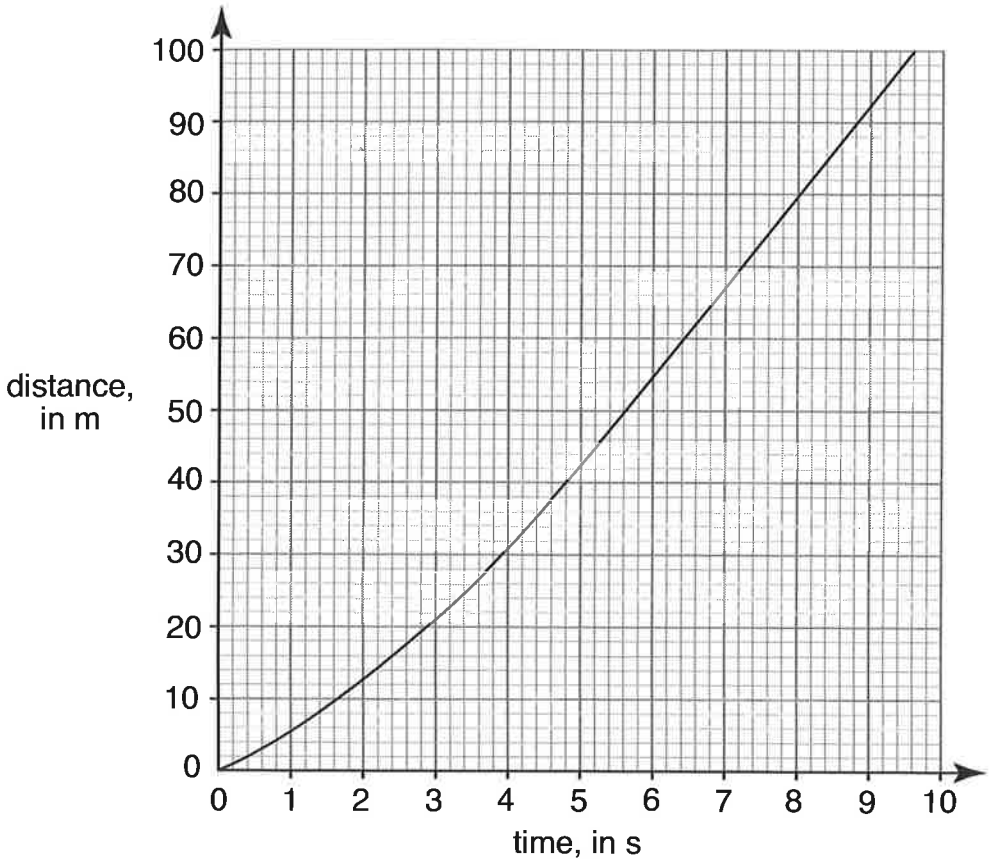
(i) describe how his speed changed over the 100 m race

.....

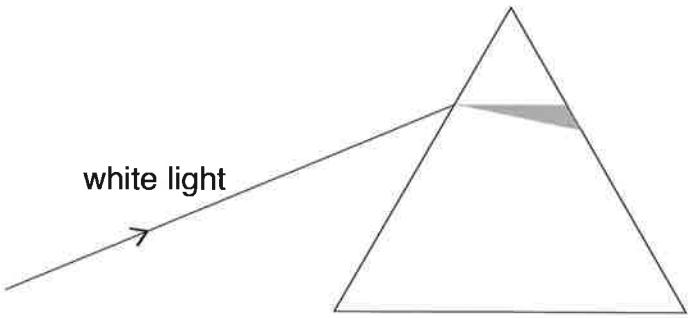
..... (2)

(ii) state how far he ran before he reached his maximum speed

..... (1)



4. The diagram shows a ray of white light entering a glass prism.



(a) On the diagram

(i) draw the normal where the light ray enters the prism (1)

(ii) label the angle of incidence (1)

(b) Give the word used to describe the change in direction of light as it enters the prism.

..... (1)

(c) Complete the diagram to show the light emerging from the prism.
Label any two colours which might be seen. (2)

5. A solar eclipse occurs on 20th March 2015.

The diagram shows the position of the Earth, the Moon and the Sun at one time during that day.

not to scale



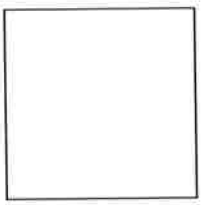
(a) Label the Earth, the Moon and the Sun on the diagram. (2)

At this time, the eclipse will be total when viewed from one part of the Earth.

(b) Draw on the diagram to show how a total eclipse is formed. (2)

People living in other places may see a partial eclipse at this time.

(c) Draw in the box below to show what the Sun looks like during a partial eclipse.



(1)

The diameter of the Sun is about 400 times the diameter of the Moon, but they look about the same size from Earth.

(d) (i) Explain how they can look the same size.

.....

..... (1)

(ii) The Sun is 150 million kilometres from Earth. How far away is the Moon?

.....

..... (2)

The Moon is a natural satellite of the Earth.

There are many artificial satellites which have been put into orbit round the Earth.

(e) State one use of an artificial satellite.

..... (1)

6. Matthew is watching a farmer hammer in a fence post some distance away from him.
He notices that he hears the sound about 2 seconds after he sees the farmer hit the post.



(a) Explain why he hears the sound after he sees the farmer hit the post.

.....

..... (2)

Matthew walks towards the farmer.

(b) State what he will notice about the time interval between seeing the farmer hit the post and hearing the sound as he walks towards him.

