



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



CO-ORDINATED SCIENCES

0654/31

Paper 3 Theory (Core)

October/November 2023

2 hours

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [].
- The Periodic Table is printed in the question paper.

This document has **28** pages. Any blank pages are indicated.

1 (a) Fig. 1.1 is a diagram of the female reproductive system in humans.

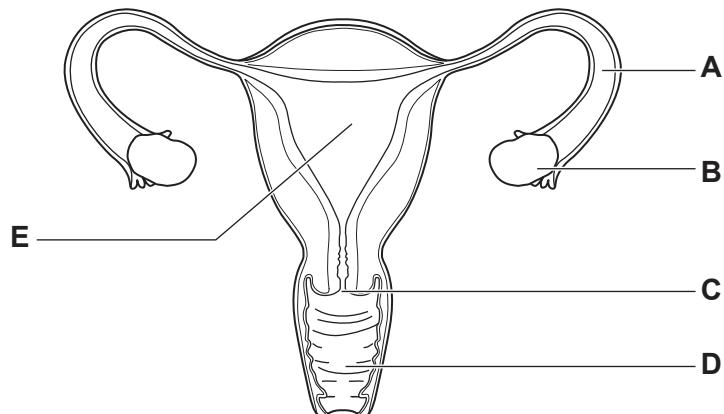


Fig. 1.1

Identify the letters in Fig. 1.1 that represent the part:

that produces female gametes
.....

that receives the penis during sexual intercourse
.....

where fertilisation occurs.
.....

[3]

(b) State the names of the female gametes and the male gametes in humans.

female gametes
.....

male gametes
.....

[2]

(c) Gametes are cells.

Draw and label the main structures in a simple animal cell in the space provided.

[3]

(d) Circle the correct word or phrase in bold in each sentence to describe early development in humans.

During fertilisation, the nuclei of gametes fuse forming a fertilised cell called **a fetus / a zygote / an embryo**.

This divides to form **a zygote / an embryo / an ovule** which is a ball of cells.

This ball of cells implants into the wall of the **cervix / uterus / vagina**.

[3]

[Total: 11]

2 (a) Air is a mixture of gases.

Fig. 2.1 shows two pie charts representing samples of air, **A** and **B**.

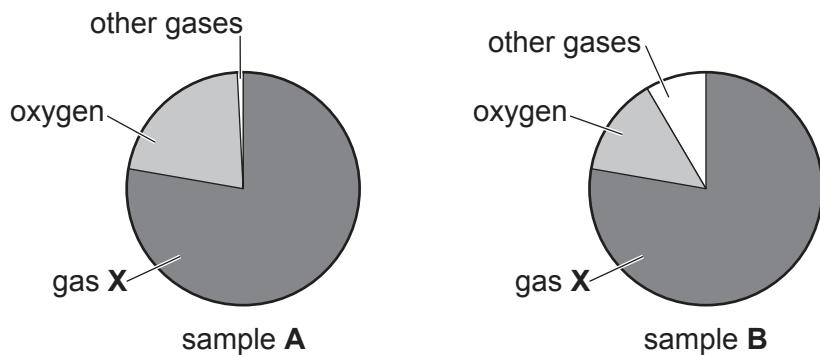


Fig. 2.1

(i) State which sample, **A** or **B**, represents clean air.

Explain your answer.

sample

explanation

..... [1]

(ii) Identify gas **X**.

..... [1]

(b) Sulfur dioxide is a common pollutant found in air.

(i) State **one** adverse effect of sulfur dioxide on the health of humans.

..... [1]

(ii) State **one** source of sulfur dioxide in the air.

..... [1]

(iii) State **one** other common pollutant gas found in the air.

..... [1]

(iv) Sulfur dioxide dissolves in rainwater to make acid rain.

Suggest a pH value for acid rain.

pH = [1]

(v) Farmers need to treat acidic soil to neutralise the acidity.

State the chemical substance used by farmers to treat soil acidity.

..... [1]

(c) An atom of sulfur has an electronic structure 2, 8, 6.

(i) On Fig. 2.2, complete the electronic structure for this atom of sulfur.

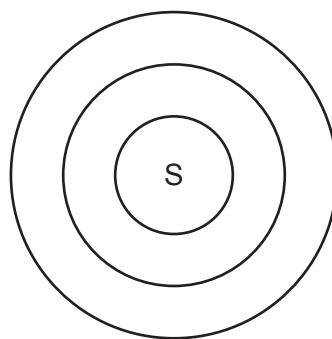


Fig. 2.2

[1]

(ii) Suggest how many electrons this sulfur atom gains to become a sulfide ion S^{2-} .

..... [1]

[Total: 9]

3 Fig. 3.1 shows four forces, **A**, **B**, **C** and **D**, acting on a submarine travelling underwater at a constant depth and at constant speed.

