



Coimisiún na Scrúduithe Stáit State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2013

SCIENCE – HIGHER LEVEL

THURSDAY, 13 JUNE – MORNING, 9.30 to 11.30

INSTRUCTIONS

1. Write your **examination number** in the box provided on this page.
2. Answer **all** questions.
3. Answer the questions in the spaces provided in this booklet. If you require extra space, there is a blank page provided at the back of this booklet.
4. The use of the *Formulae and Tables* booklet approved for use in the State Examinations is permitted. A copy may be obtained from the examination superintendent.

Centre Number

**Examination
Number**

For examiner use only	
Section / Question	Mark
Biology	
Q.1 (52)	
Q.2 (39)	
Q.3 (39)	
Chemistry	
Q.4 (52)	
Q.5 (39)	
Q.6 (39)	
Physics	
Q.7 (52)	
Q.8 (39)	
Q.9 (39)	
Total (Paper)	
Bonus for Irish	
Grand Total (Paper) (390)	
Coursework A (60)	
Coursework B (150)	
Grand Total (600)	

Biology

For
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Question 1

(52)

(1) (2)

- (a) The twins in the photo are described as identical. What does this tell us about their genetic makeup?

What? _____



- (b) Muscles can only cause movement by getting shorter (contracting).

- (i) How many muscles are needed to move a bone forward and back in a joint?

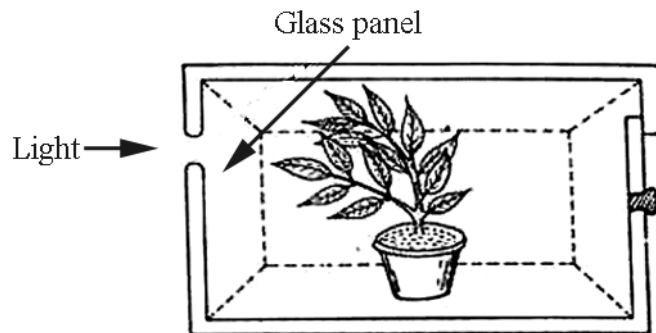
How many? _____

- (ii) Give an example.

Example _____

- (c)(i) What advantage does the plant get from bending towards the light?

What? _____



- (ii) Name this movement (growth response).

Name _____

- (d) Nerves can carry messages in one direction only.

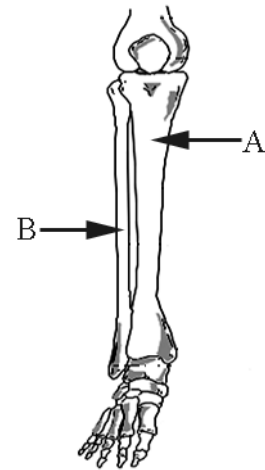
Clearly distinguish between sensory and motor nerves.

Distinction _____

(e) Name bone A and bone B of the lower leg.

Bone A _____

Bone B _____



(f) An ecosystem will have **producers, consumers** and **decomposers** present. Pick any two groups from the list and explain their role in the ecosystem.

Name of first group _____

Role of first group _____

Name of second group _____

Role of second group _____

(g) Describe, using a word equation, how green plants make food from simple non-food substances.

Equation _____

(h) The diagram is of the male reproductive system.

Give the role played by each of parts labelled A, B and C in reproduction.

Role of A _____

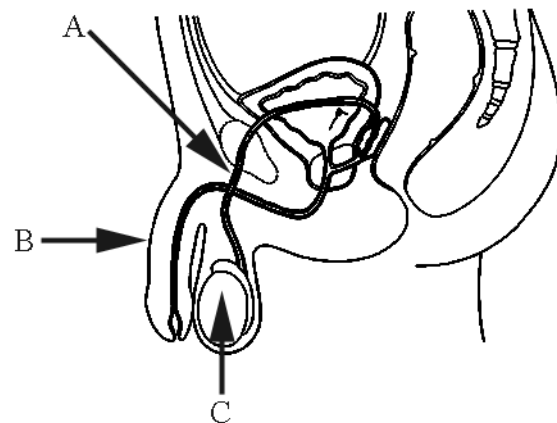
Role of B _____

Role of C _____

A sperm has a head and a tail. State the role of each.

