East Spring Secondary School

Towards Excellence and Success

Name: ..... ( )

Class: .....

Second Semestral Assessment 2021
Secondary 2 Express

Science

04 October 2021
Monday

2 hours
0815 – 1015

Additional materials:
1 sheet of OTAS

INSTRUCTIONS TO CANDIDATES

Write your name, class and register number in the spaces provided above, and 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, glue or correction fluid.
Calculators and mathematical sets are allowed.

Section A [30 marks]
Answer all questions on the OTAS.

Section B [30 marks]
Answer all questions.
Write your answers in the spaces provided.

Section C [40 marks]
Answer **C1** and **three** other questions.
Write your answers in the spaces provided.

A copy of the Periodic Table is given on page **28**.
The number of marks is given in brackets [ ]
at the end of each question or part question

100

This question paper consists of **28** printed pages including the cover page.

Section A (30 marks)

Answer **all** questions. Shade all your answers on the OTAS sheet provided.

A1 Which of the following best describes a group of butterflies and their eggs, larvae and pupae living in a garden form?

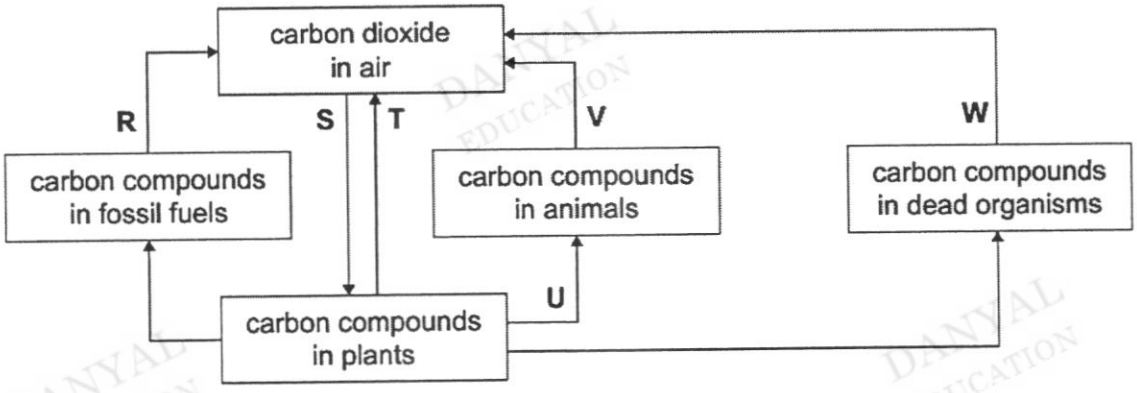
A community
B ecosystem
C habitat
D population

A2 The table shows the amount of energy flowing into four trophic levels in a food chain.

Which of the following trophic levels could represent the producers?

trophic level	energy flowing in /kJ per m^2 per year
A	3
B	32
C	301
D	3000

A3 The diagram below shows the carbon cycle.



Which of the following letter(s) could represent(s) respiration?

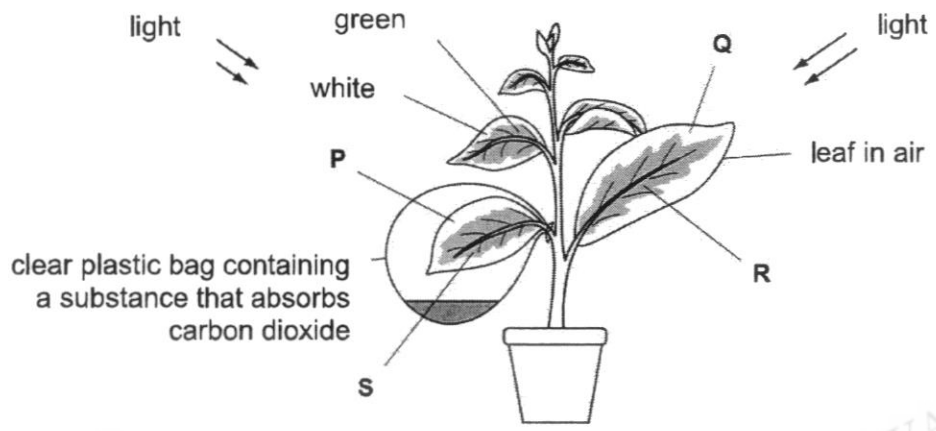
A S only
B V only
C T and V
D R, T, V and W

A4 What would occur if both bacteria and fungi are absent in the ecosystem?

1 The number of producers would increase.
2 Lower amount of nutrients would be available in the soil.
3 Photosynthesis would not take place.
4 Decomposition would not take place.

A 1 and 2 only
B 1 and 4 only
C 2 and 3 only
D 2 and 4 only

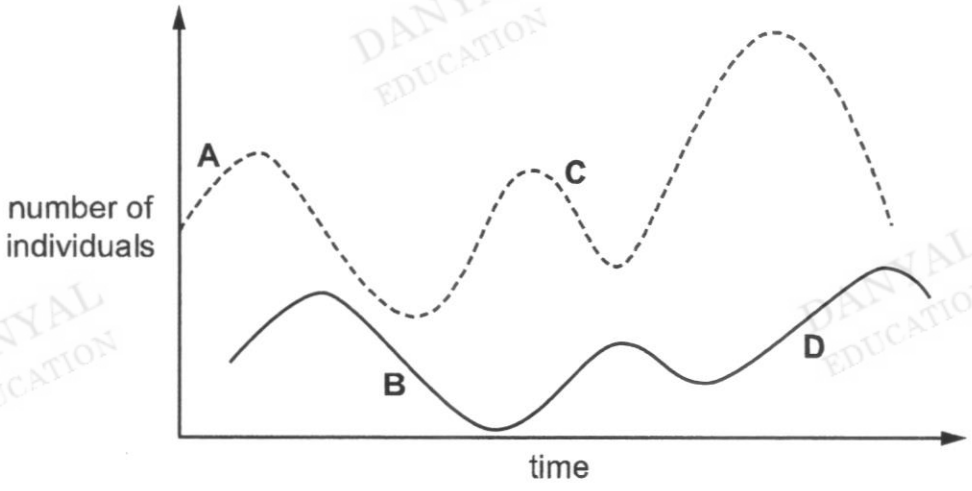
A5 The diagram shows an investigation on photosynthesis. The plant has leaves that are green in the middle and white around the edges.



Which labelled parts of the leaf lack only one factor needed for photosynthesis?

A P and Q
B P and R
C Q and S
D R and S

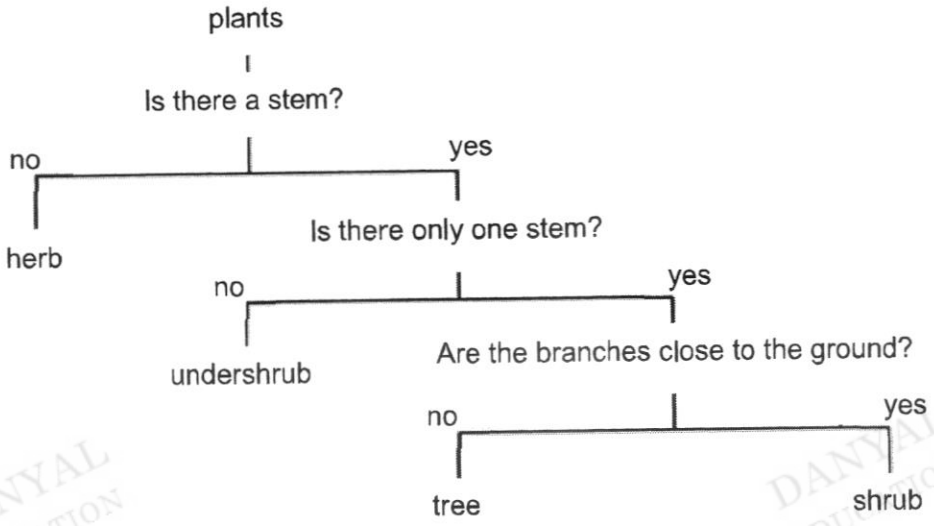
A6 The graph shows the changes in the populations of predator and prey over a period of time. Which point on the graph shows the effect of a disease outbreak on the population of predators?



A7 Which of the following is **not** a reason for protecting biodiversity?

A Biodiversity enhances our food security.
B Biodiversity allows us to use resources to live our lives richly.
C Biodiversity results in the production of pollutants into the atmosphere.
D Biodiversity increases the likelihood of discovering new ingredients for medicine.

A8 A dichotomous key is shown below.



Which type of plant has one stem and branches that are not close to the ground?

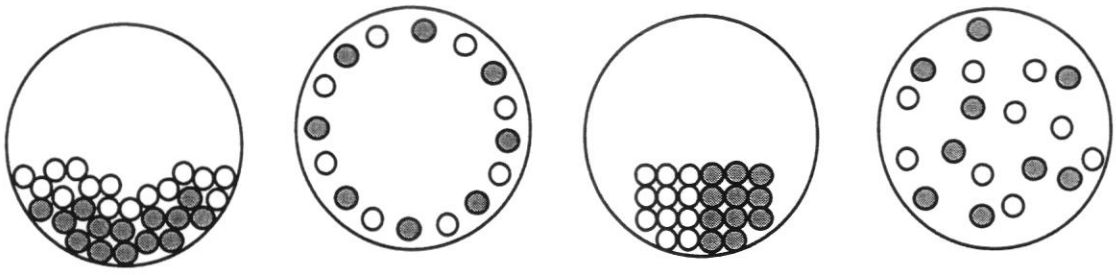
A herb
B undershrub
C tree
D shrub

A9 When a student was cleaning, he noted that dust particles were spotted to take a long time to settle down on surfaces.

Why do dust particles not settle down on surfaces easily?