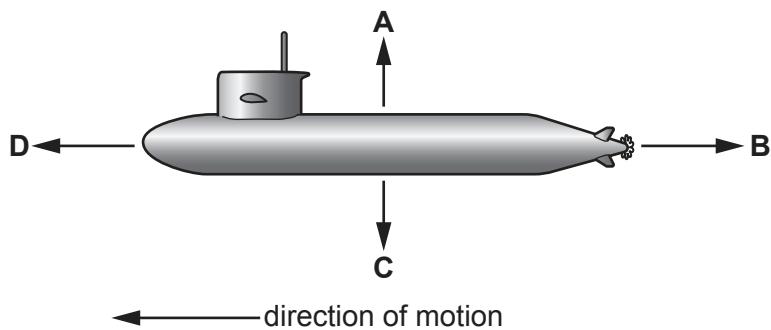


Fig. 3.1

(a) (i) State the name of force **C**.

..... [1]

(ii) State how the magnitude of force **B** compares to the magnitude of force **D**.

..... [1]

(b) Sound above the maximum frequency that the healthy human ear can hear is called ultrasound.

The submarine stops moving and then uses ultrasound to determine the depth of the sea floor.

(i) Suggest a value for the frequency of ultrasound.

frequency = Hz [1]

(ii) Pulses of ultrasound waves are sent out through the water. The ultrasound pulses reflect off the sea floor and the reflection is detected by the submarine 1.4 s later.

Ultrasound waves move through sea water at a speed of 1600 m/s.

Calculate the total distance travelled by the ultrasound pulse.

distance = m [2]

(iii) Use your answer to (b)(ii) to calculate the distance between the sea floor and the submarine.

distance = m [1]

(c) The submarine is powered by a nuclear reactor.

The nuclear reactor uses the nuclear fission of the isotope uranium-235.

(i) State what is meant by the term isotope.

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

(ii) Describe what happens to the nucleus of a uranium-235 atom during nuclear fission.

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

(iii) Suggest **one** advantage of using nuclear fission to generate electricity.

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

[Total: 9]

4 (a) A student records their pulse rate in beats per minute (bpm) during different types of activity.

Fig. 4.1 shows a bar chart of the results.

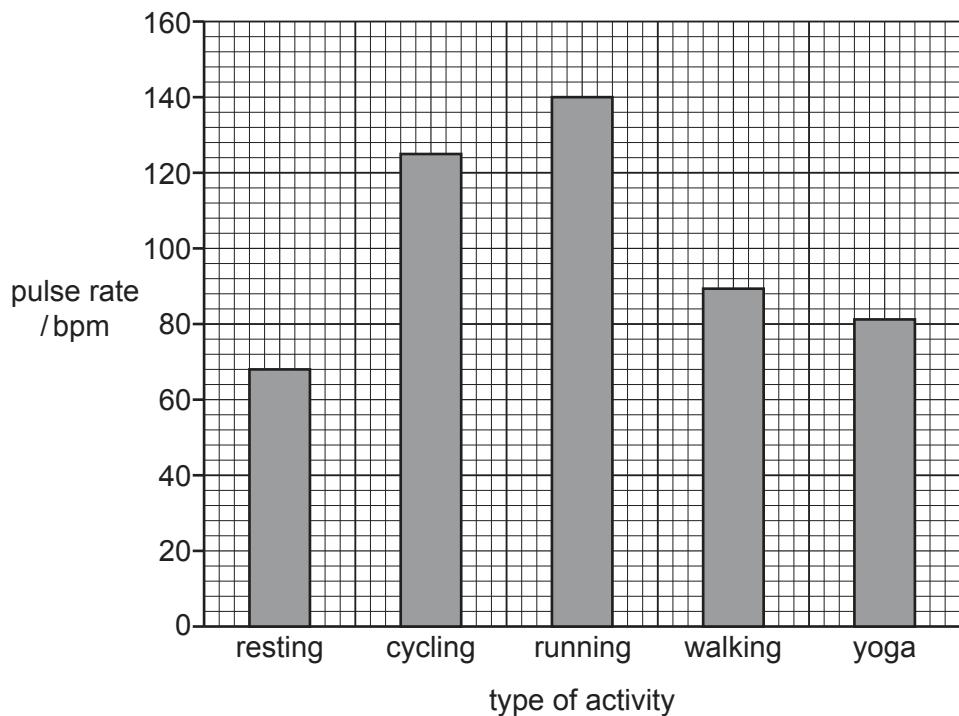


Fig. 4.1

(i) Identify the activity that results in the **smallest** increase in pulse rate from the resting pulse rate.

..... [1]

(ii) Calculate the percentage increase in pulse rate from resting to running shown in Fig. 4.1.

pulse rate during rest bpm

pulse rate during running bpm

percentage increase = [2]

(b) The rate of aerobic respiration increases during exercise.

(i) State the **two** reactants in aerobic respiration.

1

2

[2]

(ii) Suggest why the rate of respiration increases during exercise.

.....

.....

.....

..... [2]

(c) A hormone that causes pupils in the eye to widen also affects breathing and pulse rate.

