UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

9267243145

CO-ORDINATED SCIENCES **0654/22**

Paper 2 (Core) **October/November 2010**

2 hours

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 24.

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	
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10	
Total	

This document consists of **23** printed pages and **1** blank page.

1 Fig. 1.1 shows the horizontal forces acting on a moving car.

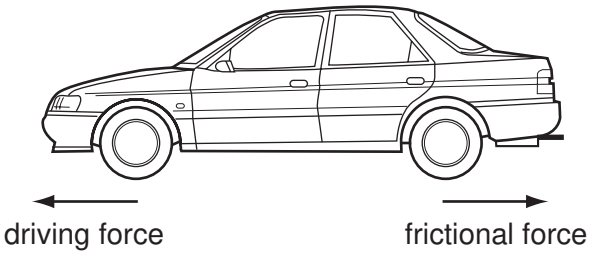

Fig. 1.1

(a) Compare the sizes of the two forces when the car is

(i) decelerating (slowing down),

..... [1]

(ii) travelling at a constant speed.

..... [1]

(b) Fig. 1.2 shows the speed-time graph for the car for the first 24 seconds of a journey.

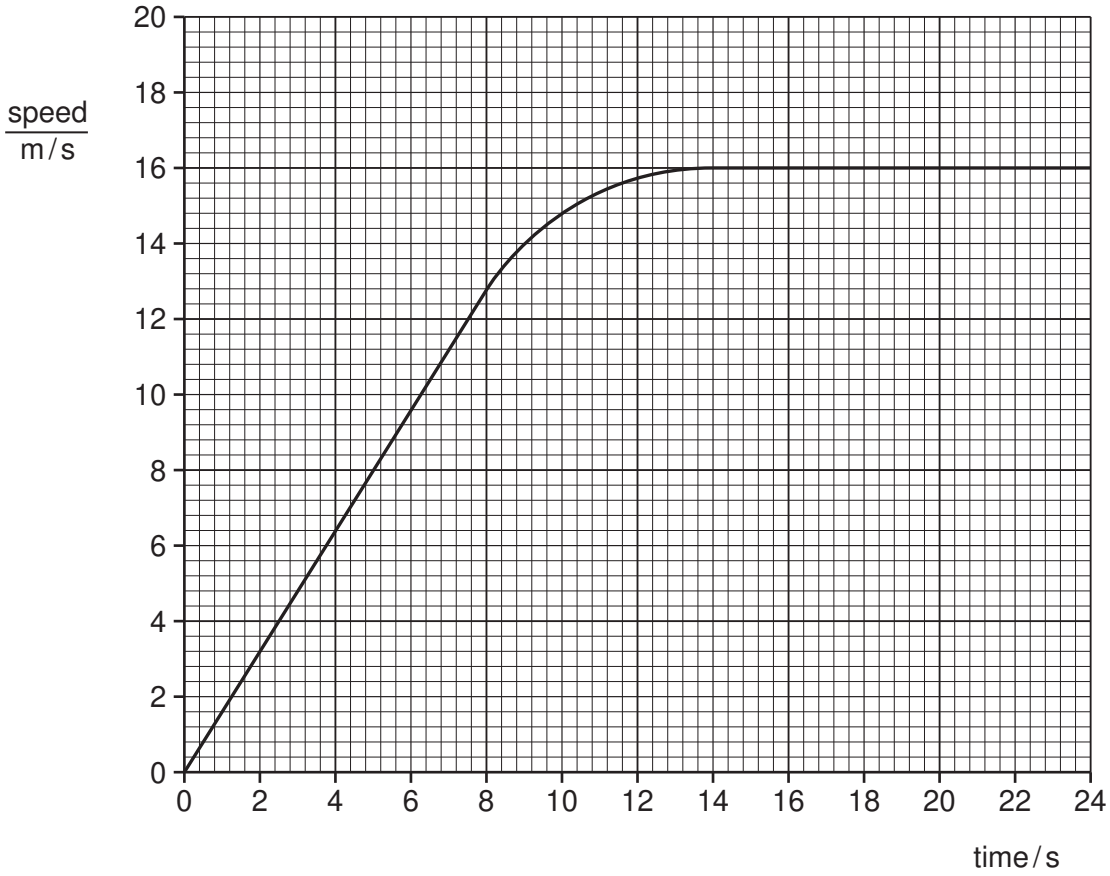

Fig. 1.2

(i) On the graph, label with an **A**, a section when the car is accelerating.

