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WARNING

You must return this paper with your answer-book, otherwise marks will be lost.



Coimisiún na Scrúduithe Stáit State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2005

SCIENCE – HIGHER LEVEL
(N.B. Not for Science – Local Studies Candidates)

THURSDAY, 16 JUNE - MORNING, 9.30 to 12.00

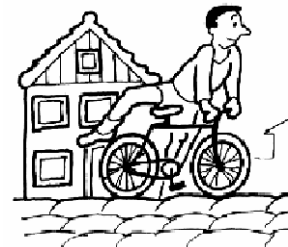
SECTION A (144 marks) TO BE ANSWERED BY ALL CANDIDATES.

(See separate sheet for Sections B, C, D and E.)

Answer *each* of the questions 1, 2 and 3. There are **TEN** parts in each question. Answer any **EIGHT** parts. All questions carry equal marks. Answer the questions in the spaces provided. Return this Section of the examination paper. Enclose it in the answer-book you use in answering the other Sections.

1. Answer *eight* of the following, (a), (b), (c), etc.

- (a) A boy cycles to school each day. His home is 6 km from his school and it takes him on average 30 minutes to get there. Calculate the boy's average speed in km/h.



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- (b) Name **one** *renewable* energy source that can be used in Ireland.

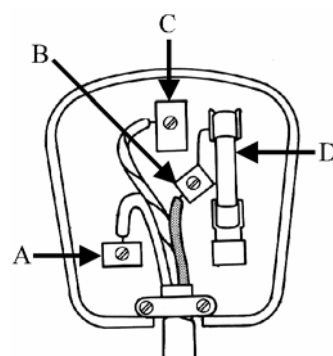
Renewable energy source _____

Why is this source considered to be *renewable*?

- (c) The diagram shows a 13 A plug with the back cover removed. Identify one part from **A, B, C, D** that is there for *safety* and state how it works.

Part _____

How? _____



- (d) Give **one** way in which *friction* can *help* a cyclist and **one** way in which it can *hinder* a cyclist.

Help _____

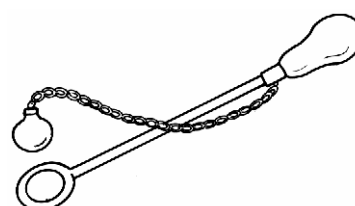
Hinder _____



- (e) Name the piece of laboratory equipment shown in the diagram and state what it can be used to demonstrate.

Name _____

Use _____



- (f) Pressure is _____ per unit area.

The unit of pressure is the _____.

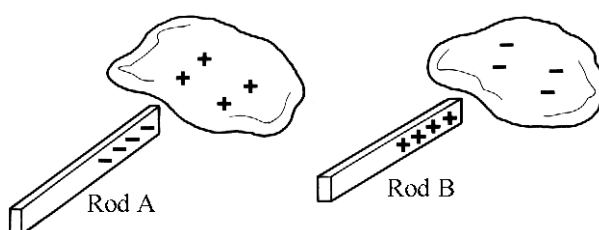
(g) Define the *frequency* of a wave.

(h) Distinguish between *heat* and *temperature*.

Heat _____

Temperature _____

(i)



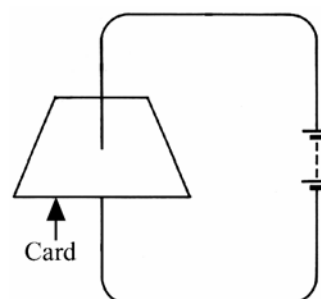
Rod **A** is made of polythene and rod **B** is made of perspex. Both rods have been rubbed with identical cloths. Explain how **A** becomes *negatively* charged while **B** becomes *positively* charged.

Rod **A** _____

Rod **B** _____

(j) The diagram shows a current carrying wire passing through a card.

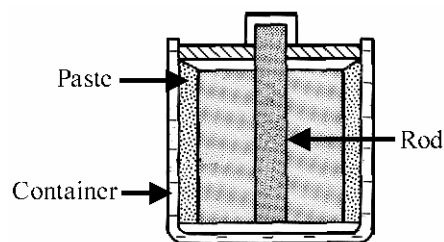
Show a *magnetic field line* on the card in the diagram with direction clearly indicated.



