

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

ADDITIONAL COMBINED SCIENCE

5130/02

Paper 2

October/November 2004

Additional Materials: Answer Paper

2 hours 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer **one** part of each of the three questions.
Write your answers on the separate answer paper provided.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.
A copy of the Periodic Table is printed on page 20.

For Examiner's Use	
Section A	
11	
12	
13	
Total	

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

This document consists of **19** printed pages and **1** blank page.



Section A

Answer **all** the questions.

Write your answers in the spaces provided on the question paper.

- 1 A student investigates how the activity of an amylase enzyme varies with temperature. Her results are shown in the bar chart in Fig. 1.1.

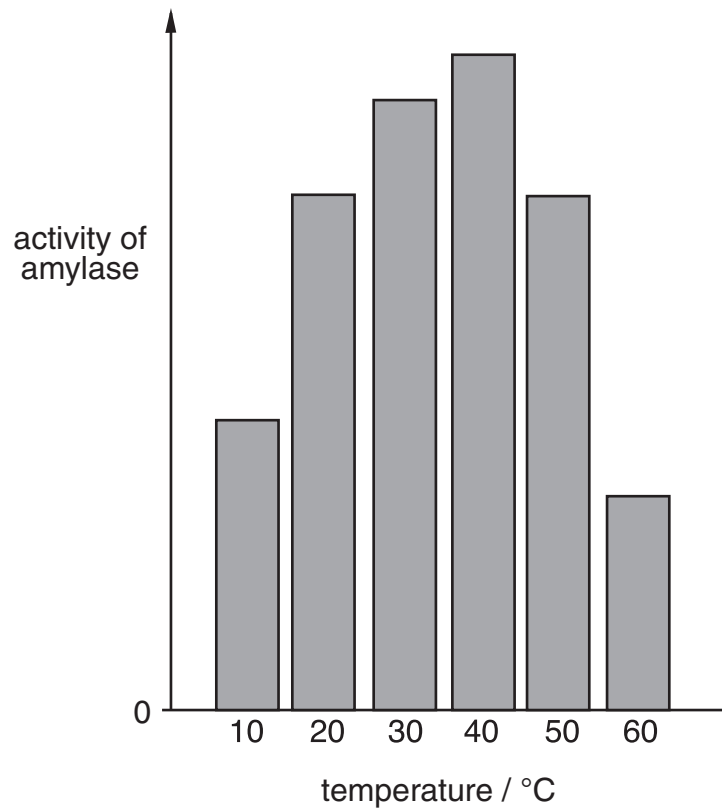


Fig. 1.1

- (a) (i) What is an *enzyme*?

.....
 [2]

- (ii) Describe the reaction that is helped by amylase.

.....
 [2]

(b) (i) Use Fig. 1.1 to describe the effect of increase in temperature on the activity of the amylase.

.....
.....
.....[2]

(ii) Explain the change in activity of the amylase above 40 °C.

.....[1]

(c) State two conditions which must be the same for each experiment in this investigation.

1
.....
2
.....[2]

- 2 Fig. 2.1 contains definitions of three scientific terms.
Choose the correct terms from the list to complete the table.

diffusion

mass

osmosis

polyester

protein

weight

scientific term	definition
	the movement of gas molecules, from a region of their higher concentration to a region of their lower concentration, down a concentration gradient
	a macromolecule made by joining together amino acids
	a measure of the amount of substance in a body

Fig. 2.1

[3]

3 Crude oil is a mixture of many different hydrocarbons. Before use the crude oil is separated into several fractions.

(a) The list contains some of the apparatus that is used to separate crude oil into fractions in the laboratory.

condenser

five test-tubes

flask

thermometer

(i) Draw a diagram of the apparatus after it has been set up.
Label each piece of apparatus.

[4]

(ii) Mark with **C** on your diagram the place where you would put the crude oil and mark with **F** the place where you would obtain one of the fractions. [2]

(b) Name and give a use for two of the fractions obtained from crude oil.

1

.....

2

.....[4]

- 4 Fig. 4.1 shows a light ray being reflected from the surface of a mirror.