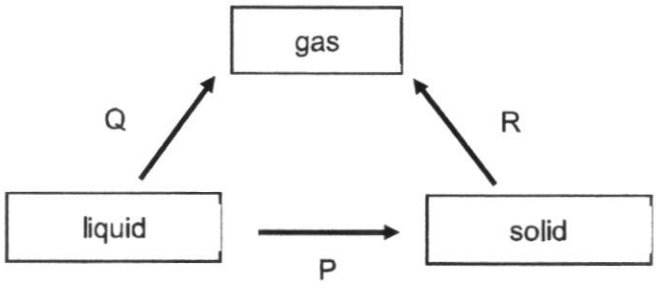
A Wind is always present where dust particles exist.
B Air molecules that are always moving knock into them.
C Gravity has no effect on tiny dust particles.
D Dust particles repel one another into the sky as they are magnetic in nature.

A10 Which of the following diagrams best shows the arrangement of particles in a balloon filled with a mixture of argon and helium gases?



A **B** **C** **D**

A11 The diagram below shows the different processes that a substance undergoes.



Which statement about the processes P, Q, and R is correct?

A During processes P and Q, the energy of the particles increases.

B During process P, the particles move slower and closer together.

C During process Q, the separation between the particles decreases.

D During process R, the attractive forces between the particles increases.

A12 What does it mean when an atom is said to be *electrically neutral*?

A The atom consists of no electrons.

B The atom consists of only neutrons.

C The atom consists of the same number of electrons as protons.

D The atom consists of the same number of electrons as neutrons.

A13 Four atoms have the following chemical symbols.

$$^{36}_{16}S \qquad ^{37}_{17}Cl \qquad ^{38}_{18}Ar \qquad ^{39}_{19}K$$

What can you conclude about the following atoms?

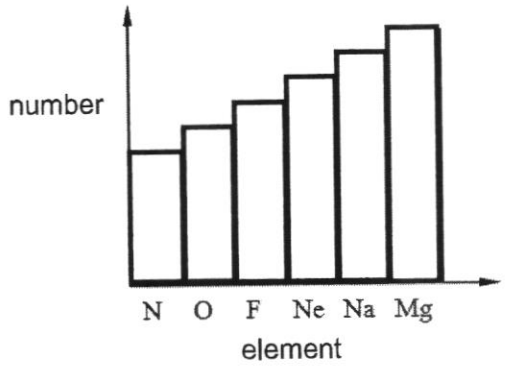
A They have the same atomic masses.

B They have the same number of neutrons.

C They have the same number of electron shells.

D They have the same total number of electrons, protons and neutrons.

A14 A bar chart for some elements is shown below.



Which of the following represents the number on the vertical axis (y-axis)?

A group number of the element

B number of protons in the atom of the element

C number of electron shells in the atom of the element

D number of valence electrons in the atom of the element

A15 Which of the following has the same total number of electrons as a magnesium ion, Mg^{2+}?

A O^{2-} **B** Ar

C C **D** Ca^{2+}

A16 Which of the following shows the correct number of elements and atoms in the respective compounds?

	chemical formula of compound	number of elements	number of atoms
A	K_2CrO_4	3	8
B	$KMnO_4$	4	7
C	Li_2CO_3	3	6
D	$(NH_4)_2SO_4$	4	14

A17 Which of the following chemical changes is caused by light?

A respiration **B** X-ray imaging

C combustion **D** electrolysis

A18 When zinc nitrate ($ZnNO_3$) is heated, it produces zinc oxide (ZnO), nitrogen dioxide (NO_2) and oxygen (O_2). What is the name commonly used to describe such a reaction?

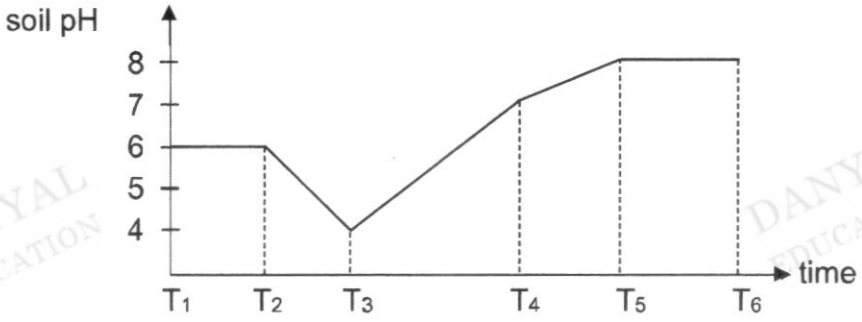
A combustion **B** decomposition

C melting **D** oxidation

A19 Which of the following does not react with dilute hydrochloric acid?

A zinc hydroxide
B zinc carbonate
C zinc sulfate
D zinc

A20 The graph below shows how the pH value of the soil in a farmer's field changes over time.

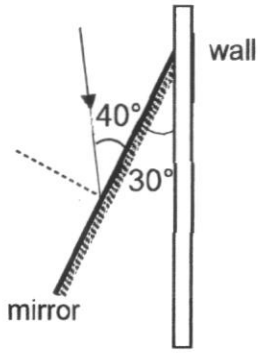


Blueberries require acidic soil to grow.

Which of the following statements best describes the growth of blueberries in the farmer's field?

A Blueberries will start to die from T_4.
B Blueberries will grow well only between T_4 and T_6.
C Blueberries will grow best only between T_1 and T_2.
D Blueberries will be able to grow throughout T_1 to T_6.

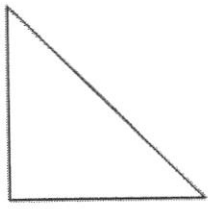
A21 A light ray is incident on a plane mirror that is tilted at an angle of 30° to a vertical wall.



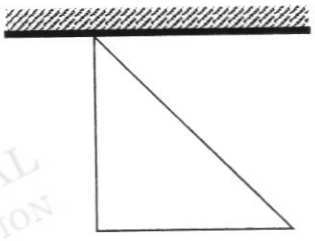
What is the angle of reflection?

A 30°
B 40°
C 50°
D 70°

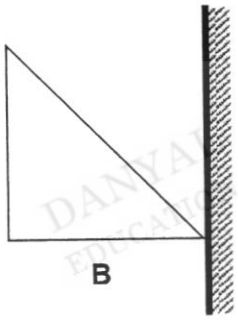
A22 A child drew a right-angled triangle as shown.



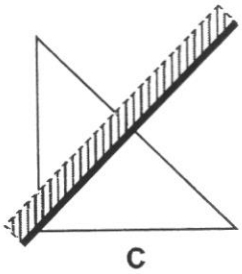
Where should he place a mirror so that the triangle and its image will form a square?



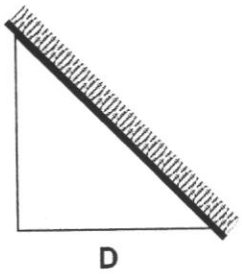
A



B

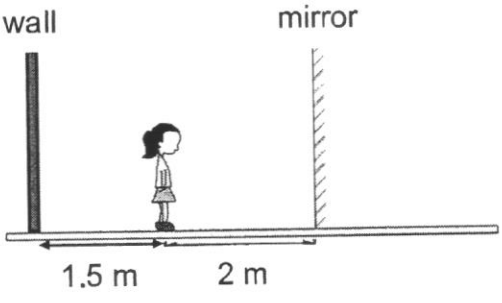


C



D

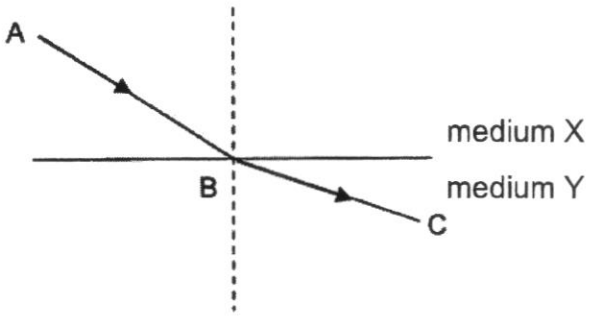
A23 A girl stands 2 m away from a plane mirror in a room. The wall of the room is 1.5 m behind her.



What is the distance between the girl and the image of the wall?

A 3.5 m **B** 4 m **C** 5.5 m **D** 7 m

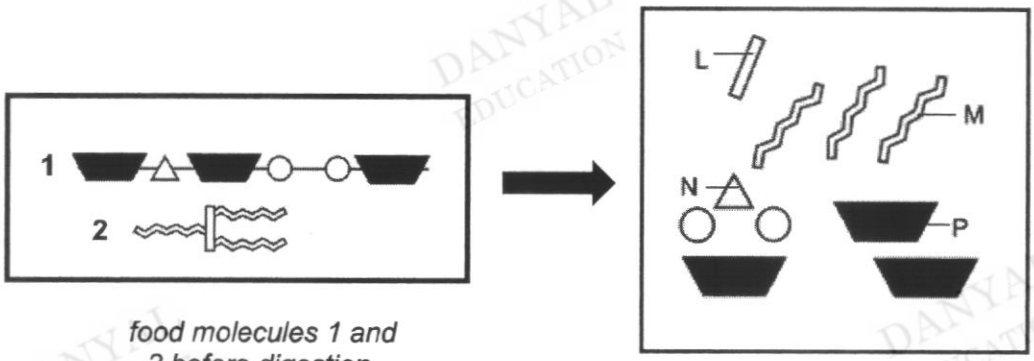
A24 A ray of light travels from medium X to medium Y as shown in the diagram below.



Which of the following is correct?

	refracted ray	optically denser medium
A	AB	X
B	AB	Y
C	BC	X
D	BC	Y

A25 The diagram shows two food molecules 1 and 2 before and after they have been digested by enzymes.



