Centre Number	Candidate Number

Candidate Name Mark scheme

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CO-ORDINATED SCIENCES 0654/2

PAPER 2

Thursday **14 MAY 1998** Morning 2 hours

Candidates answer on the question paper.
Additional materials:
Ruler (cm/mm)

Bid ✓
Chem ✓
Phys ✓

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

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

INFORMATION FOR CANDIDATES

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.

You may use a calculator.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

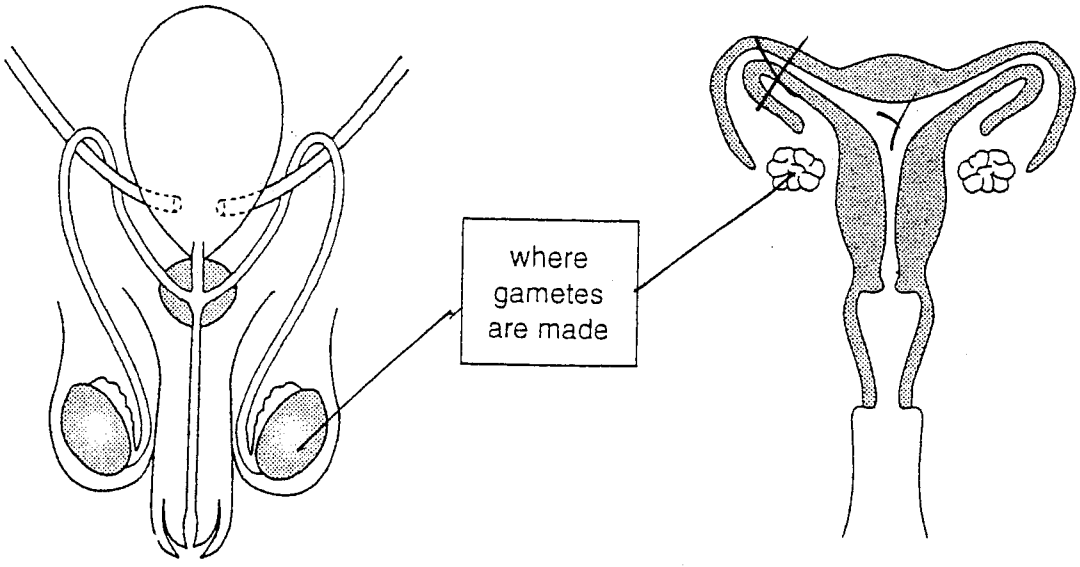
This question paper consists of 20 printed pages.

MML 242242 5/97 QF85581

[Turn over

For Examiner's Use

1 The diagrams show the male and female reproductive systems.



male female

(a) (i) Draw label lines from the box to **each** diagram, to show where gametes are made. [2]

(ii) Give the biological names for the male and female gametes.

male Testes

female Ovaries [2]

(iii) State **two** ways in which the male gametes differ from the female gametes.

1. Male Smaller

Male have a "tail"

2. .....

..... [2]

(b) In a male, gamete production begins at puberty, when the male sex hormone is secreted in larger quantities than during childhood.

Name this male sex hormone.

Testosterone [1]

For Examiner's Use

(c) In an adult female, one gamete is released from the ovaries approximately each month. If one of these gametes is fertilised, it develops into an embryo.

(i) Describe what happens to the lining of the uterus in **the two weeks before** a gamete is released from an ovary.

Increase in size/ thickens repairs/ gets blood vessels [1]

(ii) Name **two** hormones which help to control the changes in the lining of the uterus.

1. Progesterone

2. Oestrogen [2]

(iii) On the diagram of the female reproductive system, write **X** in a place where a female gamete could be fertilised. – Should be in oviduct [1]

(iv) On the diagram, write **Y** in a place where the fertilised gamete would develop into an embryo. – Should be in Uterus [1]

2 (a) Complete the table by choosing one of the words from the list to match each statement.

