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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**

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**JUNIOR CERTIFICATE EXAMINATION, 2008**

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

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**THURSDAY, 12 JUNE – MORNING, 09.30 to 12.00**

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

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

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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) The diagram shows a concrete column.  
Calculate the *density* of the column if its mass is 8 800 kg.

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- (b) A driver applied the brakes of a moving car and it stopped after travelling 20 m. Calculate the *work done in stopping the driver* if the average force applied to him, by the seat belt during the braking, was 150 N.




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- (c) Define *momentum*.

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- (d) Explain the *difference* between electrical conductors and electrical insulators. Make *reference in your answers to electric current*.

Conductors \_\_\_\_\_

Insulators \_\_\_\_\_

- (e) The photograph shows 'Wavebob' which changes the energy of waves into electrical energy off the Galway coast. A full scale version could provide 1 MW.

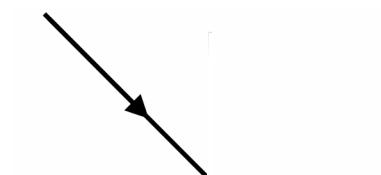


Give **one** *advantage* and **one** possible *disadvantage* of this way of generating electricity.

Advantage \_\_\_\_\_

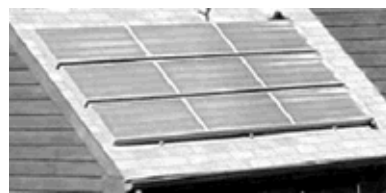
Disadvantage \_\_\_\_\_

- (f) The diagram shows a ray of light striking a flat surface. The surface *reflects* the light. Draw the *reflected ray* in the diagram. Lenses change the direction of light in a different way. What is this *change* of direction of light called?




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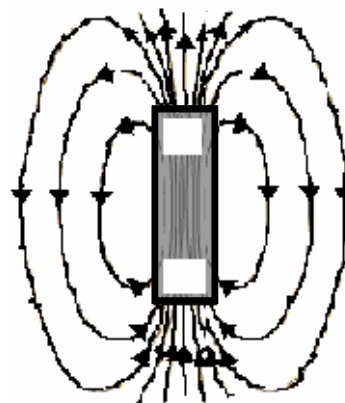
- (g) The photograph shows panels on the roof of a house in Ireland, which heat water by solar heat energy. How does the *sun's heat* reach the earth? Suggest a '*back-up*' energy source for heating the water during dull days.



How \_\_\_\_\_

Suggestion \_\_\_\_\_

- (h) Label the *north pole* of the bar magnet with field lines shown in the diagram, with an 'N'. Give a *reason* for your selection of location for the north pole.

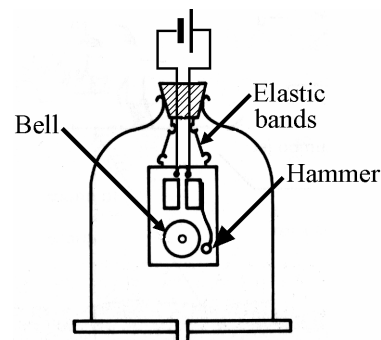


Reason \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (i) The diagram shows an apparatus used to investigate the transmission of sound. At the start, ringing was heard and the hammer was seen hitting the bell. A *procedure* was carried out and while the hammer was still seen hitting the bell no ringing was heard. What *procedure* was carried out?



Procedure \_\_\_\_\_

What does this experiment tell us about sound?

\_\_\_\_\_

- (j) How *many* waves are shown in the diagram?

How many? \_\_\_\_\_

Calculate the *speed* of this wave if its frequency is 1 kHz.

\_\_\_\_\_

(8 × 6)

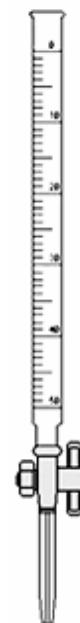
2. Answer **eight** of the following, (a), (b), (c), etc.

(a) Name the piece of laboratory glassware shown in the diagram.

Name \_\_\_\_\_

Give a *use* for this item in experimental work in a laboratory.