Head _____

Tail _____



(7 × 6 + 1 × 10)

Question 2

(39)

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(a) Most of the food we eat requires digestion.

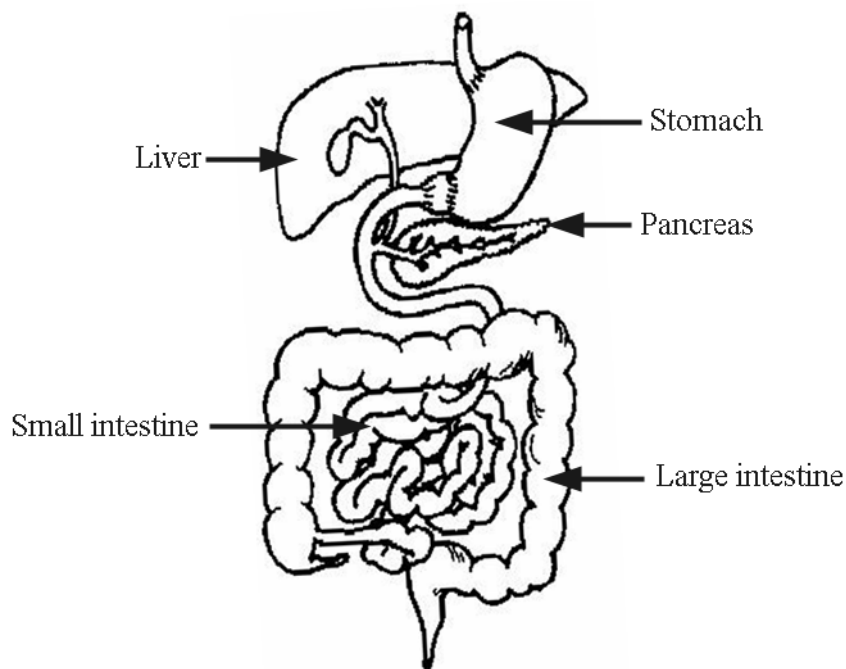
(1) (2)

(i) What is meant by digestion? State clearly why we need to digest food. (6)

What? _____

Why? _____

The labelled diagram shows most of the organs involved in digestion and associated processes in our bodies.



(ii) Give one function for each of the five organs labelled in the diagram. The word 'digestion' alone will not merit marks; if it is used in an answer it must be qualified in some way. (15)

Stomach _____

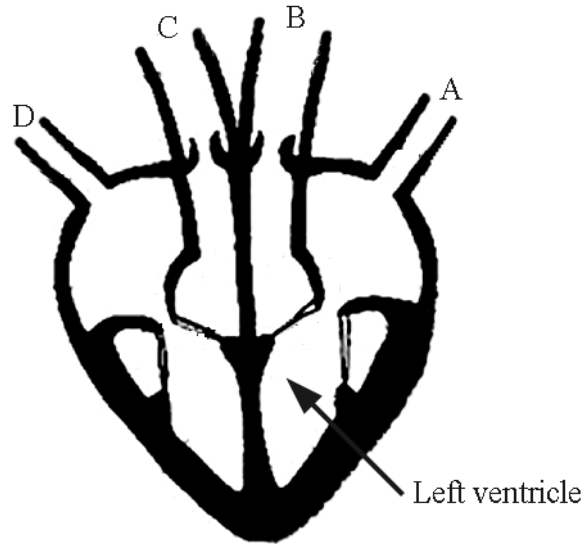
Liver _____

Pancreas _____

Small intestine _____

Large intestine _____

- (b) Four blood vessels are attached to the heart. These blood vessels are labelled A, B, C and D in the diagram.



