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ZHONGHUA SECONDARY SCHOOL

Mid-Year Examination 2017

CANDIDATE
NAME

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CLASS

2	E	
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LOWER SECONDARY SCIENCE

09 May, 2017

Secondary 2 Express

2 hours

Set by: Ms Rozianna / Mr Yusuf / Mr Christopher Lim

Vetted by: Mr Ong Kai Kun

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces at the top of this page and on all separate answer paper used.

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

There are **thirty** questions on this paper. Answer all questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the one you consider correct and record your choice in soft pencil on the separate OTAS Answer Sheet.

Section B

Answer **all** questions.

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

Section C

Answer **all** questions.

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

The number of marks is given in brackets [] at the end of each question or part question.

All essential working must be shown clearly.

A copy of the Periodic Table is printed on page 24.

For examiner's use	
Section A	30
Section B	30
Section C	30
Total	

Section A

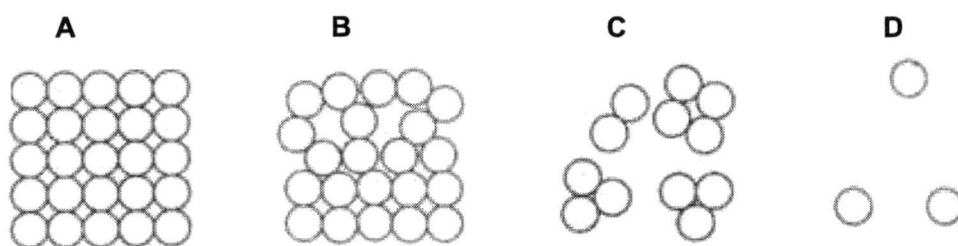
Answer **all** questions.

- 1 An empty sealed container contains air.
Which statements describe the behavior of air particles in the container?

- 1 More particles will be found at the bottom after some time.
- 2 The particles are evenly spaced and far apart.
- 3 The particles are held by very weak forces of attraction.
- 4 The particles are in constant and random motion.

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

- 2 Which of the following would show the arrangement of particles in a lump of solid sugar?



- 3 Which of the following statements best describes the particles in liquid?

- A** Liquid particles are closer than those particles in a solid.
- B** Liquid particles are in continuous random motion.
- C** Liquid particles are stationary in an ordered arrangement.
- D** Liquid particles vibrate about fixed positions.

- 4 Which of the following takes place when steam condenses?

- A** The molecules decrease in size.
- B** The molecules gain energy from their surroundings.
- C** The molecules increase in size.
- D** The molecules lose energy to their surroundings.

- 5 A student prepared a blood smear to be viewed under a microscope by adding a drop of blood and a drop of distilled water onto a glass slide, before covering it up with a cover slip. When viewed under the microscope, the glass slide appeared empty.

Which best explains the observations?

- A The blood cells burst.
 B The water caused the blood cells to shrink.
 C The blood dried up before water was added.
 D The drop of water diluted the blood so much that the blood cells are far away from each other.
- 6 Which of the following correctly states a difference between diffusion and osmosis?

	diffusion	osmosis
A	requires a selectively permeable membrane	does not require a selectively permeable membrane
B	does not only involve water molecules	involves only water molecules
C	against a concentration gradient	along a concentration gradient
D	does not require energy	requires energy

- 7 The table shows the concentrations of ions in cell sap found in vacuole of freshwater algae and the pond water in which the algae grow in.

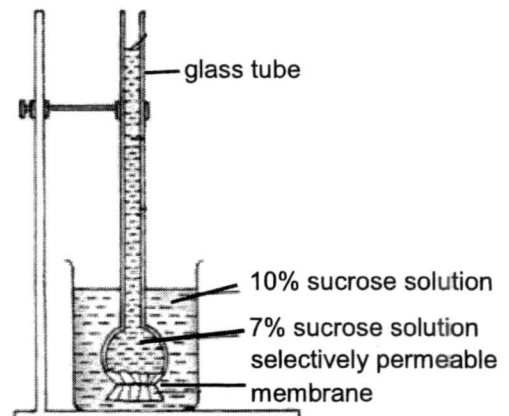
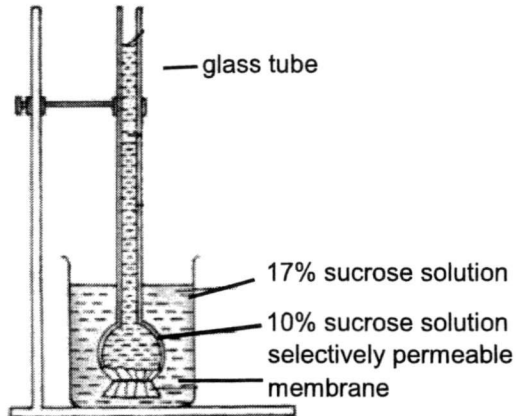
ion	sap concentration / mg ions dm ⁻³	pond water concentration / mg ions dm ⁻³
Ca ²⁺	25.0	2.6
Mg ²⁺	22.1	5.8
Na ⁺	48.7	1.8
K ⁺	48.0	0.7

Which process accounts for the movement of ions into the cell sap?

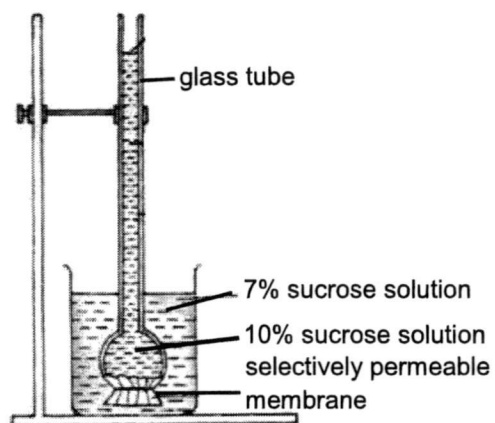
- A osmosis
 B diffusion
 C plasmolysis
 D active transport

- 8 The diagram shows four experiments on osmosis. Which set-up will have the greatest increase in liquid level in the glass tube?