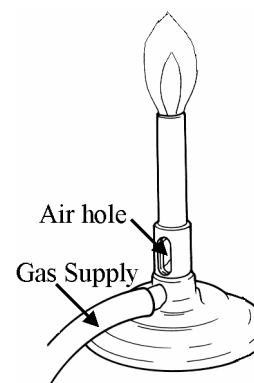
Use \_\_\_\_\_



(b) The diagram shows a Bunsen burner. The gas supply is turned on full and the air hole is fully open. Why does this setting give the hottest flame?

\_\_\_\_\_  
\_\_\_\_\_

Clearly label the hottest part of the flame in the diagram.



(c) A pupil measured the pH of two substances. The pH of lemon juice was 2.4 and the pH of household ammonia was 11.5. What do these measurements *tell us* about the two substances, apart from their pH values?

Lemon juice \_\_\_\_\_

Household ammonia \_\_\_\_\_

(d) The hazard symbol shown is on a container in a school laboratory. What does the *symbol* tell us about the substance in the container? Name a *substance* that would be labelled in this way.

What? \_\_\_\_\_ Name \_\_\_\_\_



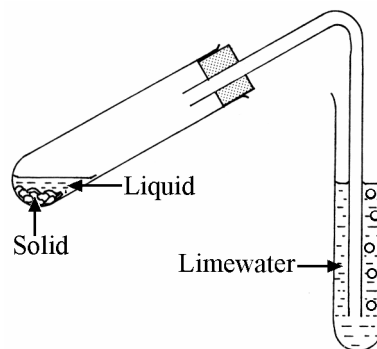
(e) Explain the term *corrosion* when applied to metals.

\_\_\_\_\_  
\_\_\_\_\_

- (f) The liquid and the solid shown in the diagram react together to produce a gas which turns limewater milky. Name a *liquid* and a *solid* that react together in this way.

Liquid \_\_\_\_\_

Solid \_\_\_\_\_

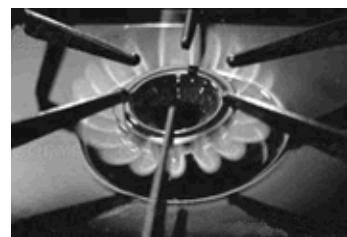


- (g) How would you *test* a sample of hard water to see if the hardness was *temporary* or *permanent*?

\_\_\_\_\_

\_\_\_\_\_

- (h) The photograph shows natural gas burning on a domestic cooker hob. Natural gas is methane, and its formula is  $\text{CH}_4$ . Complete the *equation* below for the combustion of methane.



- (i) Magnesium has atomic number twelve. How many *orbits (shells)* of a magnesium atom have electrons in them? In which *period* of the periodic table is magnesium?

How many? \_\_\_\_\_ Which period? \_\_\_\_\_

- (j) Give **one safety precaution** taken by the pupil shown in the photograph, while doing an experiment in a school laboratory.

Precaution \_\_\_\_\_

Describe a **precaution, not shown** in the photograph, that you would take when **heating a substance** in a test tube in a school laboratory.

Precaution \_\_\_\_\_



[Turn over]

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

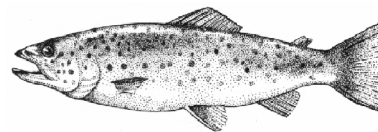
- (a) The trout is adapted to its habitat.

[You can select another named organism, if you wish, to answer this question.]

Give **one** *adaptation* of your selected organism. What is a *habitat*?

Organism \_\_\_\_\_ Adaptation \_\_\_\_\_

Habitat \_\_\_\_\_

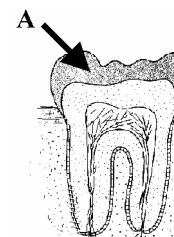


- (b) The diagram is of a tooth. Name the *part* labelled A.

Part A \_\_\_\_\_

Name the type of tooth shown in the diagram.

Name \_\_\_\_\_



- (c) Both animals and plants are composed of cells. Name a *structure* that is *common* to *both* animal and plant cells.

Name of common structure \_\_\_\_\_

Name a *structure* that is *only* associated with *plant* cells.

Name \_\_\_\_\_

- (d) The diagram shows an entire dandelion plant.

Label clearly a *part* of the plant where *seeds are produced* using the letter 'S'.