(ii) State the maximum speed of the car. ..... m/s [1]

(iii) The mass of the car is 800 kg.

Use your answer to **(ii)** to calculate the kinetic energy of the car when travelling at its maximum speed.

State the formula that you use and show your working.

formula used

working

..... J [2]

(c) A car headlamp has a power rating of 50 W.

(i) State how many joules of energy will be converted every second in the headlamp.

..... J [1]

(ii) Use the formula

power = voltage × current

to calculate the current in the headlamp when the voltage across it is 12 V.

Show your working.

..... A [2]

2 **(a)** Mammals are vertebrates. State **two** characteristic visible features of mamma distinguish them from all other classes of vertebrates.

1 .....

2 ..... [2]

(b) Mammals are able to maintain a constant internal body temperature and regulate their blood glucose concentration.

(i) State the term used to describe the maintenance of a constant internal environment.

..... [1]

(ii) Name the process that generates heat inside body cells when the internal body temperature falls too low.

..... [1]

(iii) Describe how blood glucose concentration is brought back to normal if it rises too high.

.....

.....

.....

..... [3]

(c) Mammals excrete a nitrogenous waste product called urea.

(i) Name the organ in which urea is formed.

..... [1]

(ii) Name the substances from which urea is made.

..... [1]

(iii) Name the organs that excrete urea from the body.

..... [1]

3 **(a)** Fig. 3.1 shows some of the apparatus used in the electrolysis of copper c
solution.

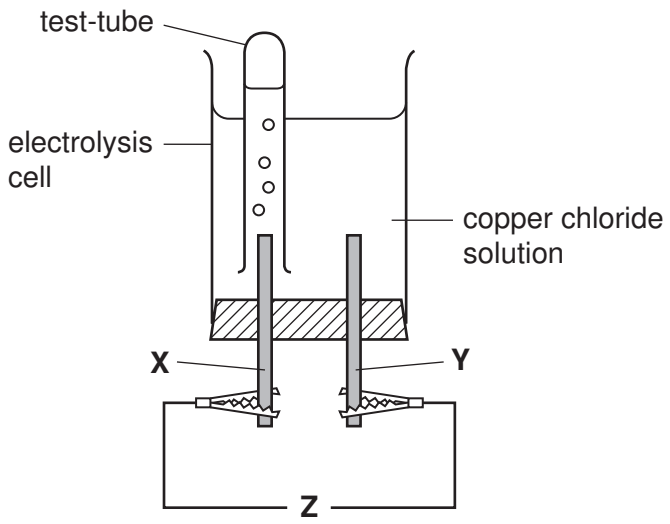

Fig. 3.1

(i) What is missing from position **Z** in Fig. 3.1?

..... [1]

(ii) Name the gas which collects in the test-tube, and explain whether electrode **X** is the anode or the cathode.

gas .....

Electrode **X** is the ..... because .....

.....

..... [2]

(iii) Describe what is observed at electrode **Y**.

.....

..... [1]

(b) The apparatus shown in Fig. 3.2 can be used to find out what is formed whe oxide reacts with carbon.

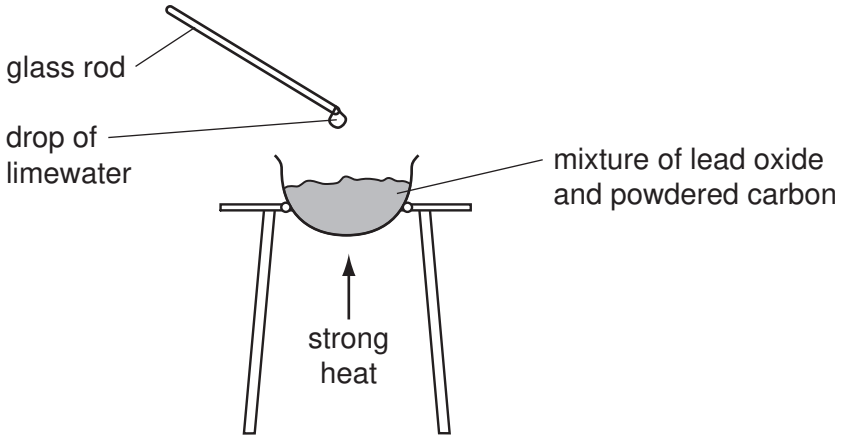

Fig. 3.2

When the mixture is heated, molten metal is formed in the container and a gas is given off which turns the drop of limewater cloudy.

