

AN ROINN OIDEACHAIS

INTERMEDIATE CERTIFICATE EXAMINATION, 1973

SCIENCE—SYLLABUS A

FRIDAY, 15 JUNE — AFTERNOON, 2 to 4.30

Six questions to be answered, one question at least being chosen from each Section. All the questions carry the same number of marks.

A Periodic Table is given in the Mathematics Tables.

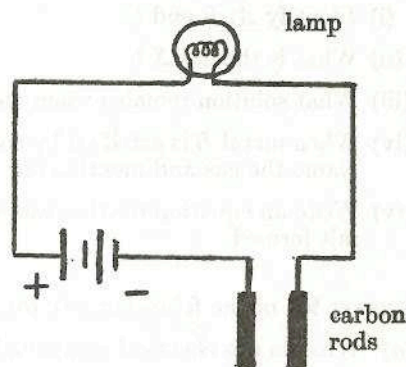
SECTION I

1. What is meant by conduction, convection and radiation of heat?
Describe (a) an experiment to show that water is a poor conductor of heat, (b) an experiment to show that a black surface is a better radiator of heat than a white one.

Explain either (i) or (ii):—

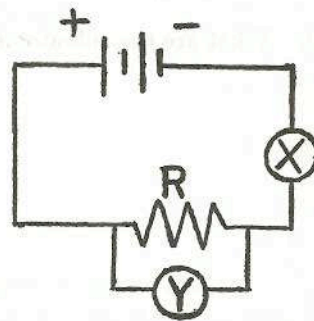
- (i) on cold mornings the metal handlebars of a bicycle feel colder than the handle-grips;
(ii) a metal spoon is often put into a jam jar before hot jam is poured into the jar.

2. (a) An apparatus is set up as shown in the diagram. State what may be observed when the carbon rods are dipped into each of the following and give reasons for your answer: (i) distilled water, (ii) a solution of common salt (sodium chloride) in water, (iii) a solution of sugar in water, (iv) mercury.
(b) Show with the aid of a diagram how electrolysis may be used to demonstrate the composition of water.



3. What is (i) centre of gravity, (ii) moment of a force about a point?
What do you understand by stable, unstable and neutral equilibrium? Illustrate your answer with diagrams.
A metre-stick balances when suspended from its mid-point. If a mass of 50 g is suspended from its 20 cm mark, where must a mass of 75 g be suspended in order to restore balance?
How may the mass of a metre-stick be found using a 20 g mass?

4. Answer ten of the following (a), (b), (c), etc. Keep your answers short.
- (a) A body weighs 12.6 g in air and 9.6 g in water. Write down its volume.
- (b) Name any use made of the fact that liquids normally expand when heated.
- (c) A clean dry razor blade placed carefully on top of water floats. What phenomenon is being demonstrated here?
- (d) What is meant by the potential energy of a body?
- (e) Suggest a reason why water is not normally used in barometers.
- (f) When the blackened bulb of a thermometer is moved through the spectrum of white light, there is a marked rise in temperature just beyond one end of the spectrum. Why is this?
- (g) The circuit used to find the value of the resistance, R , is shown. What meter is used (i) at X , (ii) at Y ?
- (h) What current is taken by an electric fire marked 2 kW, 200 V connected to a 200 volt supply?
- (i) Name the primary colours.
- (j) What is the heat given out when 1 kg of iron cools from 35°C to 25°C , given the specific heat capacity of iron = $440 \text{ J/kg}^\circ\text{C}$?
- (k) What is the wavelength in air of a note of frequency 255 vibrations per second, given that the velocity of sound in air is 340 metres per second?
- (l) For what purpose is a gold-leaf electroscope used?



SECTION II

5. Draw a clearly labelled diagram to show how you would prepare and collect dry ammonia.
Describe the properties of ammonia under the following headings: colour, solubility, reaction to moist litmus, reaction with hydrogen chloride.
How would you show experimentally that ammonia contains hydrogen?
Indicate the shape of the ammonia molecule.
6. Distinguish clearly between a covalent bond and an electrovalent (ionic) bond. State the type of bond in each of the following: (i) hydrogen, (ii) potassium chloride, (iii) methane.
Compare covalent and electrovalent compounds under the following headings: (a) melting and boiling points, (b) solubility, (c) electrical conductivity.
Describe, using a simple diagram, the structure of a sodium chloride crystal.
7. The metals copper, iron and sodium are represented by the letters *A*, *B*, *C*, but not necessarily in that order. Consider the properties of *A*, *B*, *C*, given in the following table and answer the questions below.

	occurrence	reaction with water	reaction with dilute hydrochloric or dilute sulphuric acid
Metal <i>A</i>	never found free in nature	vigorous reaction, giving off <i>X</i>	violent reaction giving off <i>X</i>
Metal <i>B</i>	often found free in nature	no reaction	no reaction
Metal <i>C</i>	rarely found free in nature	when heated it reacts with steam giving off <i>X</i>	<i>X</i> given off

