

WARNING

You must return this paper with your answerbook, otherwise marks will be lost.

AN ROINN OIDEACHAIS

JUNIOR CERTIFICATE EXAMINATION, 1996

46442

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

TUESDAY, JUNE 11 — AFTERNOON 2.00 — 4.30

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

(See separate sheet for Sections B, C, D, 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) The densities of mercury, lead and gold are 13.6 g cm^{-3} , 11.3 g cm^{-3} and 19.3 g cm^{-3} respectively. What will happen when (i) a piece of lead, (ii) a piece of gold, is placed in a beaker of mercury?

(i) _____ (ii) _____

- (b) A car starts from rest with a constant acceleration of 6 m s^{-2} . How long will it take to reach a speed of 30 m s^{-1} ? _____

- (c) What is meant by the term biomass? _____

Give an example of biomass. _____

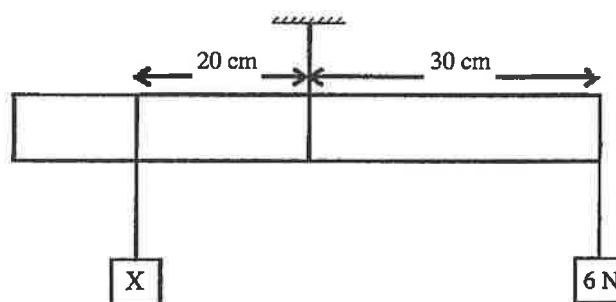
- (d) Underline the two renewable energy sources in the following list:

oil, wind, gas, coal, hydroelectric.

- (e) The diagram shows a uniform lever suspended at its mid-point which is balanced under the action of two weights as shown.

Calculate the moment of the 6 N weight.

Calculate the value of the weight X.



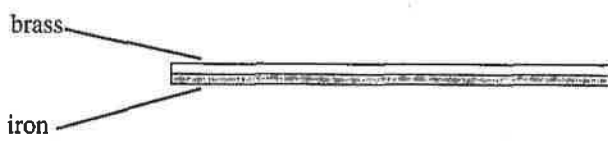
- (f) What is the main way in which heat is transferred when
- (i) the water in an electric kettle is heated? _____
 - (ii) the Sun heats the Earth? _____

(g) Give a reason why water is not a suitable liquid for use in thermometers.

- (h) State the effect of increased pressure on
- (i) the boiling point of water. _____
 - (ii) the melting point of ice. _____

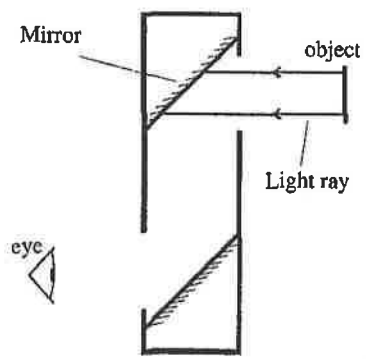
(i) Name the object shown in the diagram.

Give a common use for this object.



(j) The diagram shows a periscope.

Complete the path of **one** of the two light rays from the object to the eye of the observer.



(8 x 6 marks)

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

- (a) An atom is made up of a _____ surrounded by _____
- (b) Name one mixture in each case that may be separated by
 - (i) filtration. _____
 - (ii) distillation. _____
- (c) In an exothermic reaction heat is _____
An example of an exothermic reaction is _____

- (d) Iron filings are observed to increase in mass after rusting.
Explain this observation. _____

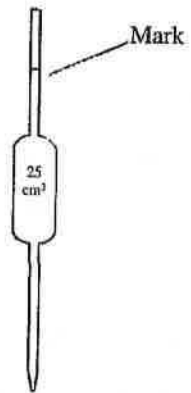
(e) State two of the requirements for a fire to continue burning.

1. _____
2. _____

(f) Complete and balance the following equation.



(g) Name the piece of glassware shown in the diagram.



What is the purpose of the mark on the stem?

(h) Name a gas which dissolves in rainwater to form acid rain. _____

What harm is caused by acid rain? _____

(i) Give an effect of hardness in water. _____

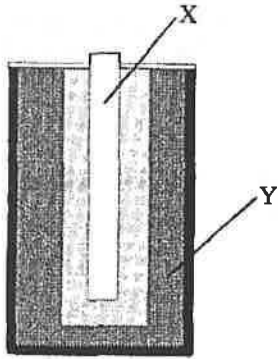
How may temporary hardness in water be removed? _____

(j) The diagram shows a dry cell.