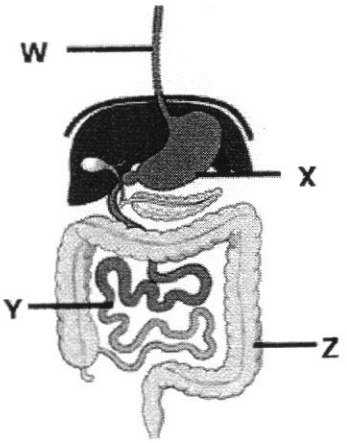
food molecules 1 and 2 before digestion

products formed after digestion

Which of the following identifies the products of fat digestion?

A L and M **B** L and N **C** M and N **D** N and P

A26 The diagram below shows the human digestive system.



Which of the following part(s) of the digestive system will not produce enzymes?

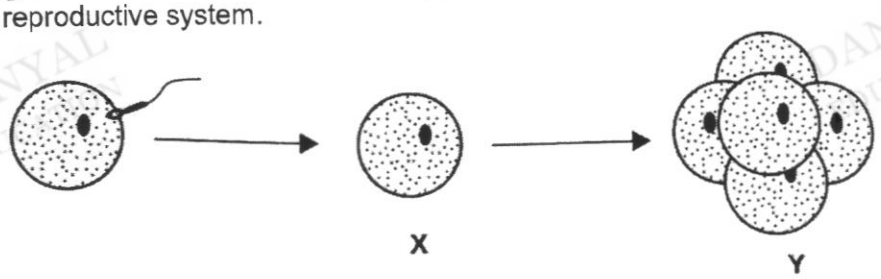
A W only
B X and Y
C Y and Z
D W and Z

A27 When faeces stay in the rectum for a long time, they become very hard.

Which of the following statements correctly explains this?

A Digestion of mineral salts cause the faeces to become hard.
B Water is absorbed from the contents in the large intestine.
C Bacteria present in the large intestine use large amounts of water.
D Only evaporation takes place when faeces stay longer in the rectum.

A28 The diagram shows a series of events happening after a successful fertilisation in the female reproductive system.

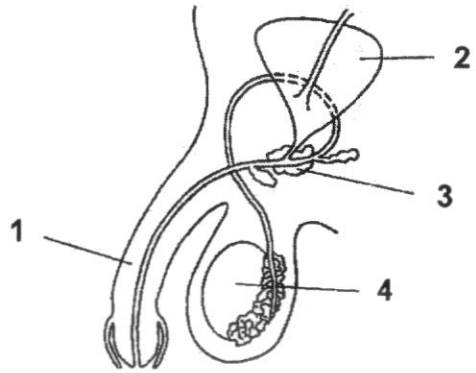


Which of the following correctly identify X, Y and site of fertilisation?

	X	Y	site of fertilisation
A	embryo	zygote	fallopian tube
B	embryo	foetus	uterus
C	zygote	embryo	fallopian tube
D	zygote	foetus	uterus

A29 The diagram shows the male reproductive and urinary systems.

Which two structures are involving in producing semen?



A 1 and 3
B 2 and 4
C 2 and 3
D 3 and 4

A30 AIDS is a sexually transmitted infection (STI).

Which of the following describes AIDS correctly?

A AIDS is caused by a bacteria.
B AIDS can be treated by antibiotics.
C AIDS is transmitted by sexual intercourse only.
D AIDS stand for Acquired Immunodeficiency Syndrome.

Section B (30 marks)
Answer **ALL** the questions in the spaces provided.

B1 Fig. B1.1 shows the changes in temperature of gaseous substance W as one kg of the substance is being cooled.

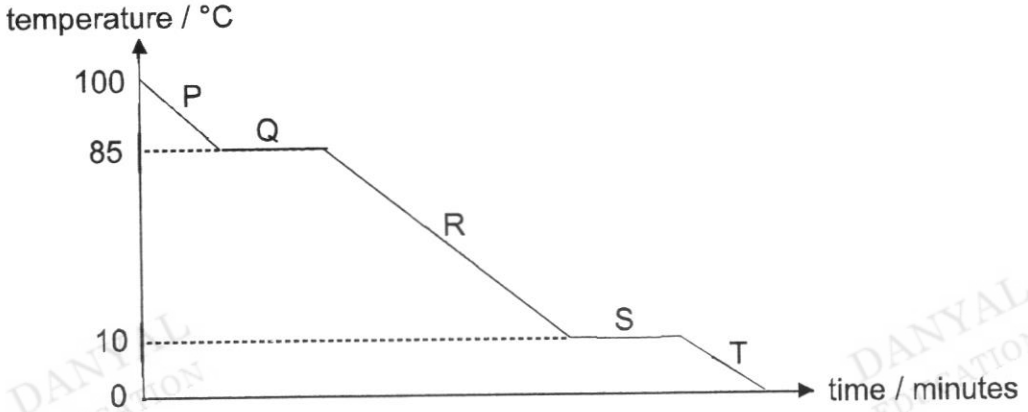


Fig. B1.1

(a) Identify the physical state(s) of substance W in the following regions of the curve by completing the Table B1.2 below.

Table B1.2

region	physical state(s) of substance W
R	
S	

[2]

(b) Describe the changes in movement and arrangement of particles when substance Q is being heated from 5 °C to 25 °C.

.....

.....

.....

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

(c) Density of a substance can be calculated using the formula below:

$$\text{density of substance} = \frac{mass}{volume}$$

With reference to Fig. B1.1 and the formula of density,

(i) identify the region of the curve in which the substance has the highest density.

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

(ii) Explain your answer to **(c)(i)**, using your knowledge of kinetic particle theory.

.....

.....

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

B2 Fig. B2.1 shows an incomplete dichotomous key of four organisms found in a garden. Study and observe the pictures of the four organisms shown in Fig. B2.1 carefully.

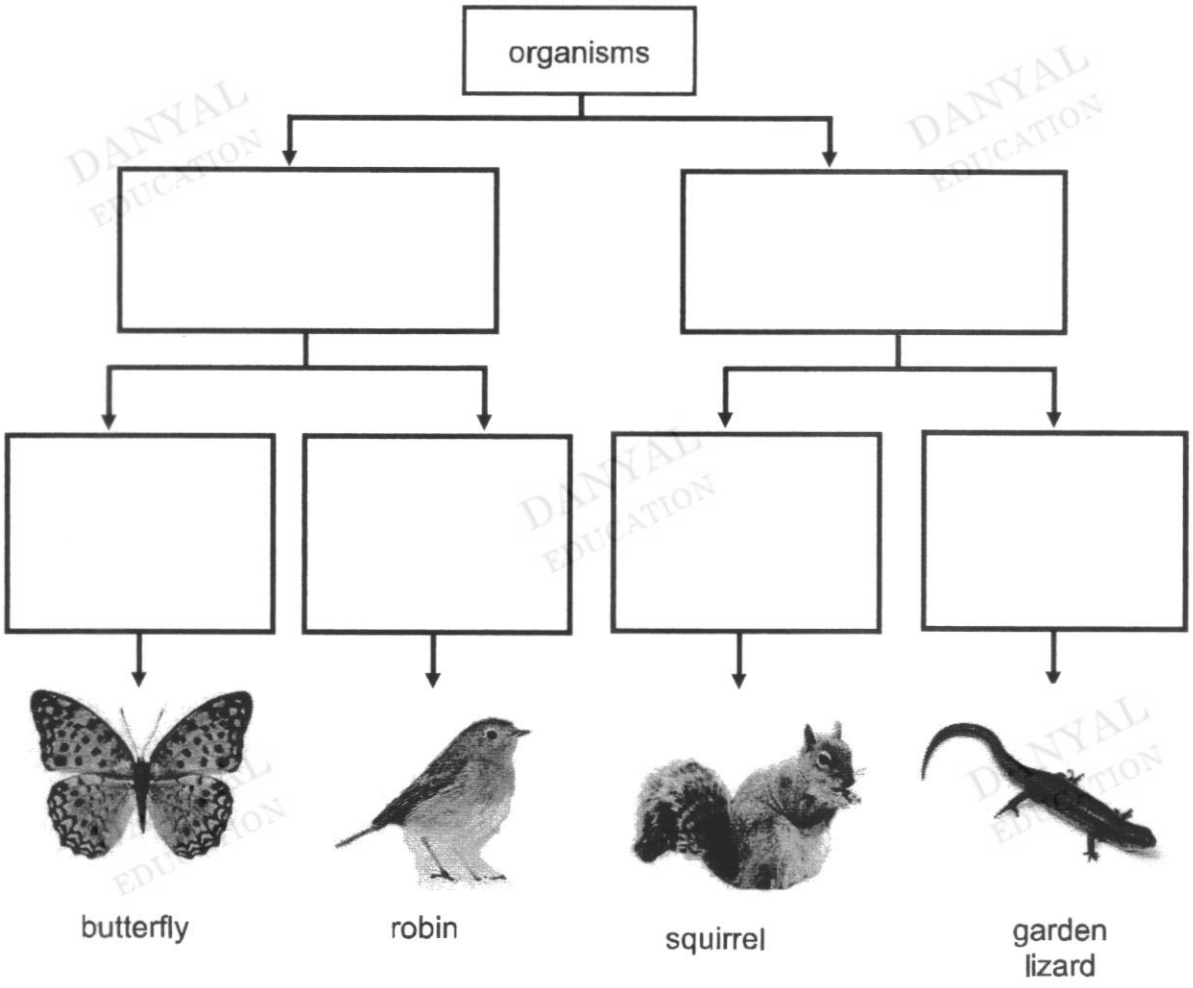


Fig. B2.1

(a) Complete the dichotomous key to classify the four organisms in Fig. B2.1. **[3]**

(b) Fig. B2.2 shows the rate of carbon dioxide uptake of a plant taken from the garden in 24 hours.

