15

ZHONGHUA SECONDARY SCHOOL
Mid-Year Examination 2016

CANDIDATE NAME		( )
CLASS	2 E	

LOWER SECONDARY SCIENCE — **11 May, 2016**

Secondary 2 Express — **2 hours**

Set by: **Ms Rozianna / Ms Lin Jiaxuan / Mr Ong Kai Kun**

Vetted by: **Mr Lawrence Tang/ Ms Ong Lay Hong/ Ms Rozianna**

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	40
Total	

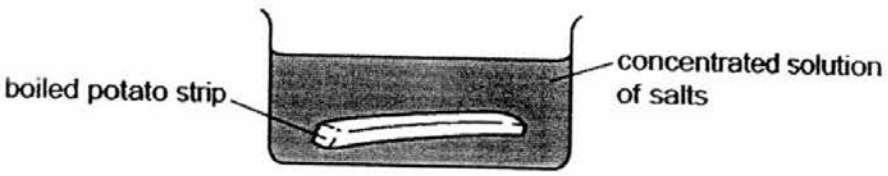
This document consists of **24** printed pages, including this cover page.

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Section A

Answer **all** the questions.

1 Boiling potatoes destroys their cell membranes. A peeled, boiled potato strip is placed in a concentrated solution of salts.

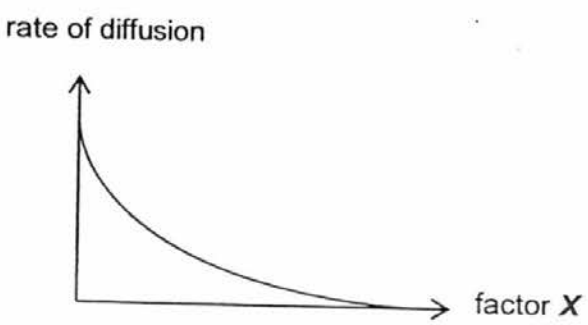


What process took place in the above experiment?

	osmosis	diffusion
A	✓	✓
B	✓	×
C	×	✓
D	×	×

key
✓ = takes place
× = does not take place

2 The graph below shows how the rate of diffusion changes with a factor ***X***.



The factor ***X*** could be _____ (P) or _____ (Q).

	P	Q
A	concentration gradient	size of diffusing molecule
B	concentration gradient	surface area over which diffusion occurs
C	diffusion distance	size of diffusing molecule
D	diffusion distance	surface area over which diffusion occurs

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3 Which of the following best describes the difference between active transport and passive transport?

	active transport	passive transport
A	water molecules only	all types of particles
B	from higher to lower concentration	from lower to higher concentration
C	requires a selectively permeable membrane	does not require a selectively permeable membrane
D	requires respiration	does not require respiration

4 Some yellow fumes are released into the corner of an enclosed room. After some time, it can be observed that the fumes are uniformly dispersed in the room.

Which of the following statements best describe what happens to the fume particles in the room?

A They diffuse uniformly to the rest of the room.

B They diffuse by random movement to the rest of the room until they are uniformly distributed.

C They moved uniformly throughout the room by active transport.

D They moved uniformly throughout the room by osmosis.

5 A human red blood cell is placed in a concentrated glucose solution.

In which direction will the water molecules move and what is the effect on the cell?

	water molecules	effect on cell
A	move into the cell	cell increases slightly in size
B	move into the cell	cell undergo lysis
C	move out of the cell	cell decreases slightly in size
D	move out of the cell	no change in cell volume

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6 The term, biomass, refers to

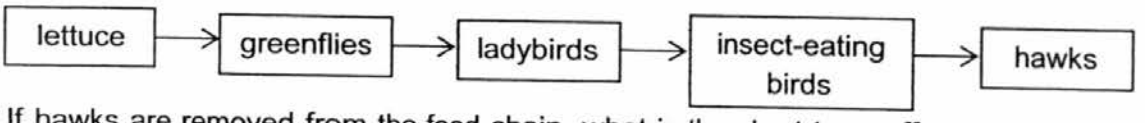
A the total weight of all organisms in a food chain.

B the total weight of all organisms in a trophic level.

C the total dry mass of all organisms in a food chain.

D the total dry mass of all organisms in a trophic level.

