

Section A (10 marks)Answer **all** questions.

- 1 The melting points and boiling points of some substances **A** to **D** are given in the table below.

Which of the following is a liquid at room temperature?

	melting point / °C	boiling point / °C
A	824	1430
B	-189	-30
C	-39	357
D	44	280

- 2 When water evaporates, what happens to water particles?
- A** They start to slide over one another.
 - B** They have higher kinetic energy.
 - C** They lose heat to the surrounding.
 - D** They break down to form hydrogen and oxygen atoms.
- 3 Which of the following does not have a fixed boiling point?
- A** chlorine gas
 - B** sugar solution
 - C** sodium chloride
 - D** zinc carbonate

[Turn Over

4 Which properties of an electron are correct?

	relative charge	relative mass
A	$\frac{1}{1840}$	1
B	1	$\frac{1}{1840}$
C	-1	1
D	-1	$\frac{1}{1840}$

5 Why are atoms electrically neutral?

- A** They have a fully-filled valence shell.
- B** They have the same number of protons as neutrons.
- C** They have the same number of protons as electrons.
- D** They do not have free-moving electrons to conduct electricity.

6 A few drops of Universal Indicator are added to a test tube of aqueous sodium hydroxide.

What will be the final colour of the mixture when one spatula of sodium chloride is added to the test tube?

- A** blue
- B** green
- C** violet
- D** yellow

7 Which one of the following changes is easily reversible?

- A** caramelisation of sugar
- B** electrolysis of water
- C** formation of charcoal from wood
- D** mixing sand and salt

[Turn Over

- 8 Three substances have the following electrical properties.

substance	property
P	conducts electricity under all conditions
Q	conducts electricity only when dissolved in water
R	conducts electricity only in molten and aqueous states

What are these three substances?

	P	Q	R
A	Cu	HCl	CuCl ₂
B	HCl	Cu	CuCl ₂
C	HCl	CuCl ₂	Cu
D	CuCl ₂	Cu	HCl

- 9 Which of the following represents an element that exists as molecules?

- A** H₂
- B** He
- C** Fe
- D** HCl

- 10 The hydride ion has the chemical formula H⁻. Which statement about the hydride ion is correct?

- A** It has two electrons.
- B** It has two protons.
- C** It has no electrons.
- D** It has no protons.

[Turn Over

Section B (30 marks)

Answer **all** questions in the spaces provided.

For
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Use

1 Dry ice is carbon dioxide in the solid state. A piece of dry ice was placed on the table at room temperature and white fumes (gases) were seen coming from the dry ice.

(a) In the box provided, draw the arrangement of particles in dry ice and in the white fumes.

dry ice	white fumes

[2]

(b) In the given choices, circle the process that the dry ice underwent at room temperature.

<i>melting</i>	<i>boiling</i>	<i>freezing</i>	<i>sublimation</i>	<i>heating</i>
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[1]

(c) Using Kinetic Particle Theory, explain the process identified in (b).

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[3]

[Total: 6]

[Turn Over

2 The elements beryllium, magnesium and calcium are placed in Group II of the Periodic Table. They are known as the alkaline earth metals.

- (a) (i) Which noble gas has the same number of valence electrons as a beryllium atom?

..... [1]

- (ii) Explain why the noble gas in (a)(i) is unreactive and does not form compounds unlike beryllium.

.....

 [2]

- (b) The table shows some information about six particles **A** to **F**. The letters are not the symbols of the elements.

	number of protons	number of neutrons	electronic configuration
A	16	22	2.8.6
B	12	14	2.8.2
C	19	20	2.8.8.1
D	16	22	2.8.8
E	20	20	2.8.8
F	12	12	2.8.2

Use the letters **A** to **F** to answer the following questions.

- (i) Which two particles are isotopes?

..... [1]

- (ii) Which particle is an ion?

..... [1]

[Turn Over

(c) Magnesium oxide, MgO is commonly used to line the walls of very hot blast furnaces.

(i) Describe how a magnesium ion is formed from a magnesium atom.

..... [1]

(ii) Which property of magnesium oxide makes it suitable for its use? Explain what gives rise to this property.

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

(iii) Draw the 'dot-and-cross' diagram for magnesium oxide, showing all the electrons.

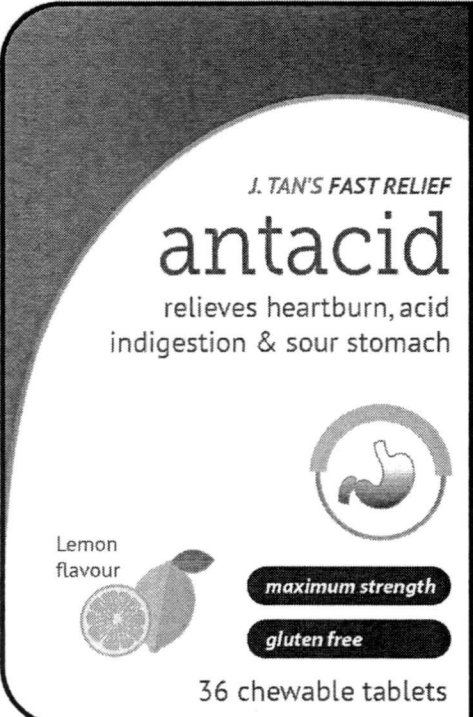
[2]

[Total: 10]

[Turn Over

- 3 The following label is taken from the packaging of J. Tan's Fast Relief antacid tablets. These tablets are taken to relieve discomfort caused by hydrochloric acid in the stomach.

