Candidate Name Mark Scheme

Centre Number	Candidate Number

International General Certificate of Secondary Education

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CO-ORDINATED SCIENCES 0654/2

PAPER 2

Thursday **9 NOVEMBER 2000** Afternoon 2 hours

Candidates answer on the question paper.
No additional materials are required.

Bio ✓
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.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
TOTAL	

This question paper consists of 19 printed pages and 1 blank page.

[Turn over

1 Some information about three drugs is shown in Fig. 1.1.

drug	formula	effect on a human
aspirin	$C_9O_4H_8$	reduces pain
caffeine	$C_8N_4O_2H_{10}$	acts as a stimulant
chloral hydrate	$C_2Cl_3O_2H_3$	causes deep sleep

Fig. 1.1

(a) (i) State the number of different elements in chloral hydrate.

4 .....[1]

(ii) State the total number of atoms that are combined in one molecule of caffeine.

24 .....[1]

(b) (i) State the meaning of the word *drug*.

A substance which changes the way the body works. .....[1]

(ii) Which drug in Fig. 1.1 is an *analgesic*? (pain reliever)

aspirin .....[1]

(iii) Suggest **one** reason why a drug company making aspirin needs to ensure that the product is as pure as possible.

Impurities present could have side effects / be toxic. .....[1]

2 Fig. 2.1 shows an elbow joint.

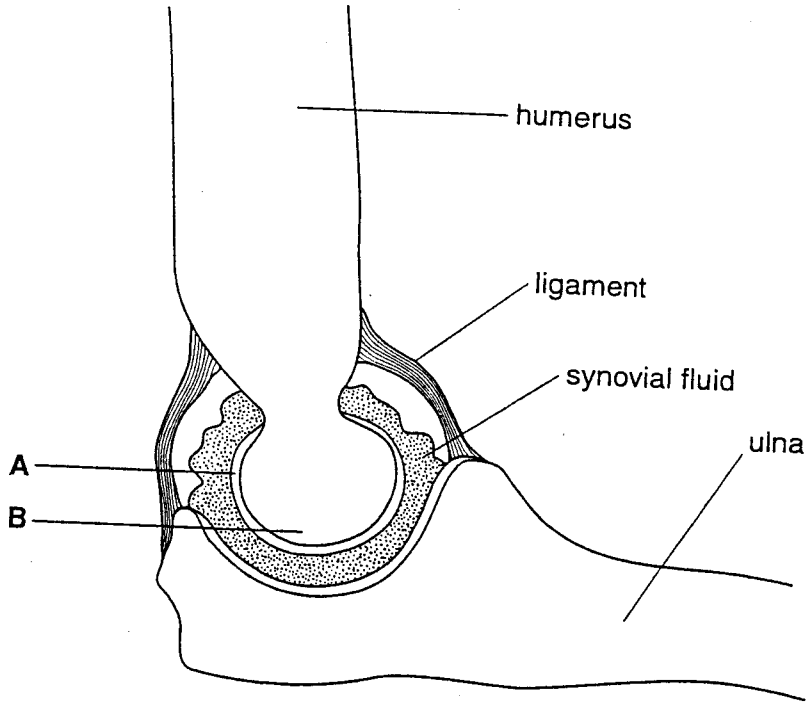

Fig. 2.1

(a) What name is used to describe this type of joint?

Ball Hinge Joint / Synovial Joint [1]

(b) **(i)** Name the substances which make up the parts labelled **A** and **B**.

A Cartilage

B Bone [2]

(ii) Describe **one** difference in the properties of the two substances you have named.

Bone is harder than cartilage

[1]

(c) In a disease called arthritis, part **A** becomes rough and gets worn away.
Suggest and explain the effect that this has on movement of the joint.