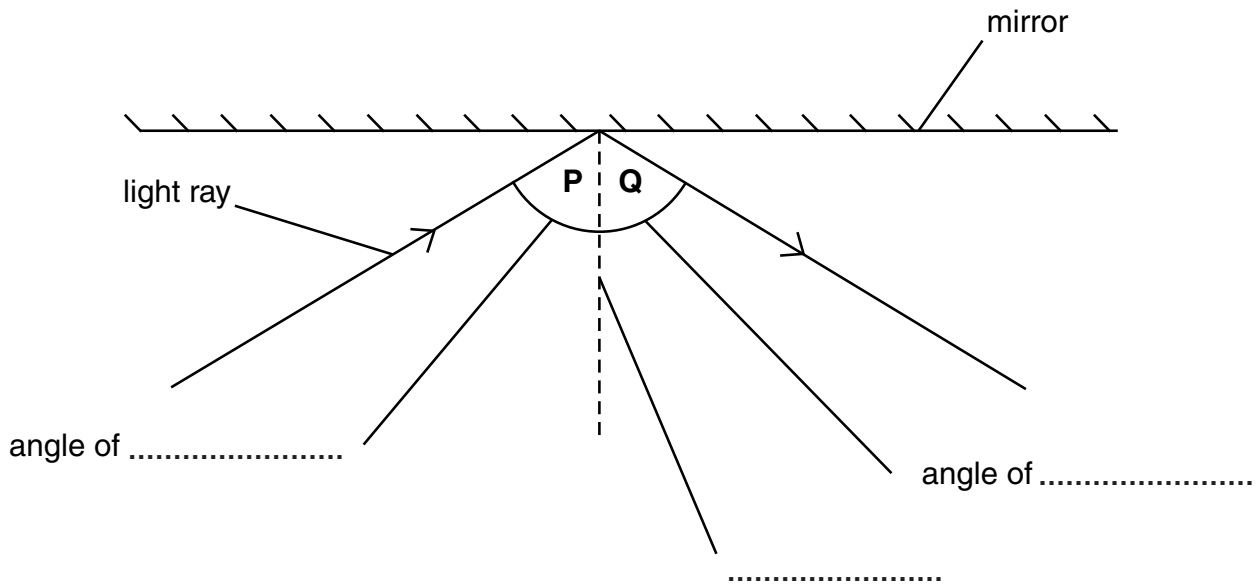


Fig. 4.1

- (a) (i) Complete the three labels in Fig. 4.1. [3]

- (ii) What is the relationship between the angles **P** and **Q**?

.....[1]

- (b) Light can also be reflected using a prism. Fig. 4.2 shows two prisms being used in a periscope.

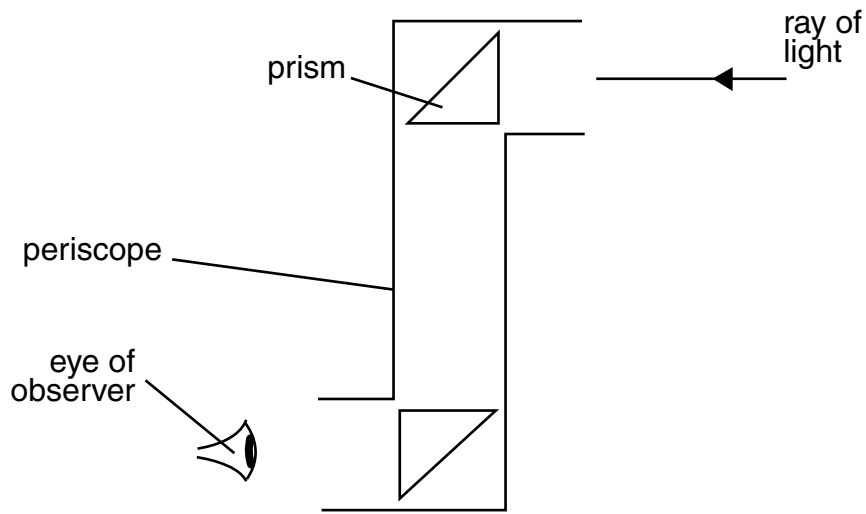


Fig. 4.2

- (i) Complete the ray of light in Fig. 4.2 to show how it passes through the periscope to the eye of the observer. [1]
- (ii) When a ray of white light hits a prism at an angle different from that shown in the periscope, dispersion occurs. Complete Fig. 4.3 to show this dispersion.