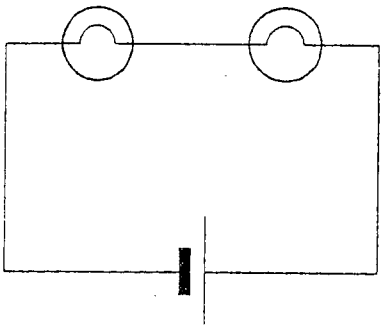
ammeter circuit coulomb

electron ohm voltmeter

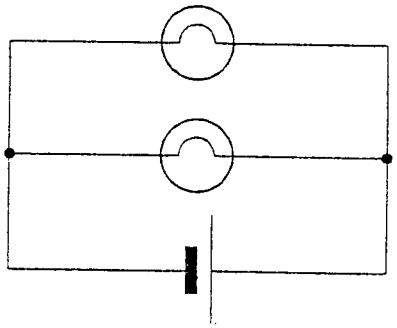
statement	*word*
a complete loop of conductors	Circuit
a particle with an electrical charge	electron
measures electrical current	ammeter
measures potential difference	Voltmeter
the unit of electrical charge	Coulomb
the unit of resistance	Ohm

[5]

(b) The diagram shows two circuits **A** and **B**. All the lamps and both cells are the same.



circuit **A**



circuit **B**

(i) If one lamp is unscrewed from circuit **A**, what happens to the other lamp? Explain your answer.

Goes out

There is only one loop, which has been broken [2]

For Examiner's Use

(ii) If one lamp is unscrewed from circuit **B**, what happens to the other lamp? Explain your answer.

Remains lit

Other lamp still has a complete loop including the battery.

[3]

(iii) Suggest which type of circuit, **A** or **B**, is used for a house lighting circuit. Give a reason for your answer.

B. When one light fails, the others remain lit.

[1]

(iv) Suggest what would happen to the lamps in circuit **B** if the cell were replaced by two cells.

Brighter

[1]

(v) What will happen to the resistance of circuit **A** if an extra lamp is placed in series with the other two? Explain your answer.

Increases

In series, resistances add together.

[2]

For Examiner's Use

3 (a) The materials in the list are used as fuels.

animal waste **coal** **gasoline** **natural gas** **wood**

(i) State **two** materials from the list which are fossil fuels.

1. coal

2. natural gas [2]

(ii) State **one** material from the list which is a renewable energy source.

animal waste [1]

(b) (i) Explain why a supply of air is needed in order for the fuels to burn.

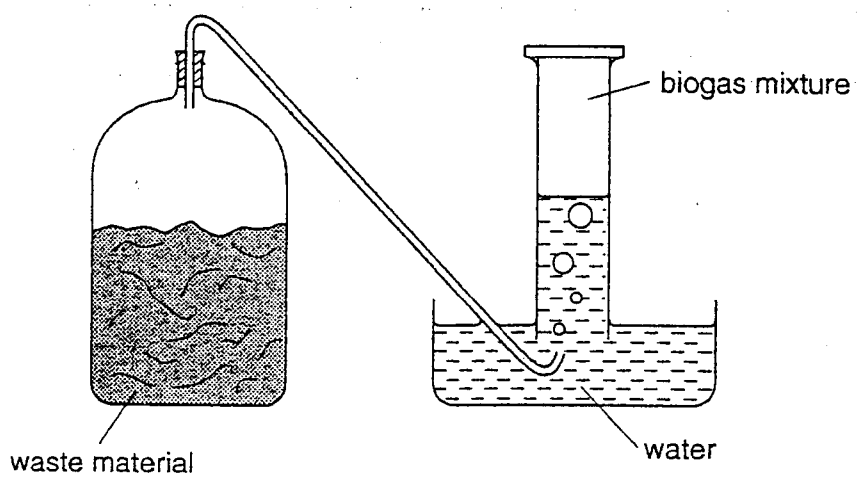
fuels require oxygen in combustion process [1]

(ii) Name **two** substances which are produced when gasoline burns.

1. carbon dioxide

2. water [2]

(c) When bacteria break down animal or plant waste materials, they produce a mixture of gases. This mixture is called *biogas* and can be used as a fuel. The diagram shows a simple apparatus to produce and collect some biogas.



