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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

LEVEL 2

PHYSICS

Specimen Paper

(for first examination in Autumn 2017)

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.

(a) An example of a non-renewable energy resource is

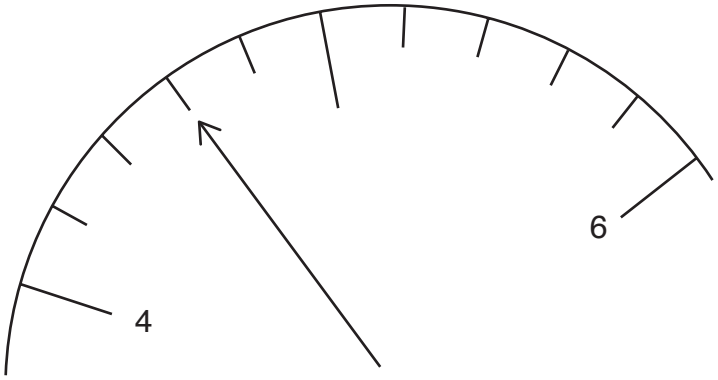
biomass **nuclear** **solar** **wind**

(b) The instrument used to measure electric current is

an ammeter **an ampmeter**

a resistor **a voltmeter**

(c)



The reading shown on the pointer on the scale above is

4.3 **4.6** **5.2** **6.7**

(d) A stone has a density of 3 g/cm^3 and a mass of 30 g. Its volume is

10 cm^3 **27 cm^3** **33 cm^3** **90 cm^3**

(e) Light beams travel

as a single colour **at the same speed in every medium**

at an infinite speed **in a straight line**

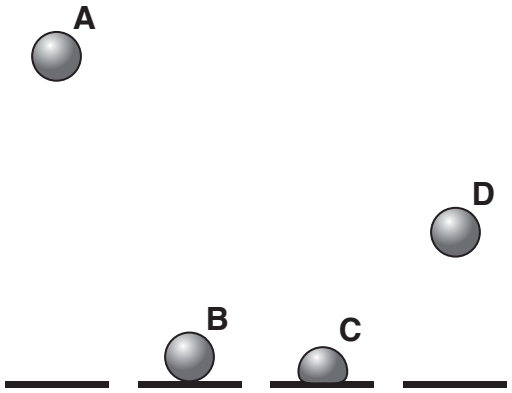
(f) In order of increasing distance from the Sun, the planets in the solar system are in the order of Mercury, Venus, Earth, Mars.

The next planet from the Sun is

Io **Jupiter** **Saturn** **Titan**

(6)

2. Mary drops a squash ball onto a hard floor so that it bounces.



In the diagrams above, **A** shows the ball being released, **B** shows it landing on the floor, **C** shows it squashed on the floor and **D** shows it at the top of its first bounce.

(a) Complete the sentence below.

As the ball falls from **A** to **B**,.....

energy is transferred into kinetic energy. (1)

The ball has 0.2 J of energy at **A**.

(b) (i) Explain why it will have about 0.2 J of kinetic energy at **B**.

.....

..... (1)

(ii) Explain why it will have slightly less than 0.2 J of kinetic energy at **B**.

.....

..... (2)

(c) Name the form of energy which the ball has at **C**.

..... (1)

(d) Explain why the ball has much less than 0.2 J of energy at **D**.

.....

..... (2)

3. Abi is a keen long jumper.



She wants to investigate how the length of her run-up affects how far she jumps.

(a) Write a detailed plan to help Abi carry out this investigation.