For
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Use

	Drug Facts		
	Active ingredients (in each tablet)		
	calcium carbonate	550 mg	Purpose Antacid
	magnesium hydroxide	110 mg	Antacid
	Uses relieves		
	■ heartburn	■ sour stomach	■ acid indigestion
Warnings			
Ask a doctor or pharmacist before use if you are now taking a prescription drug. Antacids may interact with certain prescription drugs.			
When using this product do not exceed 15 tablets daily or use the maximum dosage for more than 2 weeks.			
Keep out of reach of children.			
Directions chew 2 to 4 tablets as symptoms occur			
Other information			
■ each tablet contains: calcium 220 mg, magnesium 45 mg			
■ store at 20°–25 °C (68°–77 °F)			
Inactive ingredients dextrose, flavour, magnesium stearate, silicon dioxide, stearic acid, sucralose, sucrose (309-058).			

- (a) Name the ion responsible for causing sour stomach.

..... ion [1]

- (b) Write the chemical formula of the two active ingredients in J. Tan's Fast Relief antacid tablets.

1: 2: [2]

- (c) Consuming J. Tan's Fast Relief antacid tablets may result in build-up of gas in the stomach, causing a person to experience symptoms of bloating. With reference to the active ingredients in each tablet, explain why this is so.

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

[Total: 4]

[Turn Over

- 4 Two chemical reactions were conducted with three unknown reactants, **P**, **Q** and **R**.

Reaction 1: **P+Q** → potassium carbonate + ammonia + water

Reaction 2: **P+ R** → ammonium sulfate + carbon dioxide + water

- (a) Identify reactants **P**, **Q** and **R**.

reactants	identity
P	
Q	
R	

[3]

- (b) Describe a suitable test to identify ammonia.

Test

Observation

[2]

- (c) When a few drops of Universal Indicator were added to reactant **Q**, the mixture turns violet.

Predict the changes in colour of the mixture when reactant **R** was added, *dropwise*, to this mixture until no further change was observed.

.....

[2]

[Total: 7]

[Turn Over

5 Three experiments were conducted.

From the list, choose one word that best describes the type of reaction in each experiment.

<i>thermal decomposition</i>	<i>electrolysis</i>	<i>combustion</i>	<i>oxidation</i>
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For
Examiner's
Use

- (a) **Reaction 1:** A spatula of white calcium carbonate was placed in a test tube. The test tube was heated strongly. Carbon dioxide gas was produced, forming a white precipitate in limewater. The solid left behind was also white.

Reaction 1 is

- (b) **Reaction 2:** A candle was lit. It burnt with a flame and a lot of heat energy was released. The products were found to be carbon dioxide and water.

Reaction 2 is

- (c) **Reaction 3:** An apple was cut and its surface was exposed to air. After some time, the surface turned brown.

Reaction 3 is [3]

[Total: 3]

End of Paper

[Turn Over

SECTION A

1	2	3	4	5	6	7	8	9	10
C	B	B	D	C	C	D	A	A	A

SECTION B

1 (a)  [2]

(b) sublimation [1]

(c) Any 3 of

- Particles in dry ice/ carbon dioxide particles/ carbon dioxide molecules gain (kinetic) energy and move more rapidly;
- Particles/molecules are able to break free from its fixed position;
- Particles have enough energy to overcome the forces of attraction (holding them together);
- Particles/ molecules are now spread far apart/ able to move rapidly in any direction. [3]

2 (a) (i) helium [1]

(ii) Helium fully-filled valence shell/stable duplet configuration/stable electronic configuration [1]

Reject: octet/eight electrons

Hence, it does not need to gain, lose or share electrons [1] [2]

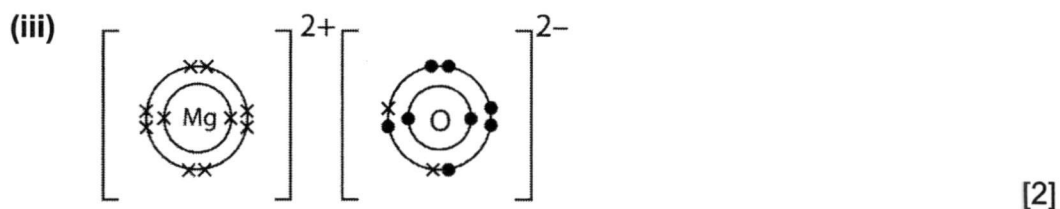
(b) (i) B and F [1]

(ii) E [1]

(c) (i) magnesium ion is formed when a magnesium atom loses two electrons [1]

(ii) magnesium oxide has high melting/boiling point [1]

A large amount of energy is required to overcome the strong electrostatic forces of attraction between magnesium ions and oxide ions [1] [2]



3 (a) Hydrogen ion [1]

(b) CaCO_3
 Mg(OH)_2 [2]

(c) Acid in stomach reacts with calcium carbonate to form carbon dioxide gas. [1]

4 (a)

P	ammonium carbonate or $(\text{NH}_4)_2\text{CO}_3$
Q	potassium hydroxide or KOH
R	sulfuric acid or H_2SO_4