(8 × 6)

2. Answer **eight** of the following, (a), (b), (c), etc.

- (a) The diagram shows a dry cell.
Name the *element* used to make the rod.
The container is an electrode of the cell
and is in contact with the paste.
Name the *element* used to make the container.



Rod _____ Container _____

- (b) Name **one** type of fire extinguisher and state how it can put out a fire.

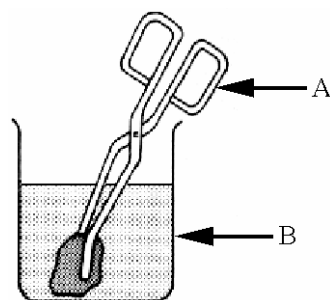
Name _____

How? _____

- (c) Name the **two** items of laboratory equipment
labelled **A** and **B** in the diagram.

A _____

B _____



- (d) Why is sodium metal stored in oil?

Name another metal that is in the *same group* as sodium in the periodic table.

Name _____

- (e) Identify the hazard symbols shown in the diagram.

Symbol **A** _____

Symbol **B** _____



A



B

- (f) Name an *acid* and a *base* that could be found in the home.

Name of acid _____

Name of base _____

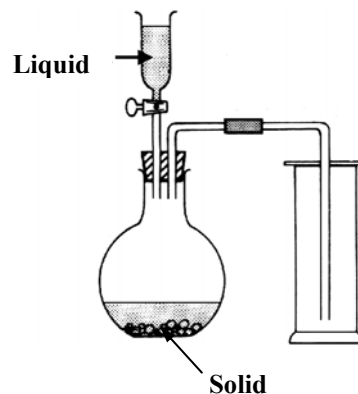
- (g) The apparatus shown was used to prepare carbon dioxide gas.

Name a suitable *liquid* for this preparation.

Liquid _____

Give the *formula* of a solid that could react with the liquid that you have named to produce CO_2 .

Formula _____



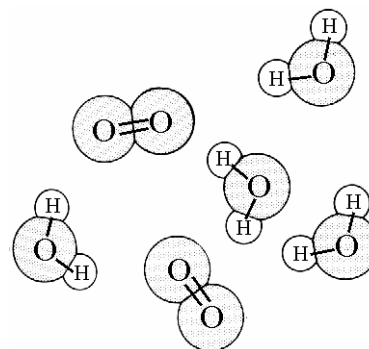
- (h) What is a *catalyst*?

- (i) The diagram shows two kinds of molecules found in air. What *type of bond* holds the atoms together in these molecules?

Type of bond _____

Name **one** other molecule, excluding CO_2 and those shown in the diagram, that is found in unpolluted air.

Name _____



- (j) Give **one** way in which the rusting of iron can be prevented and say how the method that you have given works.

One way _____

How it works? _____

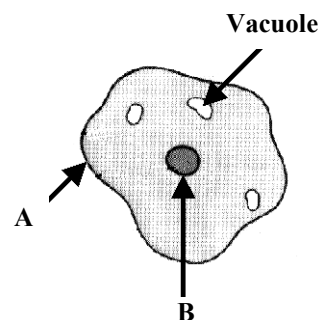
(8 × 6)

3. Answer **eight** of the following, (a), (b), (c), etc.

- (a) The diagram shows an animal cell. Name parts **A** and **B**.

Part **A** _____

Part **B** _____



- (b) Give **two** *environmental* factors that increase the *rate* of transpiration in plants.

Factor one _____

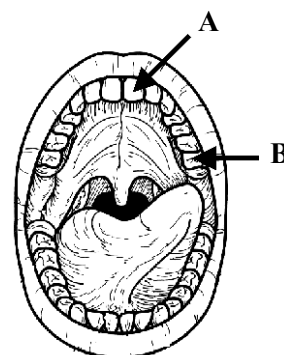
Factor two _____

- (c) The diagram shows the human mouth.
Name tooth type **A**.

Name of tooth type **A** _____

Give the *function* of tooth type **B**.

Function of tooth type **B** _____



- (d) What is the principal *function* of (i) red blood cells (ii) white blood cells in our bodies?

Function of red blood cells _____

Function of white blood cells _____

- (e) The diagram shows the chambers, valves, arteries and veins of the human heart.
Label, using **arrows** and **names**:

- (i) the vein that returns oxygenated blood from the lungs,
(ii) the chamber that pumps oxygenated blood into the body.