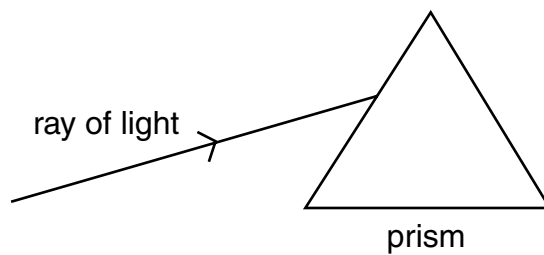


Fig. 4.3

[3]

- 5 Fig. 5.1 shows how the concentration of sugar in the leaves and stem of a green plant varies during one day.

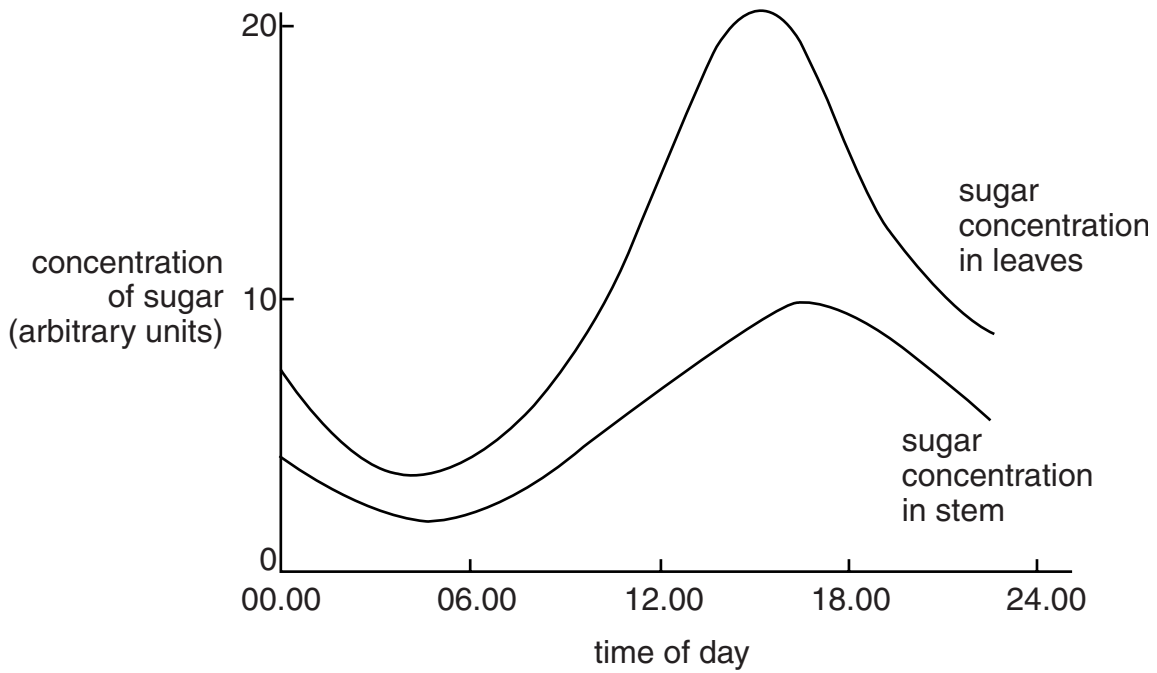


Fig. 5.1

- (a) Plants make their own food in the form of sugar.

(i) Name the process by which sugar is produced.

.....[1]

(ii) Complete the word equation for this process.

_____ + _____ → glucose + oxygen [2]

- (b) (i) Using the graph, describe how the concentration of sugar in the leaves varies during a 24 hour period.

.....
[2]

(ii) Suggest an explanation for these changes in concentration.

.....

[2]

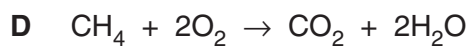
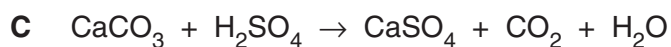
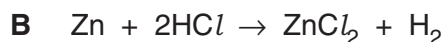
- (c) Fig. 5.1 shows that the highest sugar concentration in the leaves occurs at about 15.00 hours, but the highest concentration of sugar in the stem occurs at about 16.00 hours. Suggest an explanation for this.

.....

.....

.....[2]

6 Study these symbol equations.



(a) Choose from the letters **A**, **B**, **C**, **D** and **E** to answer the following questions. You may use each letter once, more than once, or not at all.

