



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

* 2 3 2 2 1 7 2 4 2 7 *

COMBINED SCIENCE

0653/32

Paper 3 (Extended)

October/November 2010

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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, tables or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

A copy of the Periodic Table is printed on page 20.

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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

This document consists of **20** printed pages.



1 Fig. 1.1 shows some stages in the formation of a human fetus.

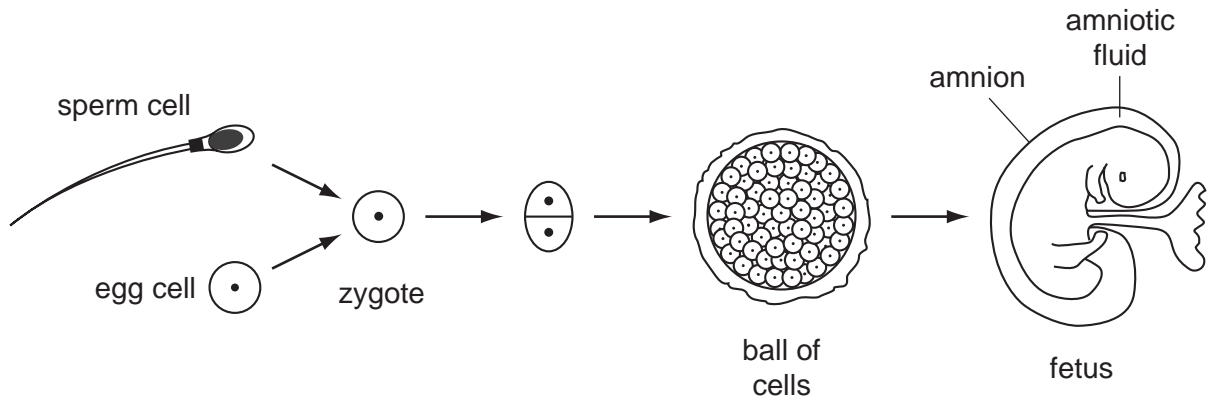


Fig. 1.1

For
Examiner's
Use

(a) Most human cells contain 46 chromosomes, but egg cells and sperm cells contain only 23 chromosomes each.

Suggest a reason for this.

.....
 [1]

(b) Name the part of the reproductive system in which each of these events takes place.

(i) Eggs are produced. [1]

(ii) Fertilisation takes place. [1]

(c) Describe the function of the amnion.

.....

 [2]

(d) A disease called thalassaemia is caused by a person's genes.

The haemoglobin gene has two alleles, **T** and **t**. A person with the alleles **tt** has thalassaemia, but a person with alleles **Tt** does not.

(i) State which allele, **T** or **t**, is dominant. Explain your answer.

allele

explanation

..... [1]

(ii) Complete the genetic diagram to show how two parents who do not have thalassaemia could have a child with thalassaemia.

phenotypes of parents

man without
thalassaemia

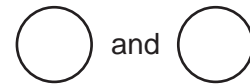
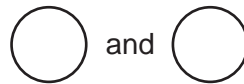
woman without
thalassaemia

genotypes of parents

Tt

.....

gametes



gametes from woman



gametes
from man



[4]

(iii) Thalassaemia reduces the amount of normal haemoglobin in a person's blood.

Explain why someone with thalassaemia often does not have the energy to do vigorous exercise.

.....

 [2]

- 2 (a) Fig. 2.1 shows apparatus used in the electrolysis of copper chloride solution.

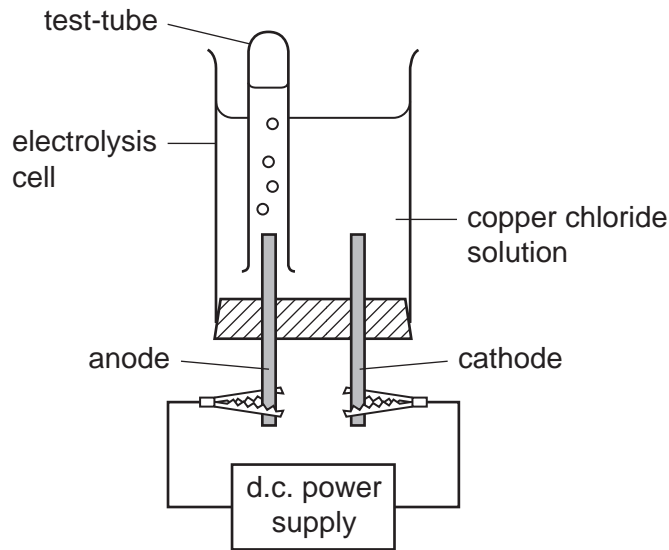


Fig. 2.1

- (i) Describe what is observed at the cathode.