[3]

(b) Test: Insert a damp red litmus paper

Observation: Damp red litmus paper turns blue

-1 m if student did not mention 'damp' [2]

(c) Violet →→ green →→ red

1 m if violet → red

0 m if violet → green or green → red [2]

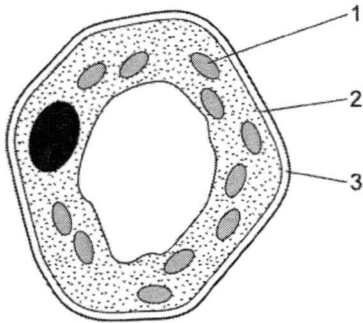
5 (a) thermal decomposition [1]

(b) combustion [1]

(c) oxidation [1]

Section A (10 marks)
Answer **all** the questions.

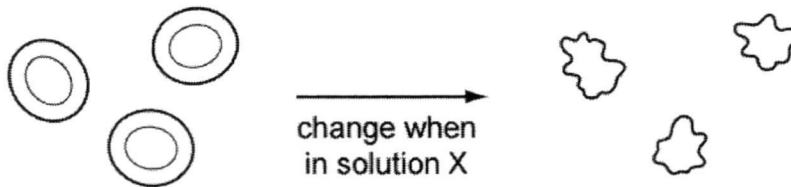
- 1 The diagram shows a plant cell as seen under a microscope.



Which of the numbered parts carry out these functions?

	controlling entry of dissolved substances	formation of carbohydrates
A	1	3
B	2	1
C	3	2
D	3	1

- 2 The diagram represents how some red blood cells change when they are placed in solution X.



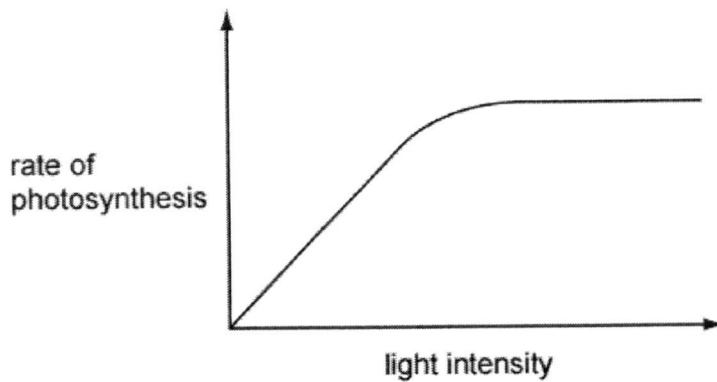
What describes the water potential in solution X and in which direction does water molecules move?

	water potential in solution X	direction of water molecules movement
A	higher than in cells	into the cells
B	higher than in cells	out of the cells
C	lower than in cells	into the cells
D	lower than in cells	out of the cells

- 3 The graph shows the effect of light intensity on the rate of photosynthesis when

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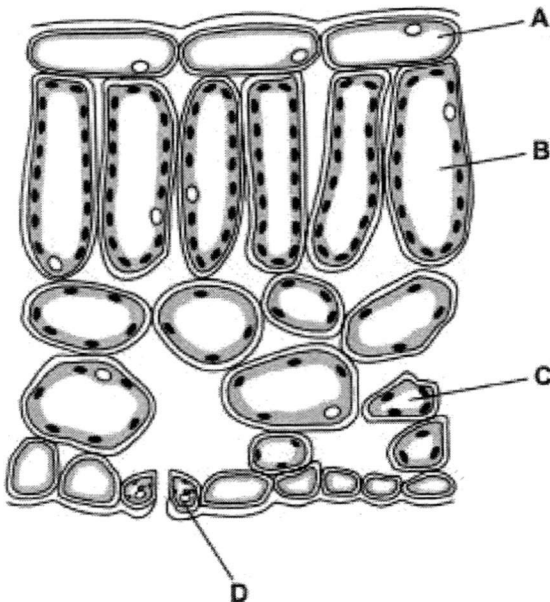
other factors are kept constant.



Which statement could explain what is happening at higher light intensities?

- A All the available chloroplasts are fully occupied in light absorption.
- B The chlorophyll in the chloroplasts has been damaged.
- C Glucose is inhibiting photosynthesis.
- D The temperature is too high for photosynthesis.

- 4 The diagram shows the cross-section of part of a leaf. Which cell produces most oxygen in the daytime?

