NAME		REG. NO.		CLASS	

SERANGOON GARDEN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2014

SUBJECT: LOWER SECONDARY SCIENCE (BIOLOGY)

LEVEL: SECONDARY TWO EXPRESS

DATE: 8TH OCTOBER 2014 (WEDNESDAY)

TIME: 0800 – 1000 HR

DURATION: 2 HOURS (TOGETHER WITH LSS (CHEMISTRY))

READ THESE INSTRUCTIONS FIRST

Write your full name, register number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.
Write your answers on the answer sheet provided on Page **6**.

Section B
Answer **all** questions.
Answers to Section **B** should be written on the spaces provided on the question paper.

Section C
Answer only **TWO out of three** questions.
Answers to Section **C** should be written on the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

_____ _____ Name/Signature of Parent/Guardian Date	**FOR MARKER'S USE** **50**

This question paper consists of 15 printed pages and 1 blank page.

Setter: Mr Yeo Kee Sheng **Vetter: Mrs Chea Yi Shan**

[Turn over

SECTION A: MULTIPLE CHOICE QUESTIONS (10 MARKS)
Choose the correct answer and write the answers on the Answer Sheet on **Page 6**.

1. The recommended diet for soldiers in freezing Arctic conditions is different from that recommended for tropical conditions. What should the Arctic diet include?

A Less fat
B Less fibre
C More energy
D More protein

2. Protease enzyme breaks down proteins to amino acids.

In the 'lock and key' hypothesis, what is the 'lock' and what is the 'key'?

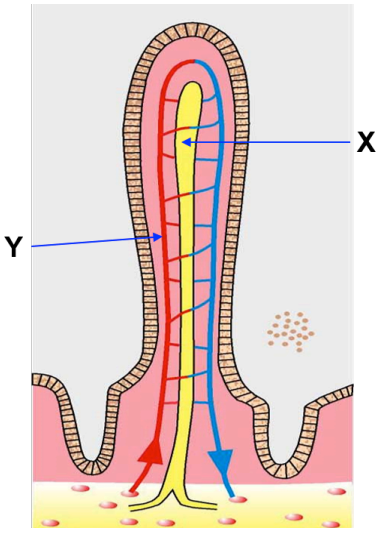
	Lock	**Key**
A	Amino acid	Protease
B	Protease	Amino acid
C	Protease	Protein
D	Protein	Protease

3. A student ate a bowl of cornflakes with milk for breakfast. The cornflakes contain only starch, while the milk contains fats and proteins.

Which of the following substances will **not** be found in his stomach after 2 hours?

A Maltose
B Polypeptides
C Starch
D Glucose

4. The diagram below shows a section through a villus.

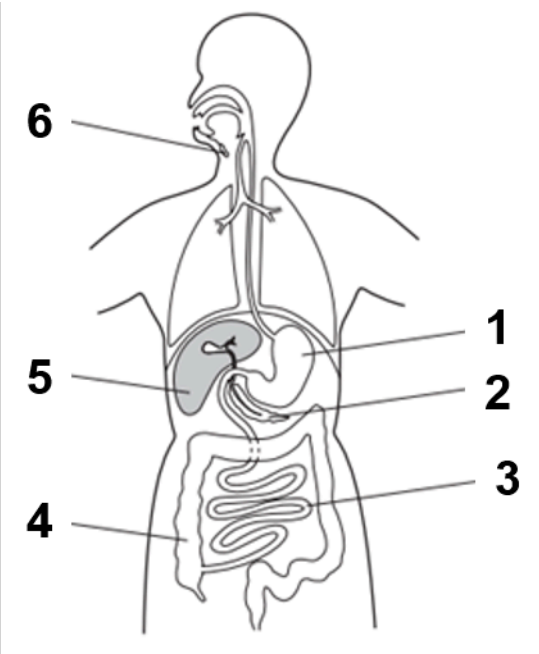


What are the functions of structures **X** and **Y**?

	X	**Y**
A	To carry blood	To transport amino acids
B	To transport glucose	To secrete enzymes
C	To transport fats	To transport amino acids
D	To transport amino acids	To carry blood

For questions 5 and 6, refer to the information given below.

The diagram below shows the digestive tract of a boy, Sam.



5. Sam just ate a hamburger, comprising a meat patty and two buns. In which of the above numbered structure(s) do(es) digestion of the meat patty occur?

	Structure(s)
A	1 only
B	2 and 5 only
C	1 and 3 only
D	2 and 6 only

6. What is the main function of labelled structure **4**?

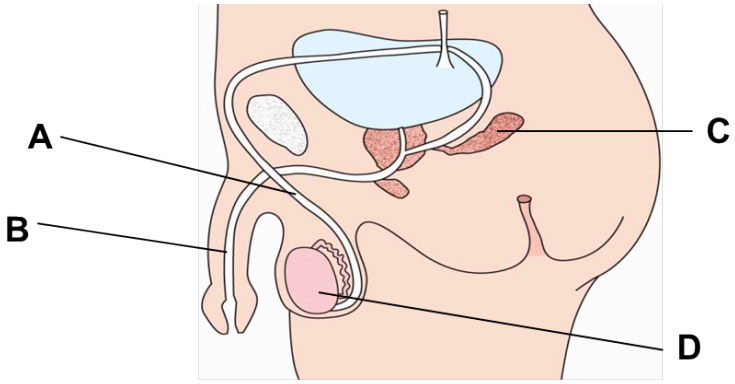
A It absorbs digested food materials.
B It absorbs water.
C It gets rid of undigested food material from the body.
D It produces enzymes to digest food.

7. In which part of the female reproductive system does a zygote start to divide to form a ball of cells?

A Uterus
B Cervix
C Ovary
D Oviduct

8. The diagram shows a section of the male reproductive system.

During vasectomy, which of the following labelled structures is operated on?



9. What is the best way to prevent the spread of the Human Immunodeficiency Virus (HIV)?

A Always keep fit by taking regular exercise.
B Do not drink from a cup that has been used by an infected person.
C Ensure that the man uses a condom during sexual intercourse.
D Be faithful to your spouse.