(i) Name the compound in the biogas mixture which will burn.

methane [1]

(ii) When a sample of biogas is bubbled through a solution of calcium hydroxide (limewater), the solution turns cloudy.

Name the compound in biogas which causes this reaction.

carbon dioxide [1]

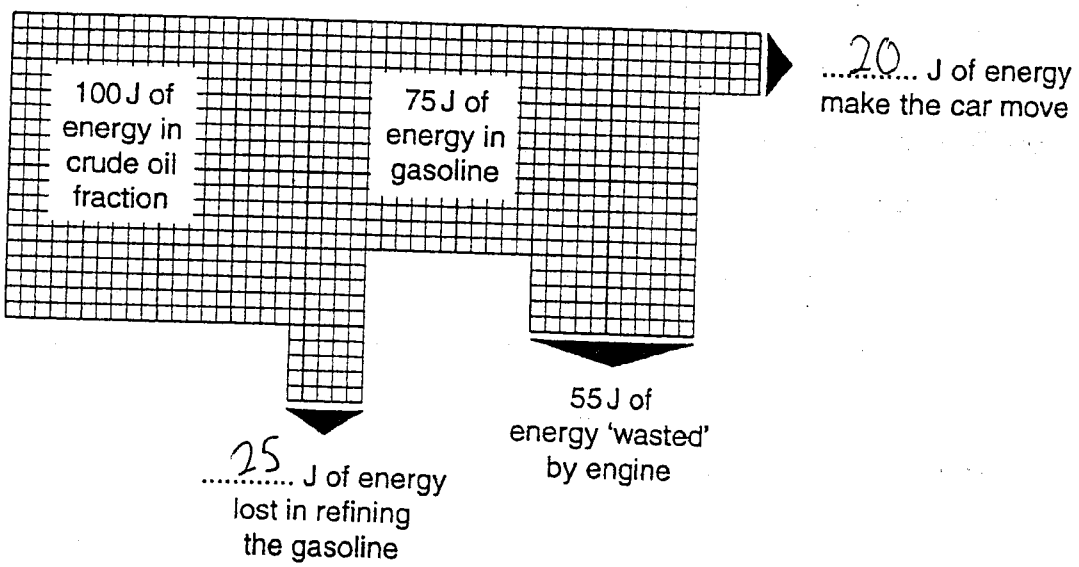
(iii) A student does an experiment to find out which of two gases, biogas or pure methane, gives out more heat when burned. He makes sure that the experimental conditions are exactly the same for both gases, and that the same mass of gas is used in each experiment.

Predict and explain the result of this experiment.

more heat given out with pure methane because CO_2 doesn't combust (which is present in the biogas mixture)

..... [2]

(d) When crude oil is refined, one fraction is converted to gasoline (petrol). The diagram shows what happens to every 100 J of energy in this fraction when it is refined and used as gasoline in a car's engine.



(i) Complete the diagram with the correct energy values. [2]

(ii) Calculate how efficient the car engine is at transferring the energy in the **gasoline** into useful movement energy. Explain your answer.

$\frac{20}{75} \times 100 = \frac{80}{3} = 26.7\%$

efficiency = useful energy output (movement of car) / input (gasoline energy) $\times 100$

..... [2]

(iii) Suggest **one** way in which energy is wasted when gasoline is burned in the car's engine.

lost as heat to surroundings ..... [1]

or kinetic energy/sound lost to surroundings

For Examiner's Use

4 Heat was transferred at the same rate to three substances: 1 kg of water, 1 kg of iron and 1 kg of aluminium. The temperature of each substance was measured every 10 minutes. The results are shown below.

time/ min	*temperature*/ °C	*temperature*/ °C	*temperature*/ °C
	water	iron	aluminium
0	20	20	20
10	40	176	108
20	60	312	186
30	80	448	254
40	100	562	311
50	100	654	358

(a) Describe what happens to the water particles:

(i) between 10 and 20 minutes;

- Gain (kinetic) energy
- Move faster

[2]

(ii) between 40 and 50 minutes.