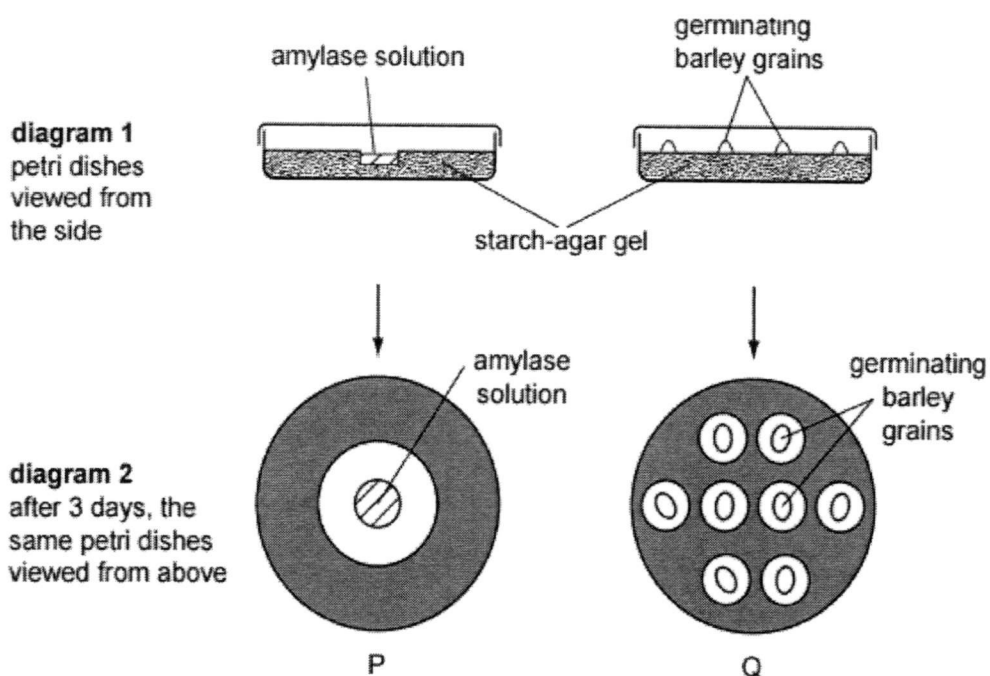


- 5 In an experiment to investigate germinating barley grains, two petri dishes are set up as shown in **diagram 1** and left for three days.

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Iodine solution is then added to the starch-agar gel.

The results are shown in **diagram 2**. The shaded areas indicate the presence of starch.

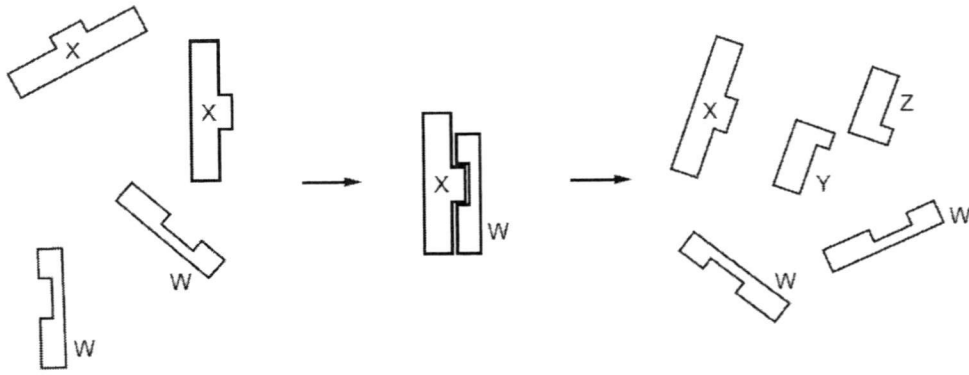


What is shown by dishes P and Q?

	dish P	dish Q
A	amylase catalyses the digestion of starch	germinating barley grains digest starch
B	amylase catalyses the digestion of starch	germinating barley grains do not digest starch
C	barley grains produce amylase	germinating barley grains digest starch
D	barley grains produce amylase	germinating barley grains do not digest starch

6 The diagram illustrates the enzyme action.

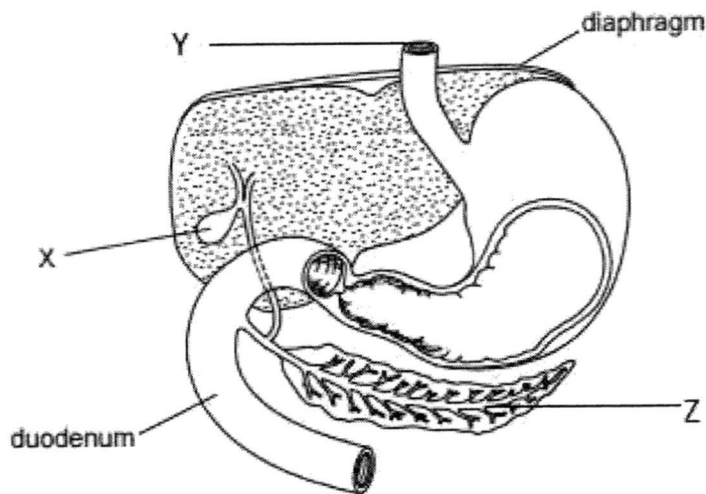
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What are the enzyme, substrate and product in this reaction?

	enzyme	substrate	product
A	W	X	Y and Z
B	W	Y and Z	X
C	X	W	Y and Z
D	X	Y and Z	W

- 7 The diagram below shows parts of the human digestive system.



What are the functions of structures X, Y and Z?

	X	Y	Z
A	to digest fats	to digest starch	to produce lipase
B	to produce bile	moves food to stomach	to produce amylase
C	to store bile	moves food to stomach	to produce lipase
D	to emulsify fats	to digest starch	to produce amylase

- 8 Four tubes containing 10 cm³ of 1 % starch solution were treated in different temperature and pH and then mixed with saliva. After 30minutes, 1cm³ of iodine in potassium iodide solution was added to

[Turn over

each tube.