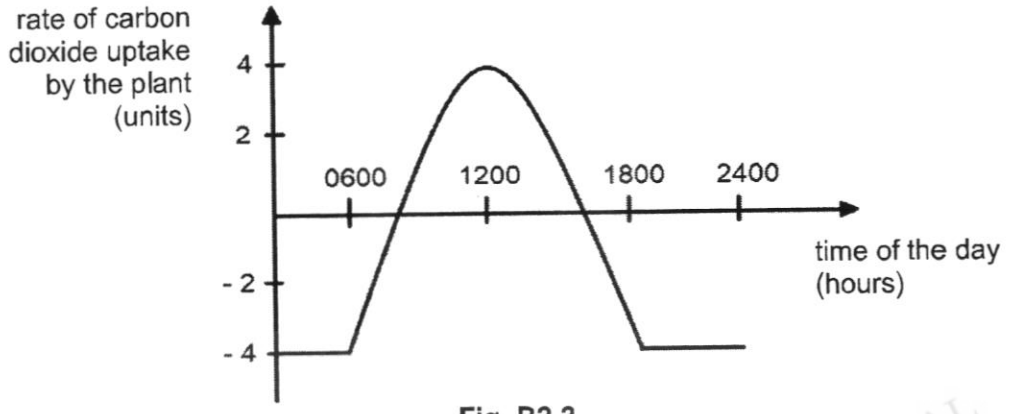


Fig. B2.2

(i) Suggest what is happening to the plant at 1200 hours.

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

(ii) Referring to data from Fig. B2.2, explain your answer for **(b)(i).**

.....

.....

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

B3 Table B3.1 shows the subatomic particles present in six particles, A to F.

Table B3.1

particle	number of		
	protons	neutrons	electrons
A	19	20	18
B	9	10	9
C	3	4	3
D	15	16	18
E	10	10	10
F	13	14	13

Using the information in Table B3.1 to state which of the particles, A to F,

(a) has the smallest nucleon number, ... **[1]**

(b) is negatively charged, ... **[1]**

(c) belong to Group I, ... and ..... **[1]**

(d) are atoms that belong to period 3. ..... and ..... **[1]**

B4 Fig. B4.1 shows part of the human digestive system.

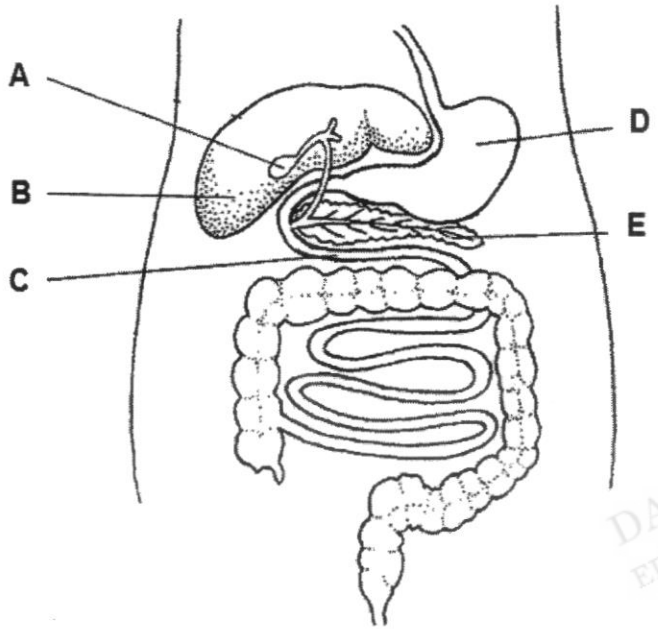


Fig. B4.1

(a) The different parts of the digestive system work together to digest food.

Using letters A to E from Fig. B4.1, state the letter that represents

(i) the part of the digestive system where bile is produced.

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

(ii) the part of the digestive system where digestion of proteins starts.

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

(b) A patient had surgery to remove part of organ C.

Explain why the patient experienced weight loss in the weeks after the surgery.

.....

.....

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

(c) Fig. B4.2 shows the rate of enzymatic action of three enzymes, X, Y and Z that are taken from the alimentary canal. The rate of enzymatic action of the three enzymes are observed to be dependent on the pH of the environment.

It was noted that enzyme Y was taken from a sample produced in the mouth.

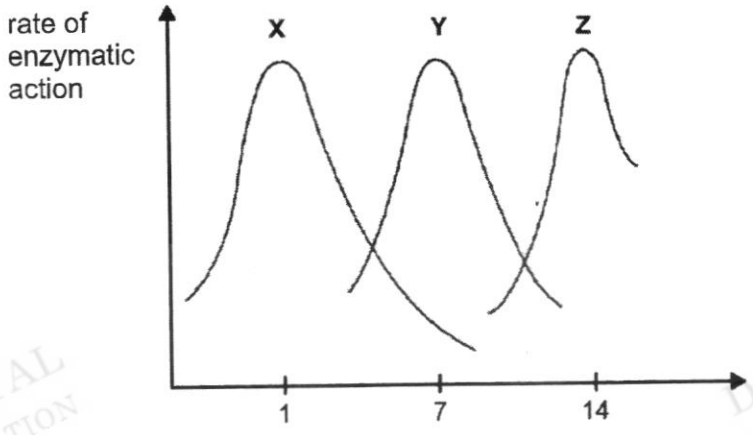


Fig. B4.2

With reference to Fig. B4.2,

(i) state the optimal pH that enzyme X would work best in.

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

(ii) identify the region of alimentary canal that enzyme X was taken from.

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

(iii) name enzyme Y.

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

(iv) describe how enzyme Y would digest food by identifying the nutrient and product involved in the process.

.....

.....

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

B5 A student observed that an image is formed when an object is placed in front of a plane mirror as shown in Fig. B5.1.

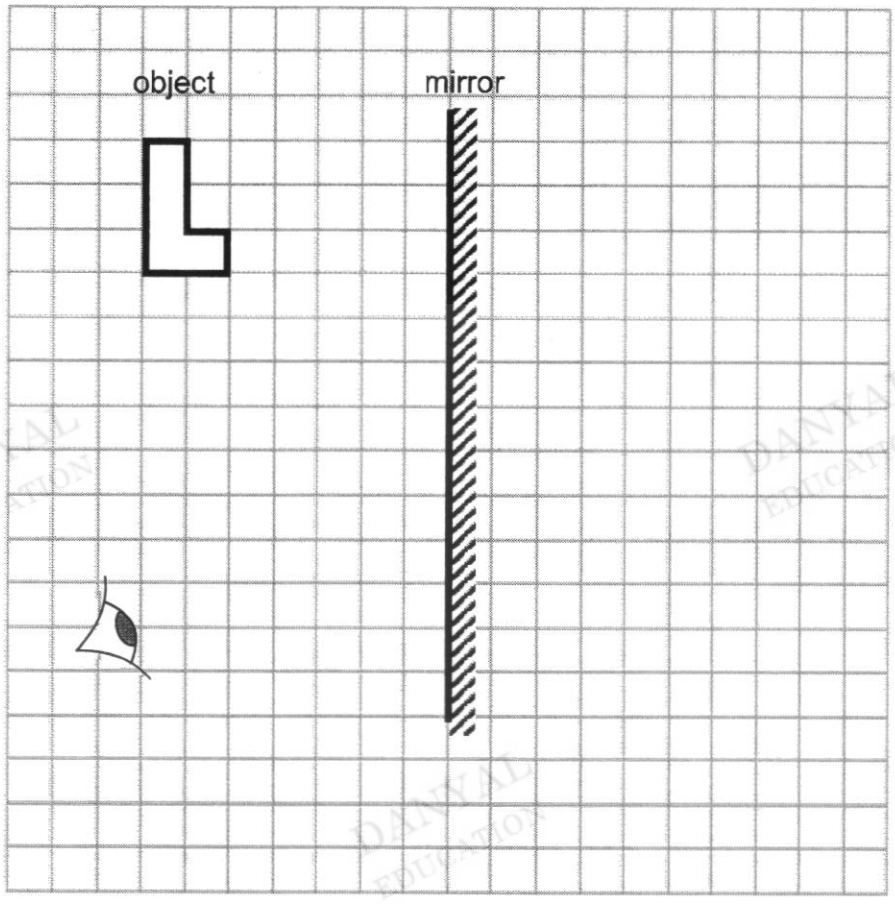


Fig. B5.1

(a) **(i)** Draw the image of object formed by the plane mirror on Fig. B5.1 and label it as **image**. **[1]**

(ii) Draw light rays on Fig. B5.1 to show how the observer sees the image of the object. **[2]**

(b) State two characteristics of the image formed by a plane mirror.

1. .....

.....

2. .....

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

Section C (40 marks)

Answer **C1** and **any other three** questions in the spaces provided.

C1 Fig. C1.1 shows the concentration of two hormones in the blood of a woman and the thickness of her uterine lining during her menstrual cycle.