..... [1]

- (ii) Chloride ions have a single negative electrical charge, Cl^- .

For every copper ion in the solution, two chloride ions are present.

Deduce the electrical charge of a copper ion.

Show how you obtained your answer.

..... [2]

- (iii) Fig. 2.2 shows diagrams of two particles, **L** and **M**. Each of these particles have 17 protons in their nucleus.

For
Examiner's
Use

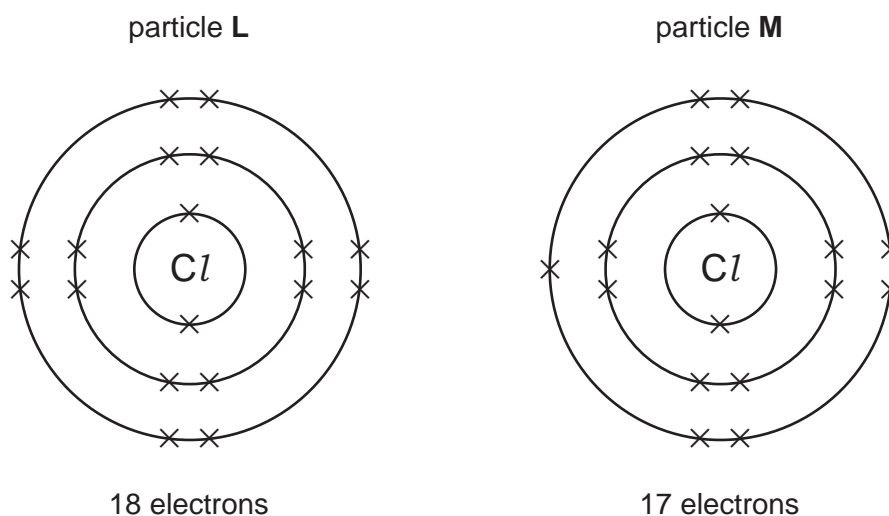


Fig. 2.2

State and explain which one of these particles, **L** or **M**, moves towards the anode during electrolysis.

particle

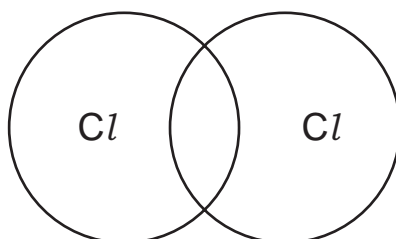
explanation

.....

..... [2]

- (iv) The bubbles of gas which rise from the anode contain diatomic molecules of chlorine.

Complete the bonding diagram below to show how the outer electrons are arranged in a chlorine molecule.



[2]

(b) The apparatus shown in Fig. 2.3 can be used to react lead oxide, PbO, and carbon.

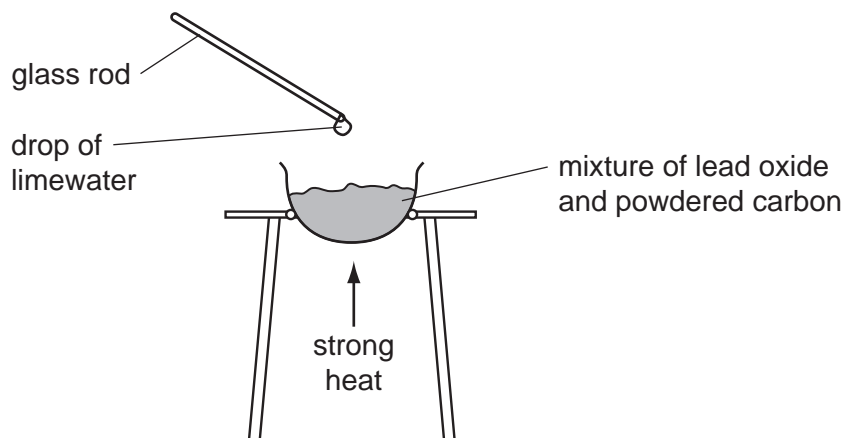


Fig. 2.3

When the mixture is heated, a redox reaction occurs in which lead oxide is reduced.