In which tube did the contents show a yellow-brown colour?

	temperature / °C	pH
A	75	2.5
B	75	6.9
C	35	6.9
D	35	2.5

- 9 Where is amylase secreted in the digestive system, and what is the end product of the reaction it catalyses?

	secreted from	end product
A	pancreas and salivary glands	glucose
B	pancreas and salivary glands	maltose
C	salivary glands and small intestine	glucose
D	salivary glands and small intestine	maltose

- 10 Vasectomy is a surgical procedure to prevent sperms from mixing with the seminal fluid.
Which part of the male reproductive system is cut in this surgery?
- A** urethra **B** testes **C** ureter **D** sperm duct

End of Section A

Section B (50 marks)

Answer **all** questions in the spaces provided.

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1 Fig. 1.1 shows different plant cells A, B, C, D, and E.

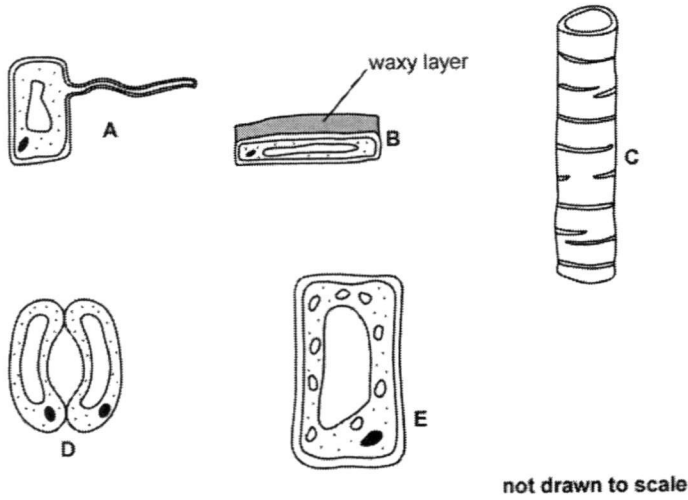
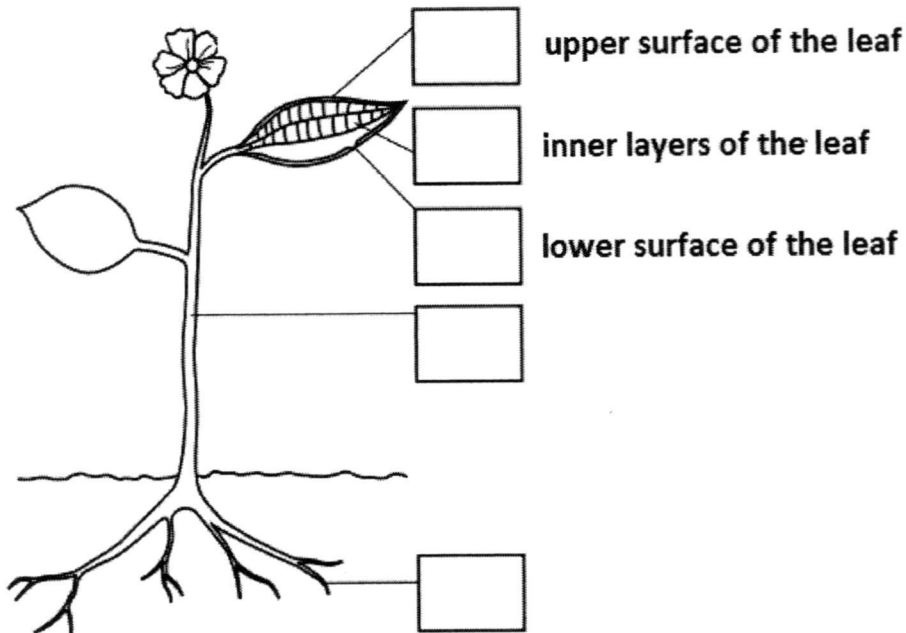


Fig. 1.1

(a) Fig. 1.2 shows a plant. Use the letters A, B, C, D, and E from Fig. 1.1 to show where these cells would be found on the plant shown in Fig. 1.2. Write each of the letters in the appropriate box.



[3]

Fig. 1.2

Explain how the structures of cells A and E are related to their functions.

(b) cell A.....

[Turn over

.....

.....

cell E

.....

.....

[2]

[2]

- 2 Fig. 2.1 shows an experiment to investigate the effect of changing light intensity on the rate of photosynthesis of a water plant called Elodea.

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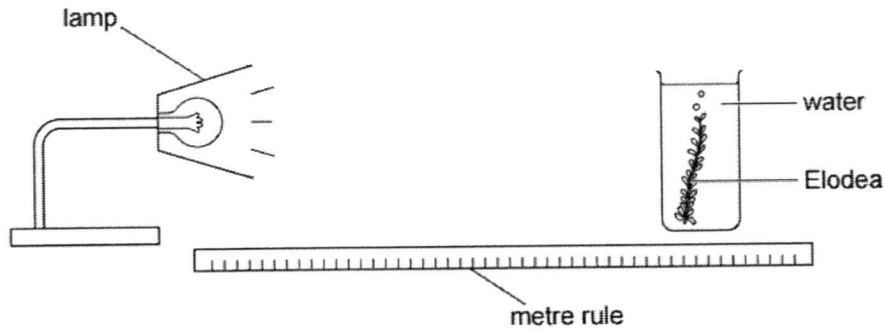


Fig. 2.1

The light intensity is altered by changing the distance between the lamp and the plant.