Select any two of the blood vessels A, B, C or D from the diagram.
 Identify your selection in each case by using the appropriate letter.
 Name the blood vessels selected.
 Give the direction of movement of blood into *or* out of the heart in each case.
 State if the blood is oxygenated *or* deoxygenated in each case. (18)

Identify _____

Name _____

Direction _____

Oxygenated *or* deoxygenated _____

Identify _____

Name _____

Direction _____

Oxygenated *or* deoxygenated _____

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(1) (2)

Question 3

(39)

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(a) In 1800 the population of the earth was about one billion people. Two hundred years later the human population on earth is more than seven billion people. Humans have both positive and negative impacts on the environment.

(1) | (2)

(i) Identify two areas of human activity that have affected the environment negatively.

1 _____ 2 _____

Explain how one of the areas you have identified has a negative impact. (9)

(ii) Identify two areas of human activity that have affected the environment positively.

1 _____ 2 _____

Explain how one of the areas you have identified has a positive impact. (9)

(b) Humans are composed of cells, tissues, organs and systems.

What is meant by each of these terms? (12)

Cell _____

Tissue _____

Organ _____

System _____

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- (c) When a cigarette burns it releases smoke that contains about 4,000 chemicals. Hundreds of these chemicals are highly dangerous.

Tar, nicotine and carbon monoxide are three of these harmful substances. Describe the damaging effect of one of these three substances on a named organ. (6)

Substance _____

Organ _____

Effect _____

- (d) Name an appliance in the house that may produce carbon monoxide. (3)

Name _____

(1) (2)

Chemistry

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Question 4

(52)

(1) (2)

(a) The pH scale is used to measure the acidity and the alkalinity of substances.

(i) Give the range of pH for acids. _____

(ii) Give the range of pH for bases. _____

(b) The two science students have just separated seawater from sand.

(i) Name a suitable method for this separation.

Name _____

(ii) How could the salt be separated from the seawater?

How? _____



(c) Matter occurs in different states.

(i) Name a state of matter that has no fixed shape.

Name _____

(ii) Name a state of matter that has no fixed volume.

Name _____

(d) The writer Jules Verne (1828-1905) said “Water decomposed into its elements will be the fuel of the future”. The photograph shows a car that uses hydrogen as a fuel.

(i) How can hydrogen be produced from water?

How? _____

(ii) Why is the exhaust emission from such a car environmentally safe?

Why? _____



- (e)(i) Name a metal that can be cut with a knife as shown in the photograph.

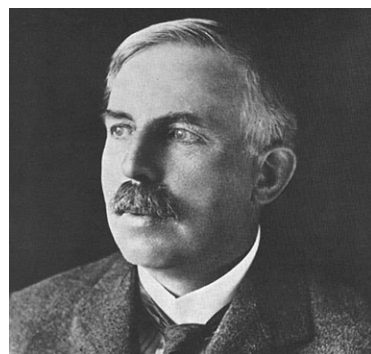


Name _____

- (ii) What happens if a piece of this metal is dropped into water?

What? _____

- (f) Ernest Rutherford (1871-1937) suggested the existence of the atomic nucleus in 1911.



Give two properties of the atomic nucleus.

1 _____

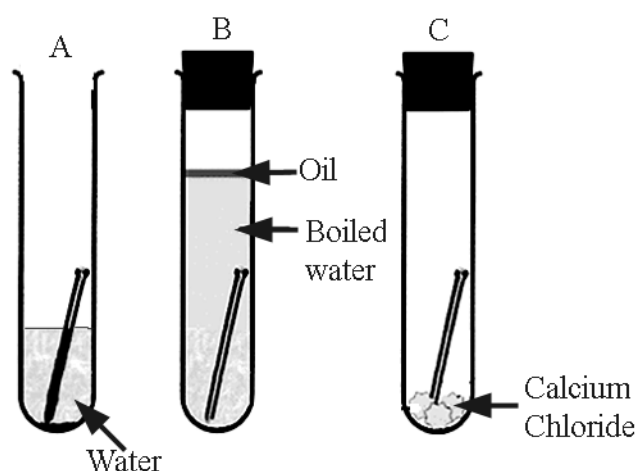
2 _____

- (g) Explain what a 'biodegradable plastic' means.