- (i) Identify *A*, *B* and *C*.
(ii) What is the gas *X*?
(iii) What solution remains when metal *A* has reacted with water?
(iv) When metal *B* is acted on by concentrated sulphuric acid and heated, a colourless gas, not *X*, is evolved. Name the gas and mention one of its chemical properties.
(v) Write an equation for the reaction between the metal *C* and dilute sulphuric acid. Give the name of the salt formed.
8. Answer ten of the following, (a), (b), (c), etc. Keep your answers short.
- (a) What is the chemical compound that forms on the inside of kettles and boilers in hard water areas?
(b) Give the name and formula of the compound formed when iron filings and sulphur are strongly heated.
(c) What yellow green gas bleaches a moist red rose petal?
(d) When impure iodine is heated in an evaporating dish a purple vapour rises and pure iodine crystals form on a cold surface above the dish. What is this purification technique called?
(e) What gas is given off when sodium nitrate is heated?
(f) A crowded room has poor ventilation. How does the composition of the air in the room differ from that of the air outside?
(g) Find the heat of combustion of carbon monoxide from the reaction $2\text{CO} + \text{O}_2 = 2\text{CO}_2 + 568 \text{ kJ}$.
(h) Show the structure of an atom of helium.
(i) What does Brownian movement show?
(j) What acid and alkali would you use to prepare sodium chloride?
(k) Which of the following is most likely to be the pH of a concentrated sodium hydroxide solution: 1, 5, 7, 10, 14?
(l) What are the sub-atomic particles in an atom of hydrogen?



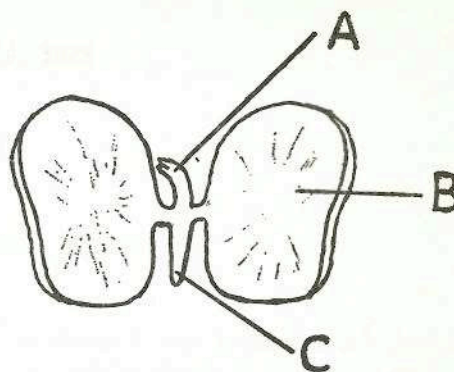
9. Name the parts labelled *A*, *B*, *C*, in the diagram of a dissected seed. State the function of each part.

Describe with the aid of labelled diagrams an experiment to show that energy is liberated during the germination of a seed. Name the process involved.

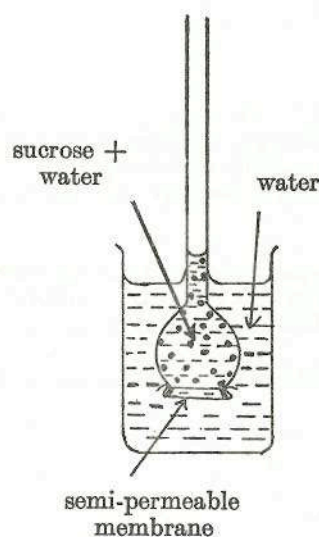
Complete the equation to illustrate the process:



Give two ways in which a seed in its pod may be compared to a baby in its mother's womb.



10. (a) Consider the experiment shown in the diagram. State what could be observed after some time. Explain what happens during the experiment. Suggest how water enters root hairs.
- (b) Describe briefly how carbon dioxide and oxygen are exchanged in the lungs. How is oxygen carried in the blood?

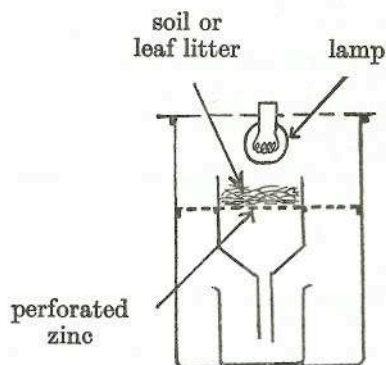


11. Describe an experiment to show the existence of bacteria in soil. Mention some simple precautions you would take to avoid the spread of harmful bacteria during the experiment.

State two ways in which bacteria play a part in the nitrogen cycle in a habitat.

List three soil factors, other than bacteria and nitrogen, which affect the distribution of plants in a habitat.

Explain briefly how the apparatus shown in the diagram separates small animals from soil or leaf litter.



12. Answer ten of the following (a), (b), (c), etc. Keep your answers short.

- Give one example of plant and animal interdependence.
- What are hormones?
- What food substance is acted upon by the enzyme lipase during digestion?
- Name two excretory organs in the mammalian body.
- Which one of the following gives a deep blue colour when tested with iodine solution: glucose, peptide, protein, starch, sucrose?
- List two atmospheric conditions which would increase the rate of transpiration.
- Which of the following is the source of oxygen for fish:
 - the oxygen in the air over the water,
 - the oxygen combined with the hydrogen in the water,
 - the oxygen dissolved in the water?
- Give one function of calcium in the animal body.
- Which two of the following produce male gametes: stigma, testis, nectary, ureter, anther, penis?
- What substance is responsible for the difference in nutrition between green plants and fungi?
- Suggest why the walls of the left ventricle of the mammalian heart are thicker than the walls of the right ventricle.
- Mention the protective function of (i) the skull, (ii) the backbone.