10. Which method of birth control does **not** prevent fertilization from occurring?

A Taking contraceptive pills
B Using a diaphragm
C Using an intra-uterine device
D Using a condom

Answer Sheet for Section A

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

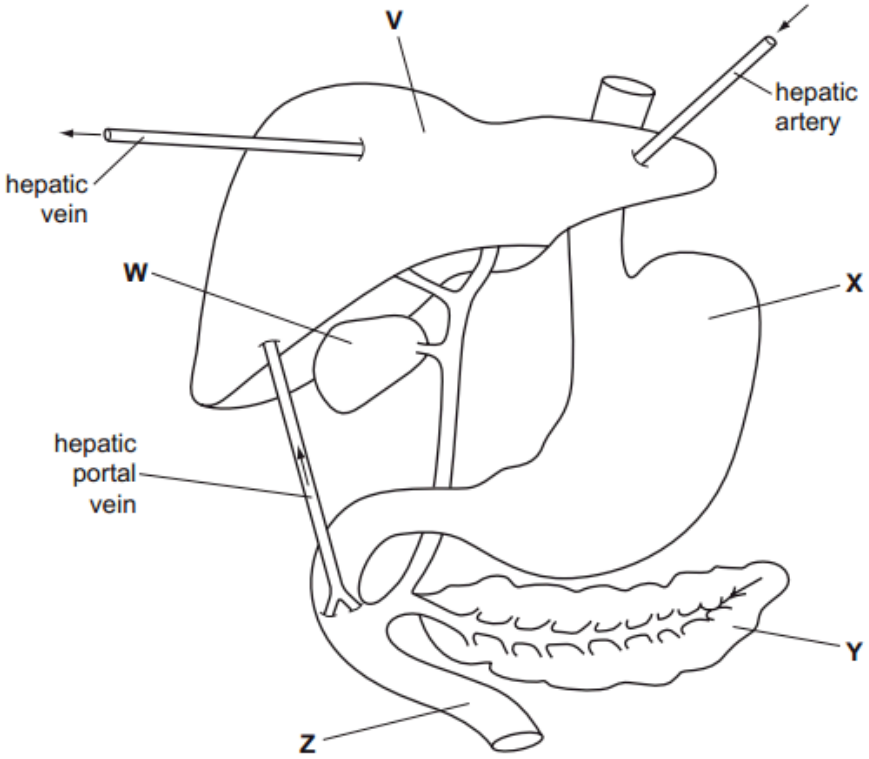
8. _____

9. _____

10. _____

SECTION B: SHORT STRUCTURED QUESTIONS (20 MARKS)
Answer **ALL** the questions in this section, in the spaces provided.

1. The figure below shows a diagram of part of the digestive system, associated organs, and blood vessels.



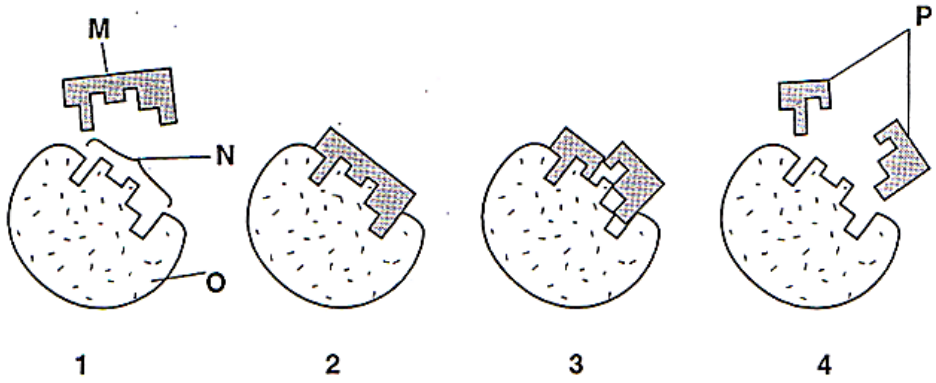
(a) Complete the table below to identify the labelled structures. [3]

Letter	Name of Structure
W	
Y	
Z	

(b) Structure **X** produces gastric juice, which contains the following components: hydrochloric acid, protease, and mucus.
State the functions of **hydrochloric acid** and **mucus** in structure **X**. [2]

Component	Function
Hydrochloric acid	
Mucus	

2. The diagram below shows, in order, four stages in which an enzyme-controlled chemical reaction may occur.



(a) Identify **M**, **N**, **O** and **P**. [2]

M ……

N ……

O ……

P ……

(b) With reference to the above diagram, state one property of an enzyme. [1]

……

……

3. The diagram shows the enzymatic breakdown of a nutrient in the human body.

(a) What is nutrient **X**, and what are the products **Y**? [2]

Nutrient X - ……

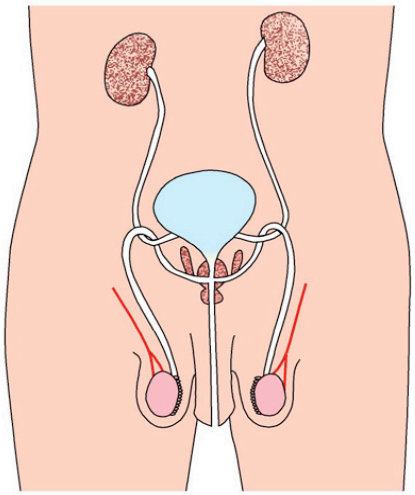
Products Y - ……

(b) What is the enzyme that breaks down nutrient **X**, and which is/are the organ(s) that produces it? [2]

Enzyme - ……..

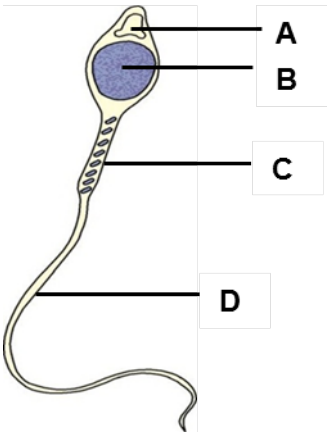
Organ(s) - …….....

4. The diagram below shows the cross-section of the human male reproductive system.



(a) Label on the above diagram, the following: (i) the urethra, (ii) testis, (iii) prostate gland [3]

(b) The testes produce the gamete as shown below.



(i) What is the name of the gamete as shown in the above diagram? [1]

……

(ii) What is structure **C**, and why is it present in large numbers in the above gamete? [2]

……

……

(iii) The gamete above is very small but produced in large numbers. Explain how these two factors are important for human reproduction.

[2]

……

……

……

Section C: LONG STRUCTURED QUESTIONS (20 MARKS)
Answer only **TWO out of three questions** in this section in the spaces provided.

1. **(a)** Why is protein important in the human body? [2]

……
……
……

(b) Enzymes are biological catalysts made of proteins. At high temperatures, the interactions between the amino acids in the proteins can be disrupted, causing the protein to lose its shape. This is known as denaturation.

Suggest a reason why the activity of salivary amylase slows down drastically when it is heated to 60 ^{o}C.