7 The diagram shows a food chain.

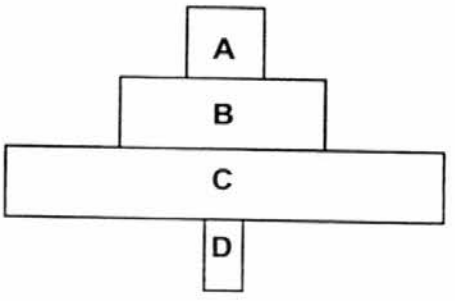


If hawks are removed from the food chain, what is the short term effect on the numbers of the other organisms?

	greenflies	ladybirds	insect-eating birds
A	decrease	increase	decrease
B	decrease	increase	increase
C	Increase	decrease	decrease
D	increase	decrease	increase

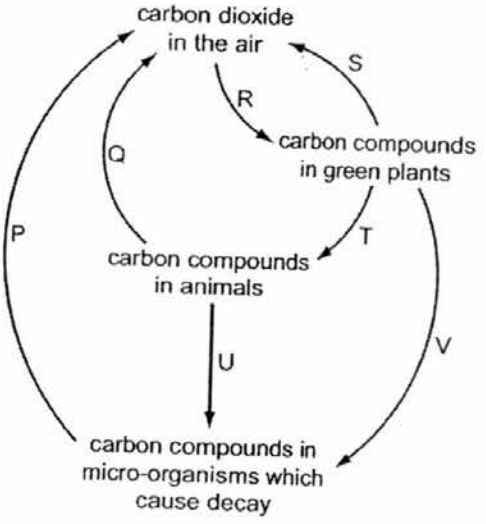
8 The diagram shows a pyramid of numbers in a woodland ecosystem.

At which trophic level are the individual organisms largest in size?



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9 The diagram shows a carbon cycle.



Which three letters represent the process of respiration?

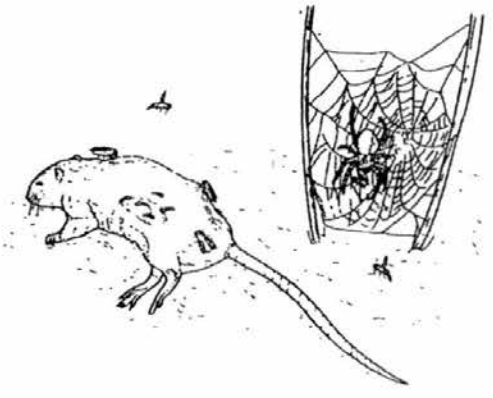
A P, Q and R

B P, Q and S

C S, T and V

D T, U and V

10 The diagram shows organisms feeding on a dead rat and one of the organisms which, in turn, feeds on them.



Which of the following is needed to complete the food chain?

A predator **B** producer

C sunlight **D** water

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11 The characteristics of blood taken from a particular human blood vessel are listed below.

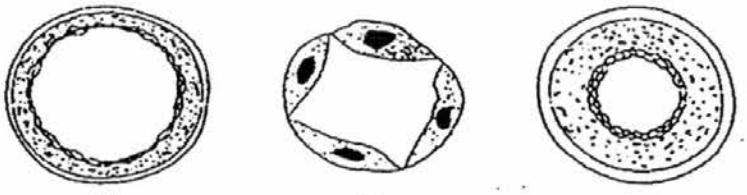
1 high oxygen concentration
2 high blood pressure
3 lower carbon dioxide concentration

Which blood vessel did the blood sample most likely come from?

A aorta **B** pulmonary artery

C pulmonary vein **D** vena cava

12 The diagram shows the cross sectional view of three types of blood vessels **X**, **Y** and **Z**.



X **Y** **Z**

	allows fluid to pass through wall	carries fluid high in pressure
A	X	Y
B	Y	X
C	Y	Z
D	Z	X

13 Which sequence shows the shortest route taken by blood travelling from a leg to an arm in the human body?

A leg → heart → lungs → kidney → arm

B leg → lungs → heart → stomach → arm

C leg → kidney → heart → lungs → arm

D leg → heart → lungs → heart → arm

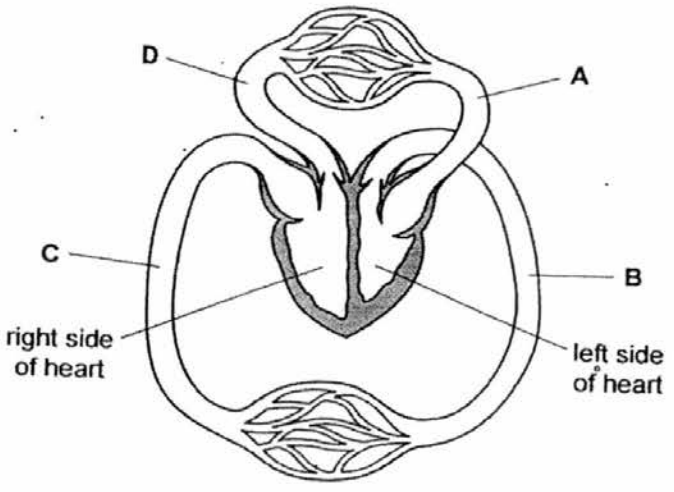
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14 How do veins differ from arteries?

	width of lumen	elastic fibres	muscles in wall
A	wider	more	more
B	wider	less	less
C	narrower	more	less
D	narrower	less	more

15 The diagram represents part of the circulatory system.

Where is the blood pressure lowest?