The number of bubbles of oxygen produced by the plant per minute is used to find the rate of photosynthesis.

The results are shown in Fig. 2.2.

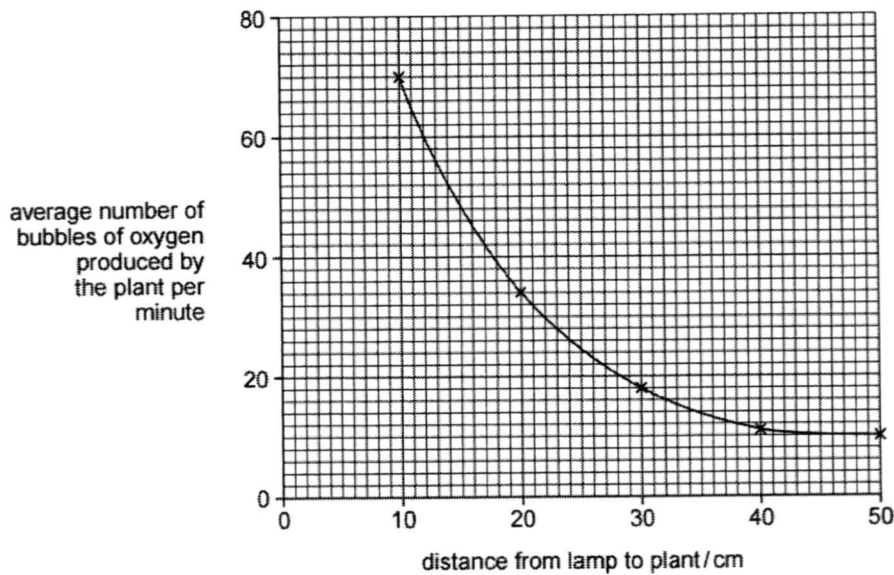


Fig. 2.2

- (a) Use Fig. 2.2 to describe how the rate of photosynthesis of the plant changes as the light intensity is varied.

.....

.....

.....

[1]

- (b) Fig. 2.3 shows some of the living organisms in a pond.

For
Examiner's
Use

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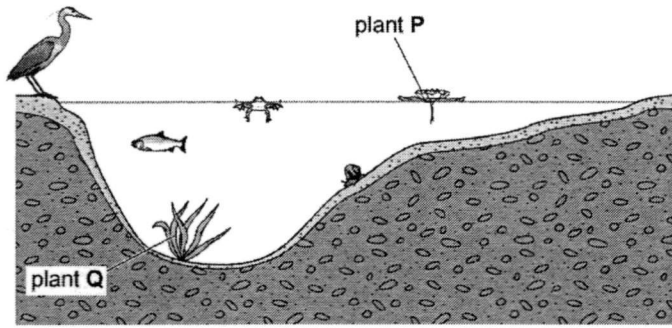


Fig. 2.3

Suggest how the rate of photosynthesis of **plant P** compares with **plant Q**. Explain your answer.

.....

.....

.....

[2]

3 Fig. 3.1 shows the effect of pH on the activity of the enzyme amylase at two different temperatures.

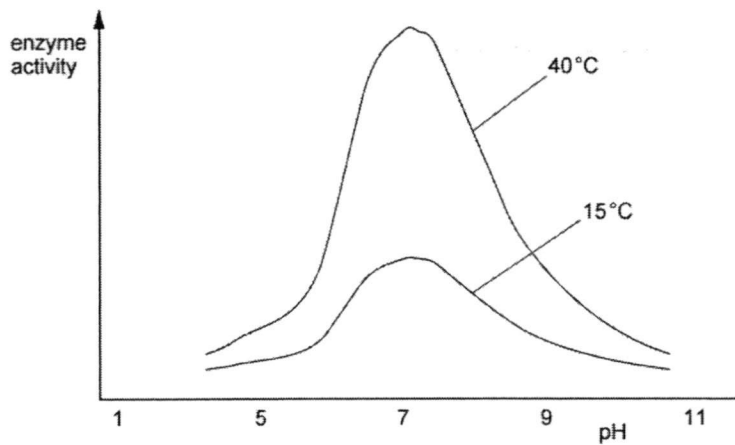


Fig. 3.1

(a) Use Fig. 3.1 to describe how this enzyme's activity is affected by

(i) temperature,

.....

.....

.....

.....

[2]

(ii) pH.

[Turn over

.....
.....

[1]

(b) On Fig. 3.1, draw a line to show the effect of pH on the activity of the enzyme at 100 °C.

[1]

(c) What is an enzyme?

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

[2]

4 Fig. 4.1 represents the human alimentary canal.

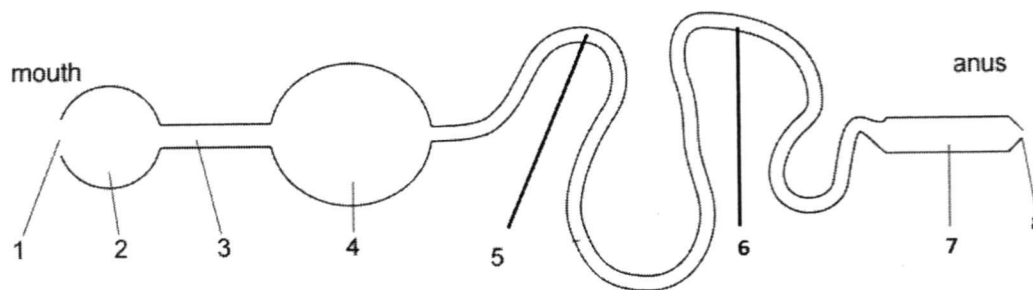


Fig. 4.1

(a) State the number of the region where each of the following processes occurs most.