Label clearly a *part* of the plant where *water and minerals* are taken into the plant using the letter 'W'.

- (e) Give **two** examples of *characteristics (traits)* that can be *biologically inherited* from our parents.

Example one \_\_\_\_\_

Example two \_\_\_\_\_

- (f) Butterflies and other insects disperse pollen.  
Why is *pollen dispersal* important?

Why? \_\_\_\_\_

Give a **second** way, other than by insects, in which pollen is dispersed.

Way \_\_\_\_\_



- (g) What is *phototropism*?

\_\_\_\_\_  
\_\_\_\_\_

- (h) The diagram shows a detail of the structure of the human lung. Alveoli (air sacs) with associated blood capillaries are drawn in the expanded portion of the diagram. Describe what *happens* between the air in the alveoli and the blood in the capillaries.

Description \_\_\_\_\_

\_\_\_\_\_

- (i) The quadrat is used for sampling plants and animals living in a habitat.  
Draw a *quadrat*, in the box provided.

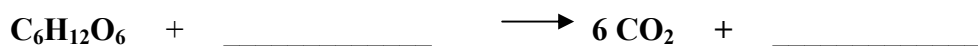
Explain how to take a *random sample* using a quadrat.

\_\_\_\_\_  
\_\_\_\_\_



\_\_\_\_\_

- (j) Respiration releases energy from food in cells. Complete the *equation* for the aerobic respiration of glucose.



(8 × 6)

# Coimisiún na Scrúduithe Stáit State Examinations Commission

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

**THURSDAY, 12 JUNE – MORNING, 09.30 to 12.00**

**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) (i) Explain what is meant by the *centre of gravity* of an object. (6)

Describe an experiment to locate the *centre of gravity* of the shape shown, in the diagram, which was cut from a thin sheet of card. Use a labelled diagram in your answer.

(9)



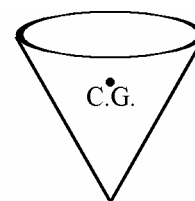
- (ii) The solid cones shown in the diagram are made of the same material and are standing on a flat surface. The dots show their centres of gravity.

Which cone is in *stable equilibrium*?

Give **two reasons** why the other cone is in *unstable equilibrium*. (9)



Cone A



Cone B

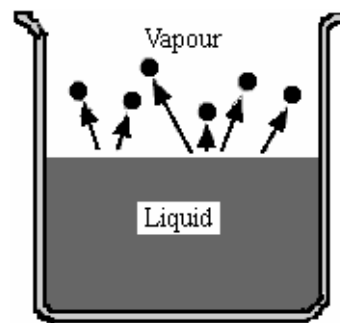
[Turn over]



- (b) (i) The diagram shows a liquid evaporating. Describe a simple experiment to show that *evaporation absorbs heat*. (6)

- (ii) What is meant by *sublimation*?  
Name a *substance* that sublimates. (9)

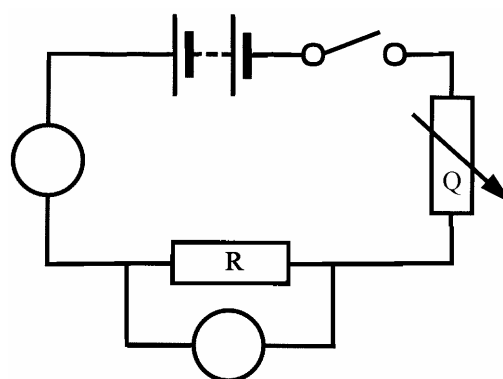
- (iii) What effect has *pressure* on the boiling point of water? Give an *application* of this effect. (9)



5. (a) A pupil investigated the relationship between the voltage applied to the resistor **R** and the current produced in it using the circuit shown.

- (i) Name *component Q* and give the *reason* why it is in the circuit. (6)

- (ii) Copy the circuit into your answer-book and *label* the ammeter and voltmeter. (6)



- (iii) The data collected by the pupil is given in the table. Draw a *graph*, using this data, on graph paper with voltage on the *y-axis*. (9)

| Voltage (volts)   | 0.0 | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
|-------------------|-----|-----|-----|-----|-----|------|------|
| Current (amperes) | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5  | 0.6  |

- (iv) State the *relationship* shown by the graph. (6)

- (b) The photograph shows ‘rays’ of light from the sun, which is obscured by clouds.