16 The testes are found within the scrotum outside the body because _____.

A it is easier to differentiate the male from the female

B the temperature in the body is too low for the sperms to survive

C the temperature outside the body is most suitable for the production and storage of sperms

D there is no space to keep inside the body

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17 The fertilisation of the egg usually takes place in the _____.

A cervix
B ovary
C oviduct
D uterus

18 Which of the following shows the correct sequence of events?

A fertilisation → ovulation → menstruation → implantation
B implantation → fertilisation → ovulation → menstruation
C menstruation → ovulation → fertilisation → implantation
D ovulation → fertilisation → menstruation→ implantation

19 Which of the following chemical substances is responsible for changes in the lining of uterus in a woman's menstrual cycle?

1 oestrogen
2 progesterone
3 testosterone

A **1** only
B **1** and **2** only
C **2** and **3** only
D **1**, **2** and **3**

20 Which of the statements below about birth control methods is correct?

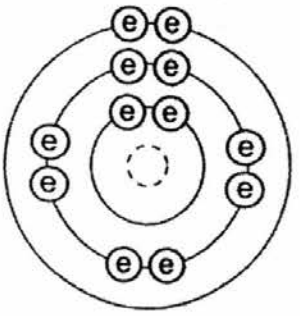
A Contraceptive pills are consumed to prevent ovulation.
B Ligation is an option for couples who are considering a temporary birth control method.
C The spermicide is usually used together with a diaphragm to kill sperms.
D The intra-uterine device (IUD) is inserted to prevent the implantation of eggs in the fallopian tube.

21 What is the electronic structure of an atom with a proton number 5 and a nucleon number 11?

A 2, 3
B 2, 4
C 2, 8, 1
D 2, 8, 6

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22 The electronic structure of an element is shown.



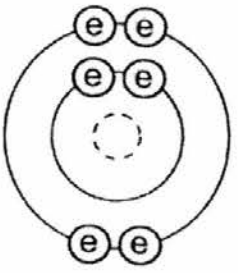
key

(e) electron

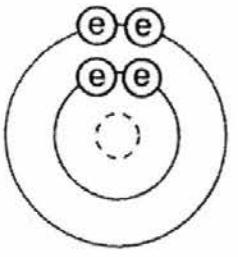
( ) nucleus

Which diagram shows the electronic structure of another element in the same group in the Periodic Table?

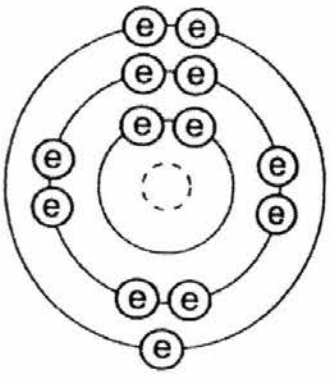
A



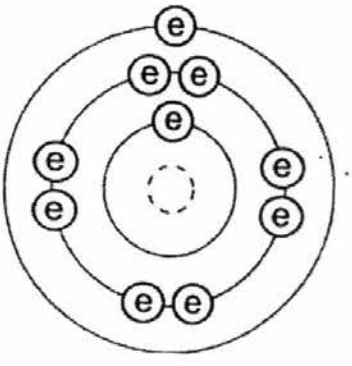
B



C



D



23 The electronic configuration of an ion is 2.8.8.

What could this ion be?

	S^{2-}	Ca^{2+}
A	×	×
B	×	✓
C	✓	×
D	✓	✓

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24 The nucleon number and proton number of the lithium atom are shown by the symbol $^{7}_{3}Li$.

What is the correct symbol for the lithium ion in lithium chloride?

A $^{6}_{3}Li^{-}$ **B** $^{6}_{3}Li^{+}$

C $^{7}_{3}Li^{-}$ **D** $^{7}_{3}Li^{+}$

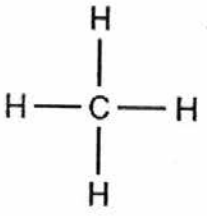
25 Which two elements react together to form an ionic compound?

element	electronic structure
W	2, 4
X	2, 8
Y	2, 8, 1
Z	2, 8, 7

A **W** and **X** **B** **W** and **Z**

C **X** and **Y** **D** **Y** and **Z**

26 The diagram shows the structure of methane.



What is the total number of outer electrons used for bonding in this molecule?

A 2 **B** 4

C 8 **D** 10

27 An element, **Q**, is in the same group of the Periodic Table as chlorine. Which of the following can be a formula of a compound containing **Q**?

A Na_2Q **B** AlQ_2

C CaQ **D** MgQ_2

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28 An aqueous solution of the organic compound methylamine has a pH greater than 7.

Which statement about methylamine is correct?

A It neutralises an aqueous solution of sodium hydroxide.

B It reacts with copper(II) carbonate to give carbon dioxide.

C It reacts with hydrochloric acid to form a salt.

D It turns blue litmus red.