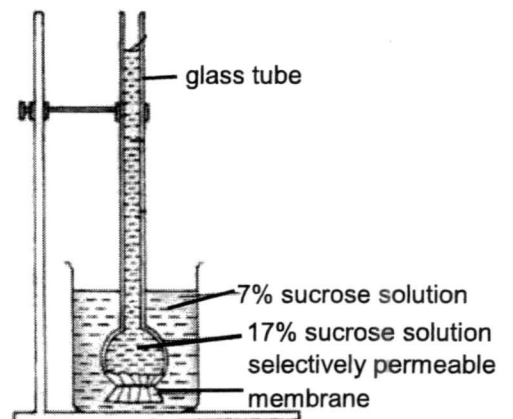
AB



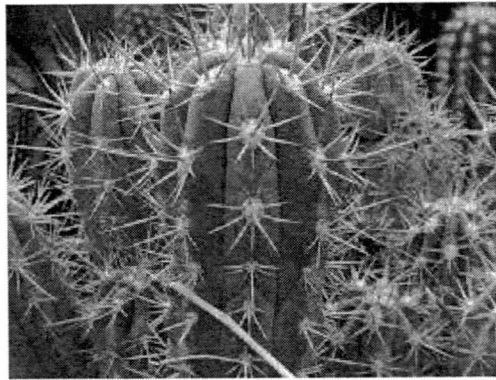
C



D



- 9 The cactus, commonly found in deserts, has spine-looking leaves that are very thin, sharp and stiff.



What is the purpose of these spines?

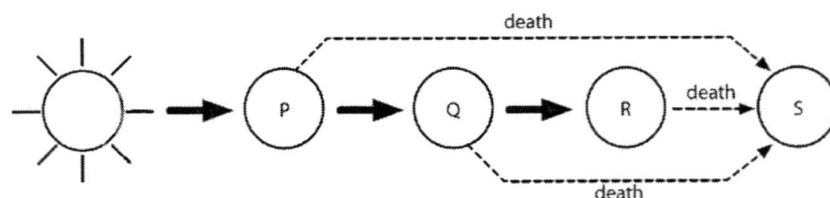
- 1 to photosynthesize
- 2 to protect the cactus from animals
- 3 to reduce water loss

A 1 only B 1 and 2 C 2 and 3 D All of the above

- 10 Which of the following options correctly describes the various processes involved in the carbon cycle?

	removes carbon dioxide from atmosphere	adds carbon dioxide to atmosphere
A	combustion and respiration	photosynthesis and decomposition
B	photosynthesis and respiration	combustion and decomposition
C	respiration	combustion and decomposition
D	photosynthesis	respiration and decomposition

Study the food chain and answer questions 11 and 12.



- 11 In this food chain, what does **S** represent?

A decomposer B parasite C predator D producer

12 How is energy lost by **Q** in the food chain?

- 1** not all plant parts are consumed by herbivores
- 2** as heat energy released during respiration
- 3** through waste products in faeces
- 4** used for growth and repair in **Q**

A 1only **B** 1 and 2 **C** 1, 2&3 only **D** All of the above

13 What would most likely result if all decomposers in a particular ecosystem were wiped out?

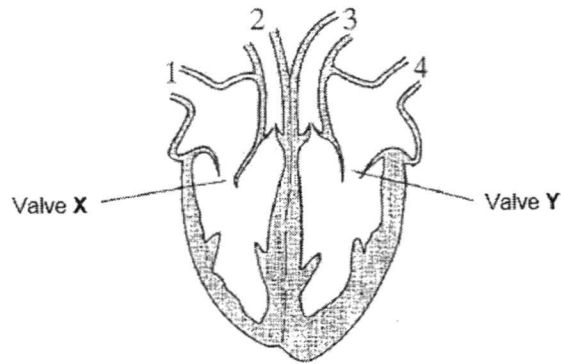
- A** There would be a decline in the atmospheric carbon dioxide, affecting rates of photosynthesis.
- B** More food would be available for other consumers in the ecosystem.
- C** There would be no significant impact as the dead organisms will decompose naturally.
- D** The other organisms in the ecosystem would experience slower death rates.

14 A man suffers from a condition which results in the weakening of the walls of his aorta. This causes it to lose its elasticity.

Which of the following is not a likely consequence of the condition?

- A** bursting of aorta leading to severe loss of blood
- B** inability of artery wall to withstand high blood pressure
- C** restriction of blood flow through the aorta
- D** widening of lumen of aorta

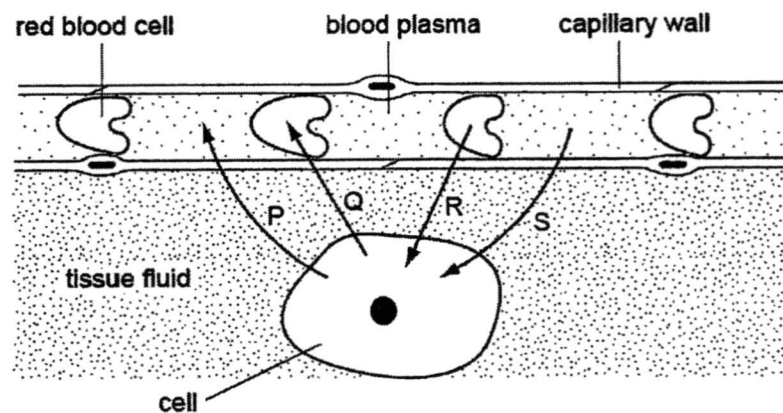
- 15 The diagram shows a cross-section of a human heart



What happens when blood is being pumped to the lungs?

	action of valves	vessel through which blood passes to the lungs
A	valve Y opens	4
B	valve Y closes	3
C	valve X opens	1
D	valve X closes	2

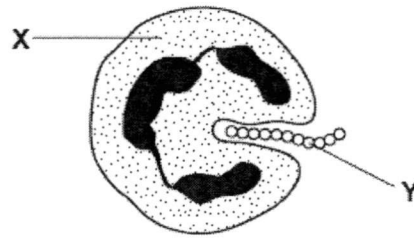
- 16 The diagram shows a blood capillary with an adjacent cell. The arrows represent the exchange of substances between the capillary and the cell.