[2]

……
……
……

(c) Some species of snakes secrete venom containing enzymes that can digest animal cells. By considering a key property of enzymes, explain why only a small drop of venom is sufficient to kill a large animal. [2]

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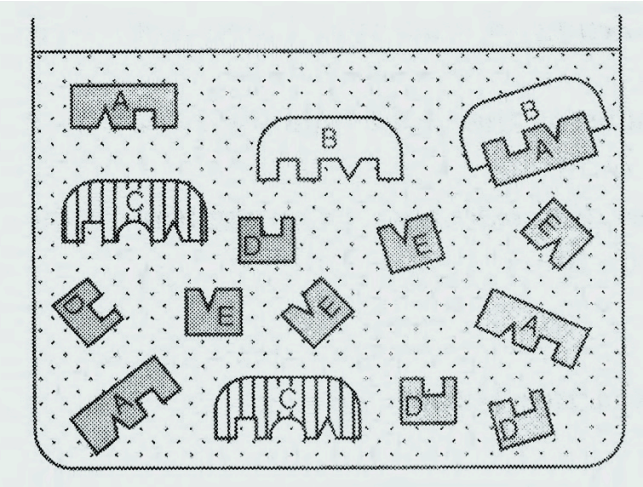
(d) A student mixed two different types of enzymes with one type of substrate in a beaker, as shown in the diagram below.



(i) Which two labelled molecules are the enzymes? [1]

……

(ii) With reference to the labelled molecules in the diagram, explain, using the lock-and-key hypothesis, why the substrate can form an enzyme-substrate complex with only one of the enzymes.

[3]

……

……

……

……

……

2. (a) (i) A patient has a tumour in his gall bladder. He followed the recommendation by his doctor and went for an operation to remove his gall bladder.

How should his diet be modified after the operation? Explain your answer. [3]

……
……
……
……
……

(ii) Another patient has a tumour in the ileum. However, this time, the doctor recommended treatment by chemicals and radiation.

Why is removal of the ileum not recommended by the doctor? [3]

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……
……
……
……

(b) John ate a biscuit as a snack. The biscuit contains only starch.

Describe the physical and chemical processes involved in the digestion of the biscuit by the digestive system. Include in your answer, the names and functions of any enzymes involved. [4]

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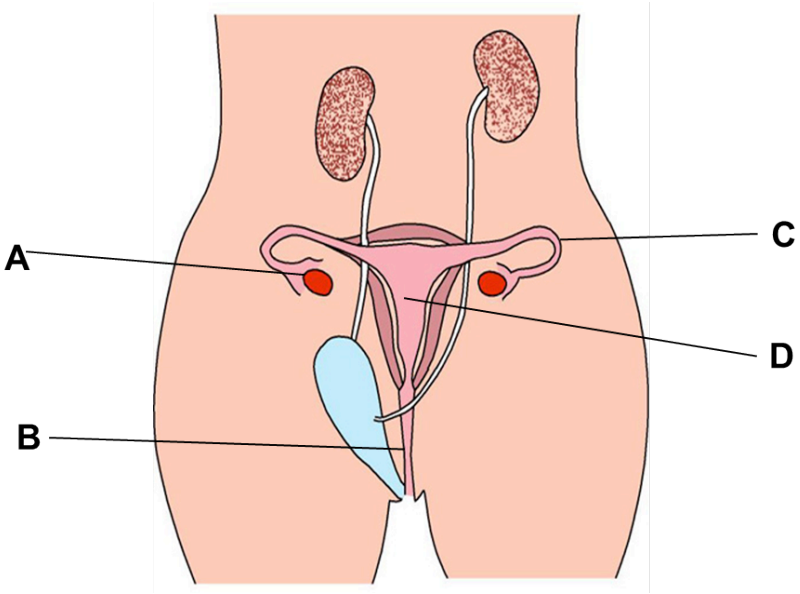
……

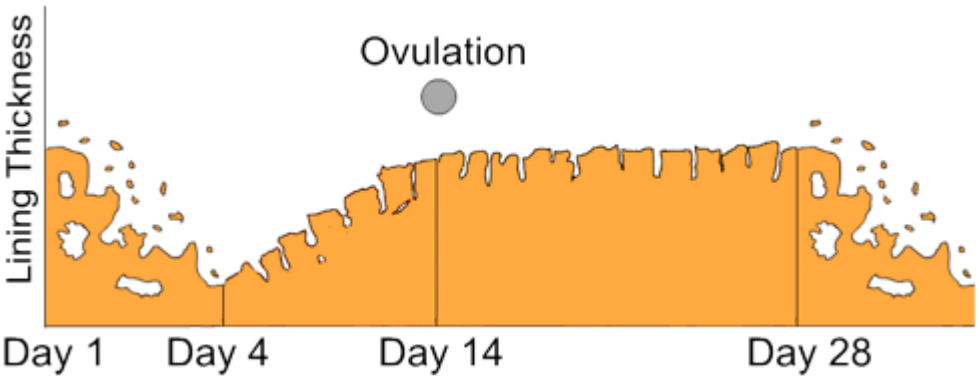
3. (a) The diagram below shows the human female reproductive system.



Name the structures **A**, **B**, **C**, **D**, and state their functions. [4]

Structure	Name	Function
A		
B		
C		
D		

(b) With the help of the below diagram, describe the changes to **the lining of the uterus** that take place during a 28-day menstrual cycle, assuming that no fertilization occurs. [4]



……

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……

(c) The fertile period for women is approximately from day 11 to day 16 in a 28-day menstrual cycle.

In an attempt to prevent pregnancy, a woman had unprotected sex with her husband, 3 days before the start of her **predicted** fertile period.

Explain why the woman became pregnant even after her effort to avoid sexual intercourse during the fertile period. [2]

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……

……

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END OF PAPER

Secondary 2 LSS (Biology) EOY MS

Section A

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

Section B

1. **(a)** W – Gall bladder
Y – Pancreas
Z – Duodenum
[3]

(1 mark each)

(b) Hydrochloric acid – kill microorganisms/provide acidic environment for protease [1] [2]
Mucus – protect the stomach wall from acid and protease [1]

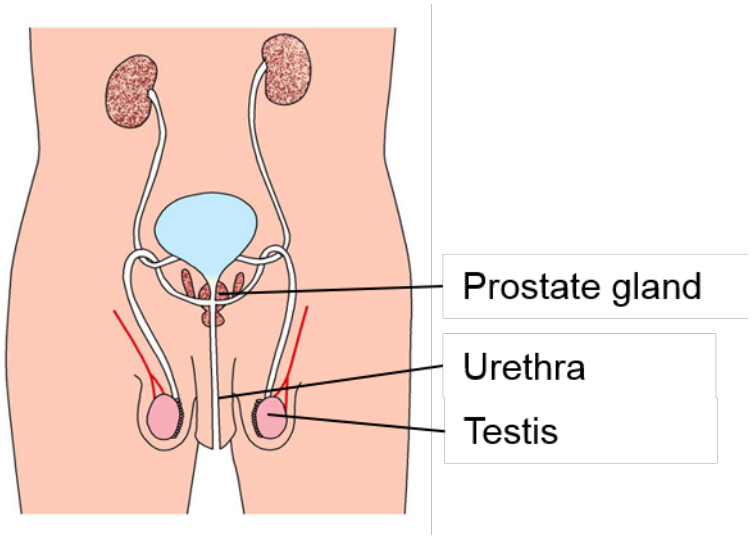
2. **(a)** M – substrate
N – active site
O – enzyme
P – products
(1/2 mark each) [2]