29 Which of the following does not react with dilute sulfuric acid?

A magnesium metal

B magnesium nitrate

C magnesium hydroxide

D magnesium oxide

30 Ammonia may be obtained from ammonium chloride by heating with _____.

A aqueous calcium chloride

B aqueous sodium hydroxide

C dilute hydrochloric acid

D water

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Mid-Year Examination 2016
Secondary 2 Express

NAME: _____ ( )

CLASS: _____

For Examiner's Use	
Section B	30
Section C	40
Total	

Section B

Answer **all** the questions.

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

B1 At -250 °C, a sample of liquid air contains a mixture of oxygen and nitrogen. The boiling points of nitrogen and oxygen are as shown in Table 1.1.

Table 1.1

substance	boiling point / °C
nitrogen	-196
oxygen	-183

(a) A sample of liquid air in a container is allowed to **warm up** slowly.

With reference to Table 1.1, complete Table 1.2 below with the states of nitrogen and oxygen respectively.

Table 1.2

temperature(s)	state(s) of nitrogen	state(s) of oxygen
from -250 °C to -196 °C	liquid	
at -196 °C		
from - 196 °C to -183 °C		liquid

[2]

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(b) In the space below, sketch to show how the temperature of the sample of the liquid air mixture will change as the sample is warmed up from -250 °C to -180 °C.

[3]

[Total: 5]

B2 Fig. 2.1 shows the energy flow in kilojoules (kJ) through a food chain.

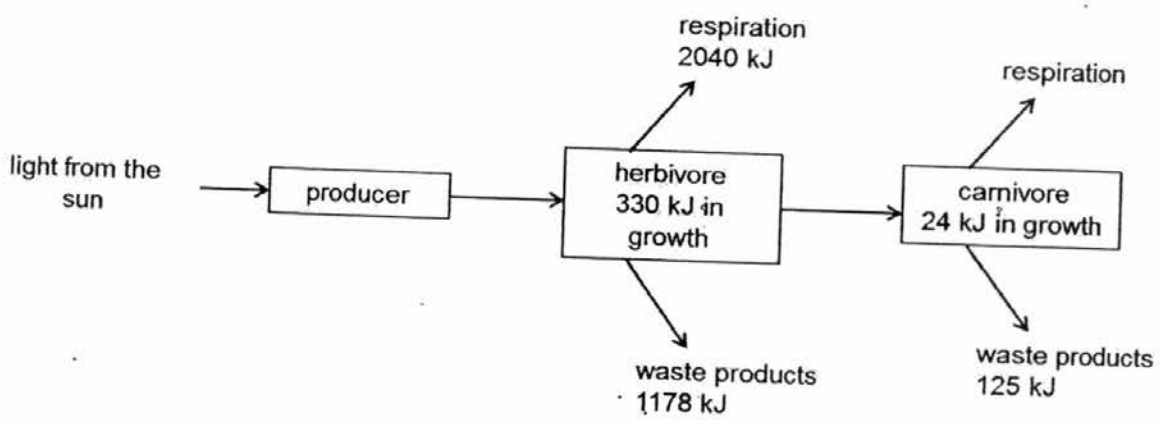


Fig. 2.1

(a) What is the amount of energy in kJ taken in by the herbivore? Show your working clearly.

[1]

(b) Calculate the percentage of energy taken in by the carnivore that is used for respiration.

[2]

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(c) Based on the information in Fig. 2.1, construct a pyramid of energy.

[1]

(d) Suggest why this food chain could not have another trophic level.

_____

_____ [1]

[Total: 5]

B3 Fig 3.1 shows a longitudinal section through a human heart.

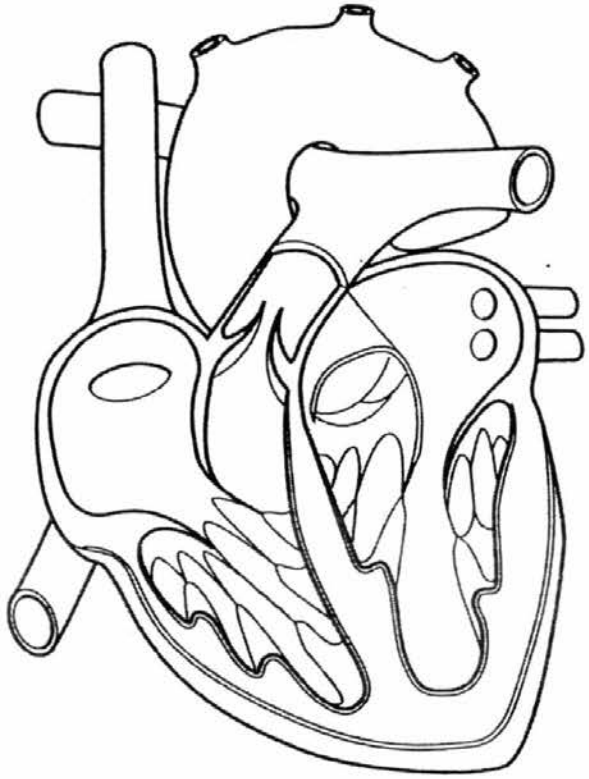


Fig 3.1

(a) Use label lines and the letters **P** and **Q** to label the following on Fig 3.1.