Which of the following arrows represent glucose, carbon dioxide and oxygen?

	glucose	carbon dioxide	oxygen
A	S	Q	P
B	S	P	R
C	R	Q	S
D	R	P	Q

- 17 The diagram shows a human blood cell **X**.

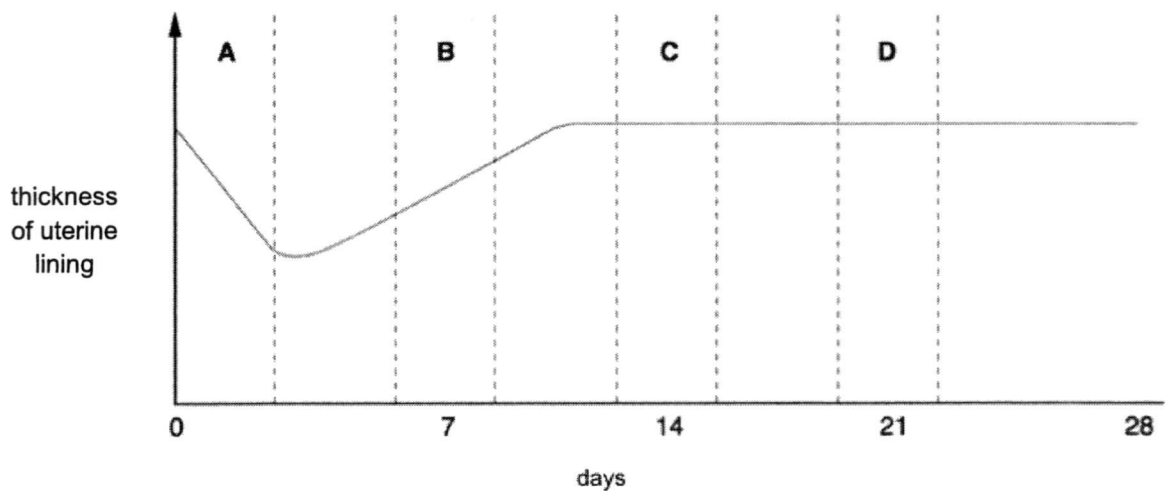


What type of blood cell is **X** and what is happening at **Y**?

	X	Y
A	phagocyte	microbes being ingested
B	phagocyte	antibodies being produced
C	lymphocyte	microbes being ingested
D	lymphocyte	antibodies being produced

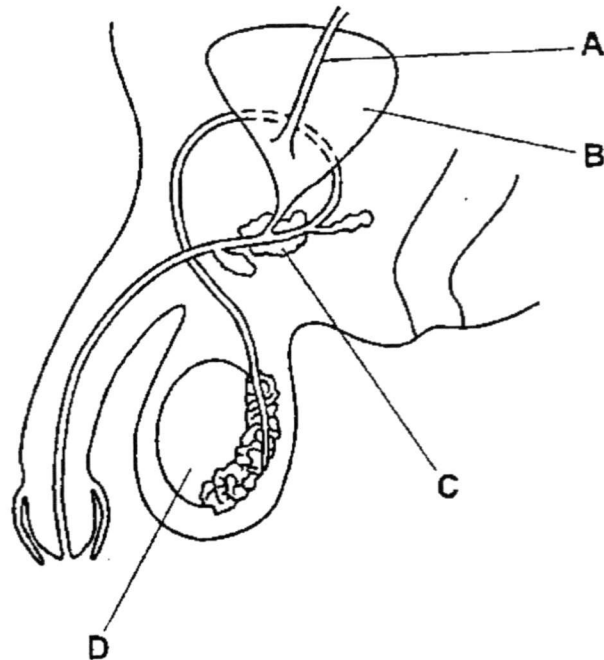
- 18 The diagram shows the thickness of the uterine lining during the menstrual cycle.

During which part of the cycle is the woman most fertile?



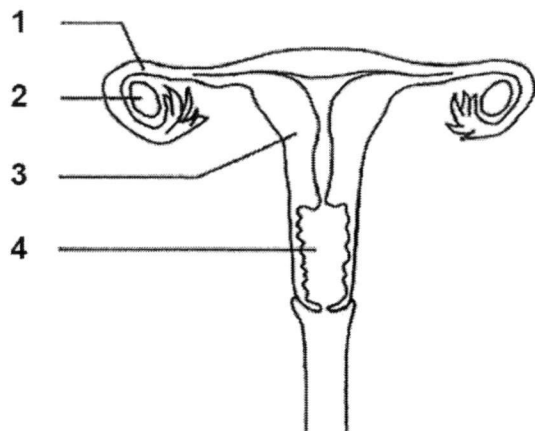
- 19 The diagram shows the male reproductive system.

Which structure produces the fluid part of semen?

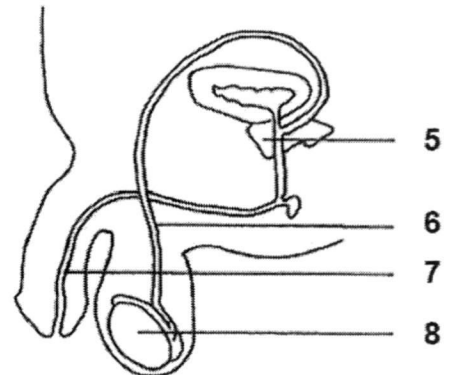


- 20 Which of the statements about birth control methods is false?
- A Ligation is an option for couples who do not want to have children permanently.
 - B The spermicide is usually used together with a condom to kill sperms.
 - C Females consume contraceptive pills to prevent ovulation.
 - D The intra-uterine device is inserted to prevent the fertilization of eggs in the uterine lining.