(i) Which equation shows the production of a flammable gas?

.....[1]

(ii) Which equation shows a neutralisation reaction?

.....[1]

(iii) Which equation shows the combustion of a fuel?

.....[1]

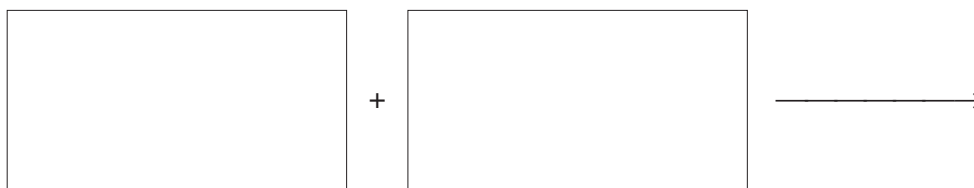
(iv) Which equation shows the synthesis of a compound from elements?

.....[1]

(v) Which equation does **not** show the formation of a salt?

.....[1]

(b) Write in the boxes the word equation for the symbol equation **C**.



[2]

Turn to page 12 for Question 7.

- 7 Fig. 7.1 shows a fairground ride with chairs carried round on a wheel.

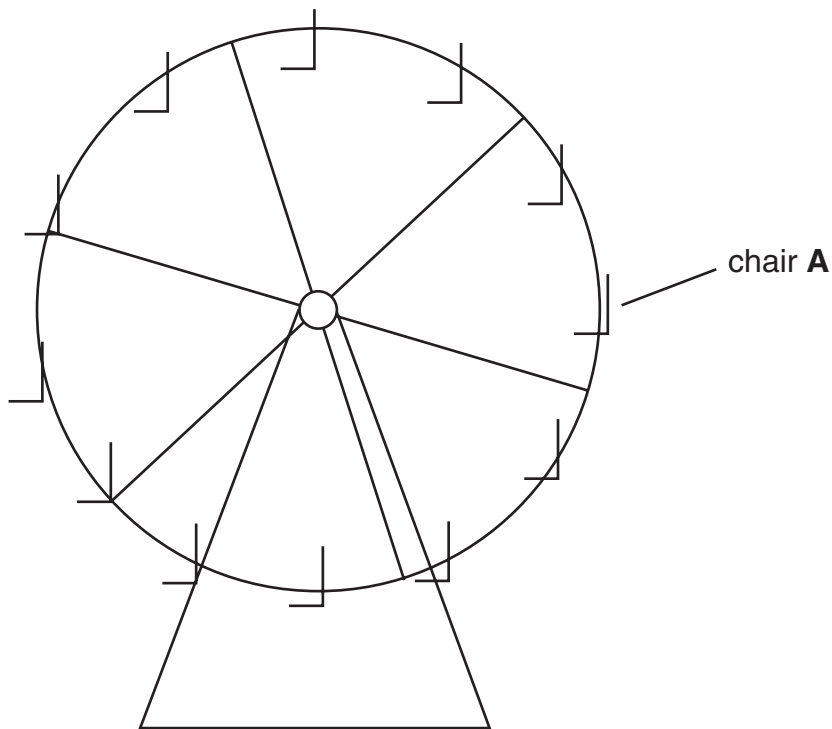


Fig. 7.1

- (a) The average mass of one chair occupied by a person is 200 kg.
The radius of the wheel is 10.5 m.
- (i) What is the average weight, in Newtons, of one chair occupied by a person?
(The weight of 1 kg mass is 10 N)

weight = _____ N [1]

- (ii) Calculate the work done when an occupied chair is raised from the bottom of the wheel to the top.
Show your working and give the unit for your answer.

work done = _____ unit _____ [4]

- (b) The circumference of the wheel is 66 m.
The wheel makes one turn each minute.
Calculate the speed at which each chair travels.
Show your working and give your answer in m/s.

speed = _____ m/s [2]

- (c) Calculate the moment about the centre of the wheel caused by the weight of chair **A** and its occupant.
Show your working and give the unit for your answer.

moment = _____ unit _____ [3]

8 Fig. 8.1 gives information about six foods.

food	% water	% carbohydrate	% fat	% protein
cheese	39	0	35	25
eggs	78	0	10	12
fish	77	0	3	18
beans	12	60	1	20
maize	10	78	1	8
meat	63	0	18	18

Fig. 8.1

(a) From Fig. 8.1, choose **one** food that would provide a lot of energy.
Give a reason for your choice.