Name the substances X and Y.

X _____

Y _____



(8 x 6 marks)

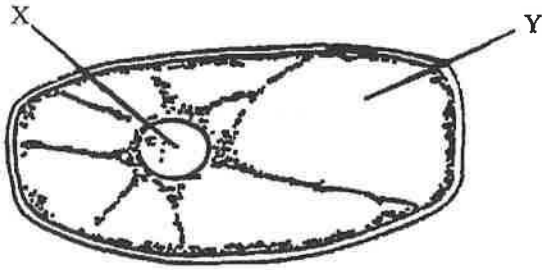
3. Answer eight of the following (a), (b), (c) etc.

(a) The diagram shows a plant cell.

Name the parts labelled X and Y.

X _____

Y _____



(b) What is meant by geotropism? _____

How does geotropism affect the shoot of the plant? _____

(c) The five stages of human nutrition are
ingestion, digestion, absorption, assimilation and egestion.

Explain the underlined terms.

digestion _____

assimilation _____

(d) Name a chamber of the human heart. _____

Give the function of the part of the heart which you have named. _____

(e) Name one part of blood. _____

State the function carried out by the part of the blood which you have named. _____

(f) State two locations in the human body where there is a synovial joint.

(i) _____

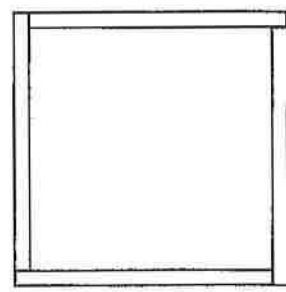
(ii) _____

(g) Name an endocrine gland in the human body. _____

Name a hormone released by the gland which you have named. _____

(h) Name the piece of apparatus, shown in the diagram, which is used in fieldwork.

State the use you would make of the apparatus.



(i) Water moves through the stem of a plant in tissue called _____ and food moves in tissue called _____

(j) In order for photosynthesis to occur _____ and _____ must be present.

(8 x 6 marks)

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SECTION A

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** questions 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) What is meant by the centre of gravity of a body? (3)

Describe how you would determine the centre of gravity of a sheet of plywood. (9)

Explain why the centre of gravity of a double decker bus should be as low as possible? (6)

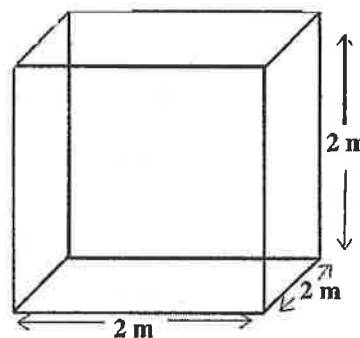
- (b) What is meant by weight?

Calculate the weight of an object of mass 10 kg. ($g = 10 \text{ m s}^{-2}$) (6)

The object was then moved to the Moon, where the value of the acceleration due to gravity, g , is one-sixth of the Earth's. What is now (i) the mass, (ii) the weight, of the object? (6)

- (c) Define pressure. State the unit in which pressure is measured. (9)

A cube of side length 2 metres as shown in the diagram has a mass of 16 kg. If the cube is lying with one face on the ground, calculate the pressure exerted by the cube on the ground. ($g = 10 \text{ m s}^{-2}$). (6)



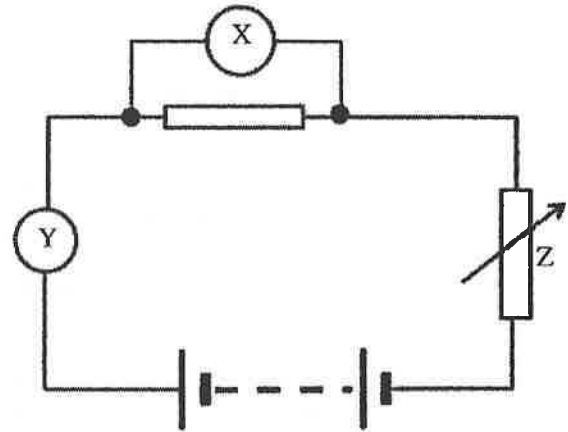
Why is the water storage tank of a house usually situated in the attic? (3)

5. (a) State Ohm's law.

(6)

The circuit shown was used in an experiment to verify Ohm's law.