Explanation _____

- (h) A science student investigated the conditions for the rusting of iron nails. A diagram of the apparatus used is given below.

- (i) Why did the iron nail rust only in test tube A?



- (ii) Why did the iron nail not rust in test tube B?

- (iii) Why did the iron nail not rust in test tube C?

(7 × 6 + 1 × 10)

Question 5

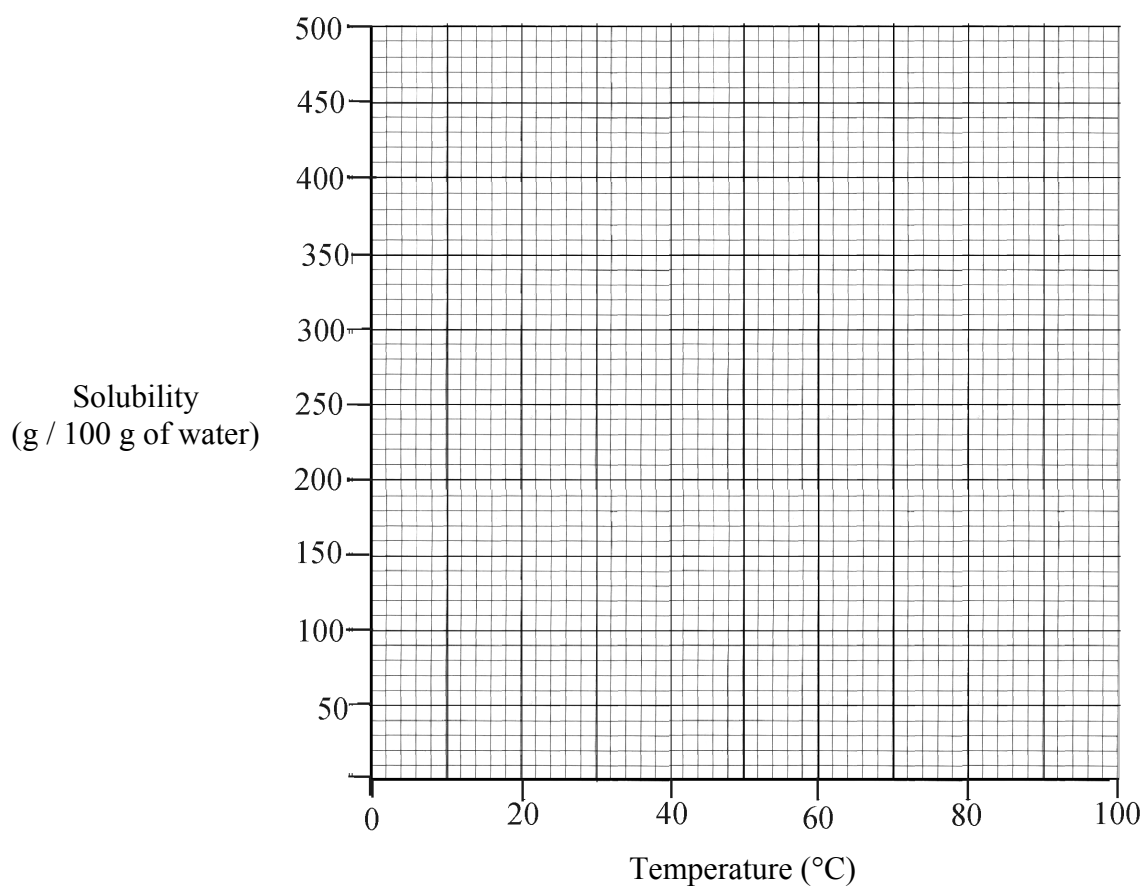
(39)

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- (a) A science student investigated the solubility of two common substances, sugar and salt, in water for a range of temperatures. The data for sugar are given in the table. Salt maintained a constant solubility of 40 g / 100 g of water for the temperature range investigated, 0 °C to 100 °C.