(i) State the name of this hormone.

..... [1]

(ii) State the component of blood that transports hormones.

..... [1]

[Total: 9]

5 Table 5.1 shows five compounds, **A**, **B**, **C**, **D** and **E**, and the formula of each compound.

Table 5.1

compound	formula
A	CO
B	CO ₂
C	CH ₄
D	C ₂ H ₄
E	C ₂ H ₆

(a) (i) State the compound from Table 5.1 that is an unsaturated hydrocarbon.

..... [1]

(ii) Describe the chemical test that distinguishes between a saturated hydrocarbon and an unsaturated hydrocarbon and state the results for each.

test

.....
result for a saturated hydrocarbon

.....
result for an unsaturated hydrocarbon

..... [3]

(b) (i) State the **name** of the **two** compounds from Table 5.1 that are possible products of the combustion of compound **E**.

1

2

[2]

(ii) State the name of the compound made when compound **D** reacts with steam.

..... [1]

(iii) State the name of the polymer made using compound **D** as a monomer.

..... [1]

(iv) Draw the structure of compound **E**, C_2H_6 .

[2]

(c) State the names of the **two** most common greenhouse gases from Table 5.1.

..... and [1]

[Total: 11]

6 (a) Fig. 6.1 shows an incomplete circuit diagram.

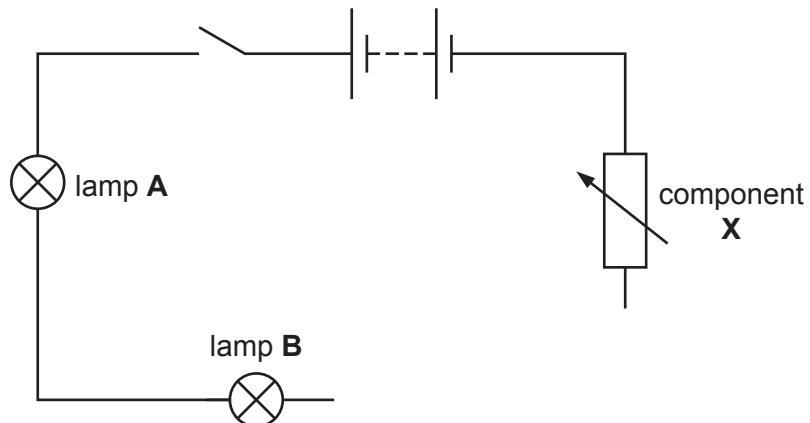


Fig. 6.1

(i) Complete the circuit diagram in Fig. 6.1 by:

- adding an ammeter to measure the current in lamp A
- adding a voltmeter to measure the potential difference across lamp A.

[3]

(ii) Identify component X.

..... [1]

(b) Lamp A has a resistance of 6.0Ω and lamp B has a resistance of 4.0Ω .

The current in lamp A is 1.2A.

(i) Calculate the potential difference across lamp A.

$$\text{potential difference} = \dots \text{V} \quad [2]$$

(ii) Calculate the combined resistance of the two lamps connected in series.

$$\text{resistance} = \dots \Omega \quad [1]$$

(iii) The two lamps are now connected in parallel. Their combined resistance is different.

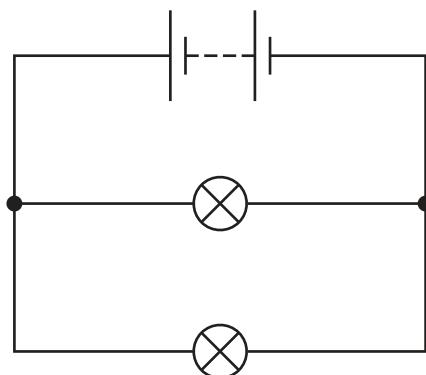


Fig. 6.2

Identify from the list the combined resistance of the two lamps connected in parallel.

Explain your answer.

2.4Ω

4.0Ω

6.0Ω

10Ω

24Ω

combined resistance

explanation

[2]

(c) In lighting circuits in houses, lamps are connected in parallel.

State **two** advantages of using lamps connected in parallel rather than in series.

1

.....

2

.....

[2]

[Total: 11]

7 (a) Horses are herbivores.

Define the term herbivore.

.....
.....
.....

[2]

(b) Fig. 7.1 is a photograph of the lower jaw of a horse.