(i) Complete the **word** equation for the reaction between lead oxide and carbon.

lead oxide	+	carbon	→		+	

[2]

(ii) State **one** substance, shown in the equation in **(i)**, which is a compound.

Explain why this substance is described as a compound and **not** as an element.

substance .....

.....

.....

..... [3]

(c) (i) The main chemical compound in most types of glass is obtained from sand.

Name this compound. ..... [

(ii) Name and explain briefly which of the metal oxides below would need to be mixed with sand in order to obtain coloured glass.

copper oxide **lead oxide** **sodium oxide**

name .....

explanation .....

..... [2]

4 **(a)** Alpha, beta and gamma radiations have different properties.

Draw **one** line from each type of radiation below to link it to its correct property.

radiation	**properties**
alpha	partly stopped by 2 cm lead
	no charge
beta	stopped by 2 cm of lead
	negative charge
gamma	stopped by 5 cm of air
	positive charge

[2]

(b) A scientist uses a Geiger counter to measure the radiation of a radioactive source.

(i) State **one** safety precaution she should take when doing this experiment.

.....

[1]

Fig. 4.1 shows the graph of her results.

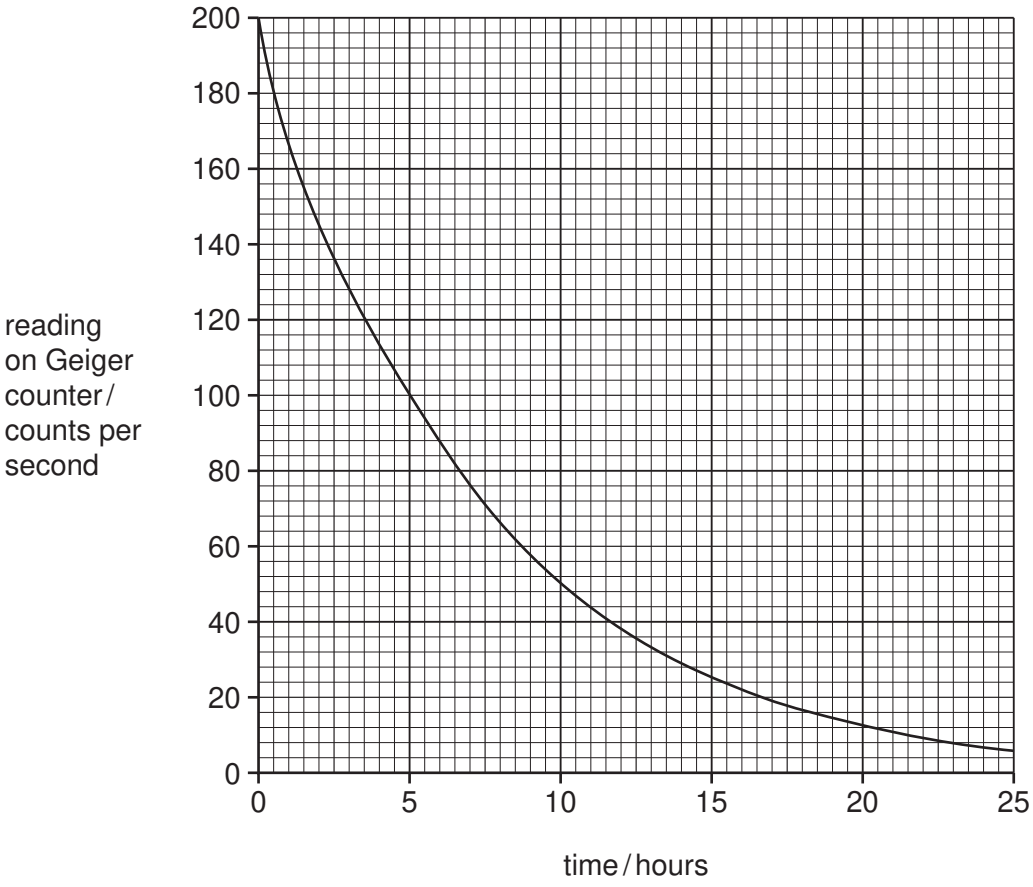

Fig. 4.1

(ii) State the reading on the Geiger counter,

at the start of the experiment, ... counts per second

after 5 hours. ..... counts per second