..... (1)

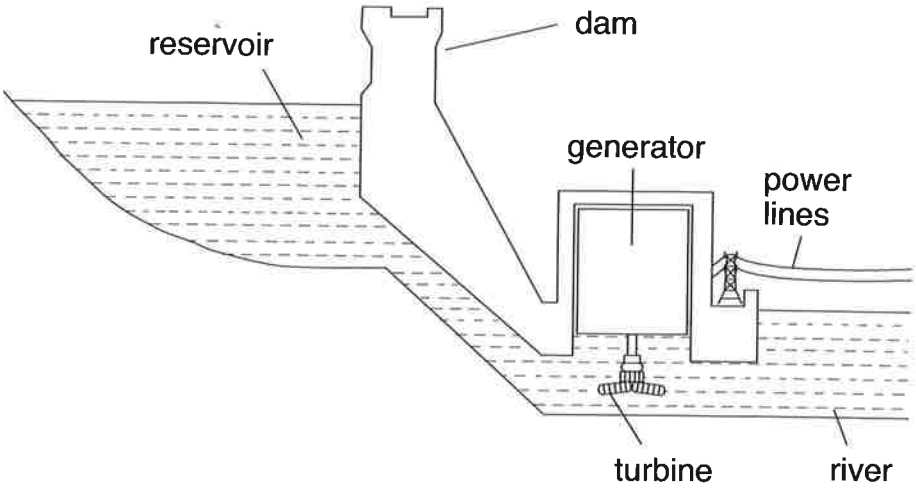
As he approaches the farmer, he hears the sound getting louder.

(c) Underline the correct words in the sentence below to explain this.

This means that the | amplitude / frequency / pitch | of the sound wave has | increased. / decreased. | (2)

7. The diagram below shows a hydroelectric power station.

The power station converts energy from water into electrical energy.



(a) Name the form of energy that the water has while it is in the reservoir.

..... (1)

The water flows from the reservoir into the river, passing over the turbine.

(b) Name the form of energy that the water has as it passes the turbine.

..... (1)

Hydroelectric resources are renewable energy resources.

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

.....

..... (2)

The energy from the water is converted to electrical energy by the generator and carried to our homes by power lines.

(d) (i) Name one device which uses electrical energy in our homes.

..... (1)

(ii) Complete the sentence below to state the **useful** form of energy that is produced by the device you have named.

This device converts electrical energy to ..... (1)

Electricity often has to be generated by burning coal, oil or gas.

(e) Give one advantage and one disadvantage of generating electricity in this way.

advantage: .....

.....

..... (1)

disadvantage: .....

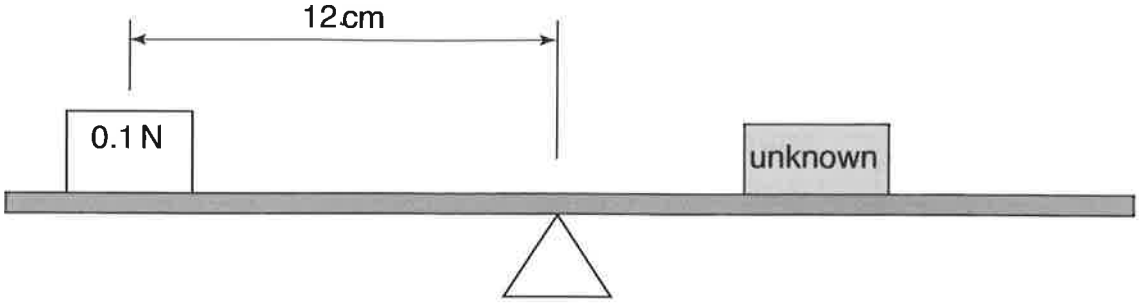
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..... (1)

TURN OVER FOR QUESTION 8

8. This question is about weighing an unknown object.

Some pupils made a balance to weigh unknown objects as shown in the diagram below.



The pupils know they have to use moments to calculate the weight of the unknown object.

(a) Explain how to use moments to find the weight of the unknown object.

.....

.....

.....

..... (3)

The distance of the centre of the 0.1 N weight from the pivot is shown in the diagram.

(b) (i) Show that the anticlockwise moment of the 0.1 N weight is 1.2 N cm.

.....

.....

..... (2)

(ii) Explain why the measurement is taken to the centre of the weight.

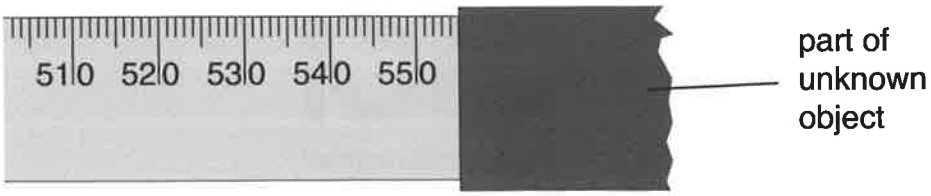
.....

..... (1)

Seen from above, the position of the unknown object on the ruler is shown in the drawing below.

The object is exactly 5 cm long.

The pivot is exactly at the 50 cm mark of the ruler.



(c) (i) Write down the measurement shown for the end of the object nearest the pivot.

..... cm (1)

(ii) Show that the distance of the middle of the object from the pivot is 8 cm.

..... (1)

(iii) Calculate the weight of the unknown object.

.....

.....

..... (3)

(iv) The force of gravity is 10 N for every kg.

Calculate the mass of the unknown object.

Give the correct unit.

.....

.....

mass = ... unit ..... (2)

(Total marks: 60)