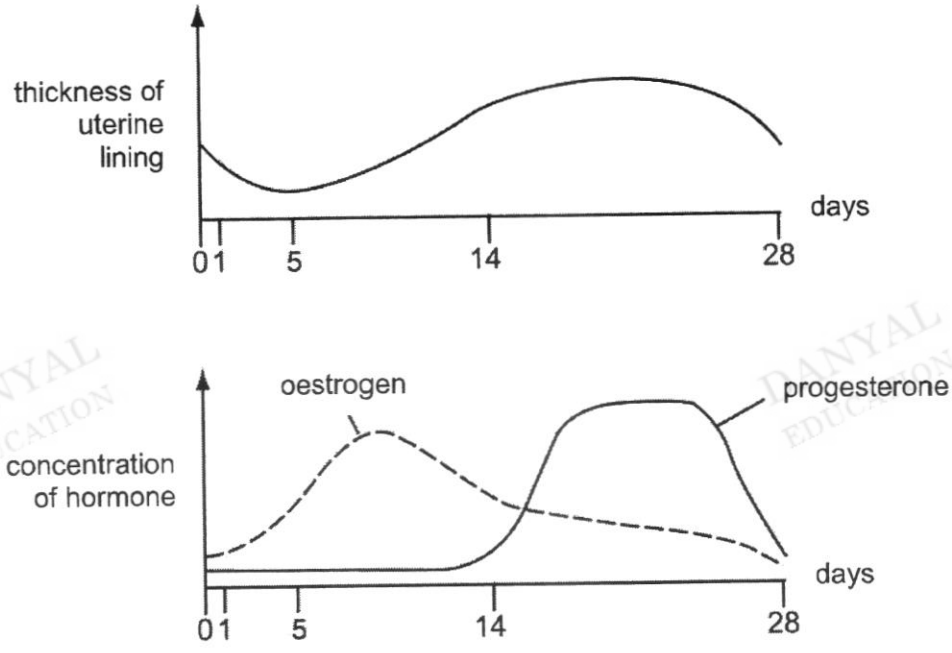


Fig. C1.1

(a) Identify the part in female reproductive system that produces the two sex hormones, oestrogen and progesterone.

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

(b) Using information from Fig. C1.1,

(i) describe and explain what is happening on day 1 to day 5 of the woman's menstrual cycle.

.....

.....

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

(ii) Describe how the levels of oestrogen changes from day 5 to day 14 of the woman's menstrual cycle.

.....

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

(iii) Describe the effect of oestrogen on the thickness of uterine lining.

.....

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

(c) Fertilisation can occur after sexual intercourse. On Fig. C1.2, draw to predict how the thickness of uterine lining would change after day 28 if fertilisation takes place. **[1]**

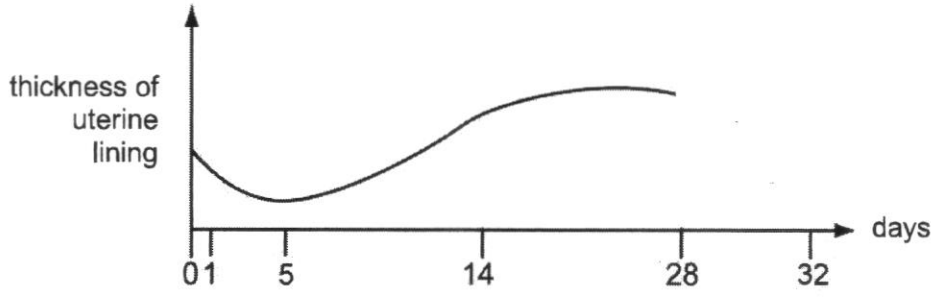


Fig. C1.2

(d) Fig. C1.3 shows the days in the months of April and May. It was noted that day 1 of the woman's menstrual cycle falls on 24 April.

April						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	(24)	25	26
27	28	29	30			

May						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Fig. C1.3

With reference to Fig. C1.3,

(i) Assuming no fertilization takes place, predict the date in which day 1 of her next menstrual cycle will fall on.

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

(ii) The woman has a regular menstrual cycle and she wishes to use the rhythm method as a contraception method.

State the dates that she should take note for rhythm method to be successful.

..... to ..... **[1]**

(iii) Explain why rhythm method would not work for women with irregular menstrual cycles.

.....

.....

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

(iv) Name a permanent contraception method that will work for women with irregular menstrual cycles.

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

C2 Fig. C2.1 shows part of the food web for the coral reef ecosystem.

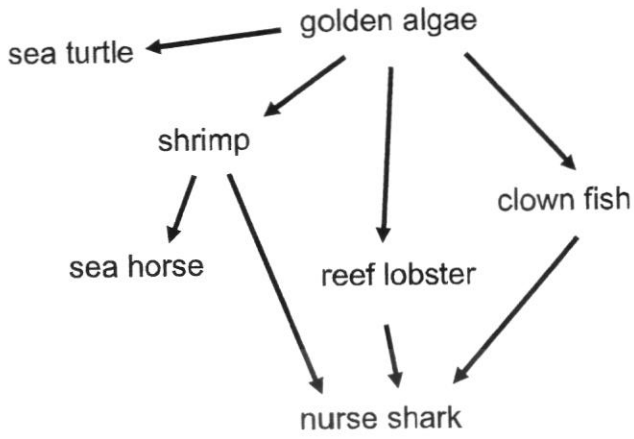


Fig. C2.1

(a) **(i)** With reference to Fig. C2.1, identify a primary and a secondary consumer in the Table C2.2 below. **[2]**

Table C2.2

type of consumer	organism
primary consumer	
secondary consumer	

(ii) Based on Fig. C2.1, state the most energy-efficient food chain.

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

(b) The following information was obtained from a poster describing coral reef ecosystems:

"The relationship between sea corals and golden algae can be described as mutualism. In the coral reef ecosystem, the sea corals consume a herbivore known as zooplankton. However, sea corals is also a source of food for butterfly fish. The nurse shark is a predator of butterfly fish."

(i) Based on the information provided, complete the food web in Fig. C2.1 to describe the relationships between the organisms listed in the poster. **[1]**

(ii) Define *mutualism*.

.....

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

(iii) Explain how sea corals and algae can share a mutualistic relationship by identifying the substances produced by each organism.

.....

..... [1]

(c) Stingrays that consume sea horses were suddenly introduced into the coral reef ecosystem.

Explain how the population of shrimps could be affected.

.....

.....

..... [2]

(d) Fig. C2.3 shows part of a poster that discusses the threats faced by coral reef ecosystems.

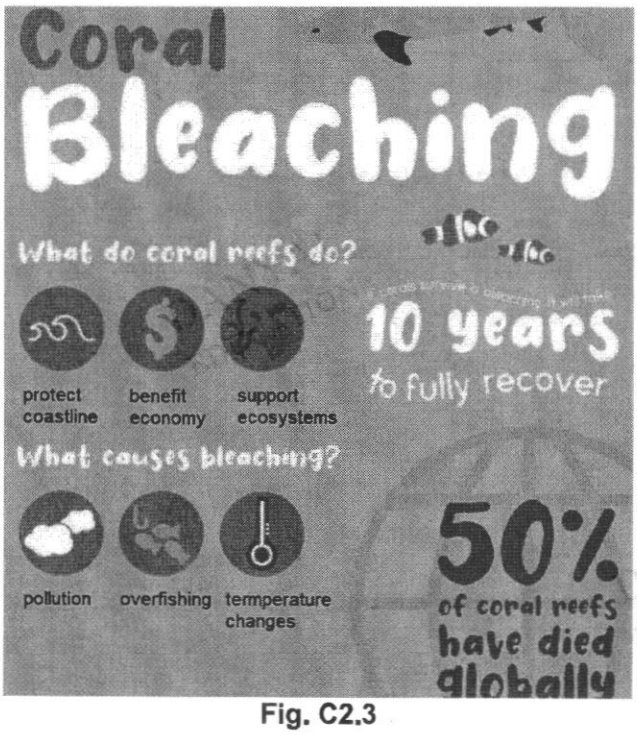


Fig. C2.3

One method to protect the coral reef ecosystem is to implement laws to prevent overfishing so that the balance in ecosystem is maintained.

State two other ways that individuals can do to conserve the diversity in coral reef ecosystem.

1. .....

.....

2. .....

..... [2]

C3 Table C3.1 shows the melting points and boiling points for some substances.

Table C3.1

substance	melting point / °C	boiling point / °C
ammonia	-78	-33
hydrogen chloride	-115	-85
octane	-57	126
water	0	100
sulfur dioxide	-73	-10
sodium	98	883

(a) With reference to Table C3.1,

(i) Name the substance(s) that will be in liquid state at -100 °C.

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

(ii) Name the substance(s) that will be made up of particles with weak forces of attraction at 25 °C.

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

(iii) Name the substances that will undergo a change in state as the substances are cooled from 150 °C to 90 °C.

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

(b) Water in solid state is known as ice. Fig. C3.2 shows how gas X was passed through a U-tube that was immersed in a beaker of ice. The gas was observed to form a colourless liquid.

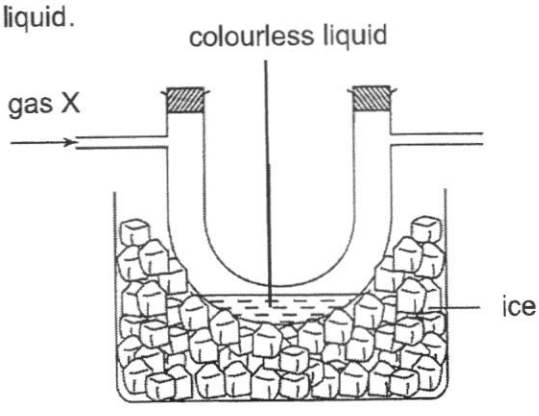


Fig. C3.2

With reference to Table C3.1 and Fig. C3.2, excluding water,

(i) name the substance that is most possibly gas X.

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

(ii) State whether gas X has undergone a chemical change or a physical change in Fig. C3.2.

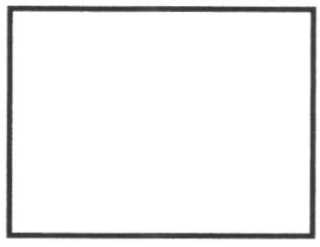
Explain your answer.

.....

.....

..... [2]

(iii) Draw a diagram to show the arrangement of particles in ice in the box below. [1]



(c) Sodium is a metallic element that can be found in the Periodic Table.

(i) State the electronic configuration of sodium.