Movement is more difficult;
More friction between the bones;
Painful; [2]

[Turn over

3 The top of a water slide is 10 m above the water in a swimming pool, as shown in Fig. 3.1.

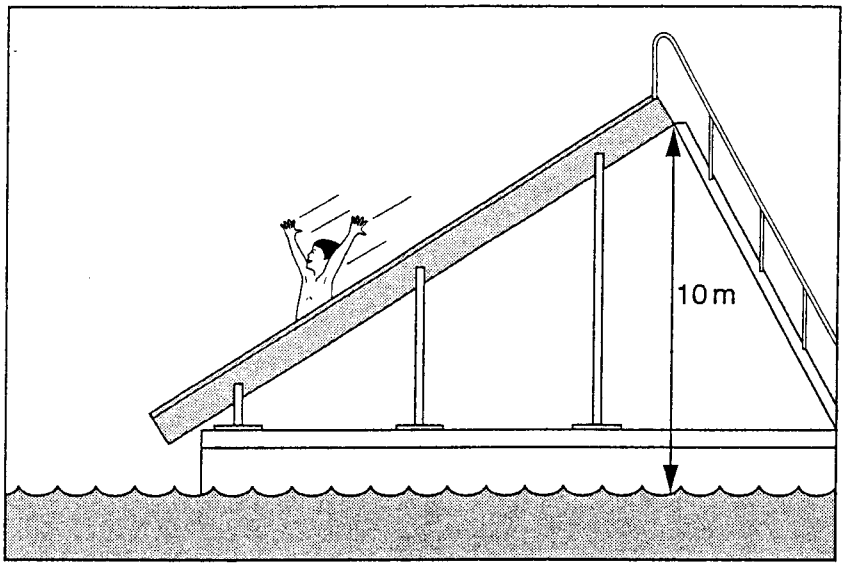

Fig. 3.1

(a) A boy has a mass of 40 kg.

What is his weight? [The gravitational field strength is 10 N/kg.]

$W = mg = 40 \times 10 = 400\ N$ [1]

(b) He climbs from the pool to the top of the slide.

How much work does he do raising his body against the pull of gravity? Show your working and state any formula that you use.

$W = F \times d = 400 \times 10$

$= 4000$ joules [2]

(c) When he reaches the bottom of the slide, his speed is 12 m/s.

Calculate his kinetic energy. Show your working and state any formula that you use.

$KE = \frac{1}{2} mv^2 = \frac{1}{2} \times 40 \times 12^2$

2880 joules [3]

For Examiner Use

(d) The boy loses his kinetic energy when he hits the water.

What happens to the kinetic energy?

Transferred to heat (or KE of water)

.....[1]

(e) The boy then climbs to the top of another water slide, which is 20 m high.

(i) When the boy is at the top of this slide, is his weight any different from when he was at the top of the 10 m slide? Explain your answer.

No. Gravitational field strength doesn't change over such a short distance.....[1]

(ii) Suggest whether the kinetic energy of the boy at the bottom of the 20 m slide will be different from his kinetic energy at the bottom of the 10 m slide. Give reasons for your answer.

It will be greater

Because he has more P.E at the top of the larger slide.....[2]

(f) Water evaporates from the pool.

Describe the process of evaporation in terms of the kinetic theory.

- Water molecules are moving
- Some will have enough energy to break out of the surface
- Over a long enough time all will break out.....[3]

For Examiner's Use

4 Fig. 4.1 shows a container used in a home to hold salt (sodium chloride).

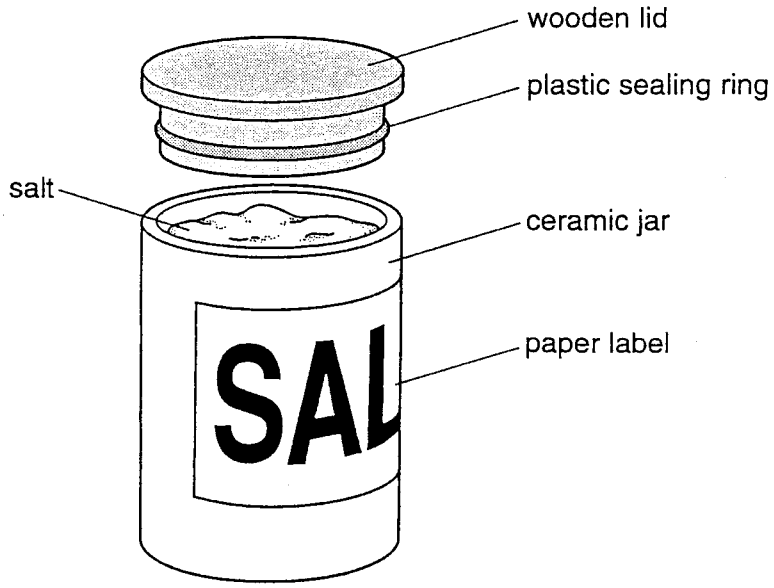

Fig. 4.1

(a) Name the raw material from which each of the following parts is made.