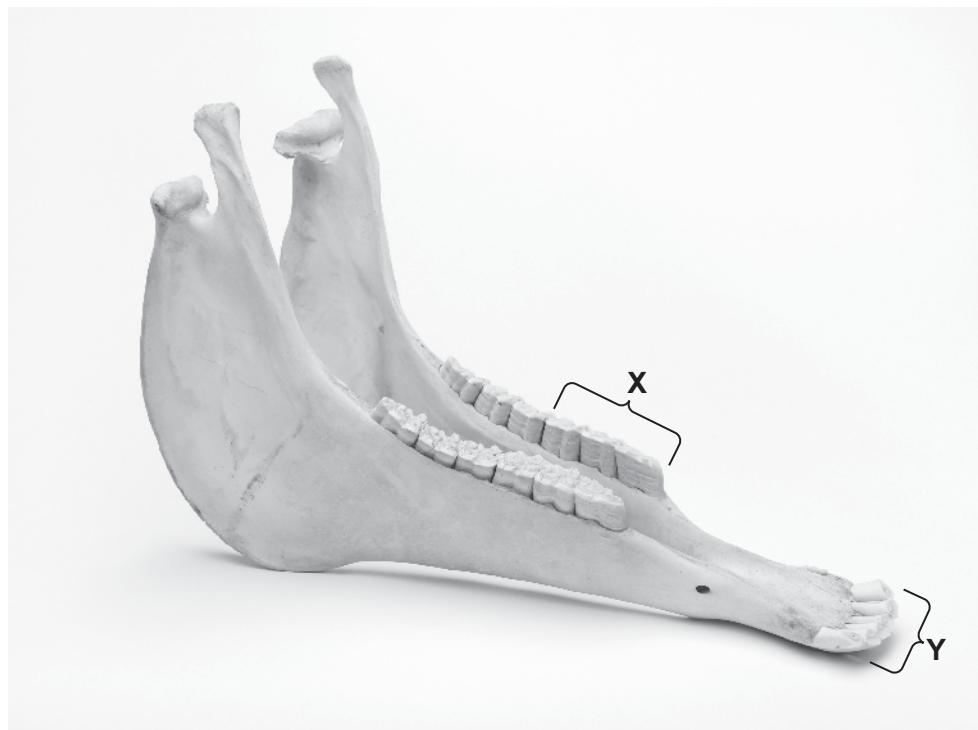


Fig. 7.1

(i) The dental pattern of a horse is similar to that of humans.

Identify the type of teeth labelled **X** and **Y** in Fig. 7.1.

X

Y

[2]

(ii) Identify the type of teeth found in a human jaw but **not** present in the jaw shown in Fig. 7.1.

..... [1]

(iii) State the name of the type of digestion that takes place using teeth.

..... [1]

(c) The statements describe some processes that occur in the alimentary canal.

Place ticks (✓) to show **all** the statements that describe the process of absorption.

food molecules are broken down so they become soluble	<input type="checkbox"/>
food molecules become part of cells	<input type="checkbox"/>
food molecules cross the wall of the small intestine	<input type="checkbox"/>
food molecules enter the blood	<input type="checkbox"/>
food molecules are taken in through the mouth	<input type="checkbox"/>

[2]

(d) Complete these sentences about biological molecules.

Choose words or phrases from the list.

Each word or phrase may be used once, more than once or not at all.

amino acids fatty acids glycerol glycogen starch

Proteins are made from smaller molecules called

Glucose is used to make **two** larger molecules called

..... and

Iodine solution is used to test for the presence of

[4]

[Total: 12]

8 (a) Table 8.1 gives statements about molecules in solids and gases.

Put a tick (✓) next to each statement to show if it refers to a solid or to a gas.

Table 8.1

statement	solid	gas
molecules are closely packed		
molecules are free to move around		
molecules are widely separated		
molecules vibrate about fixed positions		

[2]

(b) Use the list of substances to answer the following questions.

Each substance may be used once, more than once or not at all.

carbon chlorine copper ethanol oxygen water

(i) Identify **one** substance which is a compound.

..... [1]

(ii) Identify **two** substances which are solvents.

1

2

[2]

(iii) Identify **one** substance which is a transition element.

..... [1]

(iv) Identify **one** substance which is a halogen.

..... [1]

(v) Identify **one** substance which consists of diatomic molecules.

..... [1]

[Total: 8]

9 (a) Train track is made of lengths of steel rails with small gaps between them.

Fig. 9.1 shows some train track.

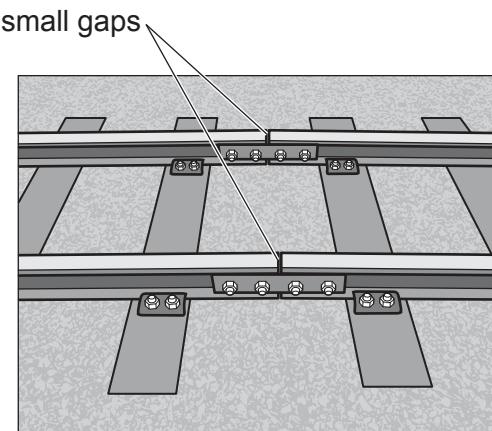


Fig. 9.1

(i) Suggest why gaps are left between the steel rails.

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

(ii) A steel rail has a volume of 0.13 m^3 .

The density of steel is 7900 kg/m^3 .

Calculate the mass of the steel rail.

$$\text{mass} = \dots \text{kg} \quad [2]$$

(b) (i) A train travels along the track for 600 s.