- (f) Gaseous exchange occurs in the lungs of many animals.
Name **two** other *systems of gaseous exchange* found in animals.

System one _____

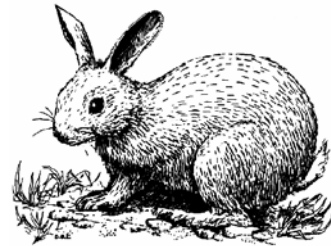
System two _____

- (g) Complete the simple *food chain* below, with a suitable named producer and a suitable named carnivore.

Producer _____

Herbivore **Rabbit** _____

Carnivore _____



- (h) Name **two** *useful plant products* excluding food and oxygen.

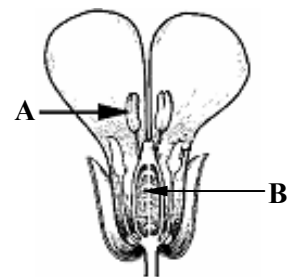
Product one _____

Product two _____

- (i) The diagram shows a section through a flower.
Give the *function* of **A** and *name* **B**.

Function of **A** _____

Name of **B** _____



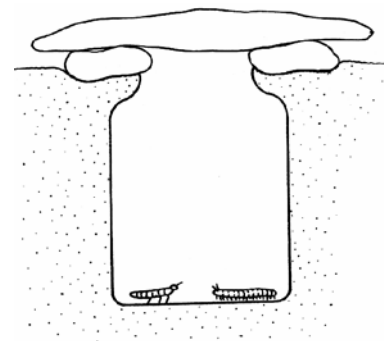
- (j) Animals can be collected, from a habitat, using the simple set-up shown in the diagram.

How can animals be enticed into the trap?

How? _____

Name a second device that can be used to collect animals on a field trip.

Name _____



(8 × 6)

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Section A is on a separate sheet, which provides spaces for your answers.
The completed sheet should be enclosed in your answer-book.

SECTIONS B, C, D, E

These sections should be answered in your answer-book.

Answer **ONE** question from each of the Sections **B, C and D**.

All questions carry equal marks.

Answer **TWO** questions from **Section E**. All questions carry equal marks.

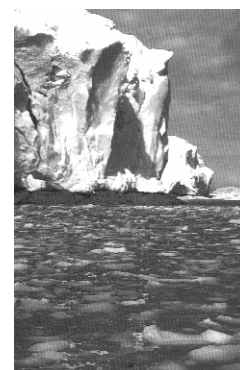
SECTION B - PHYSICS (48 marks)

Answer **either** question 4 **or** question 5.

4. (a) Describe, using a diagram, how to measure the density of a *liquid*. (15)

Give the unit used to express density measurements. (3)

Explain why icebergs float on water. (6)



- (b) Describe a laboratory experiment to show that light is a form of energy. (9)

Give **two** observations that suggest that light travels in straight lines. (6)

Draw a diagram showing the effect of a convex lens on parallel light rays.

Name a *second* lens type. (9)

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5. (a) Georg Ohm published his law in 1827. Ohm's law states the *relationship* between voltage and current for a metallic conductor.



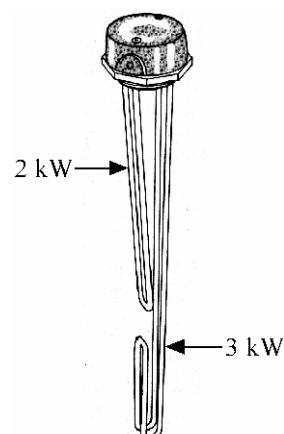
A pupil performed an experiment to verify Ohm's law and got the results given in the table.
Draw a graph, on graph paper, of voltage against current.
(12)

Voltage (volts)	0	1	2	3	4	5	6
Current (amps)	0.00	0.05	0.10	0.15	0.20	0.25	0.30

State, using words or a formula, the *relationship* shown by the graph. (6)

Calculate the resistance of the conductor used in the experiment. (6)

- (b) The diagram shows a 2 kW/3 kW dual immersion heater of the type used to heat water in the home. The shorter 2 kW element heats water for the sinks and the longer 3 kW element heats water for baths. One element is turned on at a time; the sink element heats less water than the bath element.