- (i) Describe, using a labelled diagram, how to show in a laboratory experiment that *light travels in straight lines*. (12)

- (ii) Name the *primary colours* of light. (9)



**SECTION C - CHEMISTRY (48 marks)**

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

6. (a) (i) Chemical change can produce electricity.  
The diagram shows the structure of a dry cell.

What is *part A*?

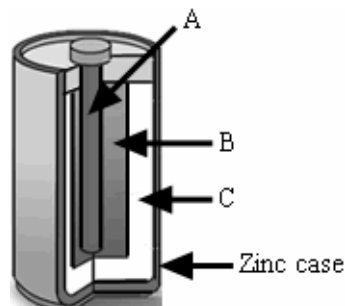
(3)

Name a *substance* found in **B** and a *substance* found in **C**.

(6)

Name the *part* of the cell which is negative.

(3)



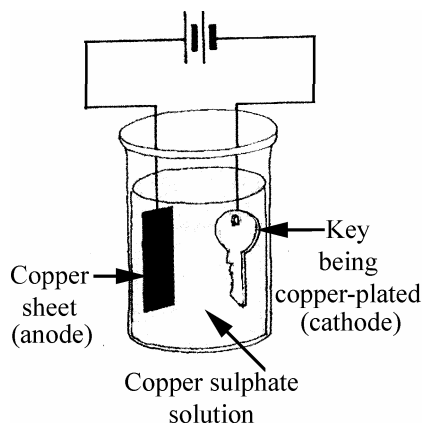
- (ii) Electricity can produce chemical change.  
The diagram shows a key being copper-plated.

Copper sulphate solution contains copper ions,  $\text{Cu}^{2+}$ .

Copper ions take part in the chemical reactions that happen at the anode and at the cathode.

Describe the *reaction* that occurs at the *anode* and the *reaction* that occurs at the *cathode*.

(12)



- (b) (i) Distinguish, clearly, between *compounds* and *mixtures*.

(12)

- (ii) Describe an experiment, using labelled diagrams, to *show how* a mixture of salt (sodium chloride) and sand could be *separated*.

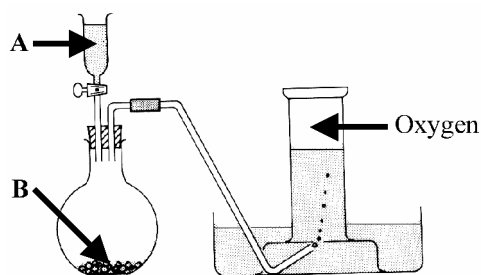
(12)

[Turn over

7. (a) The diagram shows an apparatus used in a school laboratory to prepare oxygen.

(i) Name a *liquid A* and a *solid B* that will react together to produce oxygen.

(6)



(ii) How could the gas produced be *tested* to show that it is oxygen? (6)

(iii) Magnesium was burned in a jar of oxygen. Answer the following regarding this combustion.

Give the *colour* of the flame.

(3)

Give the *colour* of the product.

(3)

Name the *substance* oxidised and give a *reason* for your answer.

(6)

(b) Part of the periodic table is shown in the diagram.

| 1                | 2                |  |  |  |  |  |  |  |  |  | 3                | 4                | 5               | 6               | 7                | 8/0              |
|------------------|------------------|--|--|--|--|--|--|--|--|--|------------------|------------------|-----------------|-----------------|------------------|------------------|
| <sup>1</sup> H   |                  |  |  |  |  |  |  |  |  |  |                  |                  |                 |                 |                  | <sup>2</sup> He  |
| <sup>3</sup> Li  | <sup>4</sup> Be  |  |  |  |  |  |  |  |  |  | <sup>5</sup> B   | <sup>6</sup> C   | <sup>7</sup> N  | <sup>8</sup> O  | <sup>9</sup> F   | <sup>10</sup> Ne |
| <sup>11</sup> Na | <sup>12</sup> Mg |  |  |  |  |  |  |  |  |  | <sup>13</sup> Al | <sup>14</sup> Si | <sup>15</sup> P | <sup>16</sup> S | <sup>17</sup> Cl | <sup>18</sup> Ar |
| <sup>19</sup> K  | <sup>20</sup> Ca |  |  |  |  |  |  |  |  |  |                  |                  |                 |                 |                  |                  |

(i) List the *alkali metals* shown using their atomic symbols.