Sugar (g / 100 g of water)	175	200	240	290	370	480
Temperature (°C)	0	20	40	60	80	100

- (i) Draw a graph of the effect of temperature on the solubility of sugar in the grid below. (9)

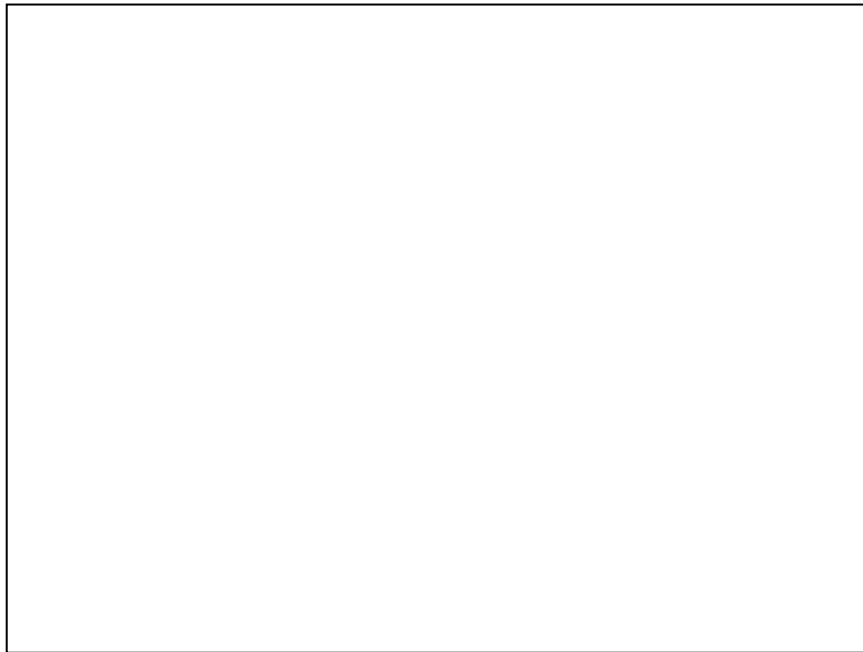


- (ii) Use the graph to estimate the increase in the solubility of sugar if the temperature of the solution is raised from 50 °C to 70 °C. (9)

- (iii) Using the same grid, draw a graph of the effect of temperature on the solubility of salt. (3)

(1) (2)

(b)(i) Describe, using a labelled diagram in the box provided, an experiment to show that carbon dioxide gas (CO₂) is more dense than air. (12)



(ii) Explain how the conclusion that CO₂ gas is denser than air can be drawn from your experiment. (6)

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(1) (2)

Question 6

(39)

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(a)(i) Distinguish between an element and a compound.

(6)

(1) (2)

Element _____

Compound _____

(ii) Iron and sulfur react to produce iron sulfide.

Complete the table below.

(9)

Property	Iron	Sulfur	Iron sulfide
Colour			
Attracted by magnet			

(b) Carbon dioxide dissolves in water to give an acidic solution. Other gases dissolve to give solutions that are more acidic and give rise to acid rain.

(i) Name two gases that react in the atmosphere to produce acid rain.

(6)

Gas 1 _____

Gas 2 _____

(ii) Give a source of one of the gases that you have named above.