[1]

(iii) State the half-life of the radioactive source. ..... hours [1]

(c) Alpha radiation is a form of ionising radiation.

(i) Explain the meaning of the term *ionising radiation*.

.....

..... [1]

(ii) An alpha radiation source is **less** harmful to humans than a gamma radiation source if it is **outside** the body.

An alpha radiation source is **more** harmful to humans than a gamma radiation source if it is **inside** the body.

Explain why.

.....

.....

..... [2]

(d) Nuclear fission and nuclear fusion are both sources of energy.

Describe how these processes differ.

.....

.....

..... [2]

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Please turn over for Question 5.

5 Fig. 5.1 shows some stages in the formation of a human fetus.

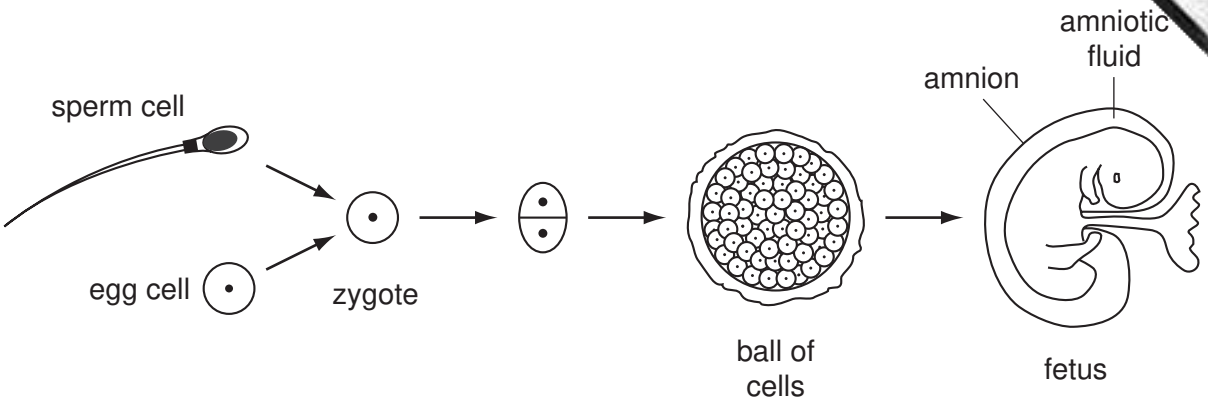


Fig. 5.1

(a) Most human cells contain 46 chromosomes.

(i) State the number of chromosomes in a sperm cell. ..... [1]

(ii) State the number of chromosomes in a zygote. ..... [1]

(iii) Name the part of the cell in which chromosomes are found. ..... [1]

(b) Describe how fertilisation takes place in the oviduct of a mammal.

.....

.....

..... [2]

(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** ha thalassaemia, but a person with alleles **Tt** does not.

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

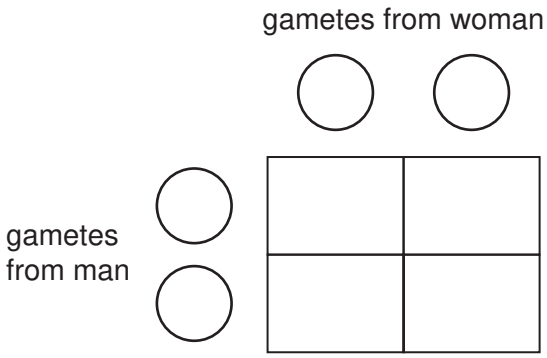
allele .....