the paper label ..... Wood .....

the ceramic jar ..... clay .....

the plastic sealing ring ..... crude oil .....[3]

(b) **(i)** Name two parts of the container that contain carbohydrate molecules.

1. ..... wooden lid (cellulose is the carbohydrate) .....

2. ..... paper label .....[2]

(ii) Name the elements that are contained in all carbohydrates.

..... carbon, hydrogen and oxygen .....[1]

(c) **(i)** Which substance shown in Fig. 4.1 has a giant ionic structure?

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

(ii) State two typical physical properties of substances that have giant ionic structures.

(any 2)

1. ..... high melting points / dissolve in water .....

2. ..... regular shape (crystalline in appearance) .....[2]

(d) The plastic ring needs to have elasticity in order to make an airtight seal between the lid and the jar.

Explain briefly the meaning of the term *elasticity*.

..... when stretched the material will return .....

..... to its original shape .....

.....[1]

5 The graph in Fig. 5.1 shows the changes in concentration of two hormones, **X** and **Y**, during a woman's menstrual cycle.

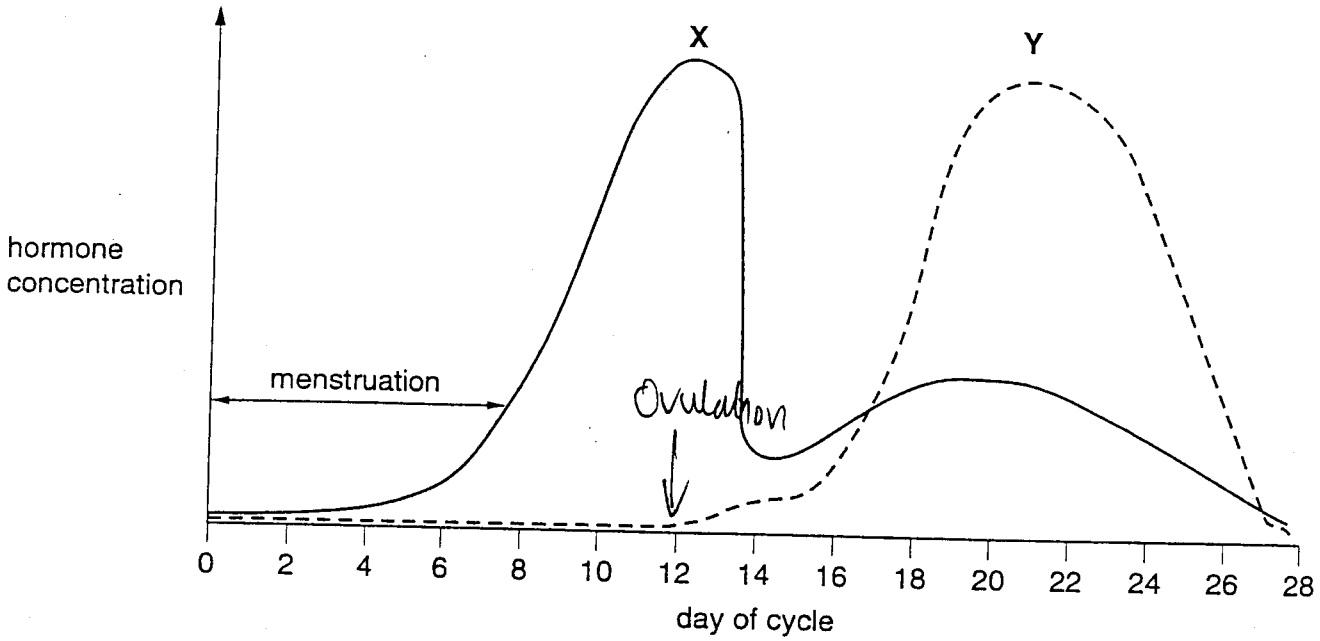

Fig. 5.1

(a) **(i)** Name the hormones **X** and **Y**.

hormone **X** Oestrogen

hormone **Y** Progesterone [2]

(ii) Where in the woman's body are these hormones produced?