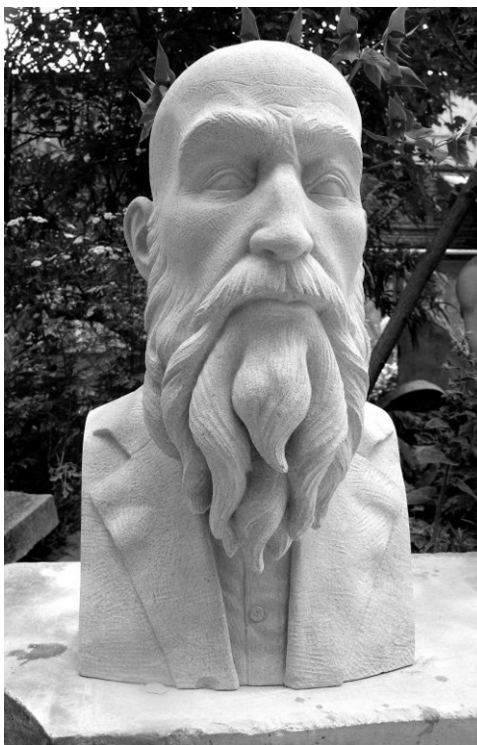
(6)

Name of gas _____

Source of gas _____

- (iii) The sculpture, carved from limestone, of a bearded man in the photograph is new. How would you expect its appearance to change after years of exposure to acid rain? (3)

How? _____



- (iv) Limestone is calcium carbonate.
Write a balanced chemical equation for the reaction of calcium carbonate with an acid of your choice. (9)

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(1) (2)

Physics

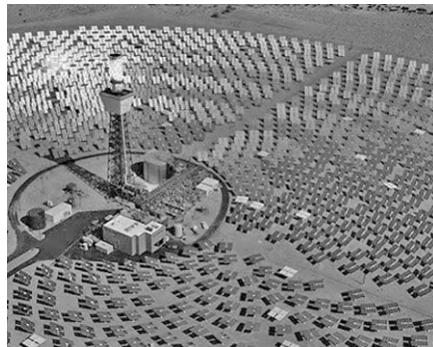
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Question 7

(52)

(1) (2)

- (a) The photograph shows a solar array in Germany which produces electricity equivalent to the power output of 20 nuclear reactors working at full capacity.



- (i) By what method of energy transfer does the sun's energy get to the solar array?

Method _____

- (ii) Compare, giving a reason, the safety of the solar array with the safety of 20 nuclear reactors.

Compare _____

- (b) Calculate the cost of using a washing machine rated at 1 kW for 5 hours per week for 7 weeks. (The net cost of one unit is 20 cent.)

Calculate _____

- (c) Barometers are used to predict weather. What kind of weather would you expect if the pressure was (i) high *or* (ii) low?

High _____

Low _____

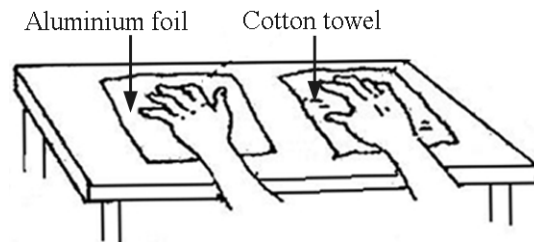


- (d) Two identical beakers, one holding 50 cm³ of water and the second holding 100 cm³ of water, are at the same temperature of 80 °C. Which contains the most heat energy? Give a reason.

Which? _____

Reason _____

- (e) The foil and the towel were both at a temperature of 10 °C.
Why did the foil feel colder?



Why? _____

(1) (2)

- (f) (i) What happens to white light when it is dispersed?

What? _____

- (ii) What part of white light is refracted most by a triangular prism?

What? _____

- (g) The diagram is of a bar magnet. Draw the pattern of the magnetic field.



- (h) When one surface in contact with another surface moves, frictional forces arise. Friction makes movement more difficult. Sometimes friction is useful, other times it is unhelpful.

- (i) Give one example where friction can be useful.