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	○ and ○	○ and ○



[4]

(iii) Thalassaemia reduces the amount of normal haemoglobin in the blood. Explain why someone with thalassaemia often does not have the energy to do vigorous exercise.

.....

.....

..... [2]

6 Fig. 6.1 shows how the current in a circuit containing a resistor varies with voltage.

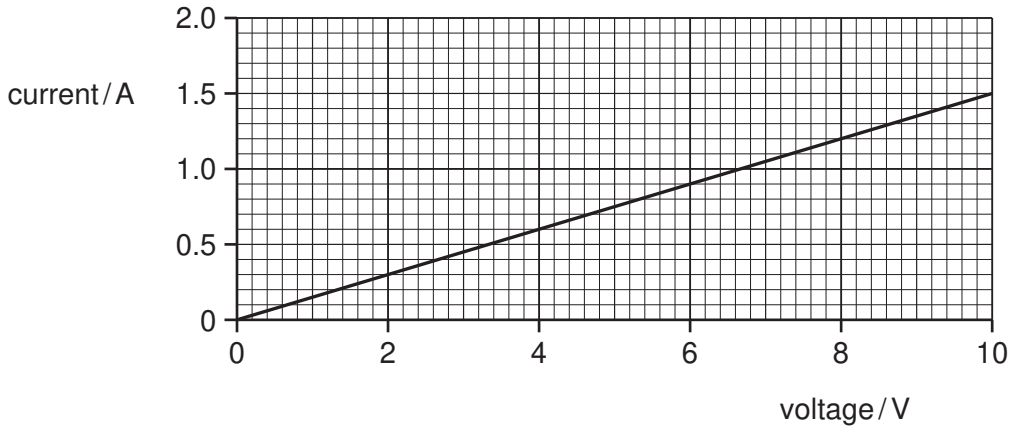


Fig. 6.1

(a) In the space below draw a circuit diagram for the circuit you would use to obtain the results shown in Fig. 6.1.

Your circuit should include:- **ammeter**
connecting wires
power supply
resistor
voltmeter

[4]

(b) (i) Predict the value of the current in the circuit at 20 V.

Explain your answer.

prediction ..... A

explanation .....

..... [2]

(ii) State the number of coulombs of charge flowing per second when the current in the circuit is 0.5 A.

..... C [1]

(iii) Name the particle responsible for carrying this charge around the circuit.

..... [1]

7 In many countries, river water is collected and treated to make it safe for humans to d

(a) (i) Suggest **one** way in which a river could become polluted because it flows throug land which is used for agriculture (farming).

.....

.....

..... [1]

(ii) Describe how water in rivers and lakes could become polluted if sulfur compounds are **not** removed from fossil fuels before they are burned.

.....

.....

.....

..... [4]

(iii) Explain which **one** of the treatments shown below might **not** remove all the harmful bacteria from water which is to be used for drinking.

adding chlorine **distillation** **filtration**

treatment .....

explanation .....

..... [1]

(b) In an experiment to compare the hardness of three water samples, **A**, **B** and **C**, equal volumes of water were shaken with the same volume of soap solution.

Fig. 7.1 shows the appearance of each mixture after shaking.

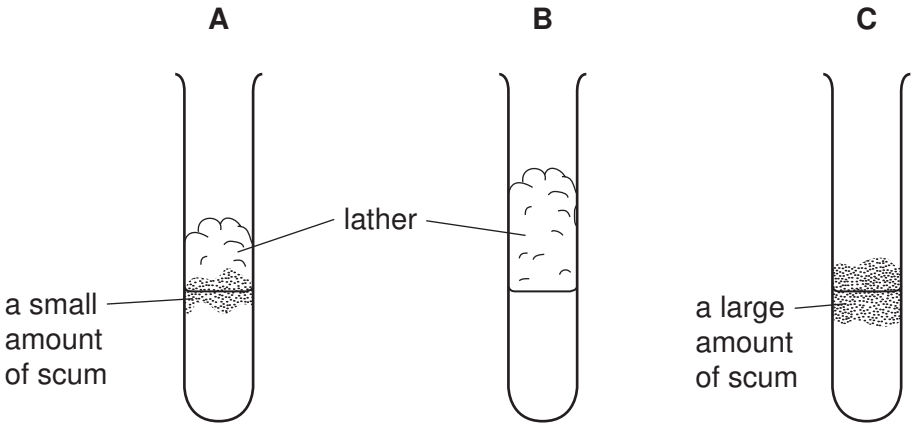


Fig. 7.1

(i) Suggest a substance, present in water samples **A** and **C**, which has reacted with soap to form scum.