Any 2

- Do not move faster
- Break their bonds
- Break out through the liquid surface

[2]

(b) Explain why the temperature of the water did not change between 40 and 50 minutes.

- The liquid was changing state

or

- The energy was used to break bonds

[1]

For Examiner's Use

(c) What evidence is there in the table that iron has a lower specific heating capacity than aluminium?

• The temp. rose more for iron

• For the same mass and energy input

[2]

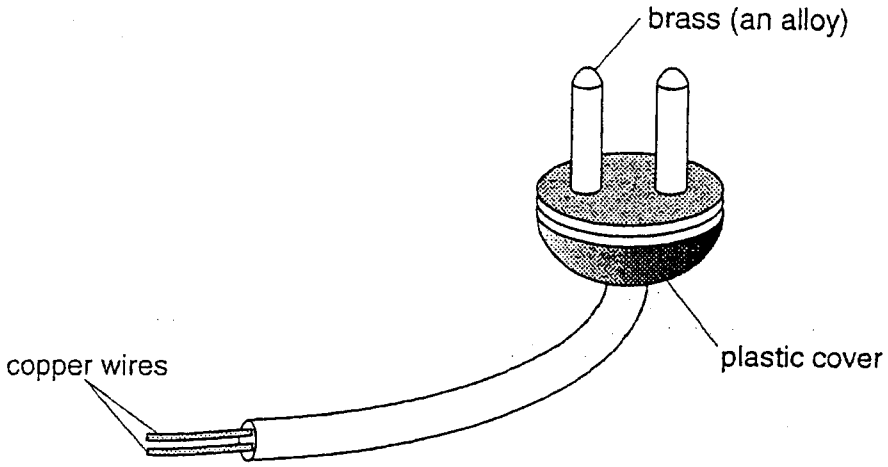
(d) A water heater supplies 42 000 J in 10 minutes. Calculate the power used by the heater. Show your working and state any formula which you use.

$$P = \frac{E}{t} = \frac{42\,000}{10 \times 60}$$

$= 70$ W [3]

For Examiner's Use

5 (a) The diagram shows an electrical plug.



(i) State **one** difference between brass and copper.

eg Brass ~~Conducts~~ is harder. [1]

(ii) State **two** properties that brass and copper have in common.

1. Both Conduct, Shiny, high mp

2. hard, dense [2]

(iii) State **one** property of the plastic used to make the plug cover.

Explain why the property you have chosen is important.

property Insulator

importance So that the user Cant get an electric shock by touching the Cover [2]

For Examiner's Use

(b) Copper can be obtained from copper oxide by reaction with a solid, non-metallic element.

(i) Name this element.

carbon ..... [1]

(ii) State the type of reaction which takes place.

reduction (or redox) ..... [1]

(c) Plastics are made from molecules called *polymers*.

(i) Name the material, extracted from the Earth, which is the raw material for most types of plastic.

crude oil ..... [1]

(ii) Describe briefly a typical polymer molecule. You may draw a simple diagram if it helps your answer.