Example _____

- (ii) Give one example where friction can be unhelpful.

Example _____

- (iii) How can unhelpful friction be reduced?

How? _____

- (iv) How can friction between air and a moving vehicle be reduced?

How? _____

(7 × 6 + 1 × 10)

Question 8

(39)

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(a)(i) Distinguish between mass and weight.

(6)

(1) | (2)

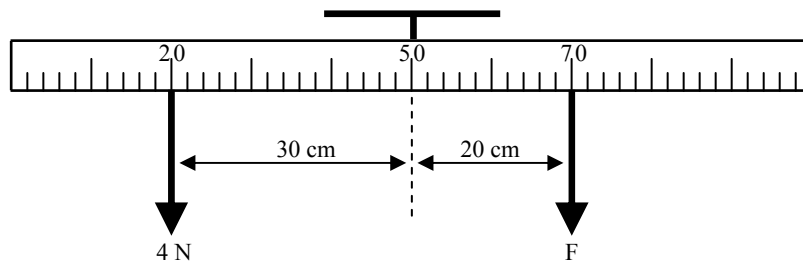
Mass _____

Weight _____

(ii) Define moment of a force.

(6)

Definition _____



The diagram shows a metre stick suspended from its centre of gravity. A force of 4 N acts on the stick at the 20 cm mark and a force of F N acts on the stick at the 70 cm mark. The metre stick is balanced horizontally. Calculate force F.

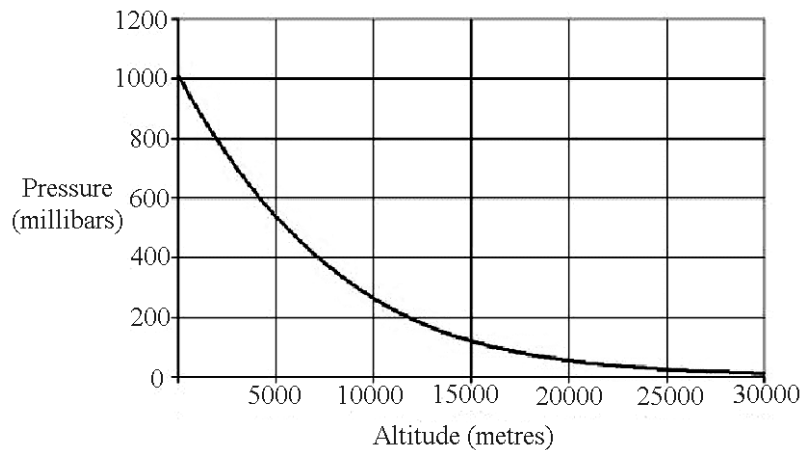
(6)

(iii) Give one everyday application of levers.

(3)

Application _____

(b) The graph is of pressure *versus* altitude for our atmosphere.



(1) (2)

- (i) Look carefully at the graph of pressure *versus* altitude. Two conclusions can easily be drawn: (1) that atmospheric pressure depends on altitude, and (2) that the dependence of atmospheric pressure on altitude is not a direct one. Explain why each conclusion can be drawn from the graph. (6)

Pressure depends on altitude _____

Not direct _____

- (ii) Give two reasons why atmospheric pressure is greatest near the earth's surface. (6)

Reason 1 _____

Reason 2 _____

- (iii) What is the effect of increased pressure on the boiling point of water? (6)

Give a reason for your answer.