The drop of limewater suspended on the glass rod turns cloudy.

(i) Name the gas which is produced in this redox reaction.

..... [1]

(ii) Suggest the balanced symbolic equation for the redox reaction between lead oxide and carbon.

..... [2]

For
Examiner's
Use

- 3 (a) (i) Complete Table 3.1 to show the properties of alpha, beta and gamma radiations.

For
Examiner's
Use

Table 3.1

	description	charge	range in air	ionising ability
alpha		positive	5 cm	very strong
beta	electron		50 cm	
gamma	electromagnetic wave		many kilometres	weak

[4]

- (ii) Many people have smoke detectors in their houses.

Smoke detectors contain a radioactive source which emits alpha radiation.

Explain why the alpha radiation from the smoke detector is not dangerous to people living in the house.

.....

.....

..... [1]

- (b) A scientist uses a Geiger counter to measure the radiation from a radioactive source. She records the results every hour.

For
Examiner's
Use

Fig. 3.1 shows the graph of her results.

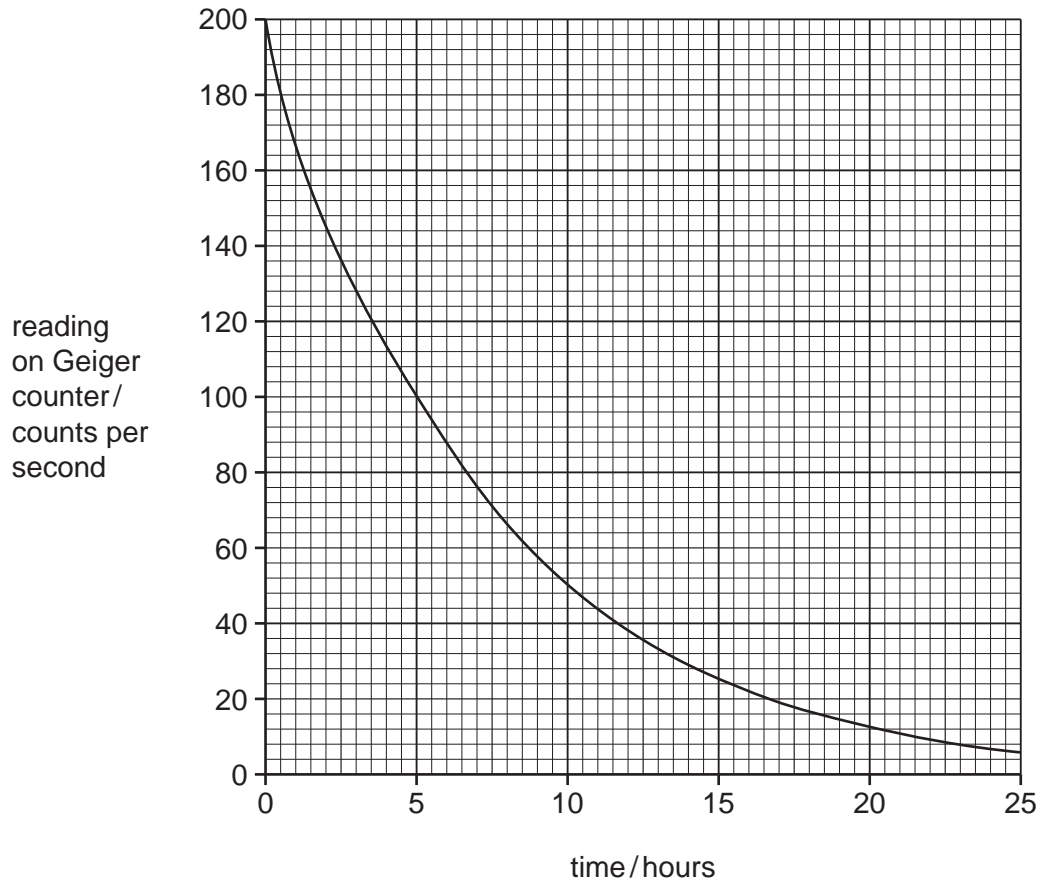


Fig. 3.1

Calculate the half-life of the radioactive source.