- 21** The diagrams show the human reproductive systems.



Female reproductive system



Male reproductive system

Which structures serve similar functions?

- A** 1 and 6
- B** 2 and 5
- C** 3 and 7
- D** 4 and 8
- 22** The element with atomic number 4 is likely to have similar chemical properties to the element with atomic number
- A** 3
- B** 5
- C** 11
- D** 20
- 23** A chloride ion has the same number of electrons as_____.
- A** an argon atom.
- B** a bromine atom.
- C** a fluoride ion.
- D** a sodium ion.
- 24** Consider the composition of the particles **W**, **X**, **Y** and **Z** below. Which species is a positive ion?

particle	number of protons	number of neutrons	number of electrons
W	9	10	10
X	11	12	11
Y	12	12	12
Z	13	14	10

A W

B X

C Y

D Z

- 25 How many protons, neutrons and electrons are there in the antimony(III) ion, $^{123}_{51}\text{Sb}^{3+}$?

	protons	neutrons	electrons
A	51	72	48
B	51	72	51
C	54	72	51
D	72	51	48

- 26 The mass number of an element T is 40. When the element forms an ion, the electronic structure can be written as _____.

A 2.8.8

B 2.8.8.1

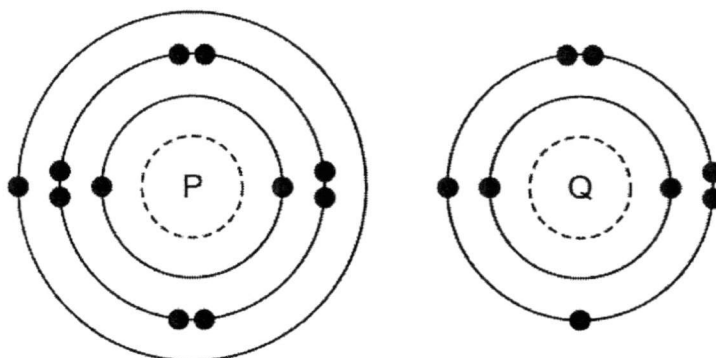
C 2.8.8.2

D 2.8.8.8.8

- 27 Element X has the electronic structure 2, 8, 5. Element Y has the electronic structure 2, 8, 7. What is the likely formula of the compound containing only X and Y?

A XY

B XY_3 C X_3Y D X_5Y_7



What is the formula of this compound?

- A** PQ_2 **B** P_2Q
C P_2Q_6 **D** P_6Q_2

- 29** A water molecule is formed when 2 hydrogen atoms and 1 oxygen atom form a bond. Which of the following statement is correct for the bond formation?

- A** Each hydrogen atom loses one electron to the oxygen atom.
- B** The oxygen atom loses two electrons to the hydrogen atoms.
- C** The oxygen atom shares two pairs of electron with each of the hydrogen atoms.
- D** The oxygen atom shares one pair of electrons with each of the hydrogen atoms.

- 30** The bonding of electrons of a compound formed between **Y** and fluorine is shown below.



Which of the following is the formula of the compound formed between Y and magnesium?

- A** MgY
- B** Mg_2Y_3
- C** MgY_2
- D** Mg_3Y_2

Zhonghua Secondary School
Mid-Year Examination 2017
Secondary 2 Express

NAME: _____ ()

CLASS: 2 E

For Examiner's Use	
Section B	30
Section C	30
Total	

Section B

Answer **all** the questions.

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

- B1** The kinetic particle theory states that all matter are made up of particles which are in constant, random movement.

(a) Complete Table 1.1.

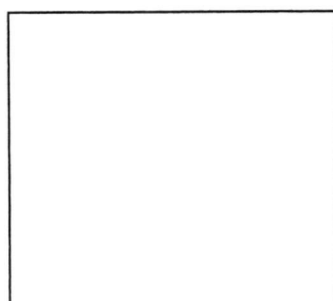
Table 1.1

	helium gas	water	iron
arrangement of particles		no regular pattern; particles are relatively close together	
forces of attraction between particles		strong but weaker than solid	
movement of particles	particles move freely and randomly in all directions at high speeds		

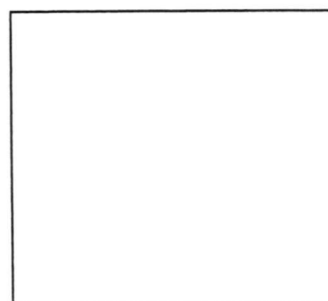
[6]

- (b) In the boxes, draw the arrangements of particles of helium gas and iron at room temperature.

helium gas



iron



[2]

[Total:8]

- B2** Fig. 2.1 shows an experiment where potato strips of equal dimensions are immersed in glucose solutions of different concentrations.

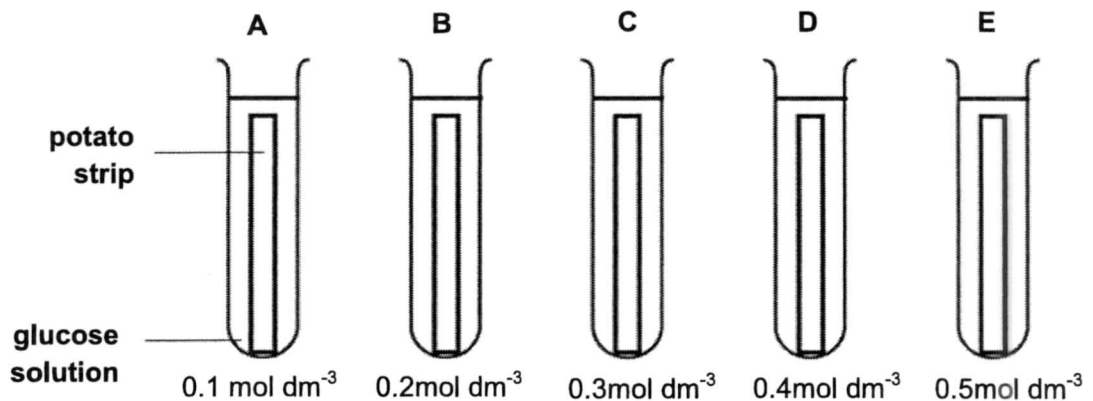


Fig. 2.1

- (a)** Define diffusion.