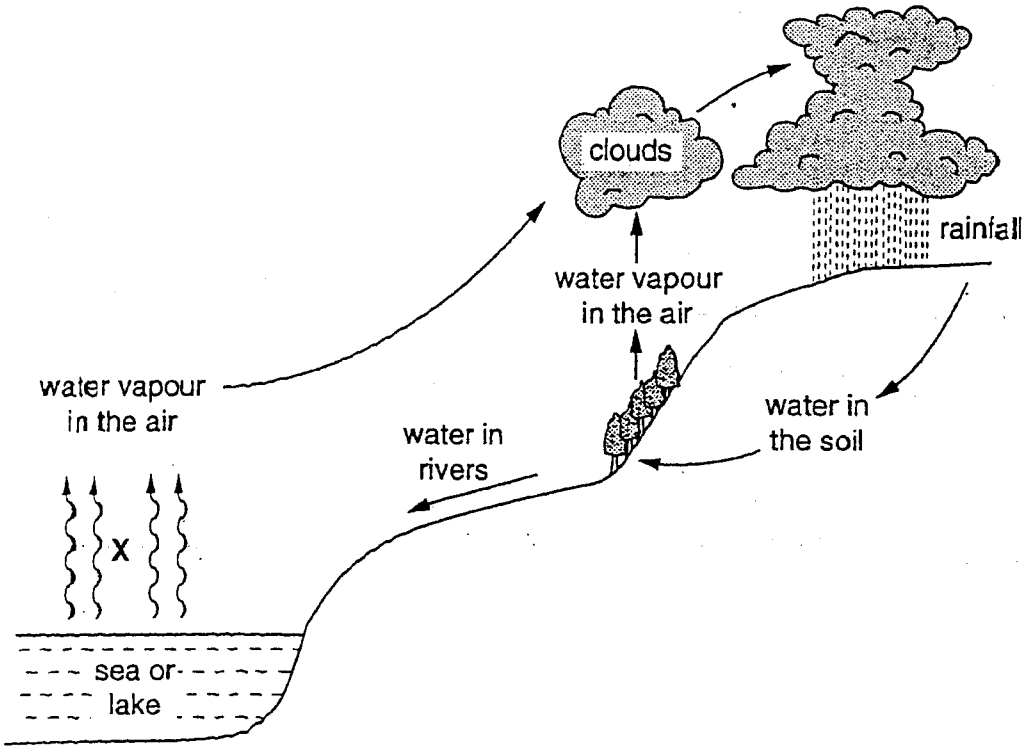
small molecules (called monomers) joined together in long chain

many M → ...M–M–M–M–M...

..... [2]

For Examiner's Use

6 The diagram shows part of the water cycle.



(a) (i) Name process **X**.

~~Transpiration~~ Evaporation ..... [1]

(ii) What is the source of the energy for process **X**?

Sun ..... [1]

(iii) Explain what happens to the water vapour as it forms clouds.

Cools ;

Condenses ;

into small water droplets ;

..... [2]

For Examiner's Use

(b) The uptake of water by trees and other plants, and its release into the air by transpiration, is an important part of the water cycle.

(i) Name the process by which water passes from the soil into the roots of a plant.

Osmosis [1]

(ii) Explain how the water passes from the roots of the plant into the leaves.

In the xylem Vessels;
Transpiration stream;
Pulled by evaporation of water out of leaves; [2]

(c) (i) With reference to the diagram, explain how cutting down all the trees might affect the amount of rain which falls in this area.

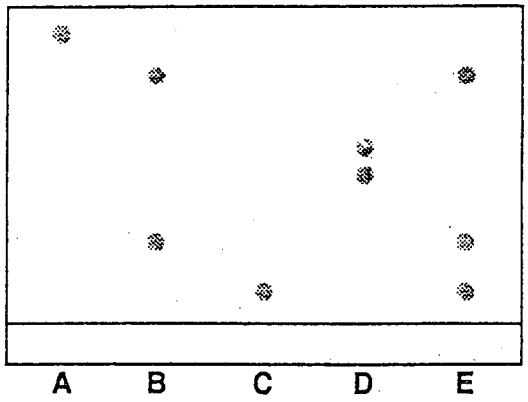
Less transpiration/Evaporation.
Less water vapour to condense into water vapour
Less rainfall
[3]

(ii) Suggest what might happen to the pH of the rain, if a coal-burning power station was built at the bottom of the hill. Explain your answer.

~~Increases~~; Decreases/More acidic;
Burning Coal produces acidic gases;
CO_2; SO_2;
Dissolve in Water;
[3]

7 Plants are the source of many useful substances such as food colourings, drugs and paper.

(a) The diagram shows results of chromatography experiments involving food colourings extracted from five sweets **A** to **E**.



(i) Identify **one** sweet which contains only one coloured compound.

A or C

..... [1]

(ii) A mixture from the food colourings used in two of the sweets is used to colour one of the others.

Complete the following sentence by writing a letter, chosen from **A** to **E**, in each space.

A mixture containing the same coloured compounds as those used in sweets ....B.... and ....C..... , has been used to colour sweet ..E..... . [2]

(iii) Explain briefly the reasoning for your answer to **(ii)**.