(b) Enzyme remains unchanged at the end of reaction.
or
The shape of the active site is complementary to the substrate.
or
The enzyme breaks down the substrate to give products. [1]

3. **(a)** Nutrient X – fat/lipid [1]
Products Y – fatty acid and glycerol [1/2 mark each] [2]

(b) Enzyme – lipase [1]
Organ(s) – pancreas [1/2], ileum [1/2] [2]

4. (a)



[1 mark each]
Note:
Testis [accept testes]
Prostate should not be labelled as seminal vesicles or Cowper's gland [3]

(b) (i) Sperm cell. [1]

(ii) Mitochondrion. (accept mitochondria) [1]
To provide sufficient energy [1/2] for movement of flagellum [1/2] [2]

(iii) Small – light enough to carry chromosomes efficiently/swim faster [1]
Large numbers – having numerous sperm cells increase chances of survival in female body [1], resulting in higher chance of fertilization. [2]

Section C

1. (a) Synthesize enzymes [1].
Synthesize protoplasm [1].
Growth and repair [1].
Synthesize hormones [1].
Synthesize antibodies [1].
[Any 2] [2]

(b) Amylase loses its shape, causing its active site to lose its shape [1]. Starch can no longer fit into the active site [1], enzyme-substrate complex cannot be formed for digestion of starch.
(accept the use of 'enzyme' and 'substrate' for discussion) [2]

(c) Enzymes remain unchanged at the end of reaction. [1] Only a small amount of enzyme is needed to digest a large number of animal cells. [1] [2]

(d) (i) B [1/2] and C. [1/2] [1]

(ii) Enzyme acts like a lock [1/2] while substrate acts like the lock [1/2].
Substrate A can fit into the active site of enzyme B [1/2], but not the active site of enzyme C [1/2], to form an enzyme-substrate complex [1/2].
Substrate A is broken down and released as products D and E. [1/2] [3]

2. (a) (i) He should decrease the amount of fats in his diet. [1]
The gall bladder stores bile, [1/2] which emulsifies fats. [1/2]
Without bile, fat digestion is slower and incomplete. [1] [3]

(ii) Removal of the ileum will result in the death of the patient. [1]
Absorption of food substances cannot take place in the absence of the ileum. [1]
Cells in the body will be starved of the necessary nutrients [1]. [3]

(b) The biscuit is first broken down into smaller pieces due to the cutting and grinding action in the teeth. [1/2]
It is then mixed with saliva, which contains salivary amylase, [1/2] which digests the starch to give maltose. [1/2]
In the stomach, the churning of the stomach breaks the biscuit down physically into even smaller parts. [1/2]
In the duodenum, any remaining starch [1/2] will be broken down by pancreatic amylase. [1/2]
Maltose will finally be broken down by maltase [1/2] to release glucose. [1/2] [4]

3. (a) A – ovary; [1/2] produces eggs [1/2]
B – vagina; [1/2] allows deposition of semen during sexual intercourse [1/2]
C – oviduct/fallopian tube; [1/2] carry the mature egg from the ovary to the uterus [1/2]
D – uterus; [1/2] site where foetus develops during pregnancy [1/2] [4]

(b) **Days 1 to 5:** Start of menstruation → discharge of dead ovum, broken uterus lining and blood [1] [4]
Days 6 to 10: Uterine lining starts to grow and thicken [1]
Days 11 to 17: fertile period, [1/2] with ovulation on day 14
Days 18 to 28: uterine lining begins to thicken further to prepare for fertilized egg to implant. [1] If no fertilization occurs, the ovum will disintegrate together with the uterine lining. [1/2]

(c) There could be changes to the menstrual cycle, resulting in the shifting of the fertile period, ***OR*** in the case of the woman, the fertile period might occur earlier due to earlier ovulation [1], due to various factors such as stress or diet ***OR*** her menstrual cycle is irregular/shorter than 28 days in the first place. [1] [2]

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Section B
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Answers to Section **B** should be written on the spaces provided on the question paper.

Section C
Answer only **TWO out of three** questions.
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A copy of the Periodic Table is printed on page **17**.
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_____ Name/Signature of Parent/Guardian _____ Date	**FOR MARKER'S USE** **50**

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Setter: Mr Yeo Kee Sheng **Vetter: Mrs Erica Tay**

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SECTION A: MULTIPLE CHOICE QUESTIONS (10 MARKS)
Choose the correct answer and write the answers on the Answer Sheet on **Page 6**.

1. The melting point of rubidium is 39 ^{o}C, while its boiling point is 688 ^{o}C. Which of the following statements is true about the movement of rubidium particles at room temperature?

A The particles vibrate about fixed positions.
B The particles slide over one another continuously.
C The particles dart about rapidly and randomly.
D The particles spread out and occupy any available volume.

2. 30 cm^3 of a gas is placed in a 50 cm^3 container. The temperature remains constant, but the pressure decreases. This is because

A the distance between the gas particles ***decreases***, and the rate of collisions between the particles and container wall ***increases***.
B the distance between the gas particles ***increases***, and the rate of collisions between the particles and container wall ***decreases***.
C the kinetic energy of the gas particles ***increases***.
D the kinetic energy of the gas particles ***decreases***.

3. The letters **X**, **Y** and **Z** represent different atoms.

$$^{40}_{19}X \qquad ^{39}_{19}Y \qquad ^{40}_{20}Z$$

What can be deduced from the proton numbers and nucleon numbers of **X**, **Y** and **Z**?

A **X** and **Y** are isotopes of one another.
B **X** and **Z** are isotopes of one another.
C **X** has more protons than **Y**.
D **Z** has more neutrons than **Y**.

4. The table shows the boiling points of some of the gases present in air.

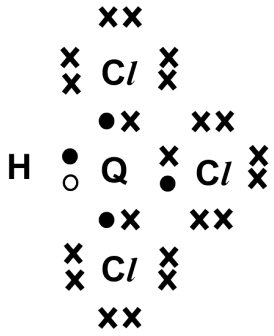
Gas	Boiling point/ ^{o}C
Argon	-186
Helium	-269
Neon	-246
Nitrogen	-196
Oxygen	-183

When air is cooled to -200 ^{o}C, some of these gases liquefy.
Which gases liquefy?

A Argon, helium and neon
B Argon, nitrogen and oxygen
C Helium and neon only
D Helium, neon and nitrogen

For questions 5 and 6, refer to the information given below:

Element **Q** can combine with hydrogen and chlorine to form a compound H**Q**Cl_3.
The diagram below shows the electronic structure of H**Q**Cl_3 (outer shell electrons only).