[1]

- (b)** Which potato strip shows the largest decrease in length? Explain your answer.

[2]

- (c)** For the strip mentioned in (b), suggest how can you modify the experiment to allow the strip to decrease in length, in a shorter time?

[1]

[Total: 4]

B3 Fig. 3.1 shows the side view of a female reproductive system.

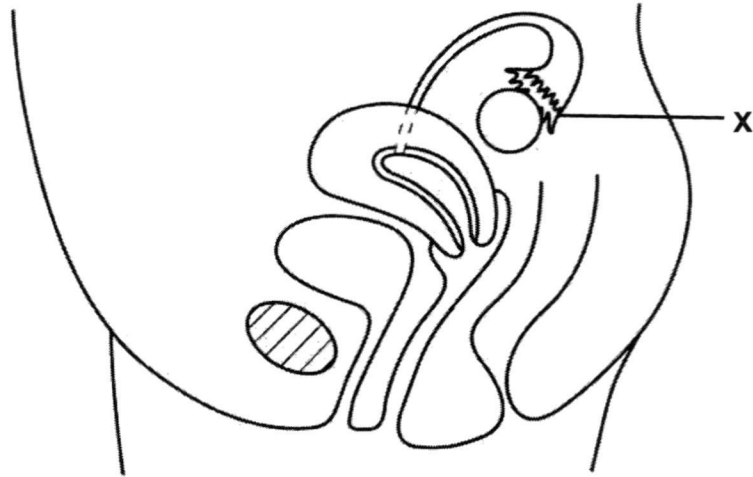


Fig. 3.1

(a) Using proper labelling lines, name and label the following structures on Fig. 3.1,

(i) where implantation occurs

(ii) where an ovum would be fertilised normally

[2]

(b) How does the structure of **X** aid in its function?

[1]

Fig. 3.2 shows the concentrations of two hormones, **F** and **G**, involved in a menstrual cycle.

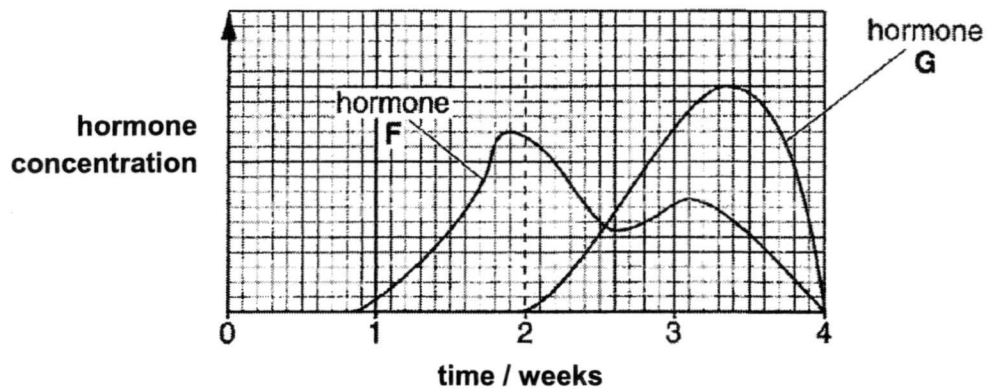


Fig. 3.2

(c) Name hormones **F** and **G**.

F _____

G _____

[1]

(d) Describe the event(s) that occur(s) in the first two weeks of the menstrual cycle.

[2]

(e) If a woman started her menstrual cycle on 6 May 2017, what is the date that she is most likely to ovulate?

[1]

[Total: 7]

B4 Sodium chloride is an important component of the blood. It helps in maintaining the osmotic pressure.

(a) (i) Describe how bonds are formed in sodium chloride.

[2]

(ii) Draw a 'dot and cross' diagram of sodium chloride. Show only the valence electrons.

[2]

(b) Natural sodium is comprised of three isotopes: ^{22}Na , ^{23}Na and ^{24}Na .

(i) What does the term, isotopes, mean?

[1]

(ii) Explain why ^{22}Na , ^{23}Na and ^{24}Na are considered as isotopes of sodium.

[4]

(c) Unlike sodium and chlorine, noble gases do not react to form compounds.

Explain why noble gases do not form compounds.

[2]

[Total: 11]

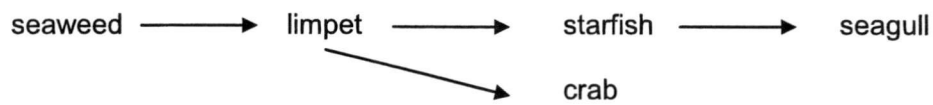
Section C

Answer **all** the questions.

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

- C5** Two habitats of similar communities are shown in Fig. 5.1.

community A



community B

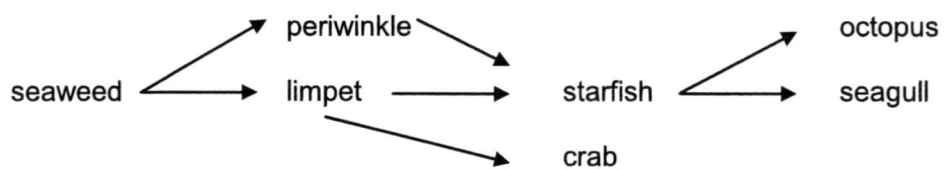


Fig. 5.1

- (a) Name a secondary consumer from community B.