Show your working.

..... [2]

4 Soya beans are an important crop in many tropical and subtropical countries, because they contain a lot of protein.

(a) A farmer grows soya beans in a field on a steep slope.

Describe **two** things the farmer could do to reduce the risk of soil erosion.

1

.....

2

..... [2]

(b) Soya beans and other crops are often attacked by aphids and other insect pests.

Farmers may use pesticides or biological control to kill the pests.

(i) Describe **one** advantage and **one** disadvantage of using pesticides, rather than biological control, to control pests of crops.

advantage

.....

disadvantage

..... [2]

(ii) State what is meant by a *systemic pesticide* and explain **one** advantage of using a systemic pesticide rather than a contact pesticide.

meaning

.....

advantage

..... [2]

5 (a) Fig. 5.1 shows a circuit built by a student.

For
Examiner's
Use

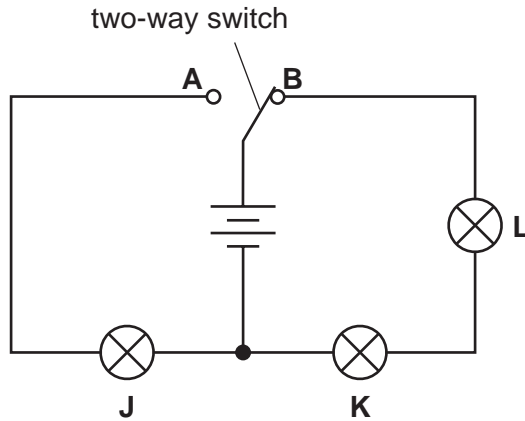


Fig. 5.1

(i) The switch is at position **B**. Which lamps will be lit? [1]

(ii) The switch is then moved to position **A**.

What happens to lamps **J**, **K** and **L**?

lamp **J**

lamp **K**

lamp **L**

[2]

(b) The student has six resistors as shown in Fig. 5.2.

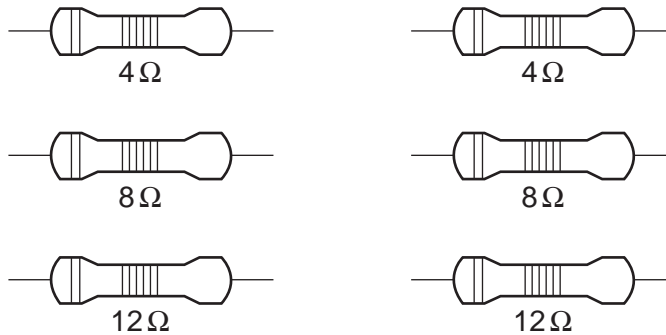


Fig. 5.2

Explain how he can combine **two** of these resistors to get a total resistance of 6 ohms.

.....

[3]

(c) Fig. 5.3 shows a simple electrical generator.

For
Examiner's
Use

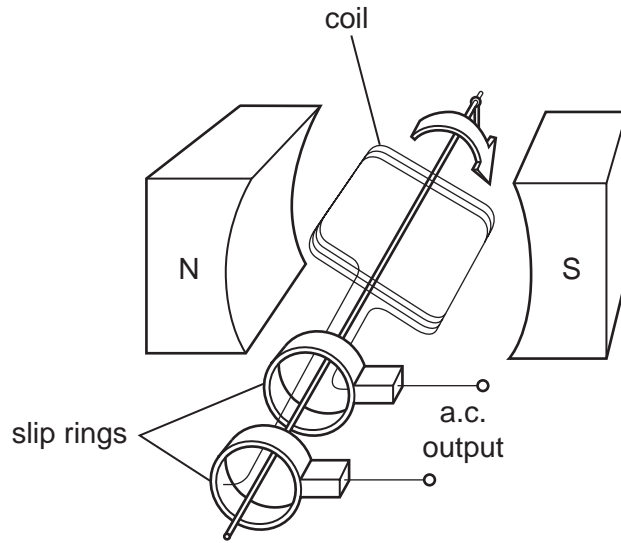


Fig. 5.3

(i) Explain why a voltage is induced in the coil when the coil is turned.

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

(ii) Explain why this generator produces an alternating current.

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

- 6 A solution of sodium chloride is produced when sodium hydroxide solution, an alkali, is neutralised by dilute hydrochloric acid. Fig. 6.1 shows apparatus which can be used to carry out this neutralisation.