- (i) Name the meter X. (3)
- (ii) State the measurements which should have been taken during the experiment. (6)
- (iii) What would you expect the reading on meter X to be when the reading on meter Y is 1.5? (6)
- (iv) State the function of the part Z. (3)



Sketch the graph which you would expect to obtain from the experiment.

(6)

(b) The diagram shows part of an E.S.B. bill for electricity used in a house.

Meter Readings		Units and Rate (pence)	Description	Amount (CR = Credit)
Present	Previous			
53233	52427	N x 7.14	GENERAL DOMESTIC	57.55
			STANDING CHARGE	6.60
			SPECIAL DISCOUNT	3.05 CR
		VAT @ 12.5% on	£61.10	7.64
	
	ELECTRICITY	CHARGES THIS	PERIOD ...	68.74

- (i) What is the scientific term for the unit used by the E.S.B. in its bills? (3)
- (ii) Calculate from the E.S.B. bill above the number of units, N, of electricity used. (3)

(c) What is meant by the power rating of an appliance? (3)

Name

- (i) a domestic appliance which has a low power rating;
- (ii) a domestic appliance which has a high power rating. (3)

State the function of a fuse. Give an example of an appliance which would require a 3 ampere fuse. (6)

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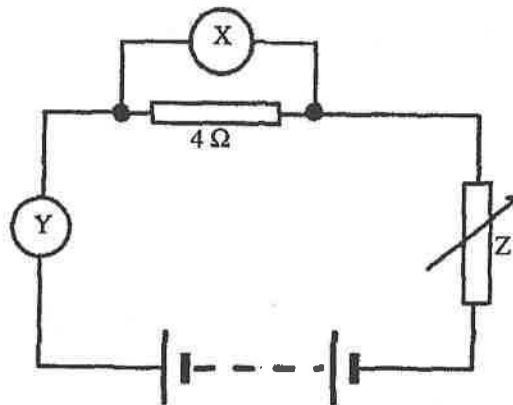
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5. (a) Diagram



Question 5 (a) Diagram

The value (4Ω) under the component under \textcircled{X} was omitted from English Versions of this paper. Please ensure that the candidates amend the diagram. The fully correct diagram is shown above.

SECTION C — CHEMISTRY (48 marks)

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

6. (a) Define atomic number. (3)

State the group number in the Periodic Table of (i) the alkali metals, (ii) the halogens. (3)

Name one alkali metal and one halogen. (3)

Describe how you would examine the reaction of the alkali metal, which you have named, with water. Give the equation for the reaction. (9)

State the type of bond which is formed between the alkali metal you named and the halogen you named. Show with the aid of a sketch how the bond is formed. (6)

(b) What is a fuel?

Explain how fossil fuels are formed. (9)

The products of the reaction which occurs when natural gas (CH_4) is burned are carbon dioxide and water.

Describe a chemical test you would perform to show that a particular colourless liquid is water. (6)

Draw a labelled diagram of the apparatus you would use to prepare carbon dioxide in the laboratory. (6)

Give two everyday uses of carbon dioxide. (3)

7. (a) Diagram (i) shows the apparatus used in the electrolysis of water.

State a substance from which the electrodes could be made. (3)

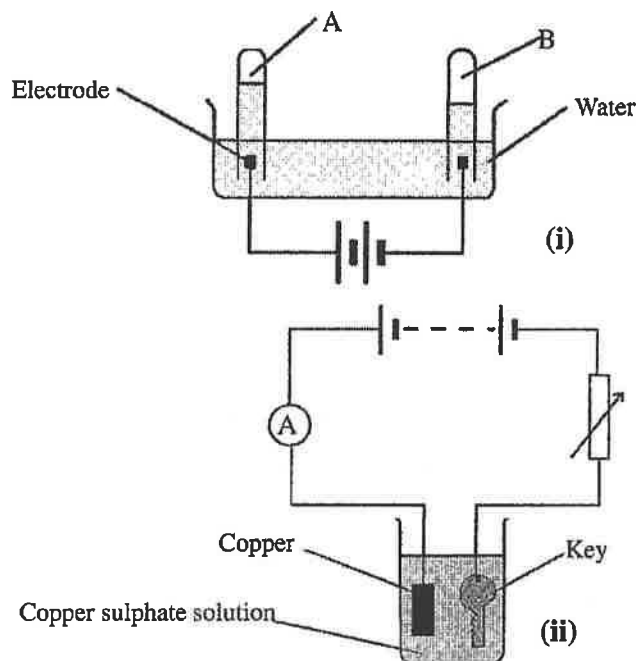
Name A and B. (6)