5. Which of these properties will this compound have?

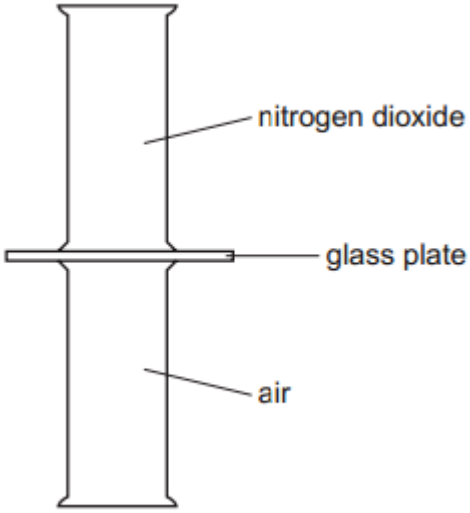
A It will be a solid at room temperature.
B It will be readily soluble in water.
C It will be a good conductor of electricity.
D It will have a low boiling point.

6. Which element can **Q** possibly be?

A Sodium
B Zinc
C Silicon
D Bromine

7. Nitrogen dioxide is a dark brown gas and is denser than air.

A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.



The glass plate is removed.

Which one of the following correctly describes the colours inside the gas jars after a long period of time?

	Upper gas jar	Lower gas jar
A	Brown	Brown
B	Dark brown	Light brown
C	Colourless	Dark brown
D	Light brown	Dark brown

8. The formulae of the ions of four elements are shown below.

O^{2-} F^{-} Li^{+} Mg^{2+}

Which statement about these ions is correct?

A They all have the same number of electrons in their outer shells.
B They all have the same electronic structure as a noble gas.
C They all have the same number of protons in their nuclei.
D They all have more electrons than protons.

9. Elements **X** and **Y** combine to form the gas $\mathbf{XY_2}$.

What are **X** and **Y**?

	X	Y
A	Chlorine	Magnesium
B	Magnesium	Chlorine
C	Fluorine	Oxygen
D	Oxygen	Fluorine

10. The table below gives the properties of four substances.

Which substance in the table could be sodium fluoride?

	State at room temperature	Solubility in water	Electrical conductivity of aqueous solution
A	Liquid	High	Poor
B	Liquid	Low	Poor
C	Solid	High	Good
D	Solid	Low	Good

Answer Sheet for Section A

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

SECTION B: SHORT STRUCTURED QUESTIONS (20 MARKS)
Answer **ALL** the questions in this section, in the spaces provided.

1. ^{37}Cl is an isotope of chlorine.

(a) Explain what is meant by the term *isotope*. [1]

……..

……..

(b) An **ion** of ^{37}Cl contains the following sub-atomic particles.

Particle	Number
X	20
Y	18
Z	17

Identify particles **X**, **Y** and **Z**. [2]

Particle **X** …….

Particle **Y** …….

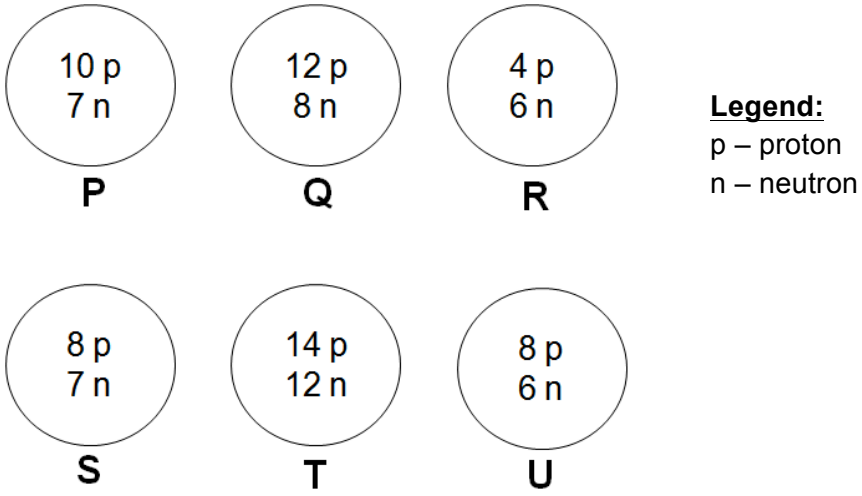
Particle **Z** …….

(c) ^{35}Cl is another isotope of chlorine.

Complete the following table to show the number of each type of particle in an **atom** of ^{35}Cl. [2]

Particle	Number
X	
Y	
Z	

2. The diagram below shows the nuclei of atoms, **P**, **Q**, **R**, **S**, **T** and **U**.
(Note: They do not represent elements in the Periodic Table.)



(a) Which atom(s) belong(s) to Group II of the Periodic Table? [1]

……

(b) Which atom(s) belong(s) to period 3 of the Periodic Table? [1]

……

(c) Which two atoms are isotopes of each other? [1]

……

(d) Which atom is a noble gas? Explain your answer. [2]

……

……

(e) What is the formula of an ion of **S**? [1]

……

3. The following table gives some information about several substances.

Substance	Type of bonding	Melting point/ ^{o}C	Boiling point/ ^{o}C
Chlorine	covalent	-220	-188
Lead (II) bromide		370	914
Methane		-182	-161
Bromine		-7	59
Sodium chloride		801	1413
Magnesium oxide	ionic	2852	3600

(a) Complete the above table by predicting the type of bonding present in lead (II) bromide, methane, bromine, and sodium chloride. [2]

(b) Name the substances that are **not** solids at room temperature and pressure. [1]

……..

(c) Which substance is a liquid over the largest temperature range? [1]

……..

(d) Which substances conduct electricity when molten? [1]

……..

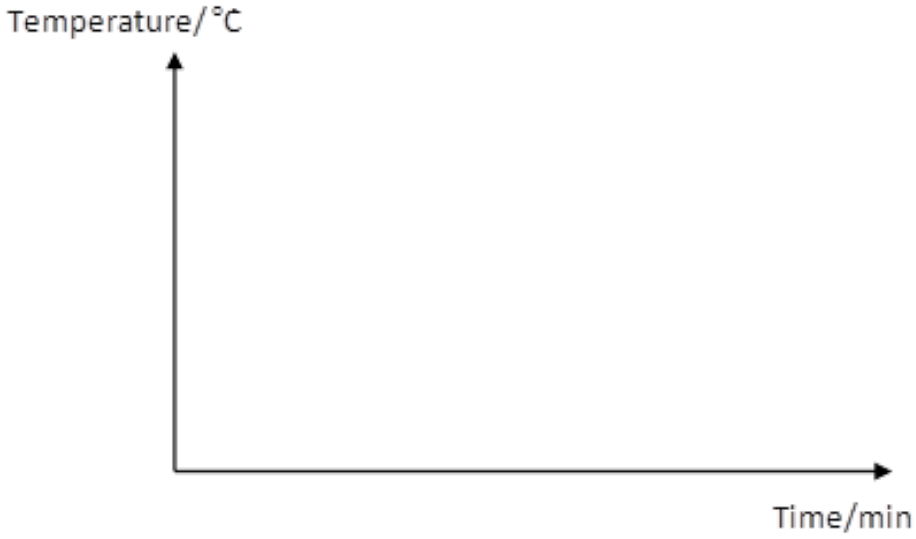
(e) Draw particle diagrams below to show the arrangement of the particles at room temperature: [2]

(i) in methane

(ii) in bromine

(f) Peter, a scientist, heated a sample of bromine from 0 ^{o}C to 120 ^{o}C.