.....

[1]

(ii) Explain the difference in appearance between the mixtures in Fig. 7.1.

.....

.....

.....

.....

[2]

8 A healthy plant growing in a pot was watered and placed in a sunny window. A trans
plastic bag was placed over the plant, as shown in Fig. 8.1.

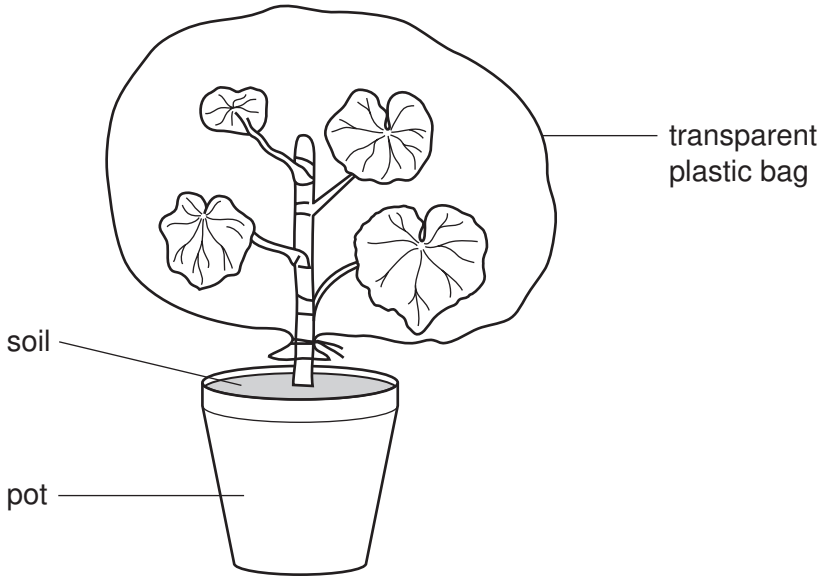


Fig. 8.1

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

(i) Explain where the water came from.

.....

.....

..... [2]

(ii) Explain why the water formed droplets of liquid on the plastic bag.

.....

.....

..... [2]

(b) The plastic bag was then removed from the plant. The plant lost a lot of wat
wilted. Fig. 8.2 shows the wilted plant.

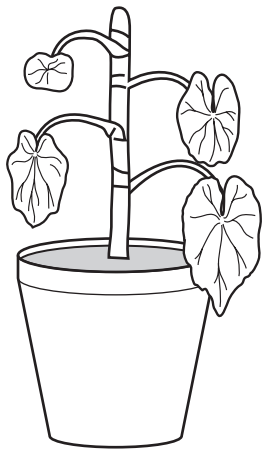


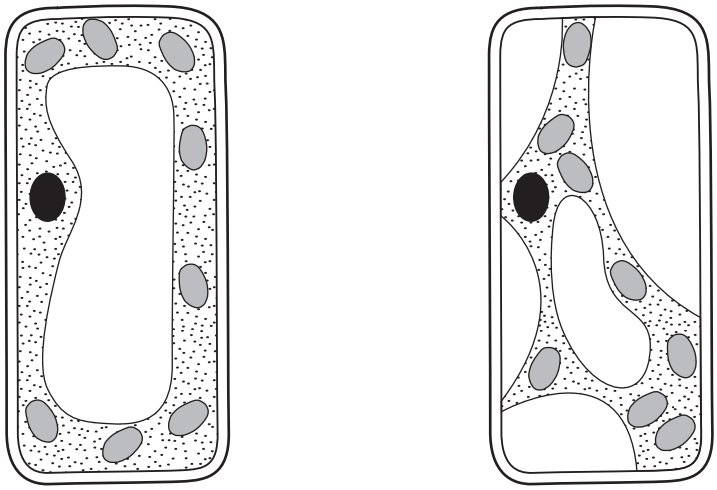
Fig. 8.2

Explain why the main stem of the plant remained upright when the rest of the plant wilted.