P pulmonary artery **Q** semi-lunar valve [2]

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(b) Fig 3.2 is an X-ray showing narrowing in the blood vessels supplying muscles in the heart. A catheter is used to insert a dye into the blood vessels so that they appear clearly in the X-ray. The arrows indicate where there is narrowing of the blood vessels.



Fig. 3.2

(i) Name the blood vessels shown in Fig 3.2 and state one likely effect of the narrowing of the blood vessels.

blood vessel _____

effect _____

_____ [2]

(ii) State one way in which the condition in Fig 3.2 can be prevented.

_____

_____ [1]

[Total: 5]

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B4 Fig. 4.1 shows a calendar page on which a woman has marked with a circle, the first day of her menstruation.

March 2016

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		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. 4.1

(a) On Fig. 4.1, circle any three consecutive days within the fertile period. [1]

(b) Her menstrual cycle has 28 days.

With reference to Fig. 4.1, when will the first day of her next period be?

_____ [1]

(c) Fig. 4.2 and Fig. 4.3 below show the graphs for the menstrual cycle of the same woman on two consecutive months.

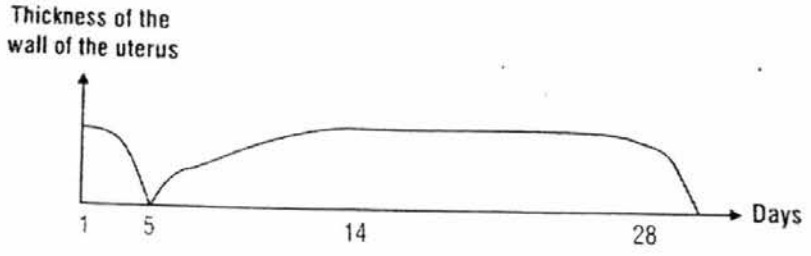


Fig. 4.2

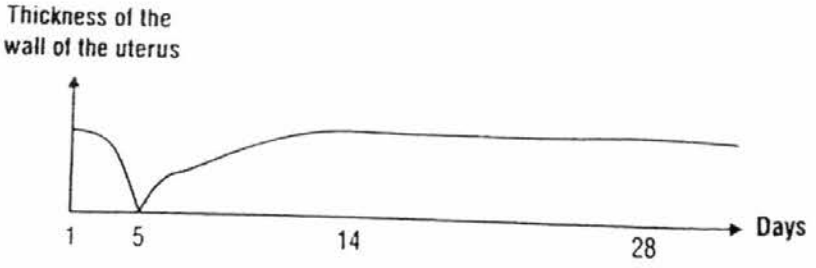


Fig. 4.3

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(i) Name the hormone that is responsible for the thickening of the uterine lining after ovulation.

_____ [1]

(ii) Account for the difference in thickness after Day 28 observed in both Fig. 4.2 and Fig. 4.3.

_____

_____

_____ [2]

[Total: 5]

B5 Table 5.1 shows the atomic structure of six particles, represented by the letters **A** to **F**. The particles are atoms or ions. The letters are not the symbols of the elements.

Table 5.1

particle	electron	proton	neutron
A	6	6	6
B	2	2	2
C	12	12	12
D	10	12	12
E	6	6	8
F	10	13	14

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

(a) Which particle has the greatest atomic mass?

_____ [1]

(b) Which particle is an atom in Group 0?

_____ [1]

(c) Which two particles are an atom and an ion of the same element?

_____ [1]

(d) Which two particles are isotopes of the same element?

_____ [1]

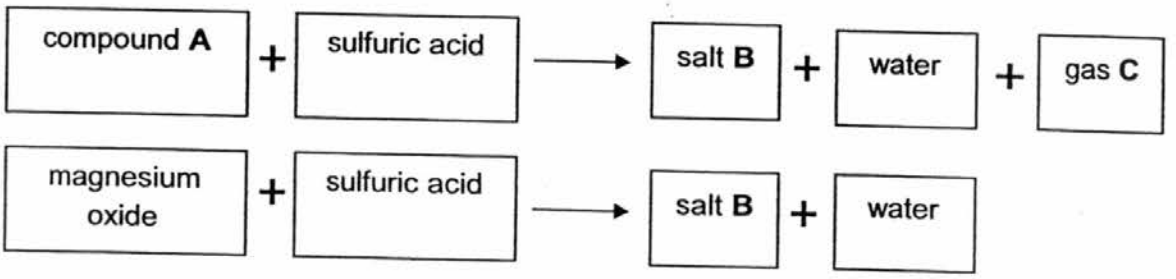
(e) Which particle is an atom of a metallic element?