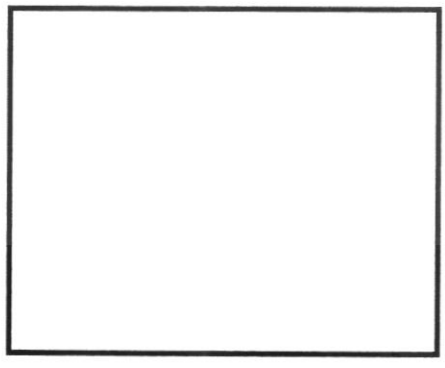
..... [1]

(ii) With reference to the electronic structure of sodium, describe how a sodium atom would become an ion.

.....

..... [1]

(iii) Draw the electronic structure of sodium ion in the box below. [1]



C4 A student conducted an experiment to investigate the reactions between five different metals by reacting them with dilute hydrochloric acid. Fig. C4.1 shows the experimental set up.

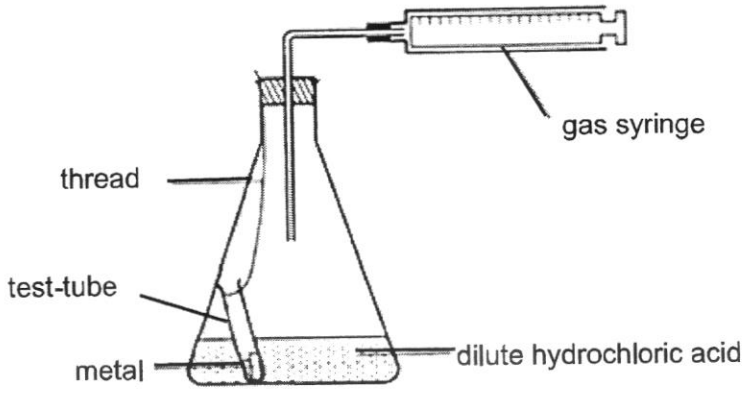


Fig. C4.1

A gas syringe was used to collect the gas produced. The time taken to collect 20 cm^3 of the gas in each experiment was recorded. The results are shown in the Table C4.2 below.

Table C4.2

metal	time/s	observations
calcium	5	bubbles observed and size of metal decreases
iron	14	bubbles observed and size of metal decreases
magnesium	8	bubbles observed and size of metal decreases
zinc	11	bubbles observed and size of metal decreases
gold	0	no bubbles observed and size of metal remains the same

(a) The metal in the test-tube was added to the dilute hydrochloric acid solution by pulling the string to tilt the test tube to the side.

Suggest a reason why the metal was added using this method.

.....

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

(b) **(i)** Suggest a reason why no bubbles were observed when gold was added to hydrochloric acid.

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

(ii) Hence, rank the **other** metals in the order of increasing reactivity.

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

(c) Write a word equation to describe the reaction between calcium metal and dilute hydrochloric acid.

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

(d) Describe a chemical test and the observation to identify the gas collected in the gas syringe in Fig.C4.1.

test: .....

.....

observation: .....

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

(e) A common household substance used to treat acidic soil is slaked lime.

Slaked lime is a compound that contains the metallic element calcium. Slaked lime is able to react with acidic soil to form a salt and water. The pH of the soil changes after the reaction.

Using your knowledge of the reactions involving acids,

(i) name the reaction between slaked lime and acidic soil.

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

(ii) Suggest the chemical name of slaked lime.

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

(f) A student has two beakers of solutions. One of the solution is an alkali, while the other solution is an acid.

Describe a chemical test to distinguish between the acidic solution and the alkaline solution.

.....

.....

.....

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

C5 A student has an aquarium. Fig. C5.1 shows an incomplete ray diagram of how the student can see the image of a fish in his aquarium.

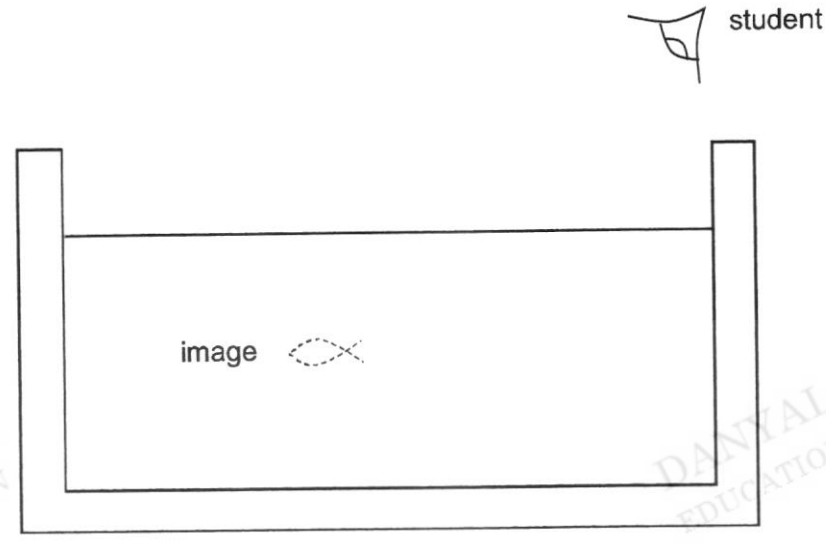


Fig. C5.1

(a) Draw the actual position of the fish in Fig. C5.1. **[1]**

(b) Complete the ray diagram in Fig. C5.1 to show how the student sees the fish. Include arrows to indicate the direction of the light rays. **[2]**

(c) The student visited an aquarium and he saw a clown fish in the aquarium.

Fig. C5.2 shows an incomplete ray diagram to show how light can travel for student to see the clown fish.

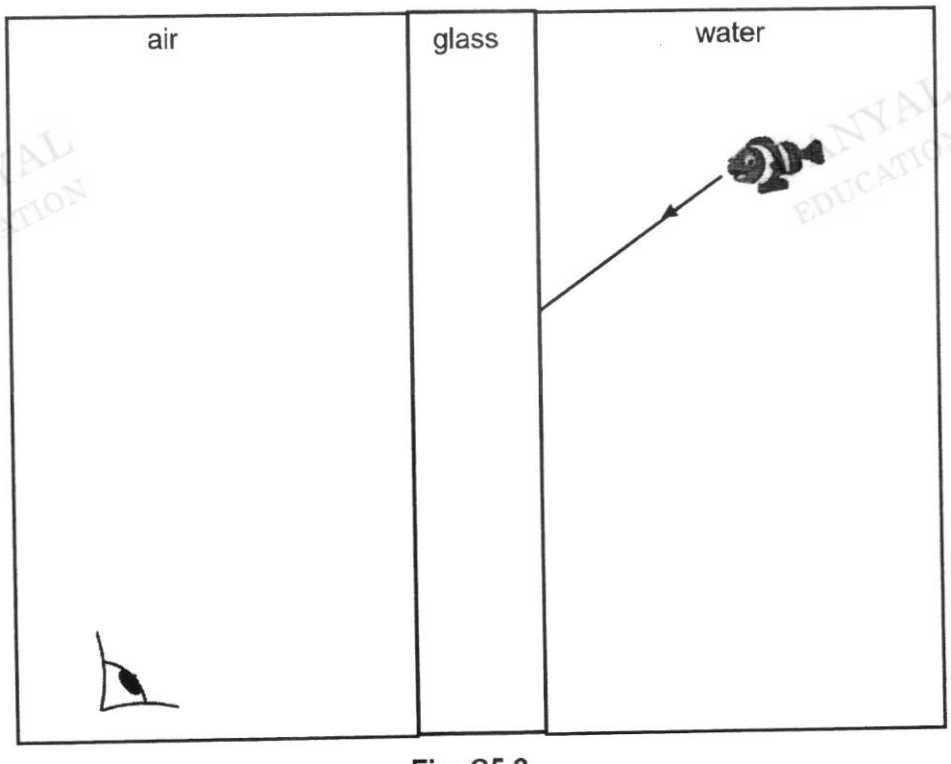


Fig. C5.2

(i) Complete the ray diagram in Fig. C5.2 to show how the path of light travels from the clown fish to the student's eye. **[2]**

(ii) Describe and explain the path of light ray travelling from the clown fish to the student's eye.

.....

.....

.....

.....

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

(d) When a beam of white light passes through a triangular glass prism, white light is separated into seven different kinds of coloured light as seen in Fig. C5.3.

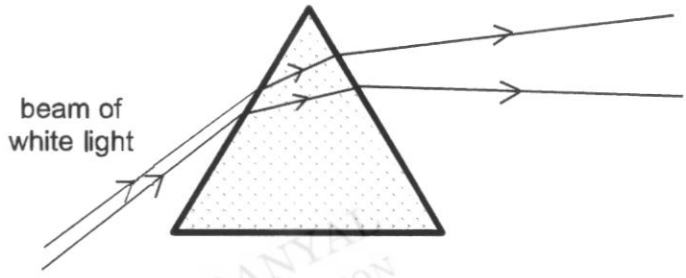


Fig. C5.3

(i) Name all the colours that make up white light.

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

(ii) Blue light is shone on a yellow object.

Suggest and explain the colour of the object that would be observed under blue light.

.....

.....

.....