Ovary [1]

(b) Describe what is happening in the uterus between day 8 and day 14.

Increase in the thickness of Uterus lining;
Becomes full of Blood;
Ready to accept fertilized egg [2]

(c) **(i)** On Fig. 5.1, indicate when you would expect ovulation to occur. [1]

(ii) Describe what happens at ovulation.

Ovarian Follicle joins wall of Ovary;
Egg is released from follicle/Ovary;
Passes into Oviduct; [2]

[Turn over

6 (a) A 10 N weight is added to a spring.

Fig. 6.1 shows the unloaded spring and the spring after the weight has been added.

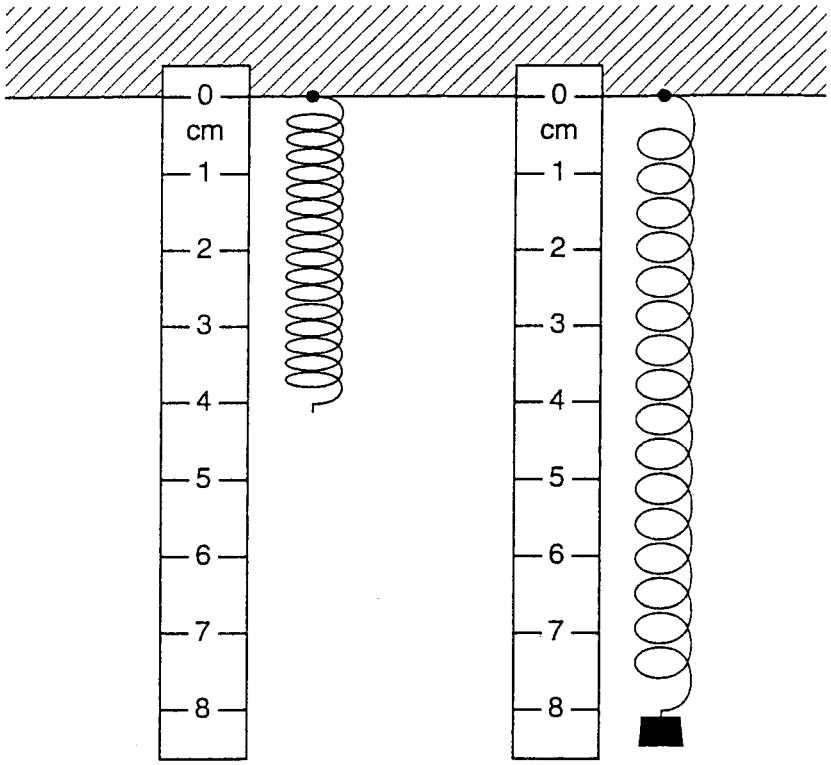

Fig. 6.1

(i) What is the extension of the spring?

8 − 4 = 4 cm [1]

(ii) Fig. 6.2 shows the same spring when an object of unknown weight is hung on it.