_____ [1]

- (b) Write down a food chain with 3 trophic levels from community B.

_____ [1]

- (c) Seaweed absorbs 500 kJ of energy from the sun and limpet obtains 45 kJ after consuming seaweed.

Calculate the percentage loss of energy from seaweed to limpet.

percentage loss of energy = _____ [2]

- (d) In community **A**, there are 100 000 seaweed, 20 000 limpet, 2 000 starfish and 400 seagulls.

Draw a labelled pyramid of numbers for the food chain mentioned above.

[2]

- (e) In May, there was a discharge of polluted waste water from a factory into both habitats, killing all limpets.

- (i) Which organism will be most affected by the limpet deaths in both habitats? Give a reason for your answer.

[2]

- (ii) Compare, with reasons, the impact of the waste water discharge on communities **A** and **B**.

[2]

[Total: 10]

- C6** Fig 6.1 shows a longitudinal section of a heart in a person who has just suffered a mild heart attack.

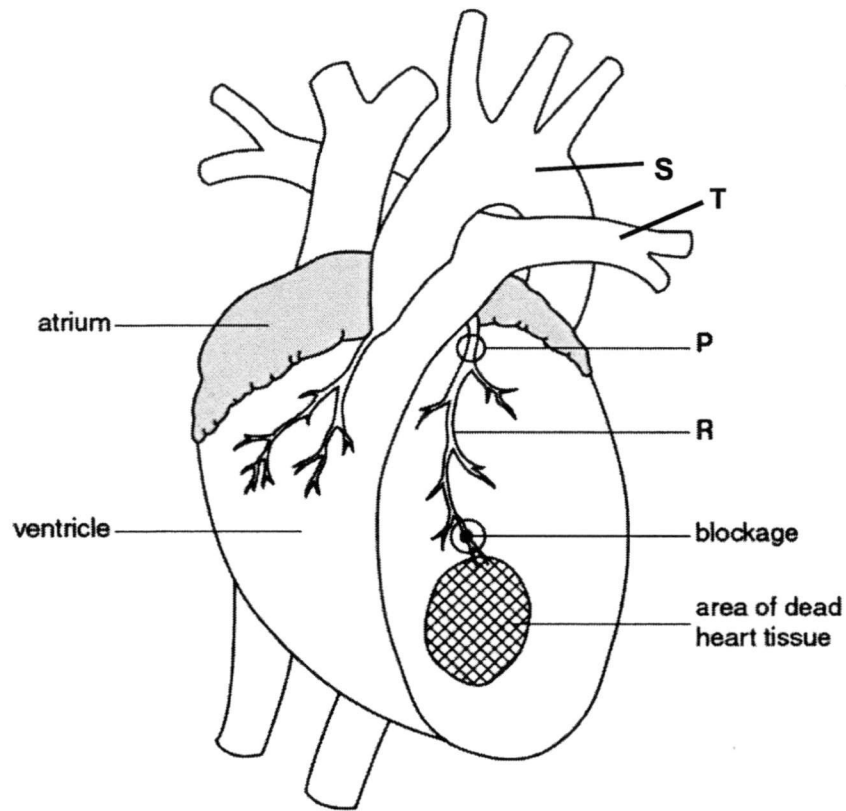


Fig 6.1

- (a)** Name blood vessels **S** and **T**.

S _____

T _____

[2]

- (b)** Describe how the blockage in vessel **R** occurred and its effect on the heart.

[2]

- (c) Suggest and explain why a blockage at point **P** on Fig. 6.1 is likely to cause more serious consequences than a blockage at point **R**.

[2]

- (d) During a detailed scan, it was discovered that the person's median septum was not fully developed.

Describe the consequence of this defect and a symptom that the person may suffer from.

[2]

- (e) The person went through a surgery to minimise the blockage in vessel **R**. After the surgery, samples of his blood were tested and the blood tests revealed that there was a high number of white blood cells and platelets.

Explain why such high numbers of white blood cells and platelets were in his blood.

[2]

[Total: 10]

C7 The element hydrogen is placed on its own in the Periodic Table. However some chemists think that hydrogen should be placed above lithium in Group I.

- (a) (i)** Using your knowledge of hydrogen and lithium, write down one similarity and one difference between the two elements.

similarity: _____

difference: _____

[2]

- (ii)** Draw a 'dot and cross' diagram of the compound formed when hydrogen combines with oxygen. Show the outermost electrons only.

[2]

- (iii)** Draw a 'dot and cross' diagram of the compound formed when lithium combines with oxygen. Show all the electrons.

[2]

- (iv)** Write the chemical formulae of compounds formed in **(a)(ii)** and **(a)(iii)**.

(a)(ii) _____

(a)(iii) _____ [2]