_____ [1]

[Total: 5]

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B6 The equations below show two chemical reactions of sulfuric acid. Both reactions produced the same salt B.



(a) Write the chemical formula of the compounds labelled **A, B,** and **C**.

A: _____

B: _____

C: _____ [3]

(b) Describe a simple chemical test to identify gas **C**.

_____

_____ [2]

[Total: 5]

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Section C

Answer all questions.

Write your answers on the lined paper provided.

C7 Fig. 7.1 shows a blood capillary and some living cells found near it. The arrows represent exchange of substances **B** and **C** between living cells and blood capillary.

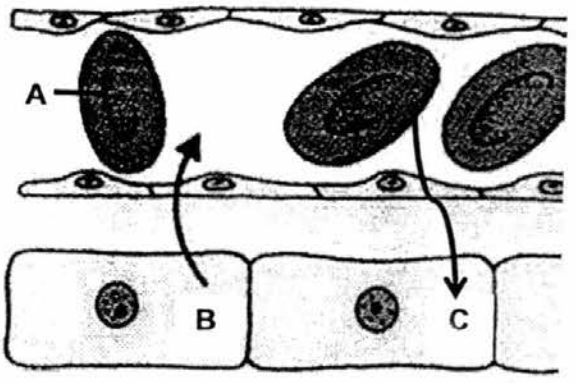


Fig. 7.1

(a) Identify cell **A** and substances **B** and **C**:

A _____

B _____

C _____ [3]

(b) Blood capillaries connect arteries to veins.

(i) What is the main function of a blood capillary?

_____

_____ [1]

(ii) How does the structure of the blood capillary make it well-suited for its function?

_____

_____

_____

_____ [2]

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(c) Describe how substances **B** and **C** move across the capillary wall.

_____

_____

_____

_____ [2]

(d) Besides cell **A**, there is another type of cell usually found in blood. Name the cell and state its function in the human circulatory system.

_____

_____

_____ [2]

[Total: 10]

C8 Fig. 8.1 shows the male reproductive system.

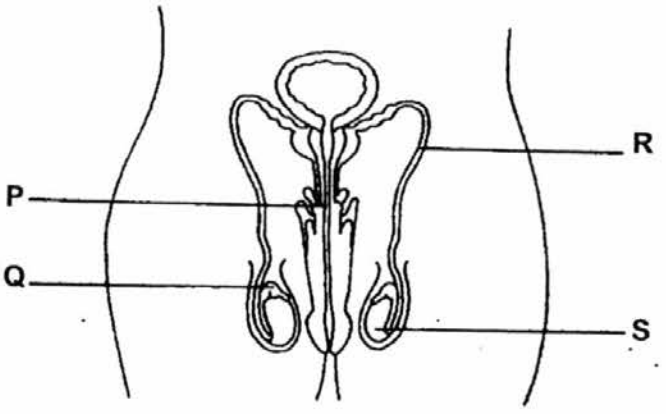


Fig. 8.1

(a) Name the following parts.

P : _____

Q : _____ [2]

(b) Explain how the functions of parts **Q** and **S** are related to each other.

_____

_____

_____ [2]

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(c) A couple decides on a permanent birth control method which involves cutting and tying of part **R** of the male reproductive system.

(i) Name this male sterilisation method.

_____ [1]

(ii) Explain how this sterilisation method is an effective permanent birth control method.

_____

_____

_____ [2]

(d) Fig. 8.2 shows a diagram of a sperm.



Fig. 8.2

(i) In order for fertilisation to be successful, the sperm has to penetrate the egg. This is possible when an enzyme is released from part **X** of the sperm to break down part of the egg membrane.

On Fig. 8.2, label the part **X** which is responsible for releasing the enzyme. [1]

(ii) A student claims that a pair of identical twins is produced when an egg is fertilised by two sperms to form two zygotes.

State whether the student's claim is true or false. Explain your answer.

_____

_____

_____

_____ [2]

[Total: 10]

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C9 Hydrogen chloride, HCl, is a compound.

(a) Draw a dot-and-cross diagram to show the bonding in a molecule of hydrogen chloride. Show only the outer electrons.

[2]

(b) State the type of bonding present in hydrogen chloride.

_____ [1]

(c) Hydrogen chloride dissolves in water to form an acidic solution (hydrochloric acid).

(i) Describe how you would use litmus paper to show that this solution is acidic.

_____ [1]

(ii) Which one of the following values is most likely to represent the pH of a dilute solution of hydrochloric acid?

Circle the correct answer.

pH 2 **pH7** **pH10** **pH14** [1]

(d) A student added some zinc powder into the test tube containing dilute hydrochloric acid.

(i) Give the chemical formula of the products formed.

_____ [2]

(ii) Describe a simple test to identify the gas produced.

_____

_____ [2]

(iii) The student repeated the experiment by replacing dilute hydrochloric acid with dilute sulfuric acid. Give the chemical name of the salt that is formed.