For
Examiner's
Use

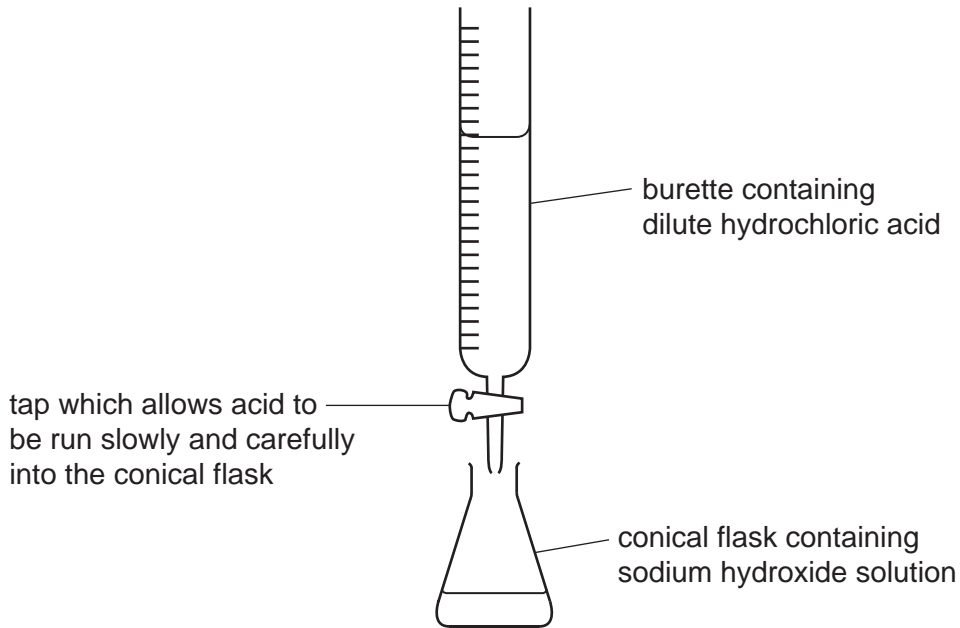


Fig. 6.1

- (a) Complete the balanced symbolic equation, involving ions and molecules, for the neutralisation reaction between an aqueous acid and an aqueous alkali.



- (b) A student adds a few drops of litmus solution, an indicator, to the sodium hydroxide solution.

Suggest what the student should then do in order to produce a **neutral** solution of sodium chloride, using only the apparatus shown in Fig. 6.1.

.....

 [2]

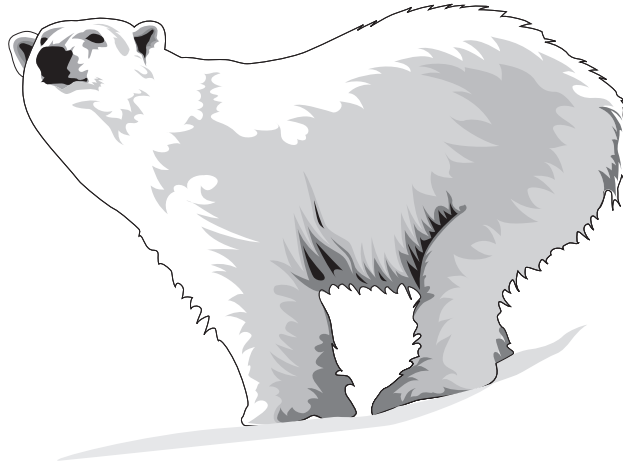
- (c) Suggest how the student could use information gained from the experiment in (b) to obtain a sample of dry, **colourless** sodium chloride crystals which do not contain any litmus.

.....

 [3]

7 (a) Polar bears live in the cold, arctic region. They have thick, white fur.

For
Examiner's
Use



(i) Describe how fur keeps a polar bear warm.

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

(ii) Explain why white fur will keep a polar bear warmer than black fur.

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

(b) An elephant can communicate with other elephants using infra-sound. This is a very low frequency vibration, which is usually impossible for a human to hear.

(i) Suggest a possible frequency for this vibration and explain how you chose your answer.

frequency Hz
explanation
..... [1]

(ii) State the meaning of the term *frequency*.
.....
..... [1]

(iii) Fig. 7.1 shows an oscilloscope trace for a low frequency sound which the human ear can just hear.