The dyes in B & C have risen by the same amount as those present in E (1)

No other spots appear in E, other than those in B & C (1)

..... [2]

(iv) Give a reason why regular checks on purity should be carried out on chemicals used to colour food.

Some impurities could be toxic

..... [1]

For Examiner's Use

(b) Aspirin is an analgesic drug.

For what purpose would a person use an analgesic?

pain relief [1]

(c) Many foods from plants contain glucose and starch.

Name the **three** elements present in these compounds.

carbon hydrogen oxygen [1]

(d) In many countries, people are encouraged to recycle paper.

State and explain an environmental reason, apart from controlling litter, why paper should be recycled.

saves trees / reduces deforestation (1)

⇒ reduces global warming / land erosion

saves habitats / saves plants which could be used for medicines (any 1) [2]

8 (a) Name **two** minerals which are required in a person's diet. For each mineral which you name, state **one** function of this mineral in the body.

first mineral Iron

function Needed in Haemoglobin / to carry O_2

second mineral Calcium

function Needed for Bones / Teeth.

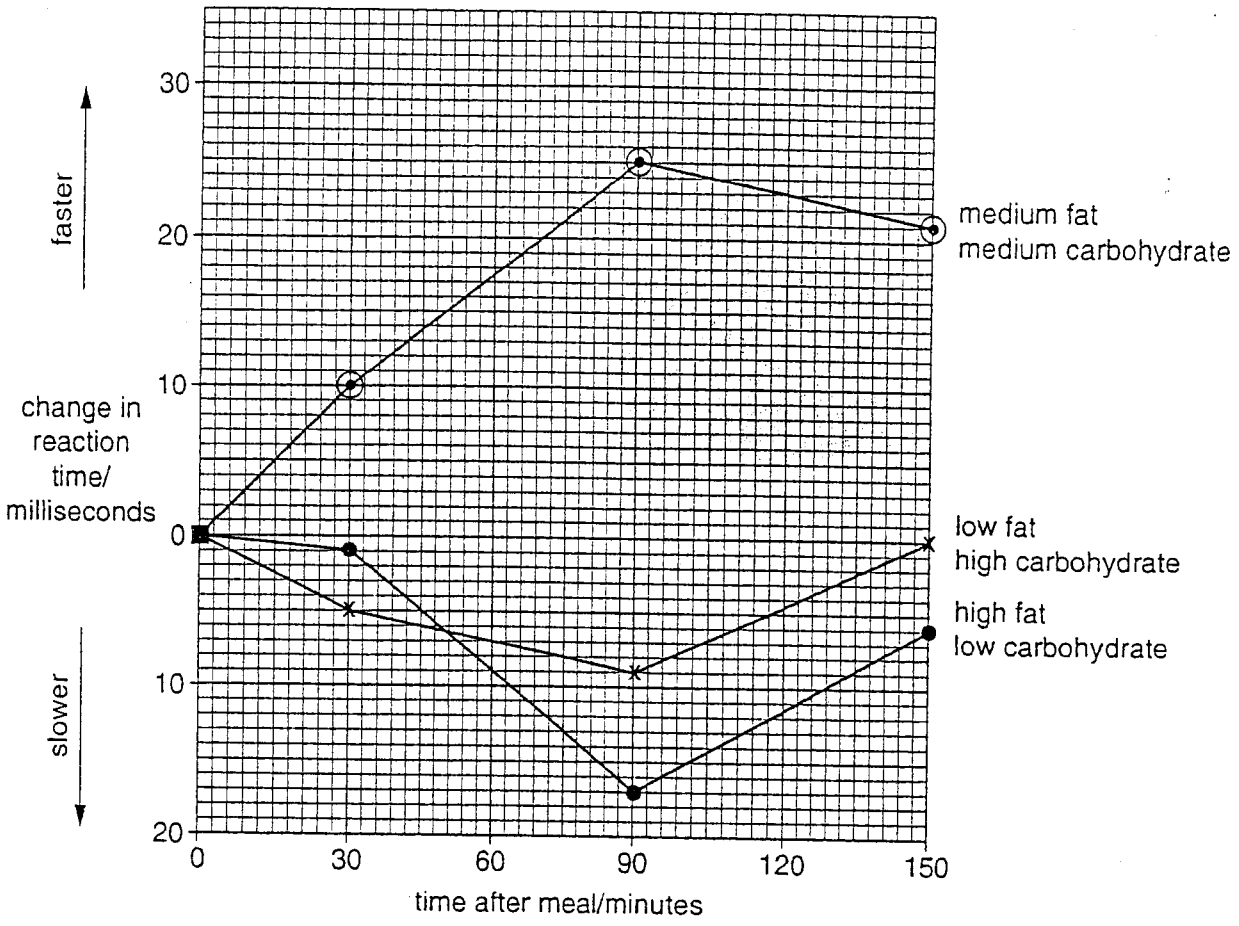
[4]