Reason _____

Question 9

(39)

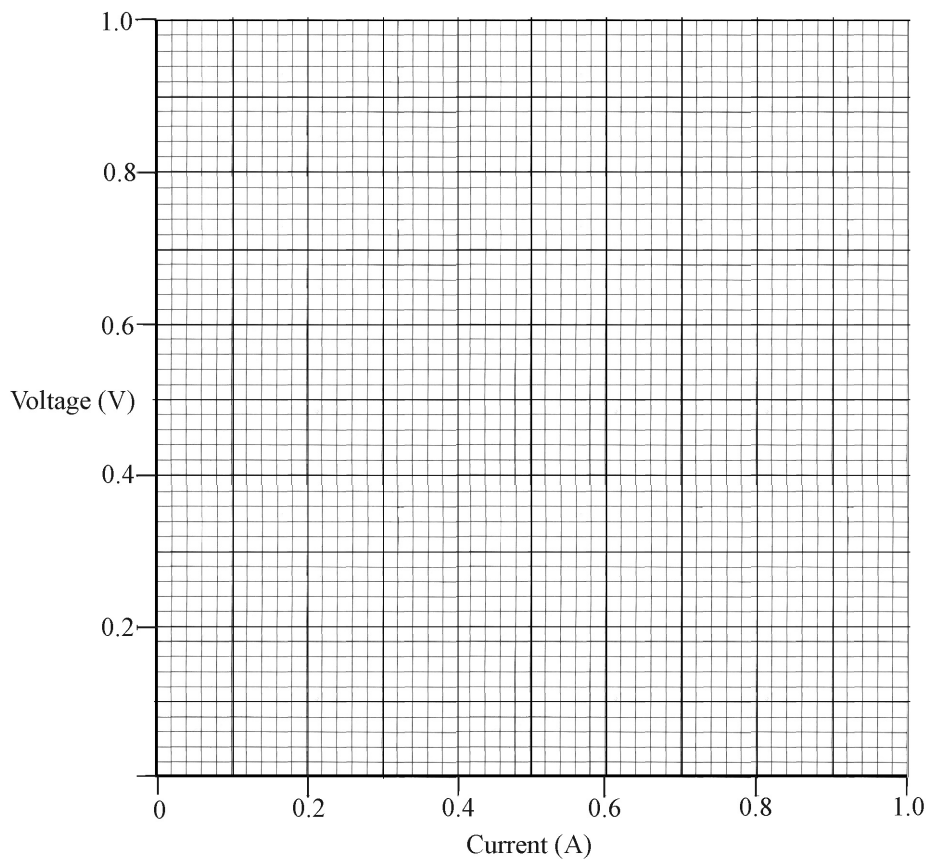
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- (a) A science student investigated the relationship between voltage and current for a resistor. The data are given in the table below.

Voltage (V)	0	0.22	0.40	0.58	0.80
Current (A)	0	0.20	0.40	0.60	0.80

(1) (2)

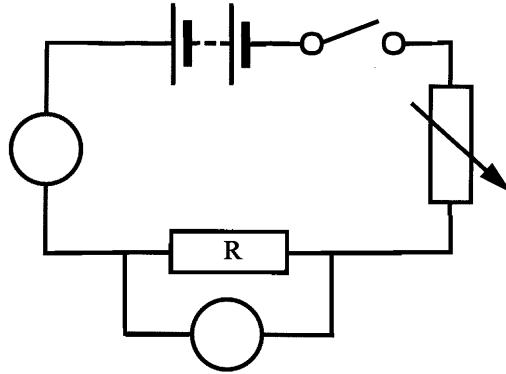
- (i) Draw a graph in the grid below of voltage *versus* current. (9)



- (ii) Describe clearly the relationship between voltage and current shown by the graph that you have drawn. (6)

- (iii) Use the graph to calculate the resistance of the resistor used in this experiment. (6)

- (iv) The diagram shows the circuit used by the student to perform this experiment. Two meters were used, one to measure voltage and the second to measure current. Enter the symbols for both meters in the circuit diagram, each one in the appropriate circle. (6)



- (v) How was the voltage/current varied when doing this investigation? (3)

- (b)(i) What are echoes? (3)

- (ii) A man stood 250 metres from a wall and fired a starting pistol. 1.5 seconds later he heard the echo of the shot. Use this data to calculate the speed of sound in air. (6)