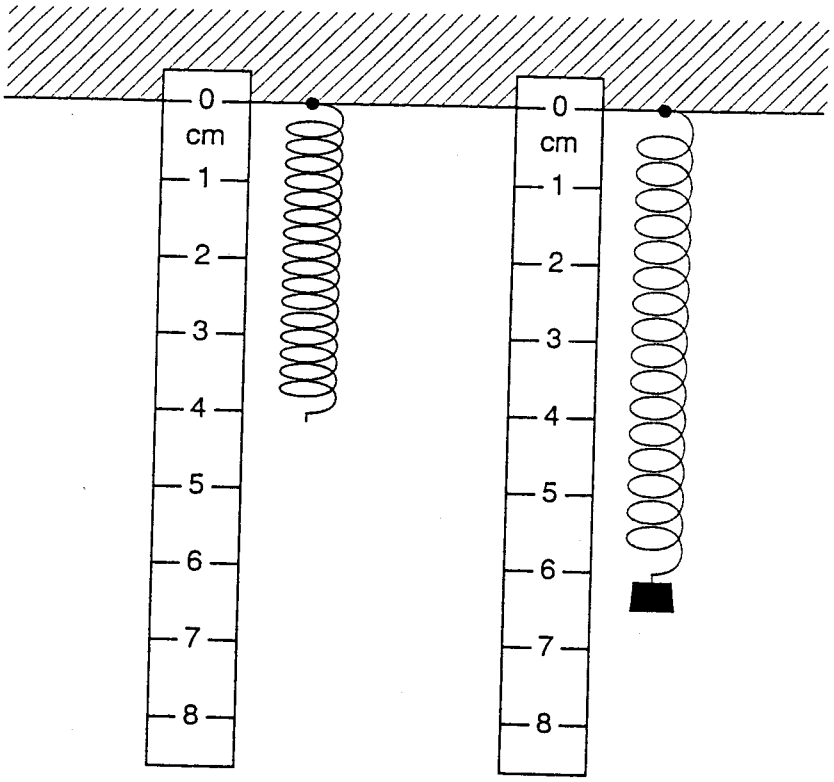

Fig. 6.2

What is the weight of the object? ..... 5N ..... N

Explain your answer.

..... Half the extension → half the force .....

.....[3]

[Turn over

For Examiner's Use

(b) The jumping ability of kangaroos is partly due to the tendons in their legs, which act rather like springs.

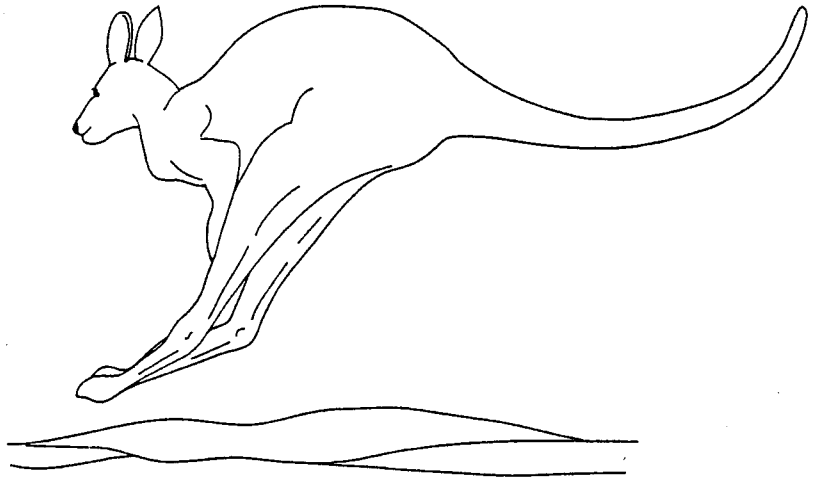

Fig. 6.3

Describe the function of tendons in a mammal such as a kangaroo.

Attach Muscles to bones;
Tendons will stretch (to a degree) when pulled;
Energy can be stored in stretched tendons [2]

For Examiner Use

7 Fig. 7.1 shows information about four elements, **A**, **B**, **C** and **D**. These letters are **not** the usual chemical symbols of these elements.

element	combining power (valency)	electrical conductivity	pH of a mixture of water and the oxide of the element
A	3	low	2
B	2	high	7
C	1	high	13
D	2	low	1

Fig. 7.1

(a) Use information from Fig. 7.1 to select, with a reason, **one** element, **A**, **B**, **C** or **D**, which

(i) is a non-metal; A or D

reason low conductivity or acidic oxide (pH 1 or 2)

.....[2]

(ii) is a metal in Group I of the Periodic Table; C

reason pH 13 means an alkaline oxide must have dissolved in water – group 1 metals form alkaline oxides [2]

(iii) forms an oxide which does **not** change the pH of water. B

reason oxide about pH 7 same as water (1) (1)

.....[2]

(b) **(i)** Using the symbols **C** and **D**, write the chemical formula of the compound which forms when element **C** combines with element **D**.