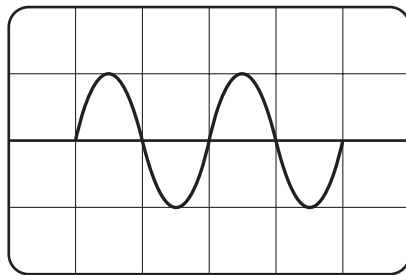


Fig. 7.1

On Fig.7.2 draw the trace of an infra-sound wave of the same amplitude.

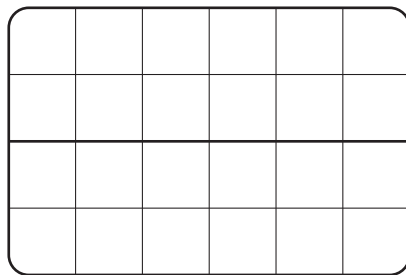


Fig. 7.2

[2]

(c) Fig. 7.3 shows a magnifying glass being used to look at a caterpillar.

For
Examiner's
Use

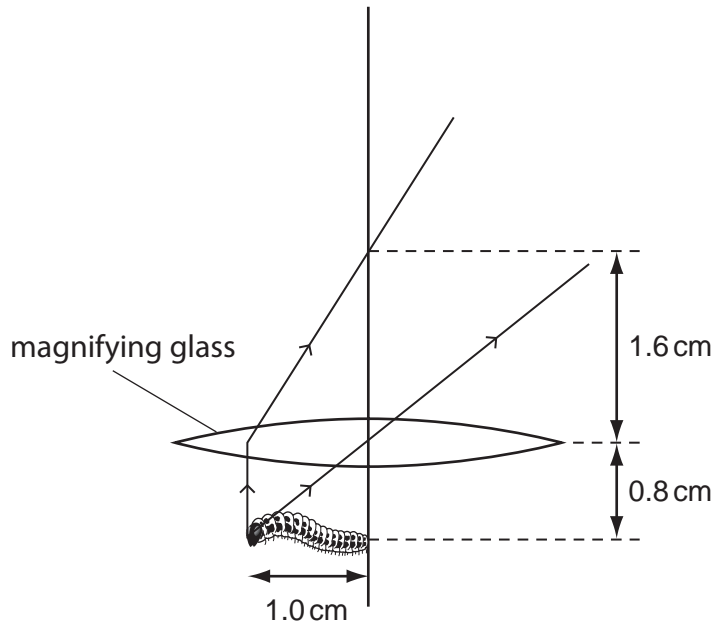


Fig. 7.3

- (i) State the focal length of the lens. [1]
- (ii) Complete the ray diagram to show how the eye sees an enlarged image of the caterpillar. [2]
- (iii) This image is called a virtual image.

Explain the meaning of the term *virtual image*.

.....
 [1]

- 8 Carbon and hydrogen combine to form hydrocarbons.

Ethene, C_2H_4 , is a gaseous, unsaturated hydrocarbon, which is of industrial importance.

- (a) Complete the displayed formula of the ethene molecule which has been started below.



[2]

- (b) Unsaturated hydrocarbons are made in industry from fractions obtained by the fractional distillation of oil (petroleum).

Name the process which is used to make unsaturated hydrocarbons, and describe briefly how it is done.

name of process

description

.....

.....

..... [3]

- (c) Describe, in terms of changes to chemical bonds, what happens when ethene molecules react to form molecules of poly(ethene).

.....

.....

..... [2]

For
Examiner's
Use

(d) Calculate the relative formula mass of ethene.

Show your working.

For
Examiner's
Use

..... [2]

- 9 A healthy plant growing in a pot was watered and placed in a sunny window. A transparent plastic bag was placed over the plant, as shown in Fig. 9.1.