(3)

(ii) Give **two** *properties* that all alkali metals have in common.

(6)

(iii) List the *halogens* shown using their atomic symbols.

(3)

(iv) List the *noble gases* shown using their atomic symbols.

(3)

(v) Apart from being gases, give **one** *property* that all noble gases have in common.

(3)

(vi) How many *electrons* have all *group four* atoms got in their *outer orbit*? (3)

(vii) Give the formula of a compound formed between an alkali metal and a halogen.

(3)

## SECTION D - BIOLOGY (48 marks)

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

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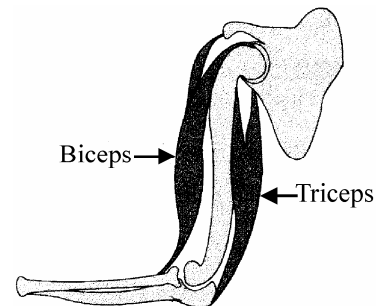
8. (a) The skeleton has a number of functions. One function is *protection*. The photograph shows a human skull. Name **two different organs** that the skull protects. (6)



A second function of the skeleton is *movement*. Movement involves muscles, nerves and bones. Muscles can only *cause movement by contraction* i.e. getting shorter. This is why *muscles always occur in pairs* to allow *two way movement* e.g. the biceps and triceps.

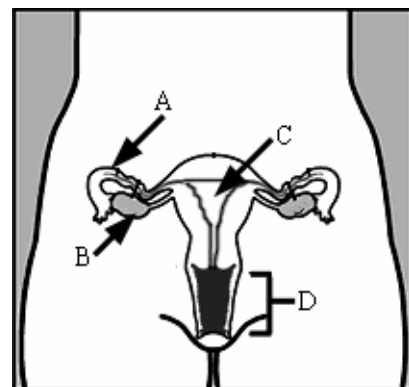
The diagram shows the bones of the arm and a pair of muscles, the biceps and the triceps.

- (i) What are *pairs of muscles* which allow movement in opposite directions *called*? (3)
- (ii) Explain, using the biceps and the triceps as an example, how pairs of muscles can produce *movement first in one direction and then in the opposite direction*. (12)
- (iii) What *type of nerve* gives a signal to a muscle to contract? (3)



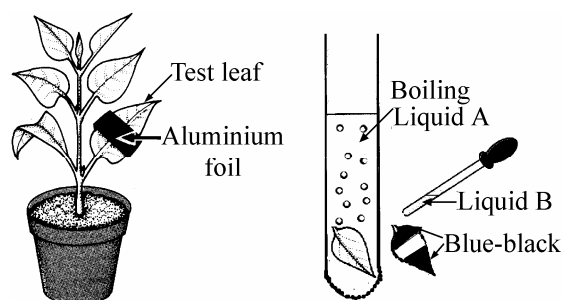
- (b) The diagram shows the female reproductive system.

- (i) Name **parts A and B**. (6)
- (ii) Give the *function* of part **C** and the *function* of part **D**. (6)
- (iii) Explain the term '*fertilisation*'. (6)
- (iv) Where does fertilisation take place? (3)
- (iv) Where does *implantation* take place? (3)



9. (a) Explain the term '*photosynthesis*'. (3)

The diagram shows three steps from an experiment to investigate photosynthesis.



- (i) The green plant used first had its leaves *destarched*. How is this done? (6)
- (ii) The plant was then left, for a day as shown, in sunlight. The test leaf was removed from the plant, the foil taken off, and the leaf was boiled in water. Why was the leaf *boiled in water*? (3)
- (iii) The leaf was then boiled in liquid **A** to *remove chlorophyll*. Name liquid **A**. (3)
- (iv) Liquid **A** is *flammable*. Describe, using a labelled diagram, how liquid **A** can be *boiled safely* in a school laboratory. (6)
- (v) Liquid **B** was dropped onto the leaf and the parts which were not covered by the foil turned blue-black as shown. Name liquid **B** and say why the *uncovered parts of the leaf turned blue-black*. (6)
- (vi) Why did the *part of the leaf covered with foil not go blue-black*? (3)

- (b) The diagram shows a food chain from a garden habitat.