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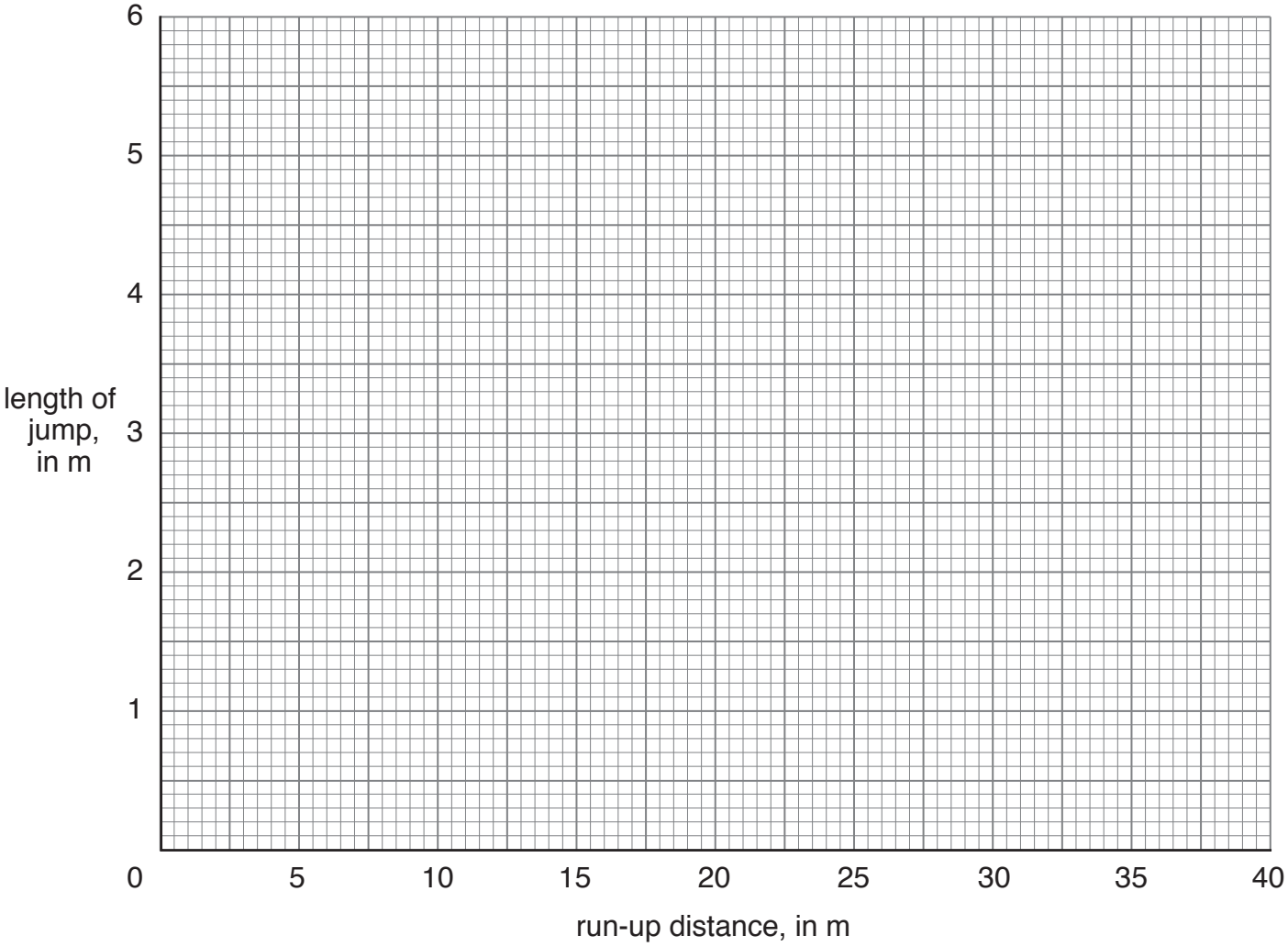
(6)

(b) Suggest one precaution which Abi should take to ensure that her investigation is a fair test.

.....

..... (1)

(c) On the graph grid below, draw a line to indicate what you think might be the results of Abi's investigation.



(2)

4. Two pupils are measuring the distance to a tree.

They decide to use sound.



They use two-way radios, **A** and **B**.

They place radio **A** at the tree and have radio **B** with them.

They use the call button on radio **B** to make radio **A** emit a loud noise.

They measure the time between pressing the call button and hearing the sound from radio **A**.

Radio waves travel at the same speed as light.

(a) Explain why the pupils can ignore the time taken for the *radio wave* to get from radio **B** to radio **A**.

.....

..... (2)

They carried out the measurement five times.

Here are their results:

measurement	1	2	3	4	5
time, in s	0.68	0.66	0.64	0.60	0.62

(b) Explain why it is sensible to repeat the measurements of the time.

.....

..... (1)

(c) Calculate the average time in seconds which it took for them to hear the sound.

Show your working.

.....

..... (2)

(d) State the relationship between speed, distance and time.

..... (1)

The pupils look up the speed of sound on the internet and find it given as 340 m/s.

(e) Use this data to calculate the distance between the pupils and the tree.

.....

..... (2)

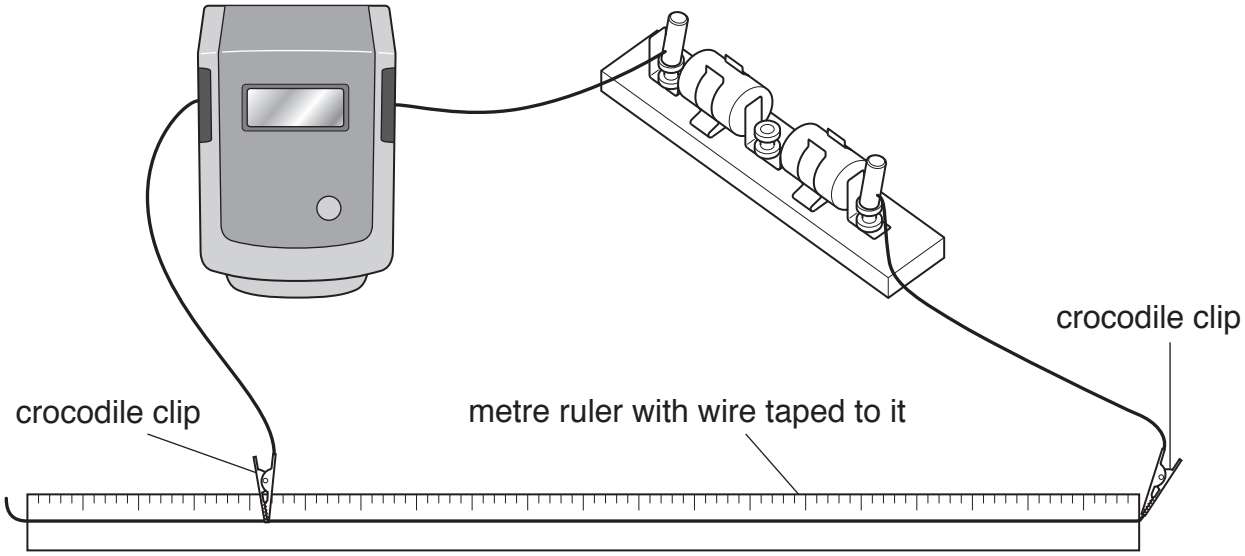
(f) Suggest how they could improve their experiment to make their results more accurate.