What *property* of water makes it possible to heat different amounts of water in the same tank? (6)

What *unit* does the ESB use to price electricity? (3)

If a unit of electricity costs 10 cent what is the *cost* of heating water for one week if the 2 kW element is on for three hours each day and the 3 kW element is on for one hour each day? (6)

If the electricity supply to the heater is 230 volts calculate the *current* in the 3 kW element when it is switched on. (9)

SECTION C - CHEMISTRY (48 marks)

Answer **either** question 6 **or** question 7.

6. (a) Pairs of liquids can be miscible (liquids that mix to form a solution) or immiscible (liquids that do not mix to form a solution).

Name the method of separation shown in the diagram. (3)

Name two *miscible* liquids that can be separated by this method. (6)

Which flask **A** or **B** contains the mixture? (3)

Why is cold water flowing through part **C** in the direction shown? (3)

Explain, using a labelled diagram, how two *immiscible* liquids could be separated. (9)

- (b) Draw a diagram showing the *nuclear composition* and the *electronic structure* of the sodium atom $^{23}_{11}\text{Na}$. (9)

Describe the formation of a sodium *ion* and a chloride *ion* from *atoms* of sodium and chlorine. (9)

Sodium ions and chloride ions can combine to form an ionic bond. Give **two** characteristic properties of *ionic compounds*. (6)

7. (a) A pupil collected water from four sources in bottles labelled **A**, **B**, **C** and **D**. The four water samples were tested before treatment, after boiling and after passing through an ion exchanger. Equal volumes of each sample were tested for hardness by finding the volume of soap solution required to produce a lather. The results of the tests are given in the table.

Water sample	Volume of soap solution added to water sample which was:		
	Untreated (cm ³)	Boiled (cm ³)	Ion exchanged (cm ³)
A	1	1	1
B	3	1	1
C	4	2	1
D	3	3	1

Study the table and identify the sample which has:

- (i) most hardness
- (ii) a mixture of permanent and temporary hardness
- (iii) only permanent hardness
- (iv) no hardness
- (v) only temporary hardness. (15)

Give the name *or* formula of a substance that causes temporary hardness in water. (3)

Name **one** treatment, other than the removal of hardness, that water for domestic use undergoes. Give a reason why the treatment you have named is carried out. (6)

- (b) Explain the term *electrolysis*. (6)

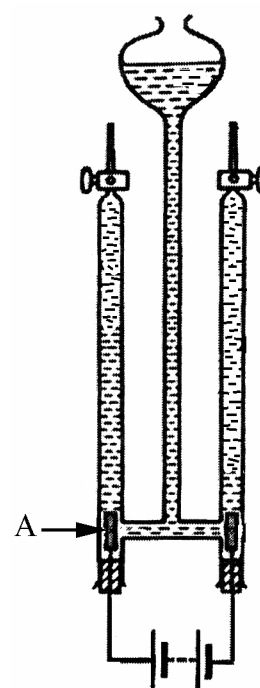
The diagram shows a Hoffman voltameter filled with water for an experiment to investigate the electrolysis of water.

What must be added to the water for this experiment to work? (3)

Name the gas produced at the electrode labelled **A** during this experiment and describe a simple test to confirm your answer. (9)

Name a suitable material for use as electrodes in this experiment. (3)

Give **one** application of electrolysis. (3)



SECTION D - BIOLOGY (48 marks)

Answer **either** question 8 **or** question 9.

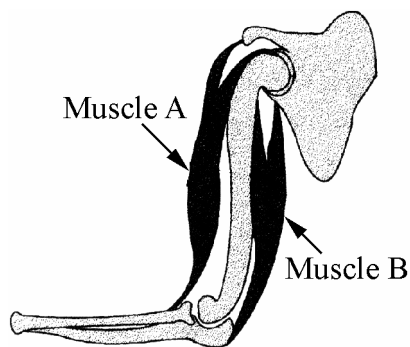
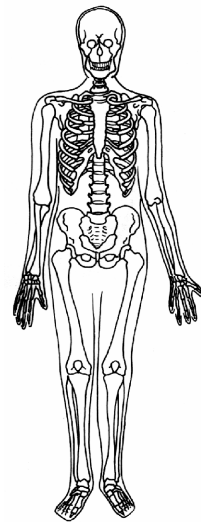
8. (a) The diagram shows the human skeleton.