C_2D [1]

(ii) State, with a reason, the type of chemical bonding in the compound formed between **C** and **D**.

type of bonding ionic

reason group 1 metals always form ions in compounds (metals bond with non metals ionically) [2]

[Turn over

For Examiner's Use

8 Read the passage, then use the information and your own knowledge to answer the questions that follow.

> Palm trees grow in most tropical and sub-tropical regions of the world. They are used by people for many different purposes. They provide food, fuel, clothing and shelter.
>
> The sago palm, *Metroxylon sagu*, provides a good source of starch, which is used as food by millions of people living on South-East Asian islands. Unfortunately, it does not contain any protein or vitamins. Date palms, *Phoenix dactylifera*, are also a good food source, as their fruits contain a lot of sugar.
>
> Coconut palms, *Cocos nucifera*, have many useful products besides the well-known edible coconuts. The white flesh of coconut seeds is a source of oil, which is used for making soap. The leaves, and the fibrous outer covering of the fruits, called coir, contain polymers which can be used for making fibres. These fibres are used to make doormats, clothing and baskets. The woody stems of coconut palms are used for making boats, for building houses, and as fuel.

(a) Explain why each kind of palm has a two-word Latin name.

Binomial classification;
Each organism is given Two (Latin) names;
Genus + Species

.....[2]

(b) **(i)** State the use of starch in the human diet.

Provide energy

.....[1]

(ii) For many people, sago is a major part of their diet.

Suggest **one** other food which they could eat, to help to make their diet more balanced.

Explain why you have suggested this food.

Any food Containing protein
Protein is needed for growth + repair
Food containing a Named Vitamin .....[2]

(c) Suggest why some fruits and seeds contain large amounts of sugar or oil (fat).

Food Store

.....[1]

(d) **(i)** Explain the meaning of the term *polymer*.

Long chain of identical (similar) subunits

.....[1]

(ii) Name **one** polymer which you would expect to find in the leaves of the coconut palm.

Cellulose

.....[1]

[Turn over

9 **(a)** Fig. 9.1 shows a telephone handset.

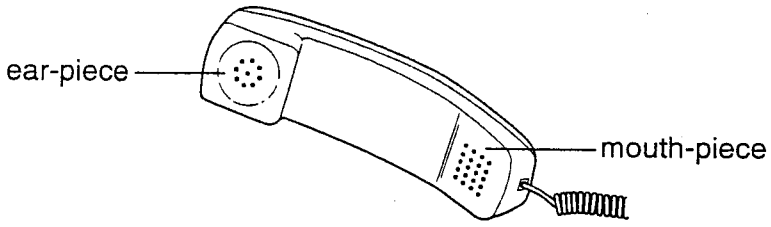

Fig. 9.1

Complete the following sentences by choosing words from the list below.
Each word may be used **once, more than once** or **not at all.**

electrical	**faster**	**gas**	**heat**	**liquid**
molecules	**slower**	**sound**	**vacuum**	**wave**

The mouth-piece contains a microphone. This changes .....Sound..... energy into .....electrical..... energy.

Sound is a longitudinal .....wave..... . Sound travels through air by the movement of air molecules. In a solid, the molecules are close together, so the sound travels .....faster..... than it does in a gas. Sound cannot travel through a .....Vacuum..... because there are no .....molecules..... present.

[6]

(b) Workers in a noisy factory are exposed to high levels of sound.

(i) What piece of apparatus could be used to measure the sound levels in the factory?

.....Decibel meter.....[1]

(ii) Explain how the high levels of sound could damage the workers' health.

.....Cause headaches / loss of hearing.....

.....[1]

(iii) Suggest how the sound levels heard by the workers in the factory could be reduced.

- .....Wear ear protection.....
- .....Use sound-proofing.....