Sketch a heating curve for bromine for this temperature range of 0 ^{o}C to 120 ^{o}C. Label the heating curve with relevant values of melting point and/or boiling point. [2]



Section C: LONG STRUCTURED QUESTIONS (20 MARKS)
Answer only **TWO out of three questions** in this section in the spaces provided.

1. Hydrogen chloride is a covalent molecule. At room temperature, it is a colourless gas which forms white fumes of hydrochloric acid upon contact with atmospheric humidity. Therefore, it is extremely corrosive and should be handled with care.

(a) **(i)** Draw a dot-and-cross diagram to show the bonding in a molecule of hydrogen chloride.
Note: You only need to show the outer shell electrons. [1]

(ii) Hydrogen chloride is a gas.
When it dissolves in water, it forms ions.

hydrogen chloride → hydrogen ion + chloride ion

Draw a dot-and-cross diagram to show the structure of a chloride ion. [1]

(iii) Hydrogen chloride gas does not conduct electricity. However, an aqueous solution of hydrogen chloride does conduct electricity.
Explain why hydrogen chloride behaves differently as a gas and as an aqueous solution. [2]

……
……
……

(b) In covalent bonding, a **single bond** involves the sharing of two electrons. A **double bond**, on the other hand, involves the sharing of four electrons.

(i) Methane, $\mathbf{CH_4}$, is a hydrocarbon, which is made up of only carbon and hydrogen atoms covalently bonded together. Methane contains **four single bonds**.

Draw a dot-and-cross diagram to show the structure of $\mathbf{CH_4}$.
Note: You only need to show the outer shell electrons. [2]

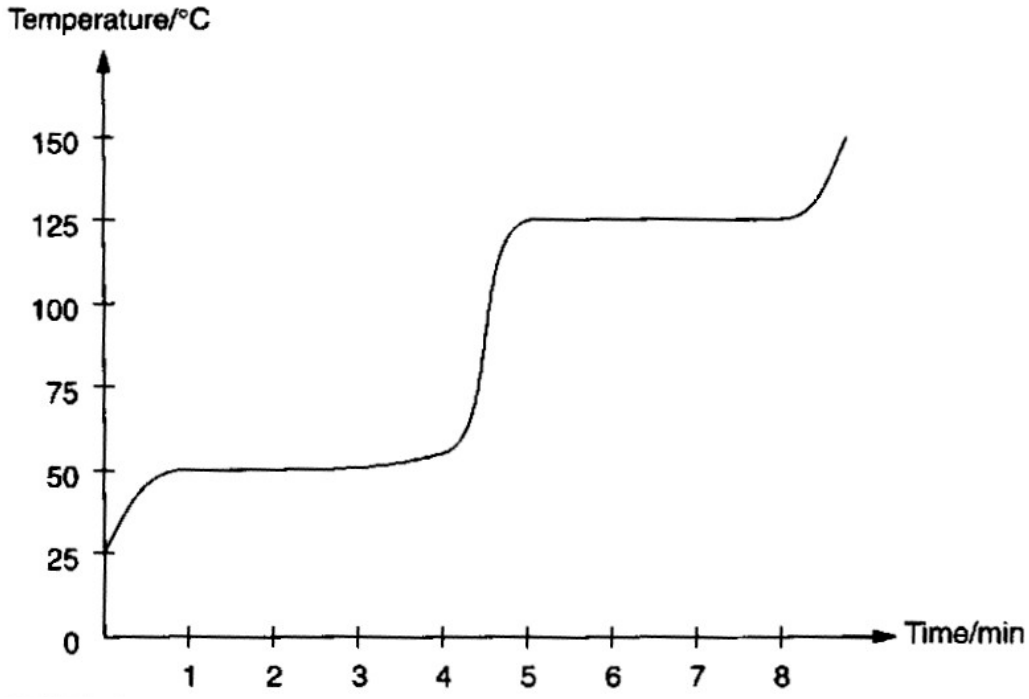
(ii) Another hydrocarbon, ethene, $\mathbf{C_2H_4}$, contains **one double bond** and **four single bonds**.

Draw a dot-and-cross diagram to show the structure of $\mathbf{C_2H_4}$.
Note: You only need to show the outer shell electrons. [2]

(iii) Ethene can react with hydrogen gas, H_2, to form another hydrocarbon called ethane, $\mathbf{C_2H_6}$. Ethane contains **seven single bonds**.

Draw a dot-and-cross diagram to show the structure of $\mathbf{C_2H_6}$.
Note: You only need to show the outer shell electrons. [2]

2. (a) The graph below shows the heating curve of a substance **Q**. The substance started as a solid, melted to become a liquid and later boiled to become a gas.



(i) What is the freezing point of substance **Q**? [1]

……

(ii) At what temperature does both liquid and gas exist together? [1]

……

(iii) Describe the arrangement of particles of substance **Q** at 64 ^{o}C. [1]

……

(b) Dry ice, the solid form of carbon dioxide, is often used as a cooling agent for preserving food. Dry ice sublimes to form carbon dioxide at -78 ^{o}C.

(i) Describe and explain the changes that occur in the movement of particles of carbon dioxide when it is heated from -100 ^{o}C to 0 ^{o}C. [2]

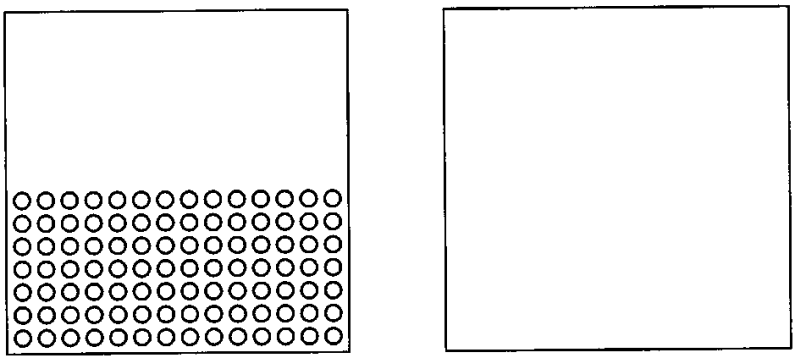
……

……

……

(ii) Box **A** represents the arrangement of particles in carbon dioxide at -79 ^{o}C.