-

-

Group				
		III	IV	V

Key
proton (atomic) number
atomic symbol
name
relative atomic mass

proton (atomic) number atomic symbol name relative atomic mass				1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
22	Ti titanium 48	23	V vanadium 51	24	Cr chromium 52	25	Mn manganese 55	26	Fe iron 56	27	Co cobalt 59	28	Ni nickel 59	29	Cu copper 64	30	Zn zinc 65	31	Ga gallium 70	32	Ge germanium 73	33	As arsenic 75	34	Se selenium 79	35	Br bromine 80	36	Kr krypton 84	37	Rb rubidium 85	38	Sr strontium 88	39	Y yttrium 89	40	Zr zirconium 91	41	Nb niobium 93	42	Mo molybdenum 96	43	Tc technetium -	44	Ru ruthenium 101	45	Rh rhodium 103	46	Pd palladium 106	47	Ag silver 108	48	Cd cadmium 112	49	In indium 115	50	Sn tin 119	51	Sb antimony 122	52	Te tellurium 128	53	I iodine 127	54	Xe xenon 131	55	Cs caesium 133	56	Ba barium 137	57	La lanthanum 139	58	Ce cerium 140	59	Pr praseodymium 141	60	Nd neodymium 144	61	Pm promethium -	62	Sm samarium 150	63	Eu europium 152	64	Gd gadolinium 157	65	Tb terbium 159	66	Dy dysprosium 163	67	Ho holmium 165	68	Er erbium 167	69	Tm thulium 169	70	Yb ytterbium 173	71	Lu lutetium 175	72	Hf hafnium 178	73	Ta tantalum 181	74	W tungsten 184	75	Re rhenium 186	76	Os osmium 190	77	Ir iridium 192	78	Pt platinum 195	79	Au gold 197	80	Hg mercury 201	81	Tl thallium 204	82	Pb lead 207	83	Bi bismuth 209	84	Po polonium -	85	At astatine -	86	Rn radon -	87	Fr francium -	88	Ra radium -	89	Ac actinium -	90	Th thorium 232	91	Pa protactinium 231	92	U uranium 238	93	Np neptunium 237	94	Pu plutonium 244	95	Am americium 243	96	Cm curium 247	97	Bk berkelium 247	98	Cf californium 251	99	Es einsteinium 252	100	Fm fermium 257	101	Mn mendelevium -	102	Nh nihonium -	103	Ds darmstadtium -	104	Rg roentgenium -	105	Cn copernicium -	106	Fl flerovium -	107	Mc moscovium -	108	Lv livermorium -	109	Ts tennessine -	110	Og oganesson -	111	Uu ununoctium -	112	Uub unubium -	113	Uut ununtrium -	114	Uuq ununquadium -	115	Uup ununpentium -	116	Uuh ununhexium -	117	Uus ununseptium -	118	Uuo ununoctium -	119	Uuhc ununhectium -	120	Uuhh ununhassium -	121	Uuhx ununhassium -	122	Uuhz ununhassium -	123	Uuhz ununhassium -	124	Uuhz ununhassium -	125	Uuhz ununhassium -	126	Uuhz ununhassium -	127	Uuhz 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[Total: 10]

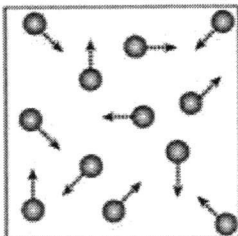
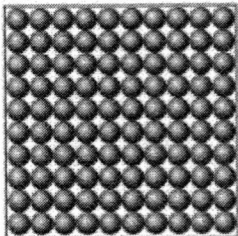
57	58	59	60	61	62	63	64	65	66	67	68
La lanthanum 139	Ce cerium 140	Pr praseodymium 141	Nd neodymium 144	Pm promethium —	Sm samarium 150	Eu europium 152	Gd gadolinium 157	Tb terbium 159	Dy dysprosium 163	Ho holmium 165	Er erbium 167
89	90	91	92	93	94	95	96	97	98	99	100
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm

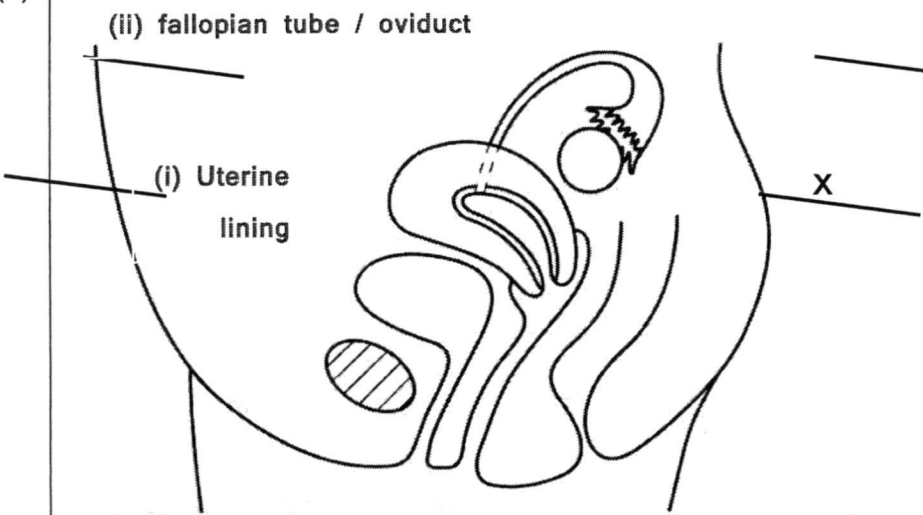
2017Zhonghua Secondary School
2E ScienceMYE Answers

Section A

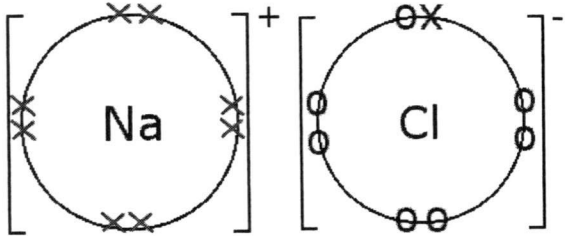
1	D	6	B	11	A	16	B	21	A	26	A
2	A	7	D	12	C	17	A	22	D	27	B
3	B	8	D	13	A	18	C	23	A	28	B
4	D	9	C	14	C	19	C	24	D	29	D
5	A	10	D	15	D	20	D	25	A	30	D