.....

..... (1)

5. Jonathan investigates how the resistance of a wire depends on its length.

He uses a battery containing two cells connected in series with an ammeter and the 100 cm length wire being investigated.



(a) In the space below, draw this circuit using the correct circuit symbols.

(You should use the symbol for a resistor to represent the wire being tested.)

(4)

Jonathan uses a metre rule to measure a 20 cm length of the wire which is held between the crocodile clips.

He records the ammeter reading.

He then repeats this with 40 cm, 60 cm, 80 cm and 100 cm lengths of wire.

(b) In his investigation, name

(i) the independent variable

..... (1)

(ii) the dependent variable

..... (1)

(iii) two variables which needed to be controlled

1. .....

2. ..... (2)

(c) State how the current will depend on the resistance of the wire.

..... (1)

Jonathan obtains the following results:

length of wire, in cm	current, in A
20	2.40
40	1.20
60	0.80
80	0.60
100	0.48

(d) Suggest how he can use these results to show the relationship between the resistance of the wire and its length.

.....

..... (2)

(e) Using the results, write a conclusion for this investigation.

.....

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..... (3)

Jonathan now plans to investigate how the resistance of a wire depends on its diameter.

He starts with the same apparatus as before but replaces the 100 cm wire with five 30 cm lengths of wire.

(f) (i) Describe how these wires should differ.

..... (1)

(ii) Describe how these wires should be the same.

..... (1)

6. The table below gives some information about the eight largest planets in our solar system.

planet	time for one orbit	time to rotate
Mercury	87.97 d	58.6 d
Venus	224.7 d	243.0 d
Earth	365.3 d	23.9 h
Mars	687.0 d	24.6 h
Jupiter	11.9 y	9.8 h
Saturn	29.5 y	10.2 h
Uranus	84.0 y	17.2 h
Neptune	164.8 y	16.1 h

(a) Use this data to suggest the length of a year on Neptune. ..... (1)

(b) Suggest which planet has the longest day.
Explain your answer.

planet: .....

explanation: ..... (2)

It takes about 300 days for a space craft to get from Earth to Mars.
It took the Voyager spacecraft 12 years to reach Neptune from Earth.

(c) Evaluate the evidence *from the table above* which shows that Neptune is much further away from Earth than Mars.

.....

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..... (2)

We know quite a lot about the surface of Mars.

(d) Comment on whether it is useful for us to explore Mars.

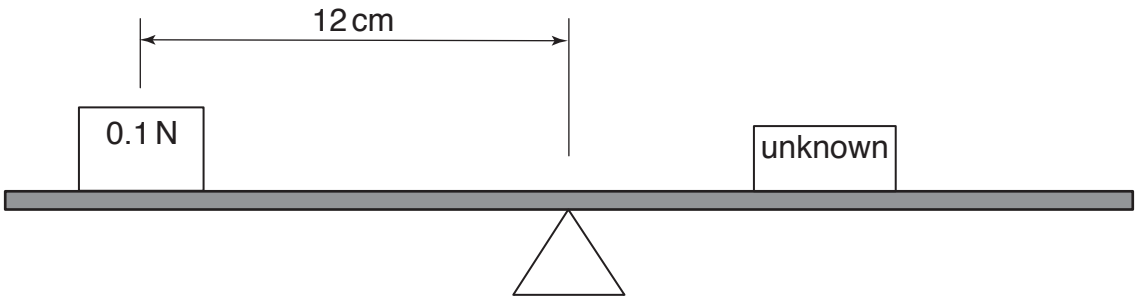
.....

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..... (2)

7. 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.

.....

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.....

..... (3)

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

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

.....

..... (1)

The position of the unknown object on the ruler is 8 cm from the pivot.

(c) Calculate the weight of the unknown object.

.....

..... (2)

(Total marks: 60)