For
Examiner's
Use

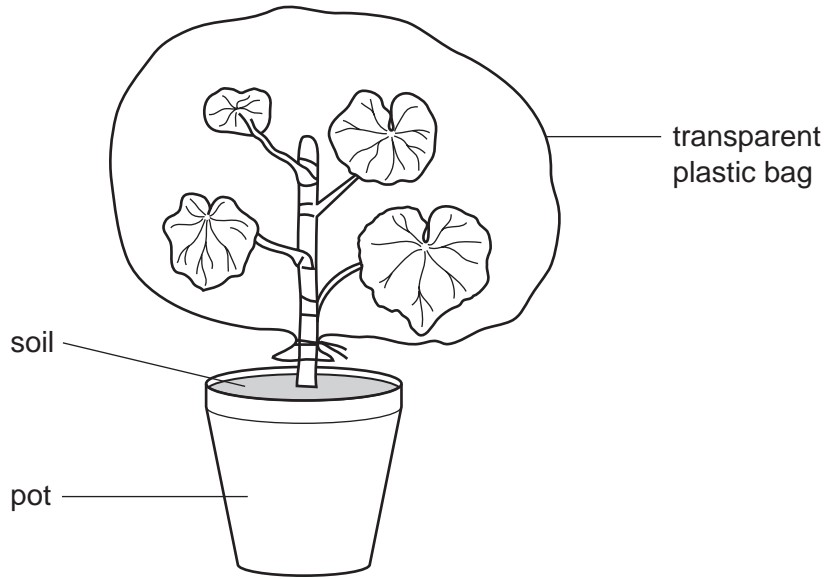


Fig. 9.1

- (a) The temperature near the window fell overnight. The next morning, small droplets of water were visible on the inside of the plastic bag.

Explain why the droplets of water appeared on the inside of the plastic bag.

.....

.....

.....

.....

..... [4]

- (b) The plastic bag was then removed from the plant. The next day was warm and sunny, and by the end of the day the plant had lost so much water that it wilted.

For
Examiner's
Use

Fig. 9.2 shows a cell from a leaf before and after the plant wilted.

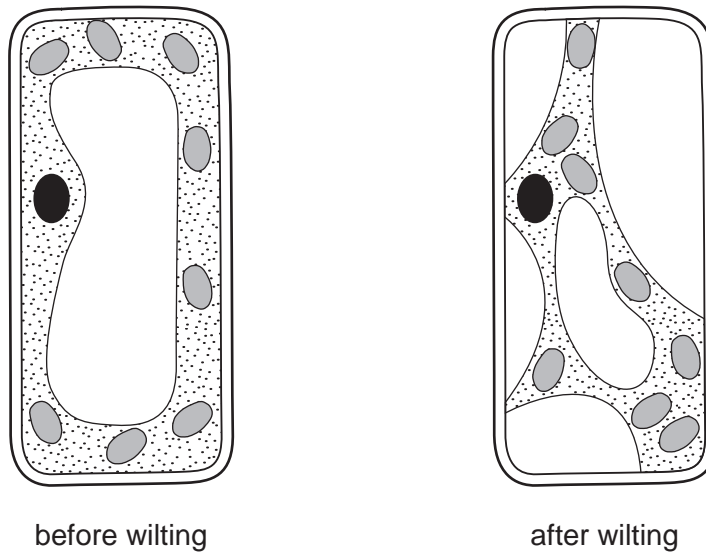


Fig. 9.2

- (i) On the diagram of the cell before wilting in Fig. 9.2, label and name **two** structures that would **not** be present in an animal cell. [2]
- (ii) Using your knowledge of osmosis, explain what happened to the plant cell to cause its appearance after the plant wilted.

.....

.....

.....

.....

..... [3]

DATA SHEET
The Periodic Table of the Elements

		Group																																			
		I	II	III	IV	V	VI	VII	0																												
		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">1</td> <td style="width: 10%; text-align: center;">H Hydrogen 1</td> <td colspan="8"></td> <td style="width: 10%; text-align: center;">2</td> <td style="width: 10%; text-align: center;">He Helium 2</td> </tr> </table>										1	H Hydrogen 1									2	He Helium 2														
1	H Hydrogen 1									2	He Helium 2																										
7	Li Lithium 3	9	Be Beryllium 4											19	F Fluorine 9	20	Ne Neon 10																				
23	Na Sodium 11	24	Mg Magnesium 12											32	S Sulfur 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	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	128	Te Tellurium 52	127	I Iodine 53	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	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	210	Po Polonium 84	210	At Astatine 85	222	Rn Radon 86						
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
87	Fr Francium 87											232	Th Thorium 90	238	U Uranium 92	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

<p>a = relative atomic mass X = atomic symbol</p>	<p>b = proton (atomic) number</p>
---	-----------------------------------

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

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.