.....

[2]

(b) A man has a heart attack. He is told that avoiding certain foods will help to prevent him having a second heart attack.

(i) Suggest two foods in Fig. 8.1 that he should avoid.

.....
[2]

(ii) Give a reason for your choice.

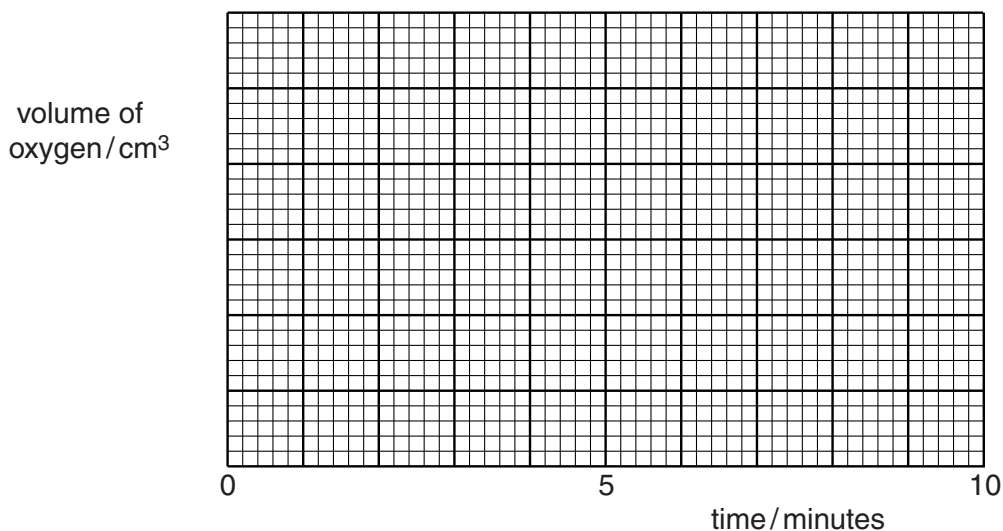
.....
[1]

- 9 Hydrogen peroxide decomposes into water and oxygen.
The reaction is catalysed by the black solid manganese(IV) oxide.
In an experiment, 1.0 g of manganese(IV) oxide was added to a solution of hydrogen peroxide and the volume of oxygen released was measured every minute.
The results of this experiment are shown in Fig. 9.1.

time / minutes	0	1	2	3	4	5
volume of oxygen / cm ³	0	15	23	26	27	27

Fig. 9.1

- (a) (i) Plot the results on the grid. [2]
(ii) Draw a smooth curve through the points.
Label this curve **A**. [1]



- (b) The experiment is repeated with all conditions kept the same, except that the hydrogen peroxide is diluted with an equal volume of water.
Sketch on the grid the curve you would expect for this repeat experiment.
Label this curve **B**. [2]

- 10 Fig. 10.1 shows the decay curve for a radioactive isotope.