The train starts from rest and accelerates to a speed of 12.5 m/s in 200 s.

The train then travels at a constant speed for 300 s before slowing down and stopping after a further 100 s.

Complete the speed–time graph shown in Fig. 9.2 to show the motion of the train.

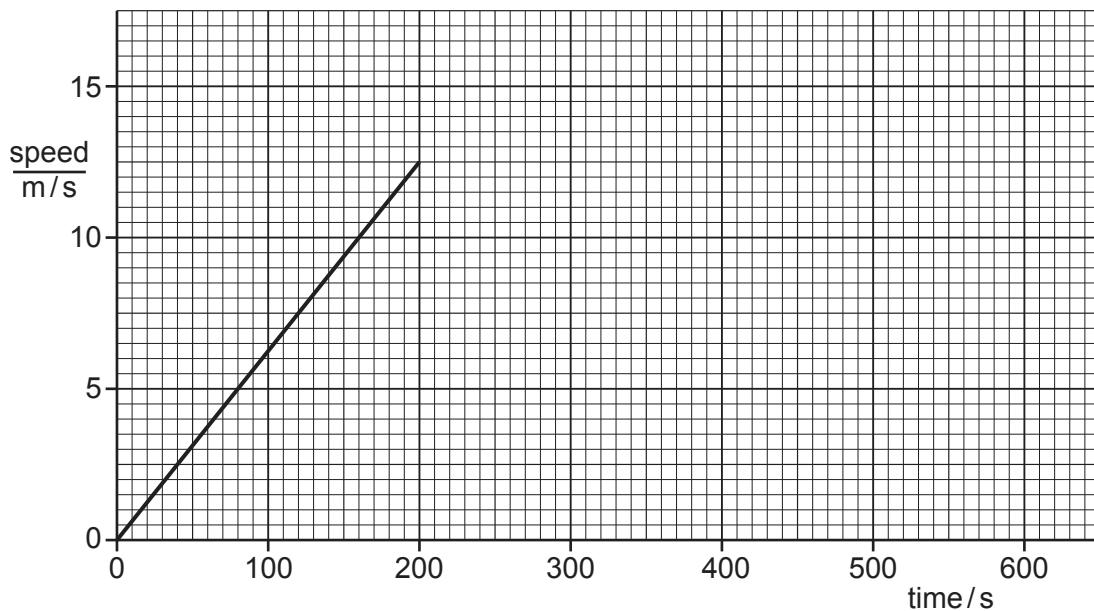


Fig. 9.2

[2]

(ii) During the journey, the train engine transfers 5×10^9 J of energy to the train.

State the work done on the train by the engine.

work done = J [1]

(c) Nuclear waste is carried by trains.

Nuclear waste emits ionising radiation.

(i) State **one** harmful effect of ionising radiation on human health.

.....
.....

[1]

(ii) Suggest how the nuclear waste is stored safely during the train journey.

.....
.....

[1]

(d) The headlamps of a train produce visible light.

Visible light is part of the electromagnetic spectrum.

Fig. 9.3 shows an incomplete electromagnetic spectrum.

Complete Fig. 9.3 to show all the parts of the electromagnetic spectrum.

← increasing frequency						
gamma radiation	X-rays			infrared	microwaves	

Fig. 9.3

[2]

[Total: 11]

10 (a) A student investigates the conditions required for the germination of seeds.

Fig. 10.1 shows the apparatus and conditions.

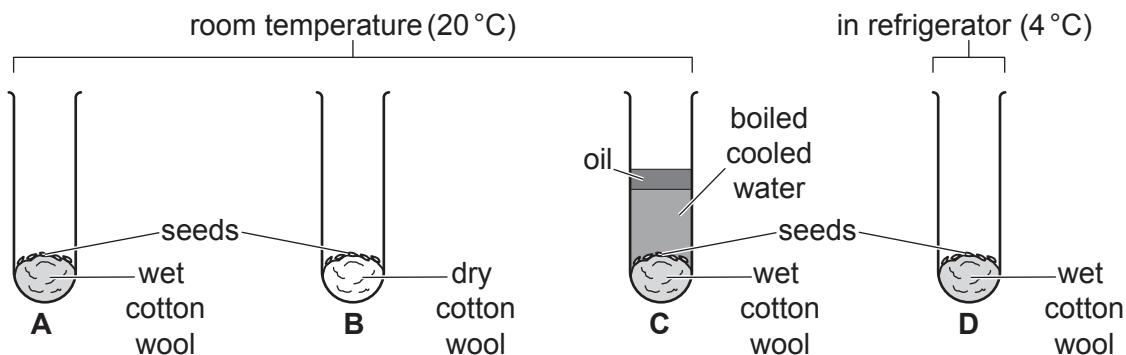


Fig. 10.1

Only the seeds in test-tube **A** germinate.

State why the seeds in test-tubes **B**, **C** and **D** do **not** germinate.

B

.....

C

.....

D

.....

[3]

(b) After germination, the shoots of the new plant grow towards the light.