_____ [1]

[Total: 10]

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C10 Two isotopes of potassium are ^{39}K and ^{40}K.

(a) Define the term *isotopes*.

_____

_____ [1]

(b) Complete the table about the number of particles found in one atom of each of these isotopes.

	number of protons	number of electrons	number of neutrons
^{39}K			
^{40}K			

[2]

(b) Potassium readily forms potassium oxide when reacted with oxygen in air.

(i) Write the chemical formula of potassium oxide

_____ [1]

(ii) Briefly describe how the potassium ions and oxide ions are formed in terms of electron transfer.

_____

_____

_____ [2]

(iii) Draw a dot-and-cross diagram to show the bonding in potassium oxide. Show only outer electrons in your diagram.

[2]

(iv) Give the chemical name and chemical formula of the salt that is formed when potassium oxide reacts with nitric acid.

chemical name: _____

chemical formula: _____

[2]

[Total: 10]

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Group																	
I	II										III	IV	V	VI	VII	0
							1 H hydrogen 1									4 He helium 2
7 Li lithium 3	9 Be beryllium 4										11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12										27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*58-71 Lanthanoid series
†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key: a / X / b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

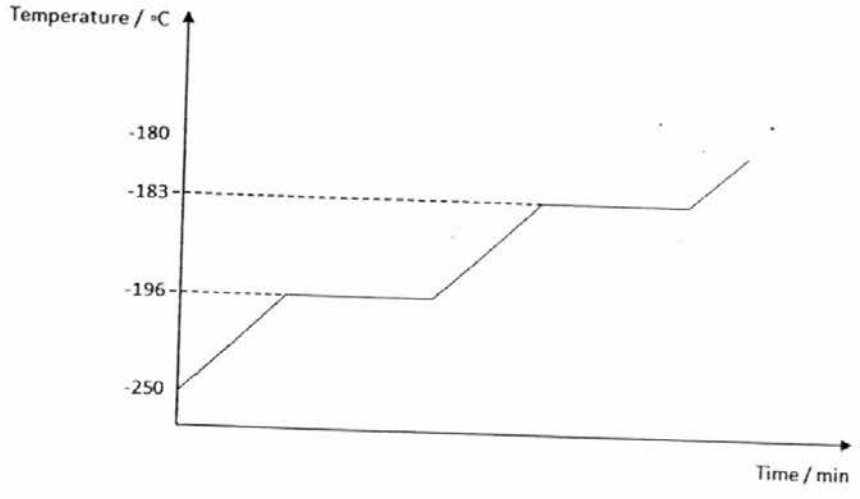
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2E LSS MYE 2016 Answers

Section A

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

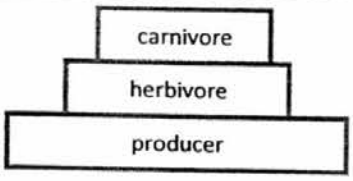
Section B

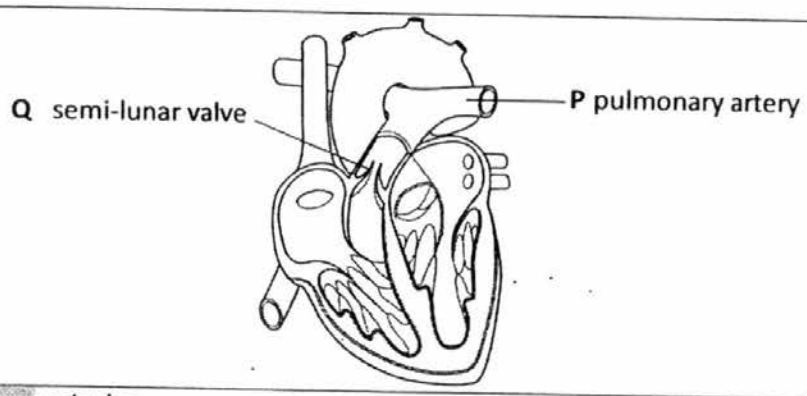
Qn	Answers	Marks
B1a		4 x ½ mark [Total: 2]
B1b		axis ½ shape ½ 2 x ½ for constant temp at -196 °C and -183 °C [Total: 2]

temperature(s)	state of nitrogen	state of oxygen
from -250 °C to -196°C	liquid	**liquid**
at -196 °C	**liquid and gas**	**liquid**
from - 196 °C to -183 °C	**gas**	liquid

Qn	Answers	Marks
2(a)	Energy taken in by herbivore = 2040 + 330 + 1178 = 3548kJ	½ ½
2(b)	Percentage of energy used for respiration = (330 – 24 -125) / 330 x 100% = 54.8%	1 1
2(c)		½ for correct

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		width ½ for correct labels
2(d)	The amount of energy transferred from one trophic level to the next, gets progressively less / 10% transfer to next trophic level / insufficient energy for the organism in another trophic level;	1