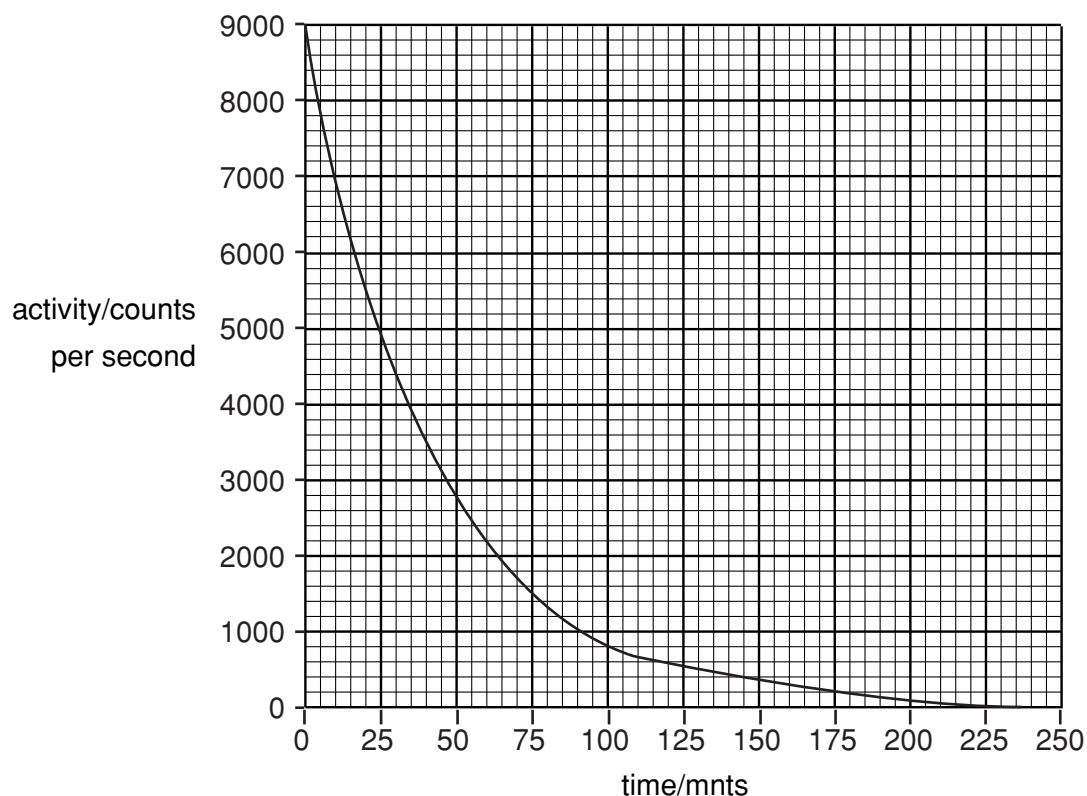


Fig. 10.1

- (a) What is meant by the term *radioactivity*?

.....
 [2]

- (b) Use the graph to find the half-life of this radioactive isotope.
 Show on the graph how you work out your answer.

half-life = _____ minutes [2]

Section B

Answer **one** part, **(a)** or **(b)**, of each of the three questions.

Write your answers on the separate answer paper provided.

11 Either

- (a) (i)** Explain how pollen from one plant can fertilise the ovules of another plant. Include in your answer descriptions of transfer of pollen and fertilisation of ovules. [5]
- (ii)** The colour of fruit produced by a plant is controlled by a pair of alleles. Red is the dominant colour and yellow is recessive. A farmer uses pollen from a heterozygous red-fruited plant to fertilise the flowers of a homozygous yellow-fruited plant. He uses the seeds from the fruit of this plant to grow 100 new plants. Predict and explain the number of yellow-fruited plants that he obtains. You may use a genetic diagram to make your answer clear. Use the symbol **R** for the dominant allele and **r** for the recessive allele. [5]

Or

- (b) (i)** The body temperature of a human varies little despite large changes in the temperature of the surroundings. Describe how humans maintain a constant body temperature. [4]
- (ii)** Explain how urea is excreted from the human body. In your answer give details of the route followed by urea from the liver where it is formed, until it is removed from the body. Why is it essential for urea to be removed from the body? [6]

12 Either

(a) In the Periodic Table, Group I contains the alkali metals and Group VII contains the halogens.

- (i) Describe trends in the properties of the elements in these two Groups of elements. [6]
- (ii) Sodium is an alkali metal with the electron arrangement 2,8,1 and chlorine is a halogen with the electron arrangement 2,8,7.
Using this information, draw a diagram to show bonding in the compound sodium chloride. [4]

Or

(b) Copper metal is purified by electrolysis.
A simplified diagram of the cell used is shown in Fig. 12.1.