(i) State the name of this tropic response.

..... [1]

(ii) Explain why plants grow towards light.

.....

.....

[2]

(c) Table 10.1 shows some of the names of the different layers of a leaf.

Complete Table 10.1.

Table 10.1

upper surface	
	upper epidermis
	spongy mesophyll
lower surface	lower epidermis

[2]

[Total: 8]

11 (a) A student investigates the reaction between magnesium and dilute sulfuric acid.

During the reaction, hydrogen gas and a salt are made.

(i) Complete the word equation for this reaction.



[2]

(ii) The reaction is exothermic.

Describe **two** observations which show that a chemical reaction occurs between magnesium and dilute sulfuric acid.

.....
.....

[2]

(iii) The hydrogen made in the reaction exists as molecules of hydrogen, H_2 .

Draw a dot-and-cross diagram to show the bonding in a molecule of hydrogen, H_2 .

[2]

(b) The formula of sulfuric acid is H_2SO_4 .

(i) State the number of different elements shown in this formula.

..... [1]

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

..... [1]

(c) Magnesium is a metal.

(i) Describe **two** physical properties of metals.

1

2

[2]

(ii) Table 11.1 shows the percentage composition of a magnesium alloy.

Table 11.1

element	percentage by mass in the alloy / %
aluminium	3.0
magnesium	
zinc	1.0

Calculate the mass of magnesium contained in 50 kg of the alloy.

Show your working.

mass of magnesium = kg [2]

[Total: 12]

12 (a) A cyclist is riding a bicycle around a circular track.

The length of the track is 400 m.

The cyclist completes five laps of the track.

The time taken for each lap is measured and recorded in Table 12.1.

Table 12.1

lap	time/s
1	35.3
2	34.7
3	37.2
4	35.0
5	34.3

(i) Calculate the average time for **one** lap.

$$\text{average time for one lap} = \dots \text{ s} \quad [1]$$

(ii) The air in the tyres of the bicycle warms up during the ride.

Describe how the motion of the molecules of the gas in the tyres changes during the ride.

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

(iii) Select the correct word from the list to complete each sentence.

solids liquids gases

..... have **no** definite shape or volume.

..... have a definite volume but take the shape of the container.

[1]

(b) Fig. 12.1 shows a cyclist near a road junction.

A car driver at the junction can see the reflection of the cyclist in a plane mirror.

The ray of light shown allows the car driver to see the cyclist approaching the junction.

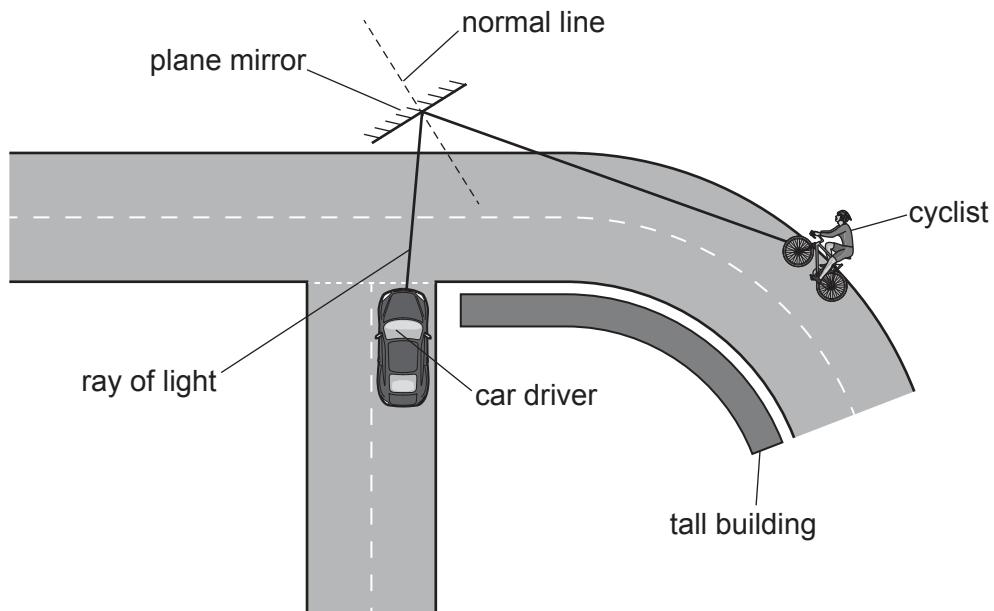


Fig. 12.1

(i) On Fig. 12.1, draw an arrow on the ray of light to show the direction of travel of the ray of light. [1]

(ii) On Fig. 12.1, label the angle of incidence with the letter i . [1]

(c) The bicycle is left outside on a sunny day. Energy from the Sun heats the metal frame of the bicycle.