Section B

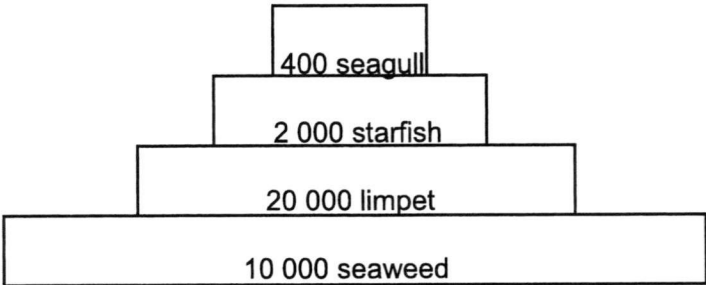
Qn	Answer				Marks
B1a		helium gas	water	iron	5
	arrangement of particles	<u>No regular pattern; [½]</u> <u>particles are very far apart from each other [½]</u>	No regular pattern; particles are relatively close together	<u>Regular pattern;[½]</u> <u>particles are very close together [½]</u>	
	forces of attraction between particles	<u>Weakest force</u>	Strongbut weaker than solid	<u>Strongest force</u> (must compare strength)	
	movement of particles	Particles move freely and randomly in all directions at high speeds.	<u>Particles slide across each other</u>	<u>Particles vibrate in fixed positions</u>	
B1b					1 each
	Helium	iron			
					

Qn	Answers	Marks
2(a)	Diffusion is the <u>net</u> movement of particles <u>from a higher to a lower</u> concentration	1
2(b)	Strip E Immersed in solution with lowest water potential compared to cell sap of potato	1 1
2(c)	Heat up the glucose solution/ Increase the temperature of the glucose solution	1
3(a)		1/2 correct naming 1/2 labelling line pointing to correct structure minus 1/2 no question number
3(b)	funnel-like opening to allow the ovum to enter fallopian tube easily	1
3(c)	F – oestrogen G – progesterone (spelling error– minus 1/2)	1/2 1/2
3(d)	1st week – shedding of uterine lining / discharge of blood/ menstruation occurs 2 nd week – <u>repair & thickening of uterine lining</u> and <u>matured egg</u> is released from ovary / <u>ovulation</u>	1 1
3(e)	19th May 2017	1

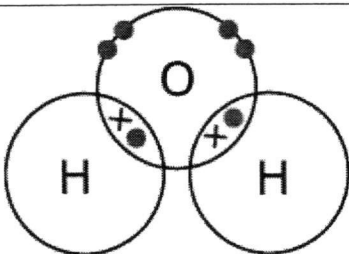
Qn	Answer	Marks
4(a) (i)	A sodium atom <u>loses an electron</u> to chlorine atom/ chlorine atom <u>gains an electron</u> from sodium atom	1

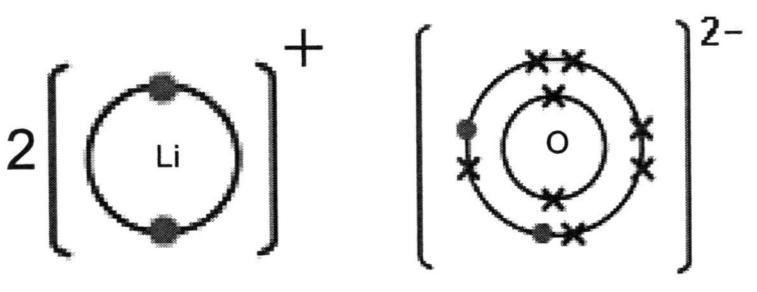
	The <u>sodium ion and chloride ion</u> formed are held by <u>ionic bonds</u>	1
4(a) (ii)		2 – no mistakes Deduct 1 mark for any mistakes (no charge, incomplete electron shells, etc)
4(b) (i)	<u>Atoms of the same elements</u> with <u>same number of protons</u> but <u>different number of neutrons</u>	1
4(b) (ii)	Number of protons = 11 Number of neutrons in ^{22}Na = 11 Number of neutrons in ^{23}Na = 12 Number of neutrons in ^{24}Na = 13	1 1 1 1
4(c)	Noble gases have a stable octet/ duplet electronic configuration They do not lose, gain or share electrons	1 1

Section C

Qn	Answer	Marks
5a	Starfish/crab	1
5b	Seaweed → limpet → crab	1
5c	$500 - 45 = 455 \text{ kJ}$ $455 / 500 \times 100\%$ $= 91 \%$	1 1
5d		
5ei	The crabs will die / The seagulls will also die as they no longer have a food supply.	1 1
5eii	The starfish will not die in community B but will die in community A as they can feed on periwinkles in community B	1 1

	OR	
	Only the crabs will die in community A and B, starfish only die in community A as they no longer have a food supply.	1 1

Qn	Answers	Marks
6(a)	S – aorta T – pulmonary artery (spelling error – minus ½)	1 1
6(b)	<u>deposit of fats or cholesterol</u> on inner walls of arteries reduce flow of <u>nutrients</u> and <u>oxygen</u> to the heart muscles	1 1
6(c)	Blockage at P reduces blood flow to <u>more</u> heart muscles <u>Greater area</u> of heart muscles dying, causing heart to be unable to pump blood	1 1
6(d)	Mixing of oxygenated and deoxygenated blood Difficulty in breathing / shortness of breaths Weakness / Fatigue / Paleness	1 1 Any one
6(e)	Increased number of white blood cells to engulf and ingest pathogens during an infection Platelets to help in clotting of blood to minimise blood loss	1 1
7(a) (i)	Similarities Both atoms have 1 valence electron Both atoms can lose that 1 electron and form a + charge ion Differences Hydrogen is a non-metal while lithium is a metal or Hydrogen can form a + or – ion but lithium can only form an – ion. Hydrogen is a gas and lithium is a solid (any other suitable ones)	Max 1 Max 1
7(a) (ii)		2 – no mistakes Deduct 1 mark for any mistakes (no charge, incomplete electron shells, etc)

7(a) (iii)		2 – no mistakes Deduct 1 mark for any mistakes (no charge, incomplete electron shells, etc)
7(a) (iv)	H ₂ O Li ₂ O	1 1
7(b) (i)	The first shell in an atom can hold a maximum of two electrons OR The second shell in an atom can hold a maximum of eight electrons.	1
7(b) (ii)	Oxygen has an atomic number of 8. Therefore, there are 6 electrons in the outer shell of its atom.	1