Say how the skeleton *protects* two named organs.

(6)

Name **two** parts of a *synovial joint* that help with the free movement of that joint.

(6)



Describe, using labelled diagrams, how pairs of *antagonistic muscles* can produce two-way movement of bones that have a *synovial joint* between them.

(12)

(b) The diagram shows the male reproductive system.

Name parts **A** and **B** and give their roles in sexual reproduction.

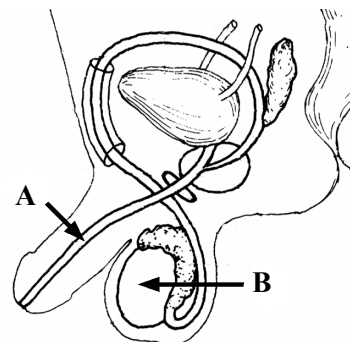
(12)

Explain the terms

(i) *fertilisation* and

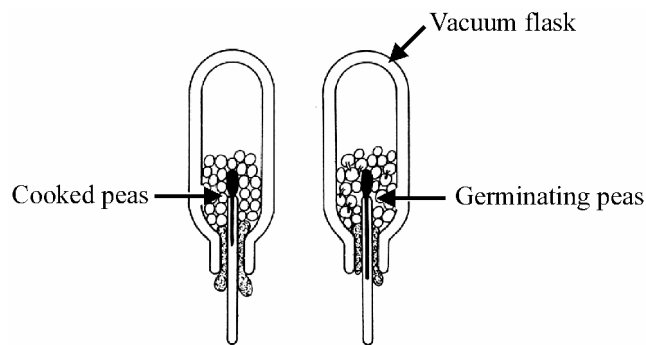
(ii) *implantation*.

(12)



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9. (a) The diagram shows an experiment to demonstrate that germinating peas produce heat. The thermometer in the flask on the right shows a higher temperature than the one in the flask on the left.



- (i) Why are vacuum flasks used in this experiment? (3)
 - (ii) Why are the peas in the flask on the left cooked? (3)
 - (iii) Why are the flasks 'upside down'? (3)
 - (iv) Name the *process* that releases the heat and carbon dioxide in the germinating peas. (3)
 - (v) Outline a simple test for carbon dioxide gas. (6)
 - (vi) What is meant by the term '*germination*' when applied to seeds? (6)
- (b) Name the *tissue* that transports water and minerals upwards in plants. (3)
- Describe, using a labelled diagram, a simple experiment to show the upward movement of water in the stem of a named plant. (9)
- What is *phototropism*? (6)
- How can phototropism can be demonstrated by a simple laboratory experiment? (6)

SECTION E - APPLIED SCIENCE (72 marks)

Answer **TWO** questions from this section.

10. EARTH SCIENCE. Answer any **two** of the following, (a), (b), (c).

(a) The sun is the star in the centre of our solar system.

Name **one** planet that is closer to the sun than the earth **one** planet that is further away from the sun. (6)

Stars release vast amounts of heat and light and other forms of energy. What is the *source* of this energy? (3)

Name a natural satellite of the earth. (3)

Give **two** reasons why the earth is the only planet, as far as we know, that can *support life* in our solar system. (6)



(b) What causes the tidal rise and fall of waters on earth? (3)

Explain the term '*spring tide*'. (3)

Draw a diagram showing how a spring tide can be produced. (6)

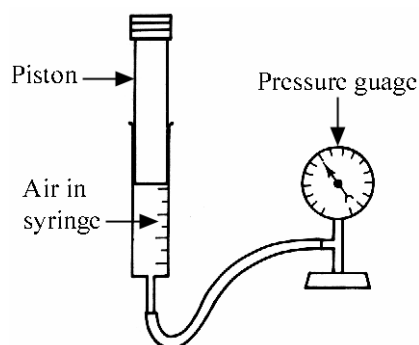
Why do we have **two** spring tides each month? (6)

(c) The apparatus shown in the diagram can be used to investigate the way the *volume* of a gas *changes* with *pressure*. The syringe has volume markings on it.