(i) State the method of energy transfer between the Sun and the Earth.
 [1]

(ii) State the method of energy transfer through the frame of the bicycle.
 [1]

(iii) Describe a simple way of testing whether the frame of the bicycle is made from steel or from aluminium.
 [2]

[Total: 9]

BLANK PAGE

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

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

The Periodic Table of Elements

I		II		Group																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
				Key				I				II				III		IV		V		VI		VII		VIII																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
				atomic number atomic symbol name relative atomic mass				H				H				H		H		H		H		H		H																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
3	Li	4	Be	beryllium	9			5	B	6	C	7	N	8	O	9	F	10	Ne	neon	20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
7								11	boron	12	carbon	14	nitrogen	16	oxygen	19	fluorine																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
11	Na	12	Mg	magnesium	24			13	Al	14	Si	15	P	16	S	17	Cl	18	Ar	argon	40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
23								17	aluminum	28	silicon	31	phosphorus	32	sulfur	35.5	chlorine																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
19	K	20	Ca	scandium	45			18	B	21	Ti	22	V	23	Cr	24	Mn	25	Fe	26	Co	27	Ni	28	Cu	29	Zn	30	Ge	31	As	32	Se	33	Br	34	Kr	35	Kr	36	Xe	37	Xe	38	Rn	39	Rn	40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
39								19	calcium	48	vanadium	51	chromium	52	manganese	55	iron	56	cobalt	59	nickel	64	copper	64	zinc	65	gallium	70	germanium	73	arsenic	75	selenium	79	bromine	80	iodine	127	iodine	128	iodine	129	iodine	131	iodine	132	iodine	133	iodine	134	iodine	135	iodine	136	iodine	137	iodine	138	iodine	139	iodine	140	iodine	141	iodine	142	iodine	143	iodine	144	iodine	145	iodine	146	iodine	147	iodine	148	iodine	149	iodine	150	iodine	151	iodine	152	iodine	153	iodine	154	iodine	155	iodine	156	iodine	157	iodine	158	iodine	159	iodine	160	iodine	161	iodine	162	iodine	163	iodine	164	iodine	165	iodine	166	iodine	167	iodine	168	iodine	169	iodine	170	iodine	171	iodine	172	iodine	173	iodine	174	iodine	175	iodine	176	iodine	177	iodine	178	iodine	179	iodine	180	iodine	181	iodine	182	iodine	183	iodine	184	iodine	185	iodine	186	iodine	187	iodine	188	iodine	189	iodine	190	iodine	191	iodine	192	iodine	193	iodine	194	iodine	195	iodine	196	iodine	197	iodine	198	iodine	199	iodine	200	iodine	201	iodine	202	iodine	203	iodine	204	iodine	205	iodine	206	iodine	207	iodine	208	iodine	209	iodine	210	iodine	211	iodine	212	iodine	213	iodine	214	iodine	215	iodine	216	iodine	217	iodine	218	iodine	219	iodine	220	iodine	221	iodine	222	iodine	223	iodine	224	iodine	225	iodine	226	iodine	227	iodine	228	iodine	229	iodine	230	iodine	231	iodine	232	iodine	233	iodine	234	iodine	235	iodine	236	iodine	237	iodine	238	iodine	239	iodine	240	iodine	241	iodine	242	iodine	243	iodine	244	iodine	245	iodine	246	iodine	247	iodine	248	iodine	249	iodine	250	iodine	251	iodine	252	iodine	253	iodine	254	iodine	255	iodine	256	iodine	257	iodine	258	iodine	259	iodine	260	iodine	261	iodine	262	iodine	263	iodine	264	iodine	265	iodine	266	iodine	267	iodine	268	iodine	269	iodine	270	iodine	271	iodine	272	iodine	273	iodine	274	iodine	275	iodine	276	iodine	277	iodine	278	iodine	279	iodine	280	iodine	281	iodine	282	iodine	283	iodine	284	iodine	285	iodine	286	iodine	287	iodine	288	iodine	289	iodine	290	iodine	291	iodine	292	iodine	293	iodine	294	iodine	295	iodine	296	iodine	297	iodine	298	iodine	299	iodine	300	iodine	301	iodine	302	iodine	303	iodine	304	iodine	305	iodine	306	iodine	307	iodine	308	iodine	309	iodine	310	iodine	311	iodine	312	iodine	313	iodine	314	iodine	315	iodine	316	iodine	317	iodine	318	iodine	319	iodine	320	iodine	321	iodine	322	iodine	323	iodine	324	iodine	325	iodine	326	iodine	327	iodine	328	iodine	329	iodine	330	iodine	331	iodine	332	iodine	333	iodine	334	iodine	335	iodine	