(i) absorption.....

(ii) emulsification.....

(iii) egestion.....

(iv) ingestion.....

[4]

(b) (i) State the process that crushes food in region 4,

.....

[1]

(ii) Name the part of a balanced diet that helps this process in (i).

.....

[1]

(c) In humans, digestion of protein is catalysed by the enzyme protease. The

[2]

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action of protease starts when food is present in the stomach.

Explain why protease from the stomach stops working after the food reaches duodenum.

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

5(a) State two ways in which sexual reproduction is different from asexual reproduction.

1.
.....

2.
.....

[2]

(b) State two ways in which the structure of an egg cell differs from the structure of a sperm cell.

1
.....

2
.....

[2]

(d) When these two cells meet, their nuclei fuse. Name this process.

.....

[1]

[Turn over

6 Fig 6.1 shows an enzyme K and a substrate P.

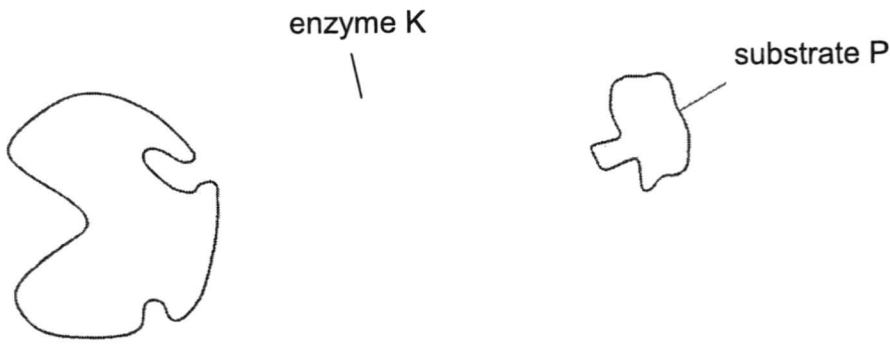


Fig.6.1

- (a) When enzyme K is mixed with substrate P under optimum conditions, no reaction occurs. Use the lock and key hypothesis to explain why there is no reaction.

.....

.....

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.....

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.....

[3]

- (b) Fig.6.2 shows enzyme K after phosphate is added to the reaction medium.



Fig.6.2

- (i) Describe the effect of phosphate on enzyme K .

.....

.....

[1]

[Turn over

- (ii) P is a carbohydrate molecule. K catalyses the breakdown of molecule P to form product N.

Name:

enzyme K

substrate P

product N and

the chemical reaction involved in breaking down P.

.....

[4]

- 7 (a) Digestion of food is catalyzed by enzymes produced by various organs in the digestive system.

Use the letters A-H in Table 7.1 to indicate the sites of production of the listed enzymes and the substrates they act on in Table 7.2

organ		food substrate	
A	stomach	F	carbohydrates
B	salivary glands	G	proteins
C	pancreas	H	fat
D	liver		
E	small intestine		

Table 7.1

	enzyme	organ/s (A/B/C/D/E)	substrate (F/G/H)
1	trypsin		
2	lipase		
3	peptidase		
4	amylase		
5	pepsin		

Table 7.2

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(b) An experiment was set up as shown in Fig.7.2.

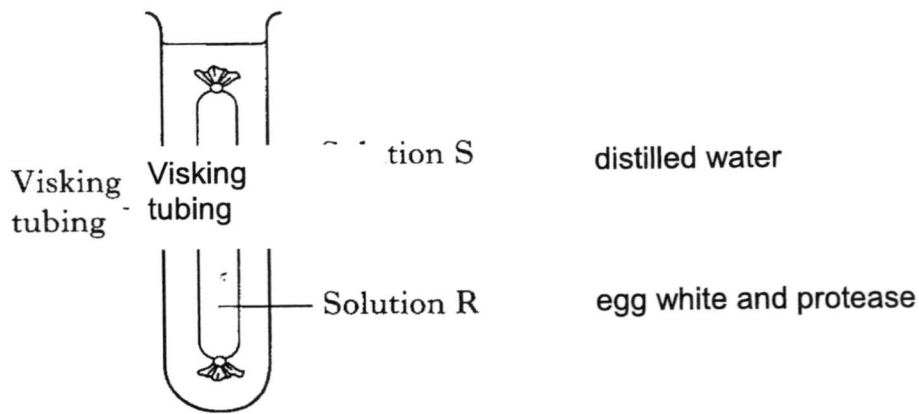


Fig.7.2

(i) After 30 minutes, the distilled water was tested with blue litmus paper which turned red.
Explain the result of litmus test.

.....

.....

.....

[2]

(ii) The experimental set up represents part of human digestive system.
Name the part of digestive system which resembles

the Visking tubing,

.....

and distilled water.

.....