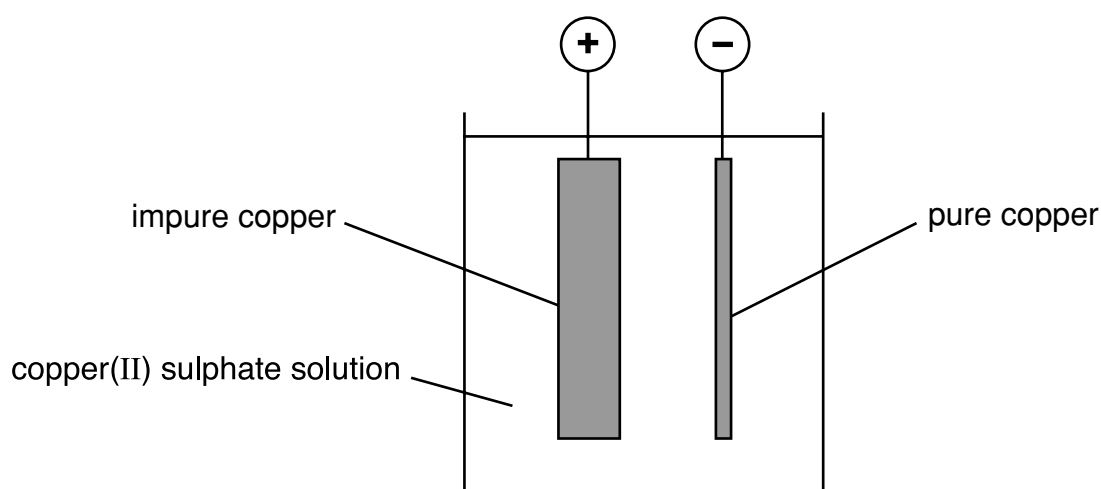


Fig. 12.1

- (i) Write ionic equations for the reactions taking place at the electrodes. [4]
- (ii) Describe and explain any changes in the mass of the electrodes and in the concentration of the solution. [6]

13 Either

- (a) A student did an experiment to find the resistance of a piece of wire. Her results are shown in Fig. 13.1.

potential difference across wire /volts	current in circuit /amps
0.3	0.5
0.6	1.0
0.9	1.5
1.2	2.0

Fig. 13.1

- (i) Describe how the student could have carried out this experiment. Include a circuit diagram in your answer. [6]
- (ii) Explain how the student's results are consistent with Ohm's Law. Why does an electric light bulb not obey Ohm's Law? [4]

Or

- (b) Fig. 13.2 shows apparatus used to test the thermal conductivity of a copper rod and a plastic rod.

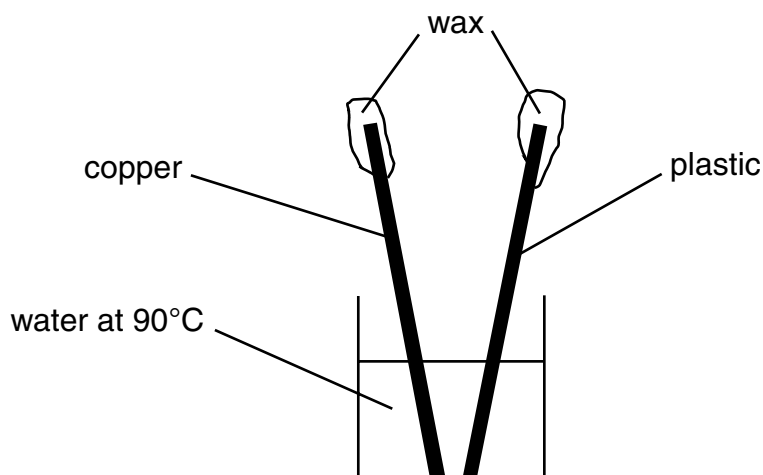


Fig. 13.2

- (i) Describe the results you would expect from this experiment. Explain your answer in terms of the behaviour of electrons, atoms and molecules. Describe how the different thermal properties of copper and plastic are used in the kitchen. [7]
- (ii) Metals expand when heated. Describe and explain one everyday consequence of the thermal expansion of metals. [3]

DATA SHEET
The Periodic Table of the Elements

		Group																		
I	II	III	IV	V	VI	VII	0													
		1 H Hydrogen 1					4 He Helium 2													
7 Li Lithium 3	9 Be Beryllium 4		11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10												
23 Na Sodium 11	24 Mg Magnesium 12		27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18												
39 K Potassium 19	40 Ca Calcium 20		45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36		
85 Rb Rubidium 37	88 Sr Strontium 38		89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Tc Technetium 43	106 Ru Ruthenium 44	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	127 I Iodine 53	128 Te Tellurium 52	131 Xe Xenon 54			
133 Cs Caesium 55	137 Ba Barium 56		139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	212 Po Polonium 84	210 Rn Radon 86				
87 Fr Francium	226 Ra Radium 88		227 Ac Actinium 89																	

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71		
232 Th Thorium 90	238 U Uranium 92	238 Pa Protactinium 91	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

a	X	b
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Key

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)