3(a)		1 each
3(b)i	coronary arteries insufficient nutrients / oxygen to heart muscles	1 1
3(b)ii	Any 1: reduce fatty food / reduce cholesterol; stress management; avoid smoking; regular physical exercise;	1

B4a	[Circle either of the following: • Any 3 consecutive days from 13 – 17 March	1
B4b	30th March 2016	1
B4ci	• Progesterone.	1
Bcii	• The woman's menstruation started after the first menstrual cycle (Fig. 4.2) but did not start after the second menstrual cycle (Fig. 4.3). • This could mean that she is pregnant / fertilization was successful. • as the thickening of the lining is to prepare for fertilization.	1 ½ ½

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B5	(a)	F (greatest number of protons and neutrons)	[1]
	(b)	B (Helium – proton number 2)	[1]
	(c)	C and D (both have same number of protons different number of electrons)	[1]
	(d)	A and E (both have same number of protons different number of neutrons)	[1]
	(e)	C (magnesium – proton number 12, number of electron = 12)	[1]

B6	(a)	A $MgCO_3$	[1]
		B $MgSO_4$	[1]
		C CO_2	[1]
	(b)	Bubble gas into limewater.	[1]
		A white precipitate is formed	[1]

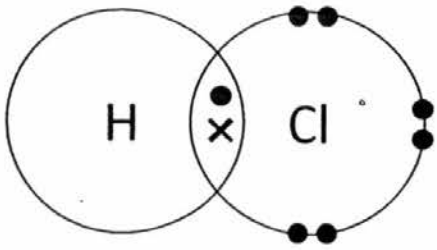
Section C

Qn7	Answers	Marks
(a)	A – red blood cell B – carbon dioxide, urea C – oxygen	1 1 1
(b)(i)	For exchange of materials between blood and cells	1
(b)(ii)	Any one One-cell thick wall; to decrease diffusion distance [illegible]; [illegible] cells Small gaps between capillary cells; allow substances to pass through	1, 1 1, 1 1, 1
(c)	B diffuses from the body cell to the tissue fluid, into the blood plasma; C diffuses from the red blood cell to the tissue fluid, into the body cell	1 1
(d)	Any one Lymphocyte – produce antibodies to fight against harmful organisms [illegible] – [illegible] harmful organisms	1, 1 1, 1

C8a	**P :** urethra **Q :** epididymis	1 1
C8b	• The testis (part **S**) will produce sperms and male sex hormones such as testosterone. • The epididymis (part **Q**) will store inactive sperms from the testis (part **S**) before they are released into the sperm ducts.	1 1

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C8ci	.Vasectomy	1
C8cii	• (As the sperm ducts are cut,) sperms cannot from entering the urethra or penis. • Ejaculation can still occur, but no sperms are released. / Since no sperm can be released, fertilisation cannot occur.	1 1
C8di		1
C8dii	• The claim is **false**. • Only **one** sperm nucleus enters the egg.	1 1

C9	**(a)**		[2]
	(b)	**Covalent bonding**	[1]
	(c)	**(i) Put a piece of blue litmus paper into the solution, it will turn red.**	[1]
		(ii) pH 2	[1]
	(d)	**(i) $ZnCl_2$ and H_2**	[2]
		(ii) insert a lighted splint into the test tube	[1]
		It will extinguished with a 'pop' sound	[1]
		(iii) Zinc sulfate	[1]

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C10

(a) **Atoms of the same elements that has the same number of protons but different number of neutrons** [1]

(b)

	number of protons	number of electrons	number of neutrons
^{39}K	**19**	**19**	**20**
^{40}K	**19**	**19**	**21**

[1]

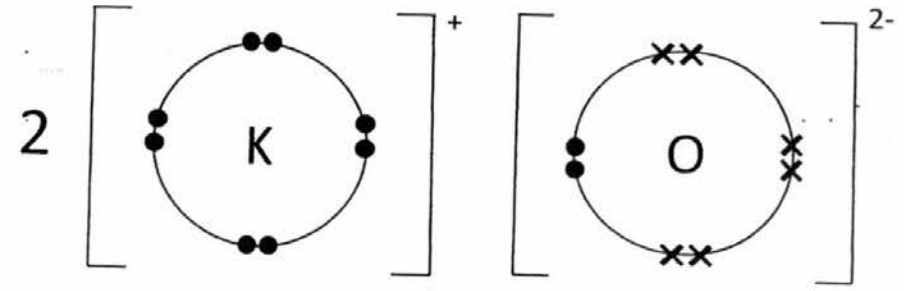
[1]

(b) **(i)** **K_2O** [1]

(ii) **Each potassium atom loses 1 valence electron to form a potassium ion** [1]

Each oxygen atom gains 2 valence electrons to form an oxide ion [1]

(iii)



[2]

(iv)

chemical name: potassium nitrate [1]

chemical formula: KNO_3 [1]

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