Draw a diagram in box **B** to show the arrangement of particles in carbon dioxide at –77 ^{o}C. [1]



Box A Box B

(c) The particulate model of matter can be used to account for many properties of matter. Explain the following phenomena using this model.

(i) Steam has a low density. [2]

……

……

……

……

(ii) Water can be obtained when steam is compressed. [2]

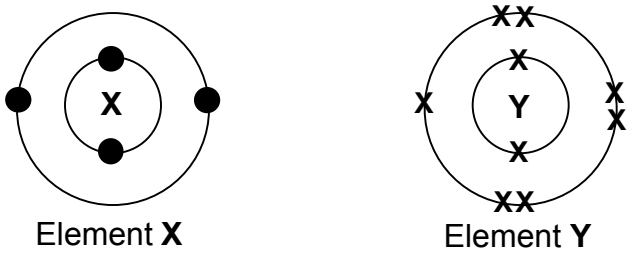
……

……

……

……

3. The diagrams below show the atomic structures of two elements **X** and **Y**.



Element **X** Element **Y**

(a) Write down the chemical symbol of the ions formed by **X** and **Y**. [2]

Element	Chemical symbol of its ion
X	
Y	

(b) Suggest the chemical formula of the compound formed between X and Y. [1]

…….....

(c) Draw a dot-and-cross diagram to show the structure of the compound formed between **X** and **Y**. [2]

(d) "*The compound of **X** and **Y** has a low melting point.*" Do you agree with the statement? Explain your answer. [2]

…….....

…….....

…….....

(e) A compound, **Z**, consists of **carbon** and atoms of **Y** chemically bonded together.

(i) What type of bonding is present in **Z**? [1]

……..

(ii) Draw the dot-and-cross diagram for compound **Z** in the space below.
Note: You only need to show the outer shell electrons. [2]

END OF PAPER

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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.).

Secondary 2 LSS (Chemistry) EOY MS

Section A

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

Section B

1. (a) Isotopes are **atoms of the same element** [0.5] with the **same number of protons but different number of neutrons**. [0.5]
(accept: same proton/atomic number, different mass/nucleon number) [1]

(b)

X	Neutron
Y	Electron
Z	Proton

[2]
(all correct: 2 marks; each error -1 mark)

(c)

X	18
Y	17
Z	17

[2]
(all correct: 2 marks; each error -1 mark)

2. (a) Q and R. (missing/extra -1/2 each) [1]

(b) Q and T. (missing/extra -1/2 each) [1]

(c) S and U. (both: 1 mark) [1]

(d) P. [1] Full valence/outermost shell. [1] [2]

(e) S^{2-}. [1]

3. (a)

Lead (II) bromide	Ionic	[0.5]
Methane	Covalent	[0.5]
Bromine	Covalent	[0.5]
Sodium chloride	Ionic	[0.5]

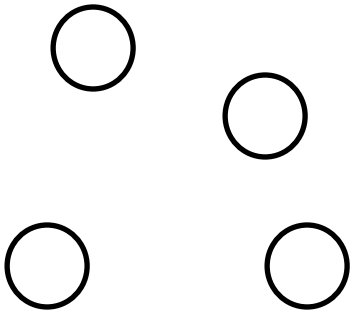
(b) Chlorine, methane, bromine. (missing/extra: -1/2 each) [1]

(c) Magnesium oxide [1]

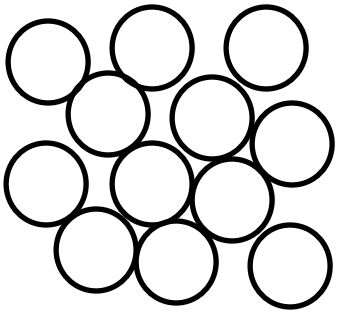
(d) Lead (II) bromide, sodium chloride, magnesium oxide. (missing/extra: -1/2 each) [1]

(e) (i) In methane

Far apart; show disorder [1]

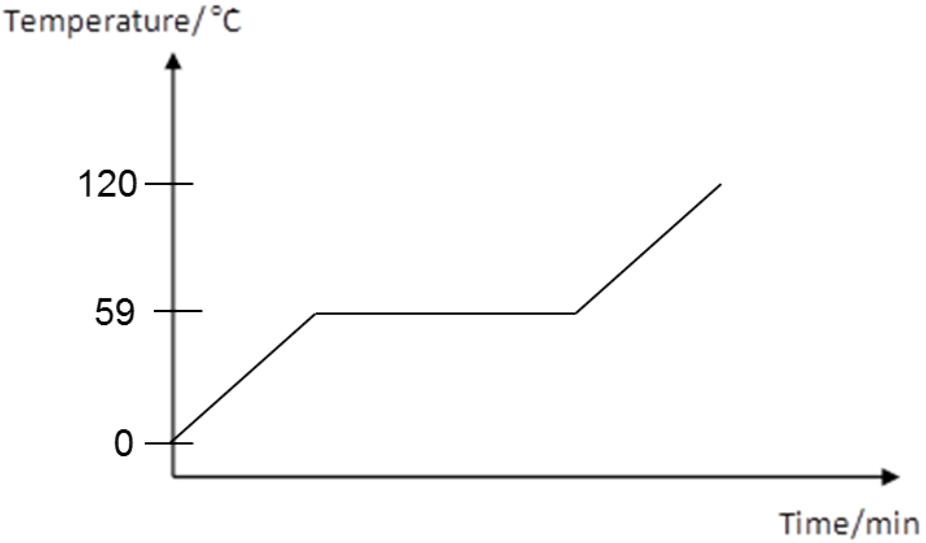


(ii) In bromine



Close together; show disorder [1]

(f)

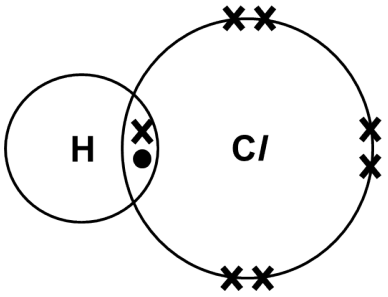


[2]

correct shape (1); correct labelling of boiling point at 59 ^{o}C. (1)
wrong labelling of starting and ending temperature (-1/2)

Section C

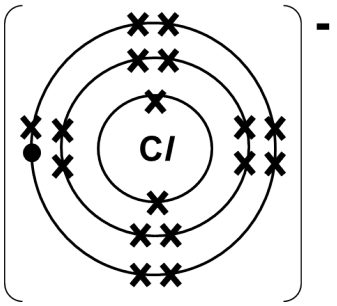
1. (a) (i)



[1]

Missing electrons/shells (-1); missing chemical symbol (-1); Failure to differentiate electrons of hydrogen and chlorine using dots and crosses (-1/2); showing inner electron shells (-1/2)

(a) (ii)