Name (i) a producer

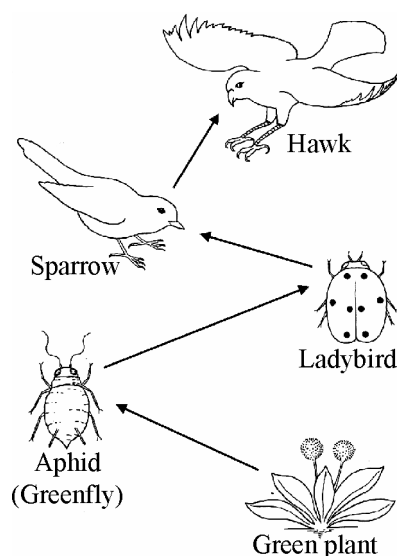
(ii) a herbivore

(iii) a carnivore

from the food chain shown. (9)

Give **two** ways in which sparrows might *compete* with each other. (6)

Give **one** way in which a food chain *differs* from a food web. (3)



## 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 diagram shows the moon's orbit around the earth and the direction of light from the sun. It also shows the spin of the earth on its axis and the direction of the lunar orbit.
- (i) How *long does it take* the earth to rotate once on its own axis? (3)
- (ii) How *long does it take* the moon to orbit the earth once? (3)
- (iii) Describe the *appearance* of the moon, viewed from earth, when it is in position C. (3)
- (iv) Explain, using a labelled diagram, how a *lunar eclipse* occurs. (9)

- (b) Name the *type of cloud* shown in the photograph. (3)

How are *clouds formed*? (9)

Why do clouds sometimes *disappear* on hot days? (6)



- (c) The photograph is of a meter that measures the pressure of gases. Read the *pressure in kPa or psi*, from the meter, and *write it* in your answer-book. (3)

Name an *instrument* used to measure the pressure of the atmosphere. (3)

Describe an experiment, using a labelled diagram, to *investigate* the way the *volume of a gas changes with its pressure*. (12)



[Turn over

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

(a) The diagram shows a hardwood cutting in a prepared pot enclosed in a transparent plastic bag.

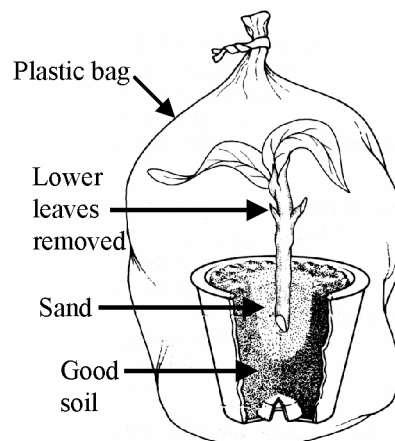
(i) Name a *plant* suitable for propagation in this way. (3)

(ii) The cutting was dipped in a rooting powder prior to being potted. Name **two ingredients** of rooting powder that help the cutting become a healthy new plant. (6)

(iii) Why is the cutting in *sand*? (3)

(iv) Why are the lower leaves *removed*? (3)

(v) Why is the potted cutting in a *transparent plastic bag*? (3)



(b) Describe *soil structure*, which allows for the free movement of gases and water. (6)

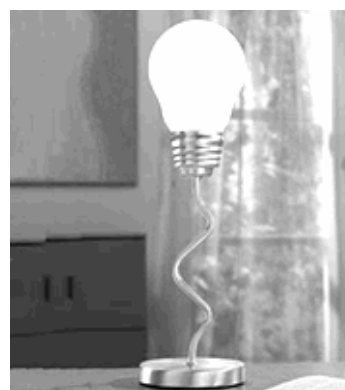
Outline an experiment to measure the *air content* **or** the *water content* of soil. (12)