336	iodine	337	iodine	338	iodine	339	iodine	340	iodine	341	iodine	342	iodine	343	iodine	344	iodine	345	iodine	346	iodine	347	iodine	348	iodine	349	iodine	350	iodine	351	iodine	352	iodine	353	iodine	354	iodine	355	iodine	356	iodine	357	iodine	358	iodine	359	iodine	360	iodine	361	iodine	362	iodine	363	iodine	364	iodine	365	iodine	366	iodine	367	iodine	368	iodine	369	iodine	370	iodine	371	iodine	372	iodine	373	iodine	374	iodine	375	iodine	376	iodine	377	iodine	378	iodine	379	iodine	380	iodine	381	iodine	382	iodine	383	iodine	384	iodine	385	iodine	386	iodine	387	iodine	388	iodine	389	iodine	390	iodine	391	iodine	392	iodine	393	iodine	394	iodine	395	iodine	396	iodine	397	iodine	398	iodine	399	iodine	400	iodine	401	iodine	402	iodine	403	iodine	404	iodine	405	iodine	406	iodine	407	iodine	408	iodine	409	iodine	410	iodine	411	iodine	412	iodine	413	iodine	414	iodine	415	iodine	416	iodine	417	iodine	418	iodine	419	iodine	420	iodine	421	iodine	422	iodine	423	iodine	424	iodine	425	iodine	426	iodine	427	iodine	428	iodine	429	iodine	430	iodine	431	iodine	432	iodine	433	iodine	434	iodine	435	iodine	436	iodine	437	iodine	438	iodine	439	iodine	440	iodine	441	iodine	442	iodine	443	iodine	444	iodine	445	iodine	446	iodine	447	iodine	448	iodine	449	iodine	450	iodine	451	iodine	452	iodine	453	iodine	454	iodine	455	iodine	456	iodine	457	iodine	458	iodine	459	iodine	460	iodine	461	iodine	462	iodine	463	iodine	464	iodine	465	iodine	466	iodine	467	iodine	468	iodine	469	iodine	470	iodine	471	iodine	472	iodine	473	iodine	474	iodine	475	iodine	476	iodine	477	iodine	478	iodine	479	iodine	480	iodine	481	iodine	482	iodine	483	iodine	484	iodine	485	iodine	486	iodine	487	iodine	488	iodine	489	iodine	490	iodine	491	iodine	492	iodine	493	iodine	494	iodine	495	iodine	496	iodine	497	iodine	498	iodine	499	iodine	500	iodine	501	iodine	502	iodine	503	iodine	504	iodine	505	iodine	506	iodine	507	iodine	508	iodine	509	iodine	510	iodine	511	iodine	512	iodine	513	iodine	514	iodine	515	iodine	516	iodine	517	iodine	518	iodine	519	iodine	520	iodine	521	iodine	522	iodine	523	iodine	524	iodine	525	iodine	526	iodine	527	iodine	528	iodine	529	iodine	530	iodine	531	iodine	532	iodine	533	iodine	534	iodine	535	iodine	536	iodine	537	iodine	538	iodine	539	iodine	540	iodine	541	iodine	542	iodine	543	iodine	544	iodine	545	iodine	546	iodine	547	iodine	548	iodine	549	iodine	550	iodine	551	iodine	552	iodine	553	iodine	554	iodine	555	iodine	556	iodine	557	iodine	558	iodine	559	iodine	560	iodine	561	iodine	562	iodine	563	iodine	564	iodine	565	iodine	566	iodine	567	iodine	568	iodine	569	iodine	570	iodine	571	iodine	572	iodine	573	iodine	574	iodine	575	iodine	576	iodine	577	iodine	578	iodine	579	iodine	580	iodine	581	iodine	582	iodine	583	iodine	584	iodine	585	iodine	586	iodine	587	iodine	588	iodine	589	iodine	590	iodine	591	iodine	592	iodine	593	iodine	594	iodine	595	iodine	596	iodine	597	iodine	598	iodine	599	iodine	600	iodine	601	iodine	602	iodine	603	iodine	604	iodine	605	iodine	606	iodine	607	iodine	608	iodine	609	iodine	610	iodine	611	iodine	612	iodine	613	iodine	614	iodine	615	iodine	616	iodine	617	iodine	618	iodine	619	iodine	620	iodine	621	iodine	622	iodine	623	iodine	624	iodine	625	iodine	626	iodine	627	iodine	628	iodine	629	iodine	630	iodine	631	iodine	632	iodine	633	iodine	634	iodine	635	iodine	636	iodine	637	iodine	638	iodine	639	iodine	640	iodine	641	iodine	642	iodine	643	iodine	644	iodine	645	iodine	646	iodine	647	iodine	648	iodine	649	iodine	650	iodine	651	iodine	652	iodine	653	iodine	654	iodine	655	iodine	656	iodine	657	iodine	658	iodine	659	iodine	660	iodine	661	iodine	662	iodine	663	iodine	664	iodine	665	iodine	666	iodine	667	iodine	668	iodine	669	iodine	670	iodine	671	iodine	672	iodine	673	iodine	674	iodine	675	iodine	676	iodine	677	iodine	678	iodine	679	iodine	680	iodine	681	iodine	682	iodine	683	iodine	684	iodine	685	iodine	686	iodine	687	iodine	688	iodine	689	iodine	690	iodine	691	iodine	692	iodine	693	iodine	694	iodine	695	iodine