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

END OF PAPER

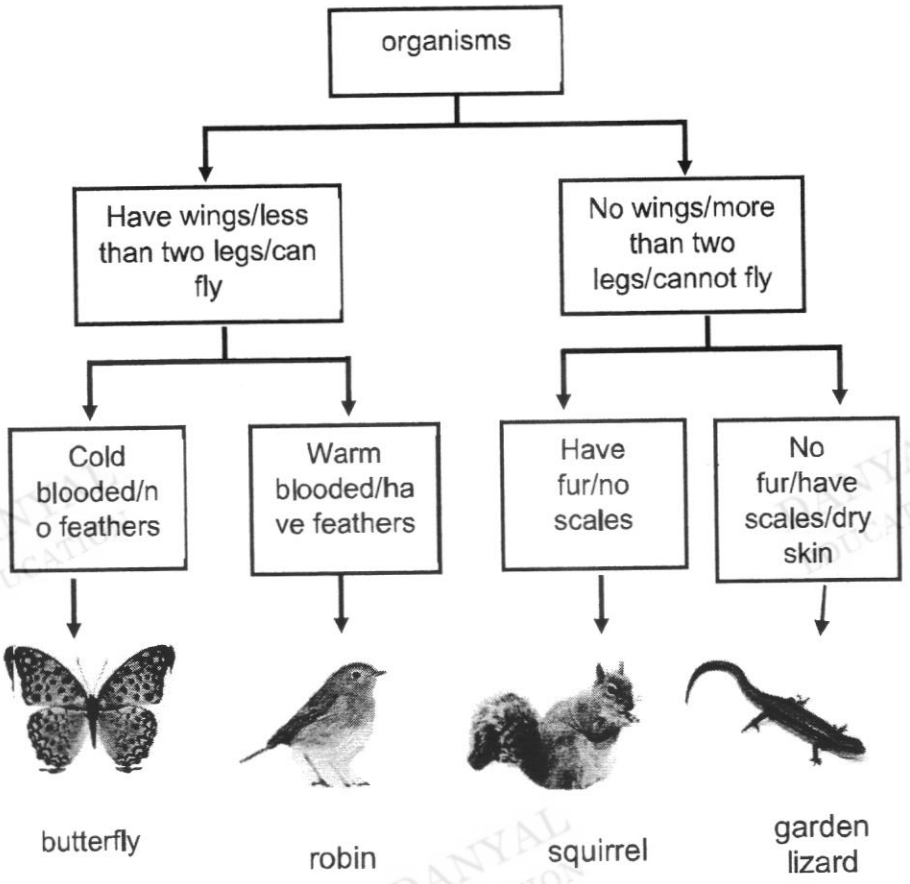
Marking Scheme (2021 SA2 Sec 2E Science)

Section A

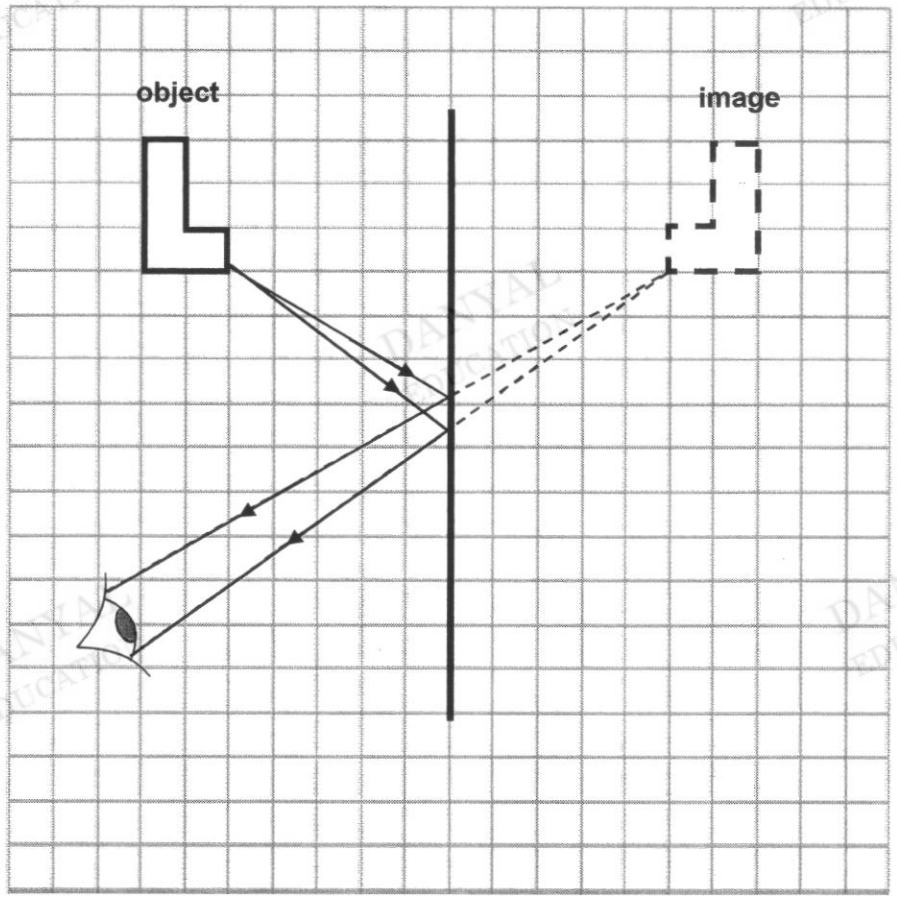
1	2	3	4	5	6	7	8	9	10
D	D	C	D	C	B	C	C	B	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
B	C	B	B	A	C	B	B	C	A
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
C	D	C	C	A	D	B	C	D	D

Section B

Qn	Answer		Marks
B1a	region	physical state(s) of substance W	1 mark each
	R	liquid	
	S	Liquid and solid Accept: solid-liquid, liquid-solid Reject: solid to liquid, liquid to solid.	
B1b	The state of substance changes from solid to liquid. The arrangement of the particles change from **being very closely packed in an orderly manner** to **being closely packed in a disorderly manner.** The movement of the particles change from **vibrating at fixed positions** to **sliding past each other randomly.**		4c - 2m 2-3c – 1m 0-1c – 0m
B1ci	T		1m
B1cii	In solid state, the particles are **very closely packed** and; **solid W occupies the least volume**, but mass remains the same. /there is **little space between the particles** and; **solid W occupies the least volume**, but mass remains the same.		1 1

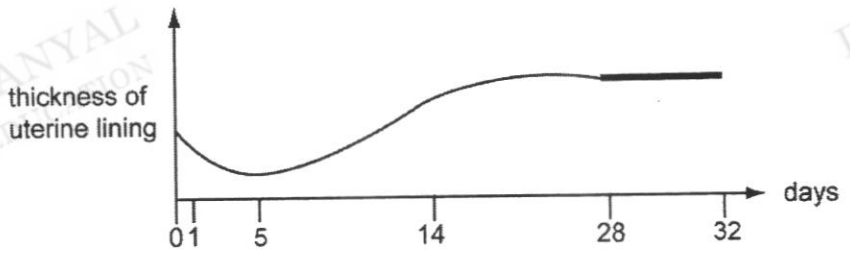
B2a	 Accept any other reasonable answers according to Google. Must compare common criteria	6c – 3m 4-5c – 2m 2-3 c- 1m 0-1c – 0m
B2bi	Photosynthesis	1
B2bii	[DATA] The rate of carbon dioxide uptake is **highest / 4 units** at 1200 hours. [REASON] During photosynthesis. plants will **take in carbon dioxide** and water in the **presence of sunlight / light** and chlorophyll at 1200 hours. REJECT: rate of carbon dioxide uptake increases → must show max. Do not use verbify photosynthesis as "photosynthesise". Say: plant is **undergoing photosynthesis**.	1 1
B3a	C	1
B3b	D	1
B3c	A and C	1
B3d	D and F	1

2

B4ai	B	1
B4aii	D	1
B4b	There will be **less secretion of intestinal juice that contains digestive enzymes**, reducing the efficiency of digestion. **Less digested food substances / less nutrients absorbed / digested food substances are less efficiently absorbed** by the villi in the small intestine. Reject: NO absorption / no digestion / answers related to large intestine.	1 1
B4ci	pH 1 (reject range of numbers, must refer to graph)	1
B4cii	stomach	1
B4ciii	amylase	1
B4civ	Salivary amylase would digest **starch** to form **maltose**.	1
B5a	 Total 3M (i)1m for: + correct position of image in dotted lines, + same distance from mirror as object + LABEL "*IMAGE*" (ii)* 1m for light rays from image to eye. * 1m for light rays from object to eye with correct arrows.	1 2

	Penalise 1M for incorrect direction of light rays Penalise 1M if light rays are from different points from object/image. Accept if light rays originate from different points – because reflection of light rays can occur from all point on the object. (question did not state draw 2 light rays from the same point)	
B5b	Upright/Virtual/Laterally inverted/Same size/Same distance away from the mirror as the object (any two)	2

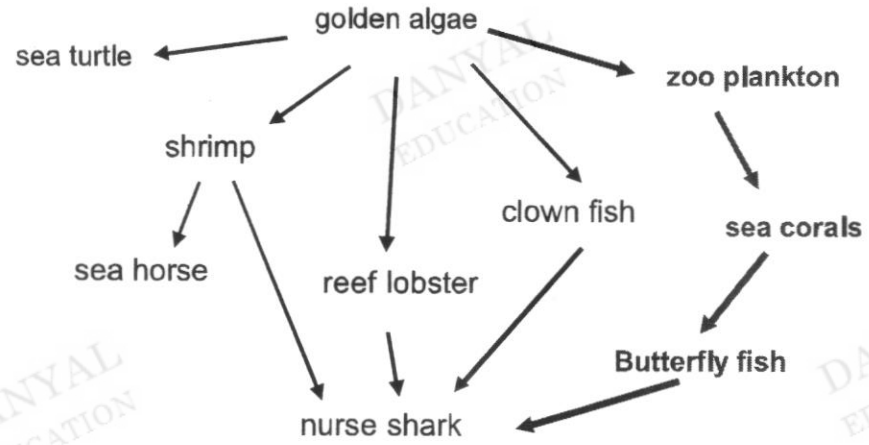
Section C

Qn	Answer	Marks
C1a	Ovary/Ovaries	1
C1bi	[DESCRIBE DATA] The "**thickness of uterine lining" decreases** from Day 1 to Day 5. [EXPLAIN] The woman is going through **menstruation, where there is discharge of / breaking down of / shedding of uterine lining,** blood and unfertilised egg.	1 1
C1bii	The level of oestrogen **increases then decreases** from day 5 to day 14 of the menstrual cycle. Also accept: **increases** to a **maximum/peak** at day 8 then **decreases**.	1
C1bii i	Oestrogen causes the **uterine lining to** repair and **thicken** after menstruation.	1
C1c	 *The thickness of uterine lining should be maintained for implantation of embryo if fertilisation takes place.	1
C1di	22 May	1