What information does this experiment give about the composition of water? (3)

What substances must be added to the water so that a current will pass? (3)

What will be observed to occur when a current is passed in the circuit shown in diagram (ii)? Explain your observation. (6)

Give an industrial use for this type of process. (3)



(b) What is (i) an acid, (ii) a base? (6)

Name and give the chemical formula of (i) an acid and (ii) a base. (6)

Give a balanced chemical equation for the reaction between the acid and the base which you have named. (3)

What is this type of reaction called? (3)

Sketch the apparatus which you would use when carrying out this experiment accurately in the laboratory. (6)

SECTION D — BIOLOGY (48 marks)

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

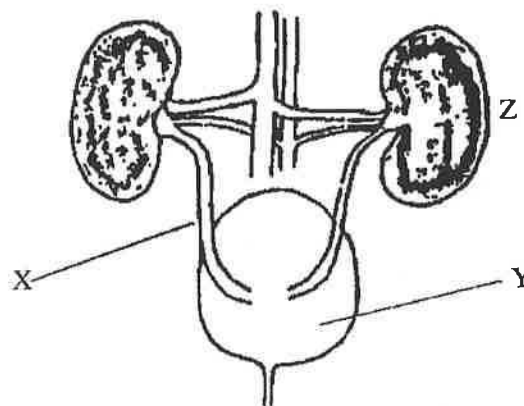
8. (a) Carbon dioxide and urine are among the substances excreted by the human body.

The diagram shows the urinary system in the human.

Identify and give the function of each of the parts labelled X, Y and Z. (12)

Name the organ through which carbon dioxide is excreted.

Describe an experiment to compare the amount of carbon dioxide in exhaled air and in inhaled air. (12)



- (b) Explain the terms (i) sensory nerve, (ii) motor nerve. (6)

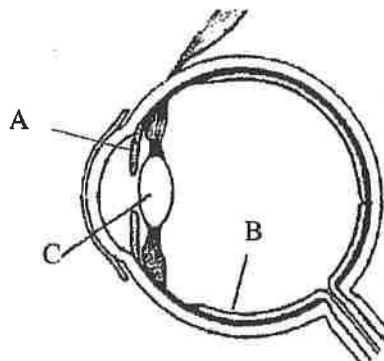
A person accidentally touches a hot surface with the hand and the hand is then rapidly withdrawn. Explain how the sensory and motor nerves acted to protect the person from a severe burn. (6)

The diagram shows the eye.

Name the parts labelled A and B. (6)

Give the function of the part labelled C. (3)

Where is the blind spot of the eye? (3)



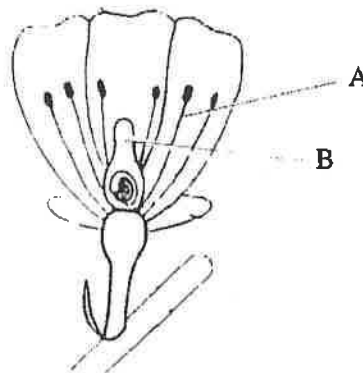
9. (a) What is meant by sexual reproduction?

Describe how sexual reproduction occurs in the flowering plant. (12)

The diagram shows a flower.

Name the parts labelled A and B.

State the function of each part. (12)



- (b) Name two plants and two animals from a habitat which you have studied.

Select one of the plants and one of the animals which you have named and explain how each has adapted to its habitat. (12)

Give a food chain (with three members) from the habitat. (3)

Describe a laboratory experiment to measure the percentage of air in a soil sample. (9)

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 Earth and the Sun are part of the Solar System which is in the galaxy called the Milky Way.
- (i) State two differences between the Earth and the Sun. (3)
 - (ii) Describe briefly the Milky Way galaxy. (6)
 - (iii) Outline the life cycle of a star. (9)
- (b) The Moon orbits the Earth and it is the major influence on our tides. During the month the Moon, as seen from the Earth, changes in appearance. These changes are called the phases of the Moon.
- (i) Explain how the Moon influences tides on the Earth. (9)
 - (ii) Why does the Moon's appearance change during the course of each month? (6)
 - (iii) What causes a lunar eclipse? (3)
- (c)
- (i) Because of the greenhouse effect the Earth is sufficiently warm to support life as we know it. What causes the greenhouse effect? (6)
 - (ii) List three measurements which are made by meteorologists in recording and forecasting the weather. Name the instrument used in each case. (6)
 - (iii) Explain how clouds are formed. (6)