Describe how one could use this apparatus to make suitable measurements for such an investigation. (6)

How could these measurements be used to find the *relationship* between pressure and volume for a gas? (6)

State the *relationship* between pressure and volume of a gas at constant temperature. (6)



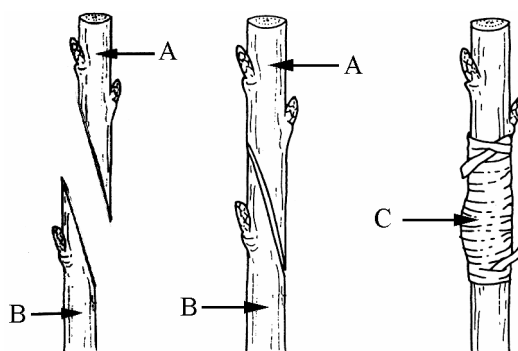
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11. HORTICULTURE. Answer any **two** of the following, (a), (b), (c).

(a) Describe an experiment to measure the water content of a soil sample. (12)

Name **two** media, other than soil, for growing plants. (6)

(b) Name the method of *propagation* of plants shown in the diagram. (3)



What are parts **A** and **B** called? (6)

Name a suitable material for **C**. (3)

Give **one** precaution that you could take to increase the chance of success of this attempt at propagation excluding binding **A** and **B** together. (3)

Name a plant that can be propagated in this way. (3)

(c) What is a *mulch*? (3)

Give **two** reasons why mulches are used. (6)

What is meant by *biological control* of garden pests?
Give **one** example. (9)

12. MATERIALS SCIENCE. Answer **both** parts, (a) and (b).

(a) Many different materials are used in the construction and in the fitting-out of our homes.

- (i) Name a plastic that is used to make gutters and down pipes.
- (ii) Give **one** use for aluminium in house construction.
- (iii) Name a fabric that is used to make curtains.
- (iv) Give **one** use for pine (deal) in the construction of a house. (12)

Select **one** material from your answers, and give a reason why it might *deteriorate* in time and give a way in which it might be *protected*. (6)

(b) Answer **one** of the following.

(i) PLASTICS

Name the raw material from which plastics are manufactured.
What is the origin of this material? (6)

Describe an experiment to compare the hardness of two plastics. (12)

(ii) METALS

Give **one** reason why metals are mixed with other substances to form alloys.
Name an alloy. (6)

Describe an experiment to compare the thermal (heat) conductivity of two metals. (12)

(iii) TEXTILES

Name **one** natural fibre and **one** synthetic fibre commonly mixed together in fabrics. (6)

Describe an experiment to compare the resistance to wear of two fabrics. (12)

(iv) TIMBER

Name a manufactured board and explain how it is made. (6)

Describe an experiment to show the effect of grain direction on the strength of timber. (12)

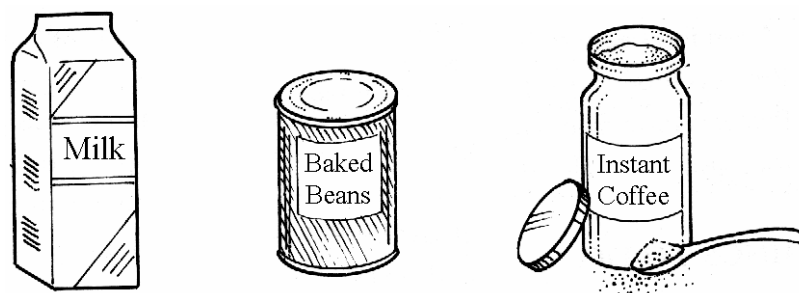
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13. FOOD. Answer any **two** of the following, (a), (b), (c).

- (a) Name **two** food types that make up a balanced diet. Give the *role* played by **one** of the food types you have named in maintaining health. (9)

Describe an experiment to show the *presence of glucose*, a reducing sugar, in a food. (9)

(b)



Select **two** of the food products shown in the diagram and state the method of *preservation* that has been used for each product. **Two different** methods of preservation must be selected. (6)

Explain how **both** methods of preservation that you have named work. (6)

The list of ingredients on the label of the baked beans include sugar, modified starch and salt. Give **one** advantage and **one** disadvantage of the use of additives in food. (6)

- (c) Yoghurt is made from milk.