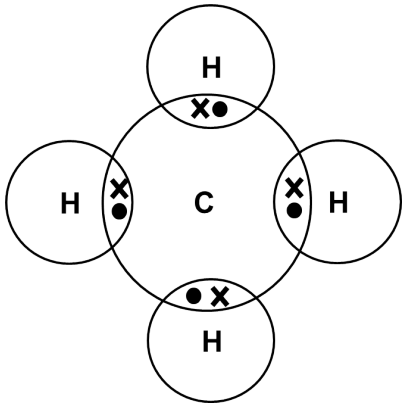


[1]

Missing electrons/shells (-1); missing chemical symbol (-1); missing bracket (-1/2); missing charge for ion (-1)

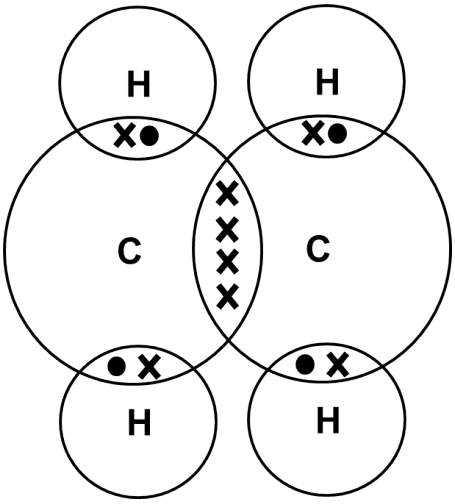
(a) (iii) As a gas, HCl exists as neutral diatomic molecules. [1] Upon dissolving in water, HCl ionizes into mobile H^+ and Cl^- ions, which are responsible for electrical conductivity. [1] [2]

(b) (i)



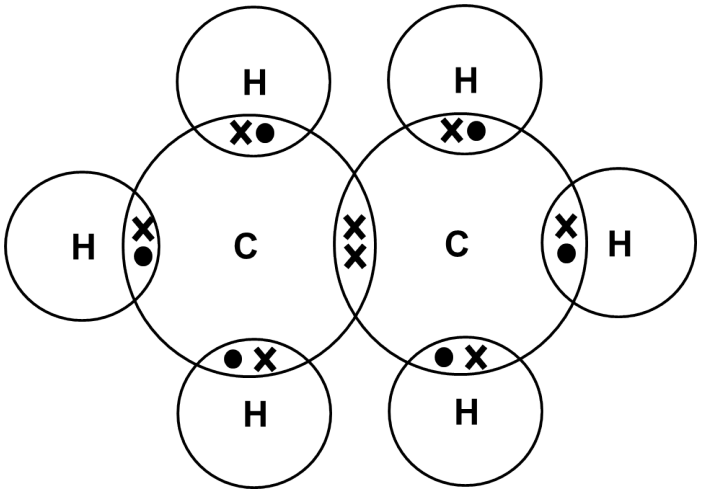
Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of hydrogen and carbon using dots and crosses (-1); showing inner electron shells (-1)

(b)
(ii)



Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of hydrogen and carbon using dots and crosses (-1); showing inner electron shells (-1)

(b)
(iii)



Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of hydrogen and carbon using dots and crosses (-1); showing inner electron shells (-1)

2. (a)

(i) 50 ^{o}C. (Accept 48 ^{o}C to 53 ^{o}C) [1]

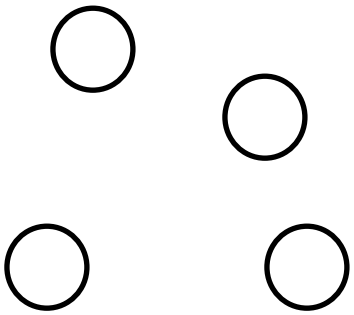
(ii) 125 ^{o}C (Accept 125 ^{o}C to 128 ^{o}C) [1]

(iii) Close together [0.5]; disorderly [0.5] [1]

(b)

(i) When carbon dioxide is heated, its particles gain energy and start to move more quickly. Their movement changes from vibrating about their fixed positions, [1] to moving randomly and rapidly. [1] [2]

(ii) Far apart; show disorder [1]



(c)

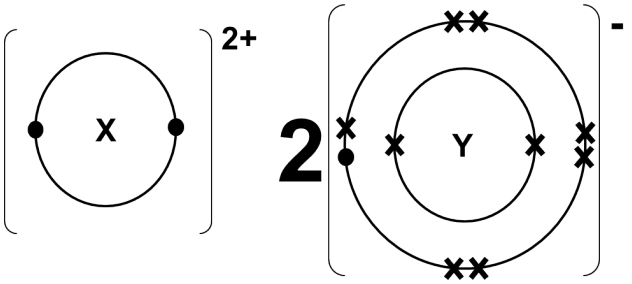
(i) Steam is a gas. [1/2] In a given volume, the <u>particles will spread out to occupy any available space</u> [1] and there are <u>a lot of empty spaces between particles</u> [1/2]. Hence, steam has low density. [2]

(ii) In a given volume, the particles in <u>gaseous state are spaced far apart from one another</u> [1/2]. However, when a pressure is exerted, the <u>particles are now packed closer to one another</u> [1/2], <u>like that of the arrangement of particles in liquid state</u> [1/2]. The forces of attraction between particles become strong again. [1/2] [2]

3. (a) X^{2+} [2]
Y^- (1 mark each)

(b) XY_2 [1]

(c) [2]

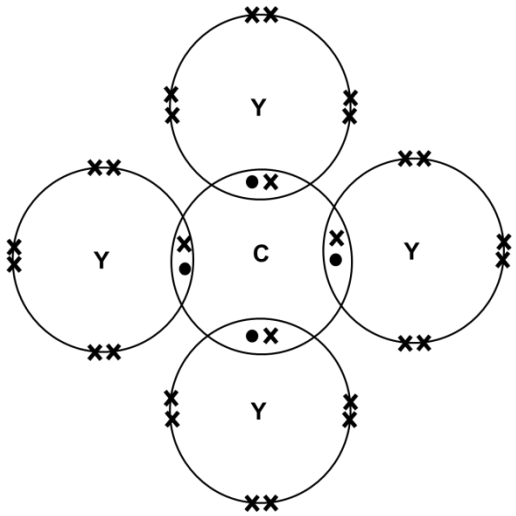


Missing electrons/shells (-2); missing chemical symbol (-2); missing bracket (-1); missing charge for ion (-2); Failure to differentiate electrons of calcium and chlorine using dots and crosses (-1); failure to balance number of calcium and chlorine ions (-1)

(d) No. [1] [2]
Large amounts of energy needed to overcome the strong ionic bonds/ electrostatic forces of attraction between the ions. [1]

(e)
(i) Covalent [1]

(ii) [2]



Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of carbon and Y using dots and crosses (-1); showing inner electron shells (-2); writing fluorine instead of Y (-1)