(b) An experiment was carried out to investigate whether the foods a person eats for their midday meal affects their reaction time during the afternoon. The types of meal tested were:

- medium fat, medium carbohydrate
- low fat, high carbohydrate
- high fat, low carbohydrate

A person's reaction time was measured just before the meal was eaten. Then the reaction time was tested again at 30 minutes, 90 minutes and 150 minutes after the meal. This was repeated many times.

For each person, the changes in their reaction times after the meal were calculated. These changes were averaged for all the different people who were tested. The results are shown on the graph.



(i) From these results, which type of meal is best to eat to make sure that your reaction time is as fast as possible during the afternoon?

Medium Fat, medium Carbohydrate. [1]

(ii) Underline one of the meals listed below, to indicate which would be likely to **slow down** your reaction time by the **greatest** amount during the afternoon.

bean soup and rice, low fat yoghurt

beefburger and fried egg, ice cream

cold roast chicken, bread roll and salad, orange [1]

(iii) A person's reaction time before a low fat, high carbohydrate, midday meal was 300 milliseconds.

From the graph, calculate the reaction time you would expect the person to have 30 minutes after the meal. Show your working.

(1)

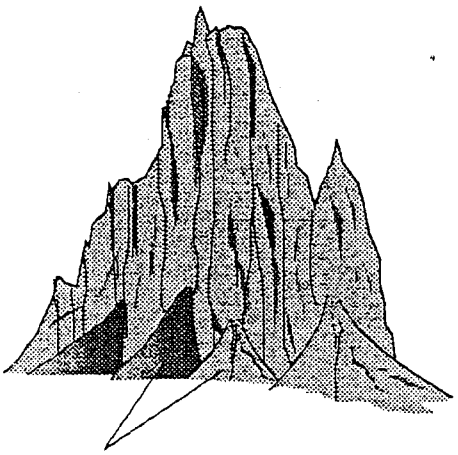
300 − 10 (1)

290

..... milliseconds [2]

For Examiner's Use

9 The diagram shows what can happen when rocks are weathered.



slopes of small pieces of broken rock

(a) Describe **one physical** weathering process.

wind, rain, freeze/thaw (onion peeling) effect
* sudden temperature changes (1)
remaining small fragments of rock (1)
(any 1) [2]
reverse

For Examiner's Use

(b) The diagrams show how the surface of a rock can change when it is weathered.

cross-section through original rock

cross-section through weathered rock

Chemical weathering can occur when rain water which is slightly acidic runs over the rock surface. The original rock weathers slowly. Once the rock starts to weather, the rate of chemical weathering increases. Suggest a reason for this.

small cracks create large surface area for rain water to attack rock

[2]

(c) Use the Periodic Table on page 20 to help you answer the questions below.

The chemical formula of a compound found in rock is $KAlSi_3O_8$.

(i) **Name** the two metallic elements in this compound.

1. potassium Aluminium (do not accept symbols!)

2. [2]

(ii) **Name** the element in this compound which is found in the second period of the Periodic Table.

oxygen [1]

(iii) State the total number of atoms shown in the formula.

13 [1]

DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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	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.)