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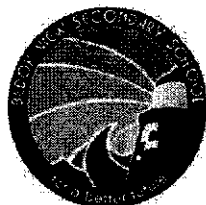
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BEDOK VIEW SECONDARY SCHOOL MID-YEAR EXAMINATION 2019

CANDIDATE
NAME

REGISTER
NUMBER

CLASS

CHEMISTRY Secondary 3 Express

6092

13 May 2019

1 hour 30 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do **NOT** use staples, paper clips, highlighters, glue or correction fluid.

Section A

There are **twenty** questions in this section. 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 Answer Sheet.

Section B

Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Candidates are reminded that **all** quantitative answers should include appropriate units.

Electronic calculators may be used.

Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of concepts than for correct answers.

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.

A copy of the Periodic Table is found on page 18 of this paper

For Examiner's use	
Paper 1	/ 20
1	/ 7
2	/ 6
3	/ 8
4	/ 5
5	/ 4
6	/ 10
Total	/ 60
% / Grade	/

Setter(s): Ms Wong W L

Parent's / Guardian's Signature:

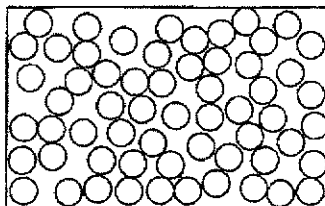
This document consists of 17 printed pages and 1 blank page.

Do not turn over the page until you are told to do so.

Section A

Answer all questions in this section on the Multiple Choice Answer Sheet.

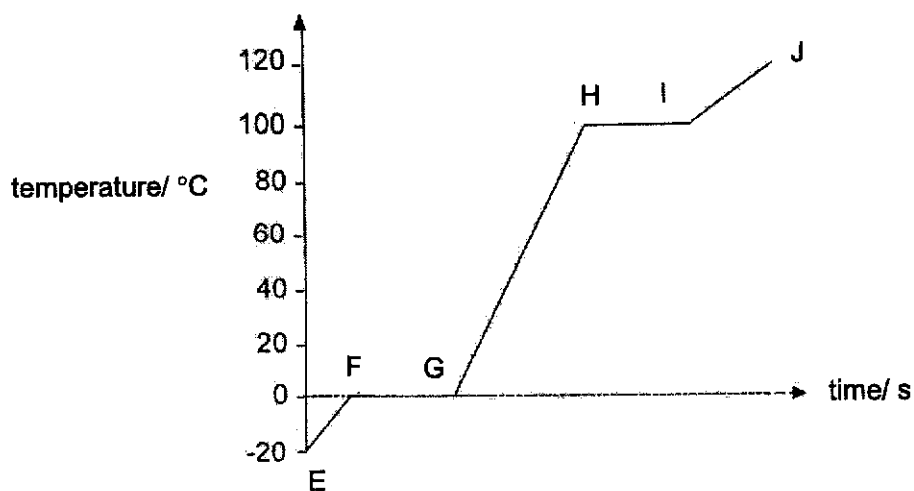
- 1 The diagram shows the arrangement of particles in a substance at room temperature and pressure.



Which of the following substances could the diagram represent?

	melting point / °C	boiling point / °C
A	-165	-101
B	-113	-78
C	-20	113
D	87	202

- 2 The graph below shows the temperature changes with time when a substance is heated from -20 °C.



Which of the following statements can be deduced from the heating curve?

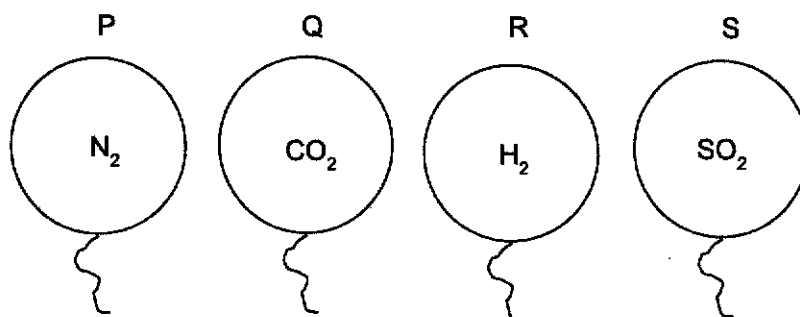
- A The volume of the substance is decreasing from points E to J.
- B Energy is released from points G to H.
- C The energy of the particles remains constant throughout from points E to F.
- D The particles absorb energy to overcome the forces of attraction between them from points F to G.

3

3 Which apparatus is most appropriate in measuring 22.6 cm³ of vinegar?

- A beaker
- B burette
- C measuring cylinder
- D pipette

4 Four balloons were filled with equal volume of different gases and left in a room for 8 hours.



The balloons are found to have shrunk to different extent after 8 hours.