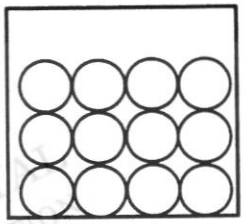
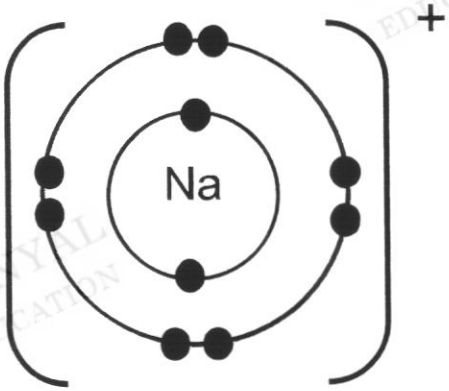
<table>
<tr><td>C1dii</td><td><u>4 May to 10 May</u> (Day 11 – 17 is the fertile period) → avoid these dates within fertile period to prevent pregnancy → contraception successful

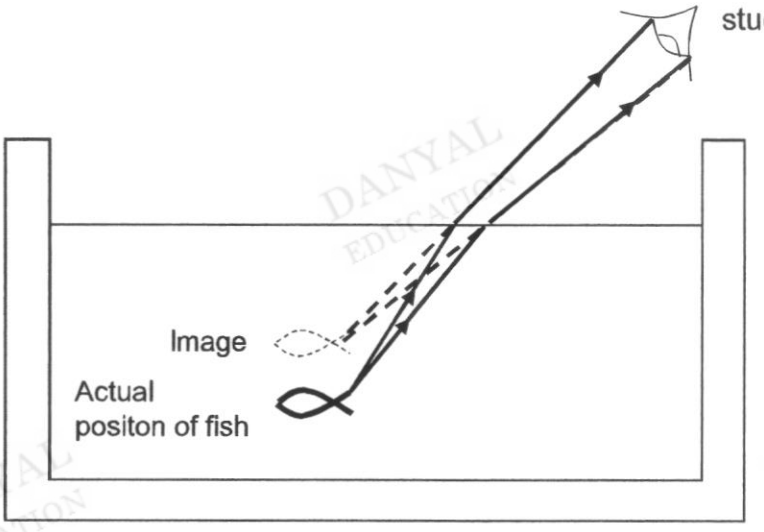
OR

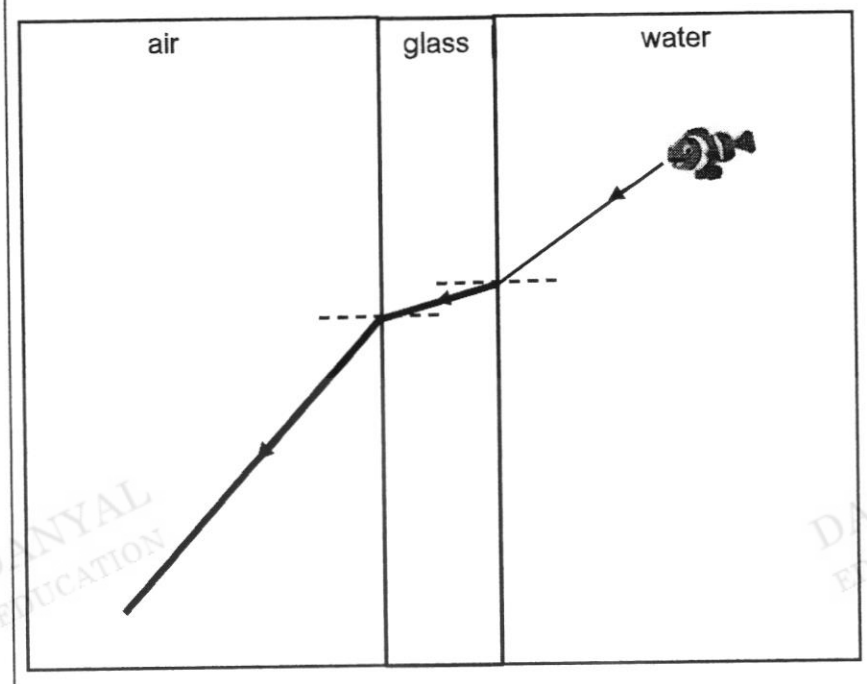
<u>24 April to 3 May</u> (Day 1 – 10) OR <u>29 April to 3 May</u> (Day 6-10) OR <u>11 May to 31 May</u> (Day 18 to 28, then Day 1 – 10 of next cycle) → can have sexual intercourse outside fertile period, so can also prevent pregnancy → contraception successful.</td><td>1</td></tr>
<tr><td>C1dii i</td><td>With irregular menstrual cycles, the menstrual cycle <u>is no longer 28 days/cannot predict the day in which ovulation would take place.</u>

Student answer must reflect understanding of ovulation/release of mature egg cannot be predicted.</td><td>1</td></tr>
<tr><td>C1div</td><td>Tubal <u>ligation</u></td><td>1</td></tr>
<tr><td>C2ai</td><td><table><tr><td>type of consumer</td><td>organism</td></tr><tr><td>primary consumer</td><td>Shrimp/clown fish/reef lobster/sea turtle</td></tr><tr><td>secondary consumer</td><td>Nurse shark / sea horse</td></tr></table></td><td>2 (1m each)</td></tr>
<tr><td>C2aii</td><td>Golden algae -> sea turtle</td><td>1</td></tr>
<tr><td>C2bi</td><td> 
</td><td>1</td></tr>
<tr><td>C2bii</td><td>Mutualism is the relationship between two organisms in which <u>both organisms benefit from</u> each other.</td><td>1</td></tr>
<tr><td>C2bii i</td><td>Sea corals <u>give out carbon dioxide</u> which algae needs for photosynthesis.
Algae <u>gives out oxygen during</u> photosynthesis which sea corals need.</td><td>1</td></tr>
<tr><td>C2c</td><td>The population of shrimps will <u>increase</u>;
Reason: when stingrays consume sea horses, the <u>population of sea horses decreases/ less sea horses;</u>
<u>to feed on shrimps / less predators</u></td><td>1
1</td></tr>
<tr><td>C2d</td><td>Introduce laws to prevent pollution of sea waters with coral reef
Reduce carbon emission/green house gases emissions to reduce effects global warming

*Accept <u>specific</u> answers related to context, with <u>actions</u>.
Address temperature change / address public transport</td><td>1
1</td></tr>
</table>

C3ai	Hydrogen chloride	1
C3aii	Ammonia, hydrogen chloride, sulfur dioxide	1
C3aiii	Sodium, water, octane	1
C3bi	octane	1
C3bii	Gas X has undergone a **physical change** Because the change is **reversible/ the properties of the substance does not change.**	1 1
C3biii	 Marking points *particles must be in same size *particles must fill up 75% of the box *at least 3x4 particles *draw the particles touching the **bottom** of the box	1
C3ci	2.8.1 / 2,8,1	1
C3cii	Sodium atom will **lose 1 electron** to achieve a fully filled valence shell/stable noble gas electronic configuration, this will form sodium ion with one positve charge.	1
C3ciii	 Marking points *Number of electrons/electronic configuration *Charge *Brackets *Labelling of Na	1
C4a	The metal was added using this method so that the flask can remain sealed to **prevent gas from escaping** into the surroundings. This will make the results obtained accurate.	1
C4bi	**No gas was produced** when gold was mixed with dilute hydrochloric acid./Gold **did not react** with dilute hydrochloric acid.	1

C4bii	Iron, zinc, magnesium, calcium	1
C4c	**Calcium** + **hydrochloric acid** -> **calcium chloride** + **hydrogen gas**	1
C4d	Test: **place lighted splint** at mouth of the test tube / gas syringe Observation: **The lighted splint/flame extinguishes with a pop sound.** *accept ECF from C4c but not full credit (1 mark max)	1 1
C4ei	Neutralisation	1
C4eii	Calcium hydroxide	1
C4f	Place **a few drops of universal indicator** into both beakers. If universal indicator solution changes from green to **red/orange/yellow, solution is an acid**. If universal indicator solution changes from green to **blue/violet, solution is an alkali.** OR Place **both red and blue litmus papers** into both beakers. If **red litmus paper turns blue, solution is an alkali.** If **blue litmus paper turns red, solution is an acid.**	1 1
C5a	 Marking points *Fish to be below image/further away from the surface *1m for light ray from object to eye with arrows *1m for light ray from image to eye with arrows -1m if direction of (arrows for) light rays wrong Accept if light rays originate from different points – because refraction of light rays can occur from all point on the object. (question did not state draw 2 light rays from the same point)	1 2

C5c	 Marking points *1m showing light ray bending towards the normal as light enters glass (more optically dense) from water with arrow *1m showing light ray bending away from the normal as light enters air (least optically dense) from glass with arrow Penalise 1M if student draws 2 light rays to eye (not dispersion of light).	2
C5cii	As light enters glass from water, light will **bend/ refracts towards the normal** since **glass is more optically dense than water** As light enters air from glass, light will **bend/ refracts away from the normal** since air is **less optically dense than glass/least optically dense medium out of the three.** Reject if student writes: denser/less dense	4c – 2m 2-3 c -1m 0-1c – 0m
C5di	Red, orange, yellow, green, blue, violet, indigo (ROYGBIV) →ALL 7 colours must be written Reject: cyan, magenta	1
C5dii	A yellow object will reflect red, green and yellow light into our eyes. When blue light is shone on yellow, **blue light will be absorbed** by the object so no coloured light enters our eye. **Object will appear to be black.**	1 1

8