(c) Outline the *life cycles* of an aphid **or** of the cabbage white butterfly. (12)

Describe a *biological* control and *chemical* control for the pest that you selected. (6)

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

- (a) The photograph shows a table lamp. Name **three materials** that could have been used in its manufacture and say what *property* of each material named makes it suitable for its use in the lamp. (18)



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

(i) **PLASTICS**

Give the **two** stages of the *production* of plastics from crude oil. (6)

Describe an experiment to show that plastics are *good electrical insulators*. (12)

(ii) **METALS**

Metals can be extracted from their ores. What is an *ore*?  
Name a *metal mined* in Ireland. (6)

Describe an experiment to compare the *reactivity* of **two** metals. (12)

(iii) **TEXTILES**

Name **one** plant and **one** animal that are sources of *textile fibres*. (6)

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

(iv) **TIMBER**

Give a *difference* between the leaves of most hardwood trees and the leaves of most softwood trees. (6)

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

**[Turn over**



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

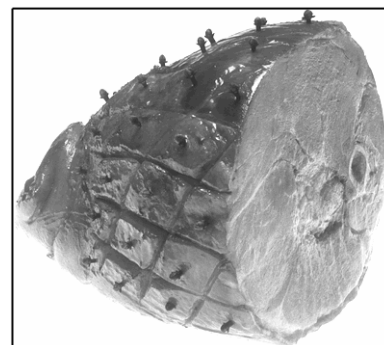
- (a) 100 g of the average apple including the skin, core omitted, contains: sugars 10.4 g, fibre 2.4 g, protein 0.7 g, fat 0.2 g, seven vitamins and six minerals in valuable quantities.

- (i) Give **one** *role* for each of the following in our bodies: *sugars*, *fibre*, *protein* and *fat*. (12)  
(ii) Name **one** *vitamin* and name **one** *mineral* needed in a healthy diet. (6)



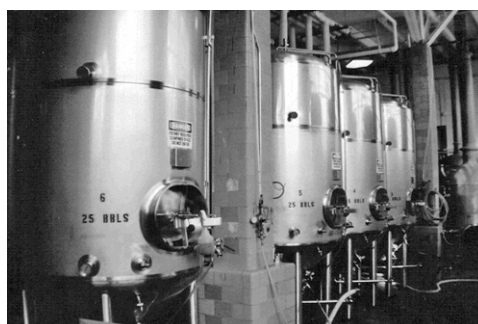
- (b) The photograph shows a *ham*, which has been *cured* and *smoked*. Both add flavour to the meat and both help to *preserve* the meat.

- (i) What is meant by the term '*cured*'?  
How does curing *help* to preserve meat? (6)  
(ii) Meat and fish (e.g. salmon) can be smoked.  
Describe this *process* and say how it *helps* to preserve the food. (9)  
(iii) Name **one** *other method* of food preservation. (3)



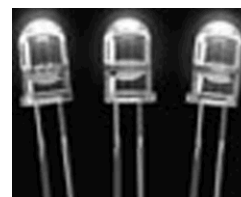
- (c) The photograph shows *fermentation* tanks in a modern brewery.

- (i) What is meant by the term *fermentation* when applied to the production of beer/wine? (6)  
(ii) Describe an experiment to *show fermentation* in a school laboratory. (12)



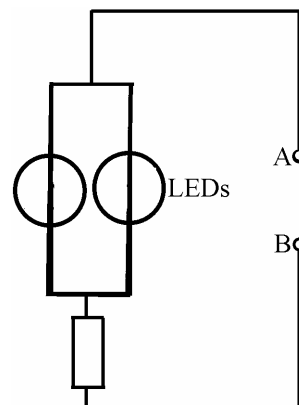
**14. ELECTRONICS.** Answer **both** parts, (a) and (b).

(a) The photograph shows three LEDs.



(i) 'LED' uses the first letter of each word of the name of the device shown. Give the *name in full*. (3)

Copy the incomplete circuit diagram shown into your answer-book. This circuit is to test the polarity (+/-) of a power supply e.g. battery.  
The power supply is connected across **A, B**.