.....[2]

10 Fig. 10.1 shows the cell of a bacterium.

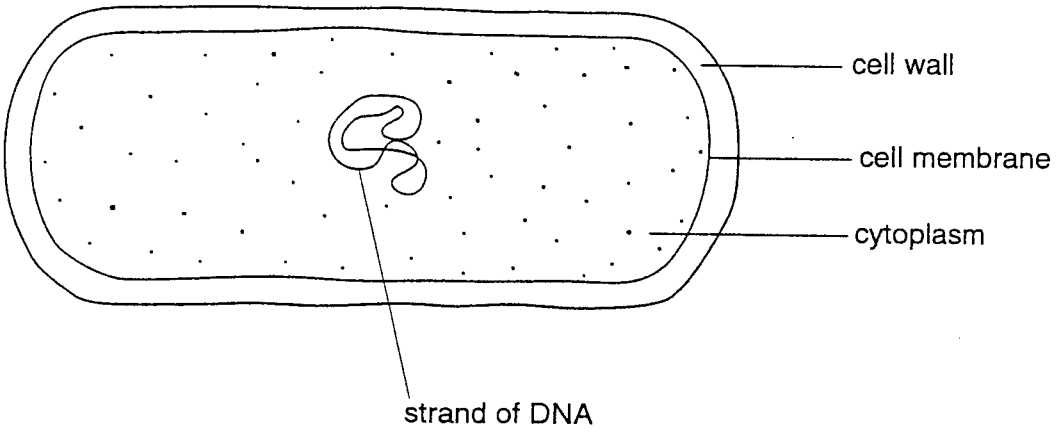

Fig. 10.1

(a) State two ways in which this cell differs from an animal cell.

1. No nucleus;
   Smaller;
2. No mitochondria;

[2]

(b) Which component of human blood helps to defend the body against infection by bacteria?

White Blood Cells [1]

(c) Explain how bacteria can cause tooth decay.

Bacteria feed on sugars;
Acid is produced;
Acid "eats" through enamel;

[3]

(d) Some bacteria help to rot dead bodies and animal faeces. They use carbon-containing compounds in the dead bodies to supply their energy. They release the carbon into the air as carbon dioxide. This is an important part of the carbon cycle.

Explain why it is important to other living organisms that carbon is released from dead bodies in this way.

So that Carbon can be re-used;
By photosynthesis;
to produce more food for animals; [2]

[Turn over

11 A soil sample from a farm was shaken with water in a test-tube. Fig. 11.1 shows the appearance of the tube and its contents after about one hour.

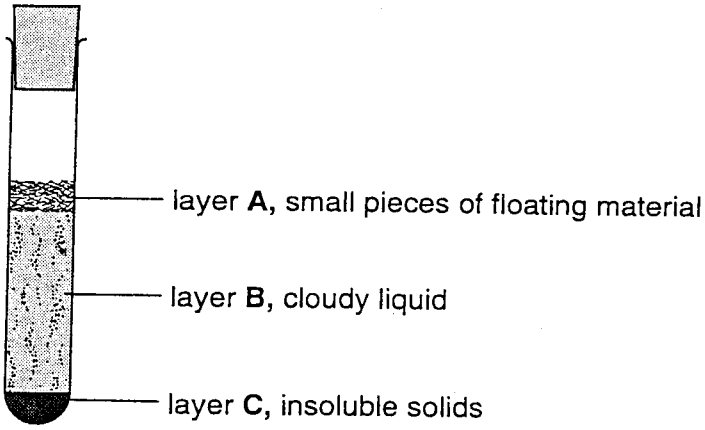

Fig. 11.1

(a) Suggest what the floating material in layer **A** contains.

humus [1]

(b) Fig. 11.2 shows the appearance of a small drop from layer **B**, as seen under a microscope.