[2]

[Turn over

- 8 Jennifer plans to go to Mauritius for scuba diving for a week, as soon as her menstruation ends in May. Fig.8.1 is a calendar showing her first day of menstruation in April (marked with #) which usually lasts for five days.

APRIL 2017						
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						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 2017						
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	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.8.1

- (a) What is menstruation?

 [1]
- (b) What controls the menstrual cycle?
 [1]
- (c) What is the earliest date when Jennifer can go to Mauritius?
 [1]
- (d) State what can cause Jennifer's menstrual cycle to be irregular.
 [1]
- (e) Jennifer would like to start a family as soon as she returns from Mauritius. What is the date of ovulation when she is most likely to conceive?
 [1]

[Turn over

- (f) Katherine does not want to have children and she has been taking birth control pills.
Birth control pills contain female sex hormones.
Name a sex hormone which is found in birth control pills and explain how it prevents pregnancy.

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

[2]

End of Paper

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1	2	3	4	5
B	D	A	B	A
6	7	8	9	10
A	C	C	B	D

1a	none B E D C A [3]	All correct = 3 2 errors = 2 3 errors = 1 4-6 errors = 0
b	A: has long hair-like / elongated cellularextension ; thin walls ; increases /large surface area to volume ratio ; for faster <u>absorption</u> (of water/ minerals) ; Ignore : has no chloroplasts ; underground so does not photosynthesise ; E: presence of chloroplasts ; for light absorption ; for photosynthesis ; long and thin/ cylindrical shape ; many cells can be packed together for maximum light absorption (for photosynthesis) ;	2 2
2a	as the <u>light intensity decreases the rate of photosynthesis decreases</u> /ora ; R if reference is only to distance and bubbles not a linear/ proportional relationship/numbers taken from graph to illustrate relationship ;	1
2b	(b) <u>faster rate with plant P</u> (than plant Q) or vice versa because it gets more light ; water/ plants / debris <u>prevent some light from reaching plant Q</u> ; A if there is comparison of depth/ amount of sunlight bet P and Q	1 1
3a	(i) <u>faster at higher temperature</u> / at 40° C / best at 40° C ; A 1m only for higher temp = higher activity. Must qualify statement. <u>denatures / lost shape of active site higher than 40°C</u> (ii) fastest / optimum at <u>pH7</u> ; <u>Increases to pH 7 then decreases</u> ;	1 1 1

[Turn over

b	Straight line drawn below 15° C curve throughout ; R if line is not labelled	1
3c	protein and/or catalyst and/or speeds up reactions ; remains unchanged acts on a specific substrate, needed in small amounts lowers the activation energy for a reaction	1 1 Any one
4a	(i) 6 (ii) 5 (iii) 8 (iv) 1	1 each
4b	(i) Peristalsis R = churning (ii) fibre	1 1
4c	enzyme is denatured ; not the optimum pH for the enzyme ; alkaline pH / pH 9	1 1
5a	<u>Sexual reproduction vs asexual reproduction</u> two parents vs 1 parent <u>genetically different</u> / vs <u>genetically identical</u> dissimilar offspring R genetically similar R looks similar fertilisation/fusion of vs no fusion/gametes involved gametes R 1 gamete involved	Any 2 2
5b	Motility - Presence/ absence of tail R motile/non-motile Size - ovum larger, sperm smaller A if correct dimensions given Chromosomes - X chromosome in ovum and X or Y chromosome in sperm Shape – spherical for ovum, while sperm has head, middle piece and tail	Any 2 2
5c	fertilization	1
6a	a. <u>Shape of active site of enzyme / K is not complementary</u> to shape of P / substrate; b. Enzyme is lock, substrate is key ; c. No enzyme-substrate complex can be formed; AW	1 1 1
6b i	Phosphate <u>changes the shape of active site</u> on K; / active site is complementary in shape to P;	1

[Turn over

6b ii	K = maltase P = maltose N = glucose Hydrolysis	1 1 1 1												
7a	<table border="0"> <tr> <td>Organ</td> <td>substrate</td> </tr> <tr> <td>1. C</td> <td>G</td> </tr> <tr> <td>2. C , E</td> <td>H</td> </tr> <tr> <td>3. E</td> <td>G</td> </tr> <tr> <td>4. B,C</td> <td>F</td> </tr> <tr> <td>5. A</td> <td>G</td> </tr> </table>	Organ	substrate	1. C	G	2. C , E	H	3. E	G	4. B,C	F	5. A	G	1 for list of organs 1 for substrates
Organ	substrate													
1. C	G													
2. C , E	H													
3. E	G													
4. B,C	F													
5. A	G													
7bi	a. Protease catalyse / breaks down protein to amino acids; b. Amino acids has low pH / acidic pH/ amino acids small enough to diffuse across PPM;	1 1												
7bii	Ileum / small intestine/ villi/ wall of small intestine; Blood/ bloodstream/ circulatory system;	1 1												
8a	Breakdown and discharge of <u>uterine lining</u> through the <u>vagina</u> ;	1												
8b	(female) <u>Sex</u> hormones/ oestrogen and progesterone;	1												
8c	15 May;	1												
8d	Stress / illness/ malnutrition/ starvation/ unbalanced diet/ lack of nutrients;	1												
8e	23 May;	1												
8f	<u>Progesterone</u> ;	1												
	It <u>prevents ovulation</u> / prevents release of ova/ prevents maturation of eggs	1												

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