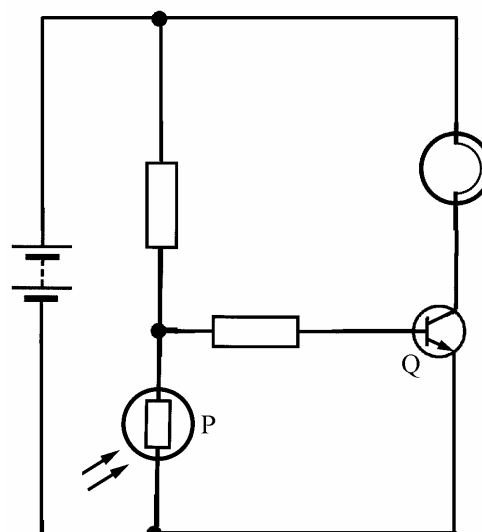


(ii) Complete the *LED symbols* in your diagram. (6)  
(Hint: use **two** different colours of LED)

(iii) Explain how to *use this circuit* to test polarity. (6)

(iv) Give an *everyday use* of LEDs. (3)

(b) The diagram shows a circuit which responds to the brightness of light. Changes in light intensity can turn on or off the lamp.



(i) Name the *components* labelled **P** and **Q** in the diagram. (6)

(ii) What *happens* to component **P** when it gets dark? (3)

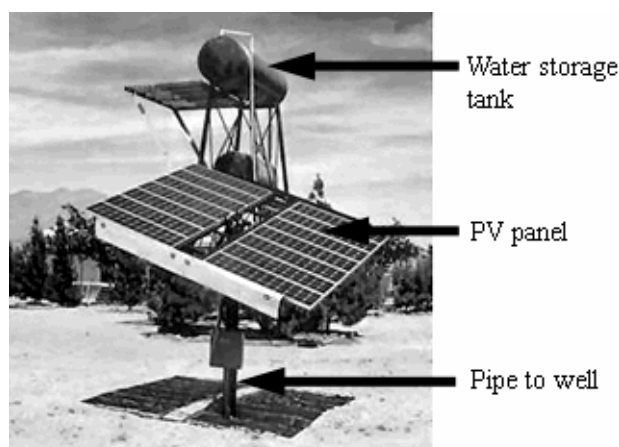
(iii) Draw *component Q* as it appears in the circuit diagram in your answer book and *label* and *name* any **two** of its *terminals*. (6)

(iv) Give an *application* of this circuit. (3)

[Turn over

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

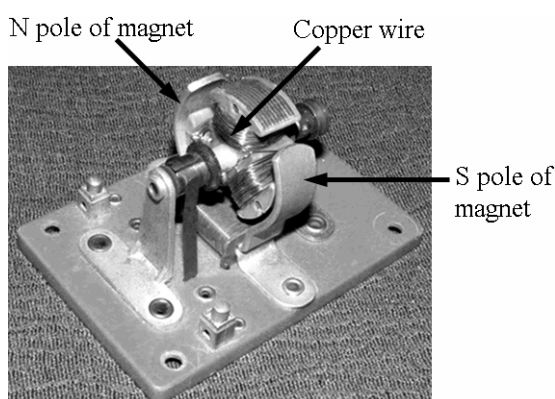
- (a) The photograph shows a solar powered water pump. The PV (solar) panel takes in light energy from the sun. This energy is used by an electric motor to pump water up a pipe from a well to a storage tank. The water in the tank has potential energy. A number of energy conversions occur in this system.



- (i) In the PV (photovoltaic/solar) panel, what *form of energy* is sunlight converted into? (3)
- (ii) Give the *energy conversion* that takes place in the electric motor which operates the water pump. (6)
- (iii) Give the *energy conversion* that occurs when the water is moved up the pipe from the well to the storage tank by the pump. (6)
- (iv) When water is drawn from the tank for use, what *energy conversion* happens? (3)

- (b) The photograph shows a model of an electric motor. It is a simple d. c. motor.

Describe an experiment, apart from turning on an electric motor, to show the *principle of the electric motor* i.e. that a *current carrying conductor in a magnetic field experiences a force*. An appropriately labelled diagram is required with your answer. (12)



Outline, no diagram required, the principle by which a *dynamo* (generator) produces electricity from motion. (6)