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

- (a) What is meant by grafting?
- Give an advantage of grafting. (9)
- Describe, using a diagram, how grafting may be carried out. (9)
- (b) Name three grasses found in lawn seed mixtures. (6)
- Name a grass which must be included in a seed mixture for
- (i) a football pitch;
 - (ii) a golfing green?
- Give a reason for your choice in each case. (9)
- Give an identifying characteristic of **one** of the grasses which you named. (3)
- (c) Name two common garden insect pests. (3)
- Describe the life cycle of one of the insects which you have named. (12)
- Explain how you would control this insect in the garden. (3)

12. MATERIALS SCIENCE. Answer both parts.

- (a) Name (i) a natural textile, (ii) a synthetic textile. Give an example of a textile which is a mixture of natural and synthetic fibres. State an advantage of this textile. (9)

Sketch a care symbol commonly found on clothing and state what the symbol means. (6)

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

(i) **PLASTICS**

Name two common plastics. (6)

Describe an experiment to compare the densities of the two plastics. (15)

(ii) **METALS**

Name a commonly used metal and the ore from which it is extracted. (6)

Describe an experiment to compare the flexibility of two named metals. (15)

(iii) **TIMBER**

Name **one** hardwood and **one** softwood. (6)

Describe an experiment to show the effect of grain direction on the strength of a piece of timber. (15)

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

- (a) (i) What is a protein? (3)

(ii) Give the function of protein in the diet. (3)

(iii) Give two sources of protein. (3)

(iv) Describe how you would carry out a laboratory test to show the presence of protein in a food. (9)

- (b) What is meant by (i) curing, (ii) smoking, meat? (6)

State the basic principles involved in (i) the curing, (ii) the smoking, of meat. (6)

Indicate the undesirable side-effects of **either** hormones **or** antibiotics when used in food production. (6)

- (c) Describe an experiment to compare what happens to (i) cooked food, (ii) uncooked food, which is exposed to the air. (9)

Explain how food is preserved by dehydration. (6)

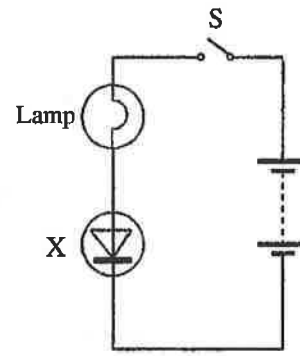
What is meant by an anti-oxidant? (3)

14. ELECTRONICS. Answer each part.

(a) The circuit shown contains a switch S.

Name the device X. (3)

What term is used to describe the way X is arranged in the circuit? (3)



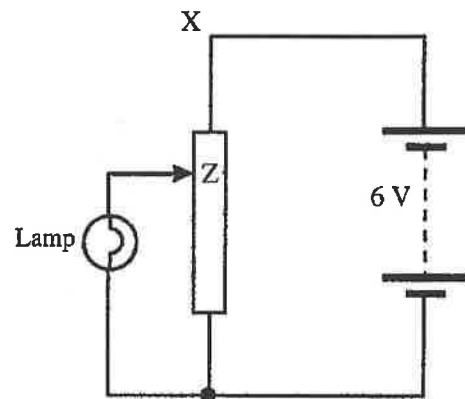
State what you would observe when switch S is closed. (3)

Give another use which can be made of X. (3)

(b) State the function of the potentiometer in the circuit shown below. (3)

State what happens to the lamp as the contact Z moves towards X.

Explain your answer. (6)



(c) What is a transducer?

Name two electrical transducers. (9)

Give the circuit symbol for (i) a transistor, (ii) a light dependent resistor (LDR). (6)

15. ENERGY CONVERSIONS. Answer both parts.

(a) What is meant by kinetic energy? (3)

Name a device, one in each case, in which the following energy conversions take place

(i) chemical energy to electrical energy;

(ii) electrical energy to kinetic energy;

(iii) kinetic energy to heat energy. (9)

State an energy conversion which takes place in the light bulb. (3)

(b) The diagram shows a circuit containing a coil and a galvanometer.

Describe what is observed as the magnet is moved into the coil. Explain your answer. (6)

Name a device which is based on the principle being demonstrated here. (3)

Outline how the device you have named operates. (12)