Describe how yoghurt can be made in a school laboratory. (12)

Name **two** ways in which meat is processed. (6)

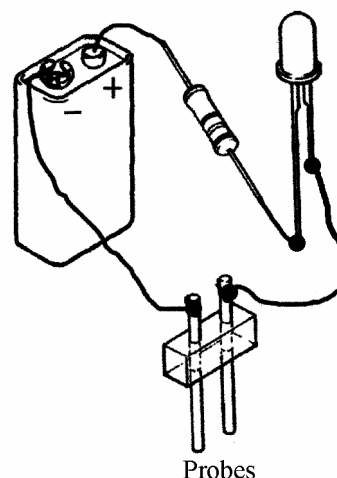
14. ELECTRONICS. Answer **both** parts, (a) and (b).

- (a) A pupil made the simple *water detector* shown in the diagram. The LED glowed dimly when the probes were in water.

Draw a circuit diagram, using circuit symbols, of this circuit. The probes can be shown by two parallel lines. (9)

Why is there a resistor in the circuit? (3)

Would the circuit work, as described above, if the battery connections were reversed? Give a reason for your answer. (6)



- (b) The pupil wished to improve the sensitivity of the circuit above and added another component **A**, shown in the diagram, with a second resistor. The LED glowed brightly in the modified circuit when the probes were immersed in water.

Name the added component **A**. (3)

The circuit diagram shows the modified circuit.

Component **A** has three terminals (connections). Draw the circuit symbol for **A** in your answer-book, then label and name the three terminals. (9)

Copy the diagram of the modified circuit into your answer-book and show where a switch could be inserted to turn on/off the circuit. (3)

If the modified circuit was to be used to alert someone that a bath was full of water what component could replace the LED to make it more effective? (3)

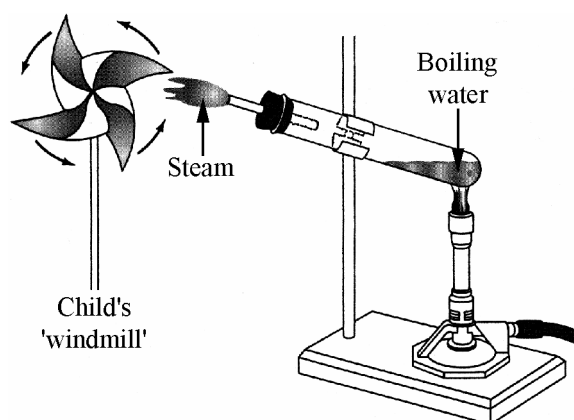
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15. ENERGY CONVERSIONS. Answer **both** parts, (a) and (b).

- (a) A pupil did a project on energy conversions and set-up the demonstration shown in the diagram.

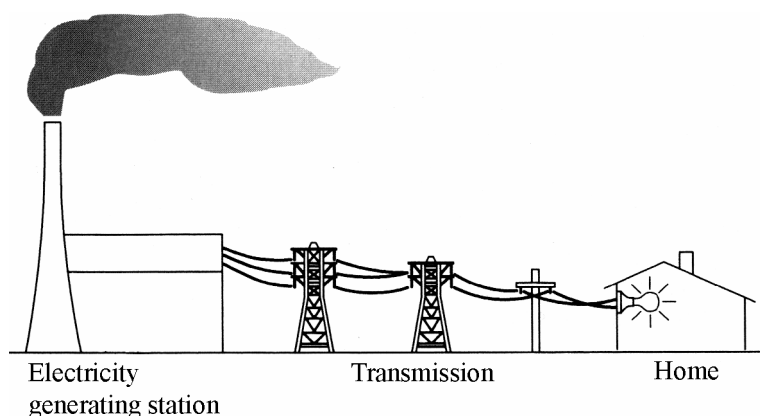
The demonstration shows how a steam turbine works.

Write down **two** *energy conversions* taking place in the demonstration that lead to the child's 'windmill' turning. (12)



What *energy conversion* occurs when a mobile phone is being charged? (6)

- (b) Electricity generating stations use steam turbines that work like the demonstration in the diagram in (a) above.



These steam turbines turn generators (dynamos) at high speed. What energy conversion occurs in a generator (dynamo)? (6)

Draw a labelled diagram of a simple generator (dynamo). (9)

Electricity is transmitted as a.c. and its voltage is *increased* leaving the generating station and then is *reduced* before it reaches your home. Name a *device* that can change a.c. voltage. (3)