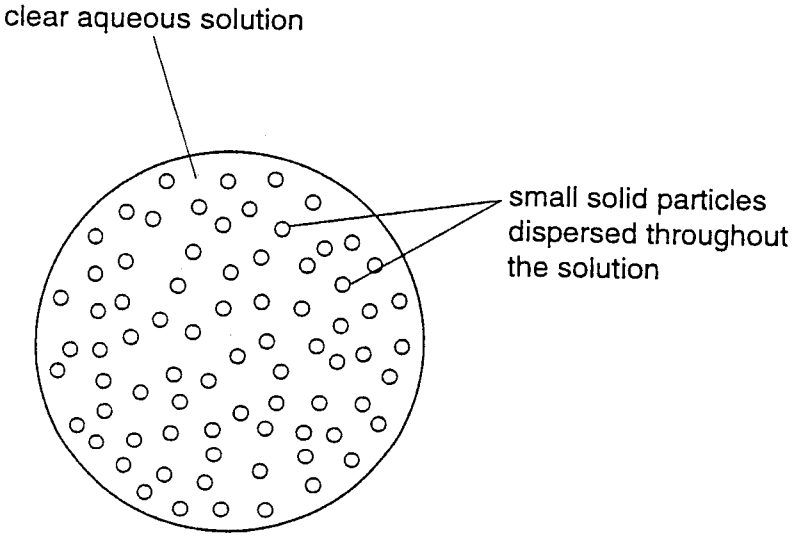

Fig. 11.2

(i) What name is given to the type of mixture shown in layer **B**?

colloid [1]

(ii) Explain why layer **B** is **not** transparent.

light is scattered by colloidal particles [1]

For Examiner's Use

(c) Some of layer **B** was removed and added to some dilute sodium hydroxide solution. The mixture was then warmed gently. Ammonia gas was given off.

(i) Describe a safe test for ammonia.

add pH paper to gas given off
— result pH paper turns blue/purple
(litmus (red) turns blue) [2]

(ii) Name an **ion** which must be present in layer **B**, in order for ammonia to be released in this experiment.

ammonium [1]

(iii) Suggest **one** reason why the soil contains the ion you have named in **(ii)**.

farm fertilizer may have been added (or manure)
with certain ammonium compounds eg ammonium nitrate [1]

(d) The results of some tests carried out on material from layer **C** in the original test-tube are shown in Fig. 11.3.

test	observation
reaction with dilute hydrochloric acid	gas evolved which reacts with limewater
flame test	brick red flame colour

Fig. 11.3

(i) Name the gas evolved. Carbon dioxide [1]

(ii) Name the metal which is shown to be present by the flame test.

Calcium [1]

(iii) Which compound do these results suggest is present in layer **C**?

Calcium carbonate [1]

(iv) Suggest **one** reason why the soil contains the compound you have named in **(iii)**.

Chalk/limestone present in soil.

[1]

[Turn over

12 A student mixed light of three different colours and observed the results shown in Fig. 12.1.

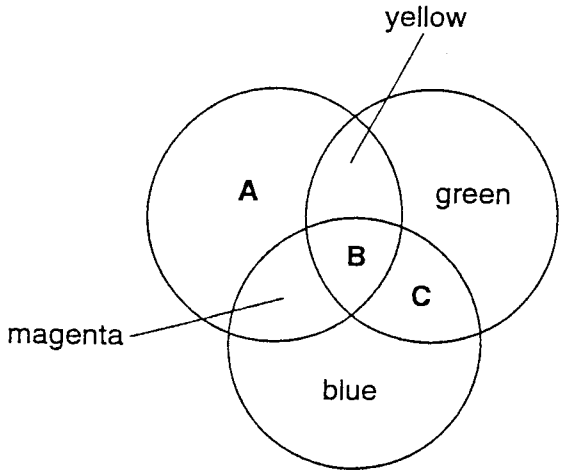

Fig. 12.1

(a) Identify colours **A**, **B** and **C**.

A Red

B White

C ~~Yellow~~ Cyan

[3]

(b) **(i)** **Name** one primary colour labelled on Fig. 12.1.

green / blue [1]

(ii) **Name** one secondary colour labelled on Fig. 12.1.

Magenta / yellow [1]

(c) Visible light, radio waves and X-rays form part of the electromagnetic spectrum.

Name **one** other part of the electromagnetic spectrum.

Microwaves, IR, UV, Gamma [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.).