.....

..... [2]

(c) Fig. 8.3 shows a cell from the plant leaf before and after it wilted.



before wilting

after wilting

Fig. 8.3

(i) On the diagram of the cell **before** wilting in Fig. 8.3, 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 wilting.

.....

.....

..... [2]

9 The chemical symbols for the atoms shown below include proton (atomic) numbers and nucleon (mass) numbers.

$$^{16}_{8}O \quad ^{31}_{15}P \quad ^{32}_{16}S \quad ^{70}_{31}Ga$$

(i) State which of these symbols represent atoms of elements in the same **group** of the Periodic Table.

..... [1]

(ii) Complete Table 9.1 which shows the names and the numbers of protons and neutrons in two of the atoms shown above.

Table 9.1

element name	protons	neutrons
oxygen		
	15	16

[2]

(b) Fig. 9.1 shows a diagram of a water molecule, H_2O.

Choose words or phrases from the following list to complete the labelling of the diagram.

covalent bond	**hydrogen atom**	**ionic bond**
nucleus	**oxygen atom**	**proton**

....

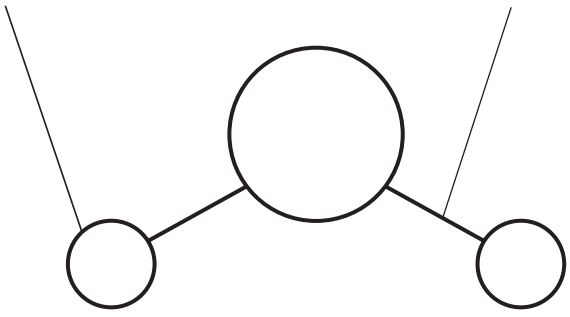


Fig. 9.1

[2]

(c) Carbon and hydrogen combine to form a very large number of different compound
Ethene is a gaseous, unsaturated compound of carbon and hydrogen.

Fig. 9.2 shows two different chemical reactions, **1** and **2**, involving ethene.

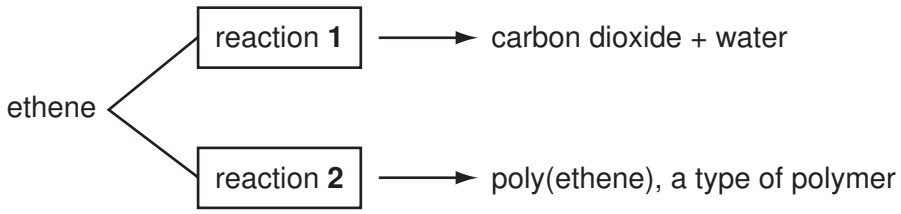


Fig. 9.2

(i) What general name is given to all compounds which contain only carbon and hydrogen?

..... [1]

(ii) Explain the meaning of the term *unsaturated* when used to describe ethene.

.....

.....

..... [2]

(iii) For reaction **1** above, deduce the type of chemical reaction which occurs and name the substance which has reacted with ethene.

type of reaction .....

substance which has reacted with ethene ..... [2]

(iv) For reaction **2** above, deduce the type of chemical reaction which occurs and describe briefly what happens to the molecules of ethene during the reaction.

type of reaction .....

what happens to ethene molecules .....

.....

..... [2]

10 **(a)** Below is a list of some types of waves.

gamma **infra-red** **microwave** **sound**

ultrasound **ultraviolet** **visible light**

State **one** wave from the list that is

(i) a longitudinal wave, ... [1]

(ii) a transverse wave, ... [1]

(iii) emitted by hot objects but cannot be seen by the human eye,

..... [1]

(iv) used to send mobile phone (cell phone) messages from phone to phone.

..... [1]

(b) Green light and red light are two of the three primary colours for light.

(i) Name the third primary colour for light. ..... [1]

(ii) Name **one** secondary colour for light. ..... [1]

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 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	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	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	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	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	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

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

Key: a = relative atomic mass; **X** = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).