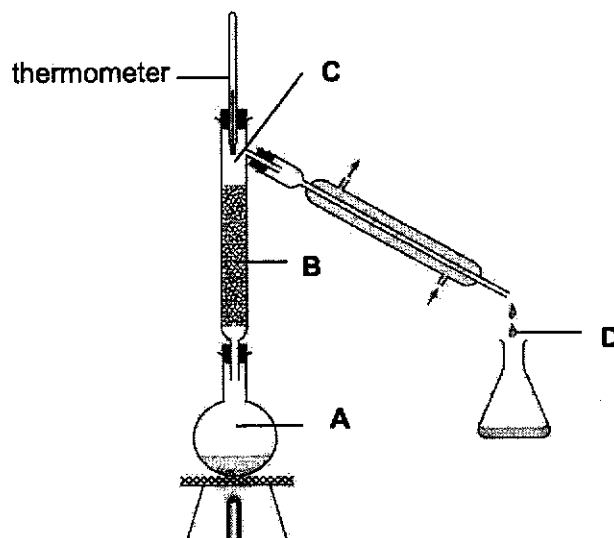
Which of the following gives the correct sequence in increasing order of size of balloon after 8 hours?

- A P, R, Q, S
 - B R, Q, P, S
 - C R, P, Q, S
 - D P, R, S, Q
- 5 The boiling point of solid X is 742 °C and it is soluble in water.
What is the most likely boiling point of water if it contains a small amount of X?
- A 99 °C
 - B 101 °C
 - C 740 °C
 - D 744 °C

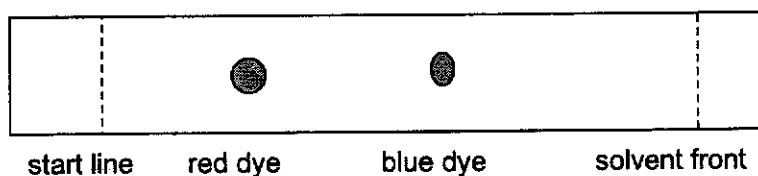
4

- 6 A mixture contains equal volumes of two miscible liquids that do not react together. The mixture is placed in the apparatus as shown in the diagram below. Heat is applied to the mixture until the thermometer first shows a steady reading for some time.

At which point will there be the highest proportion of the liquid with the higher boiling point?



- 7 The diagram shows the chromatogram of a food colouring used in a candy.



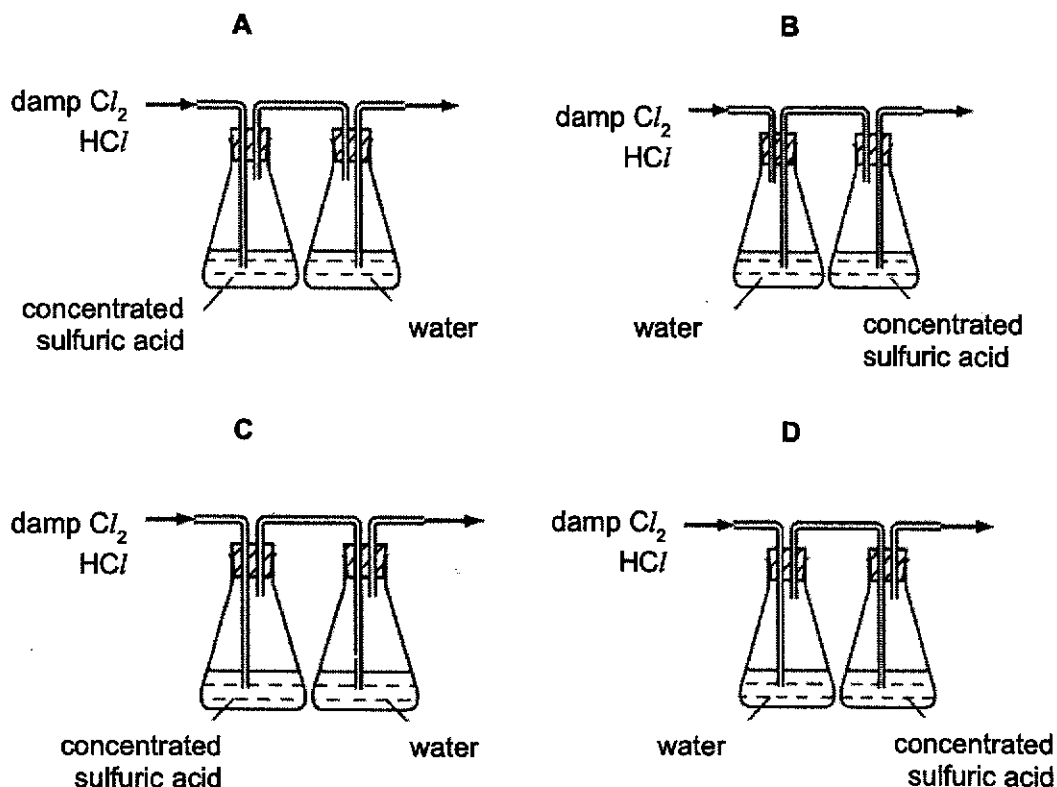
Which of the following can best be deduced from the chromatogram above?

- A The colour of the sweet is purple.
- B The molecules of the red dye are heavier than those of the blue dye.
- C The red dye is more soluble in the solvent than the blue dye.
- D The R_f value of the red dye is less than that of the blue dye.

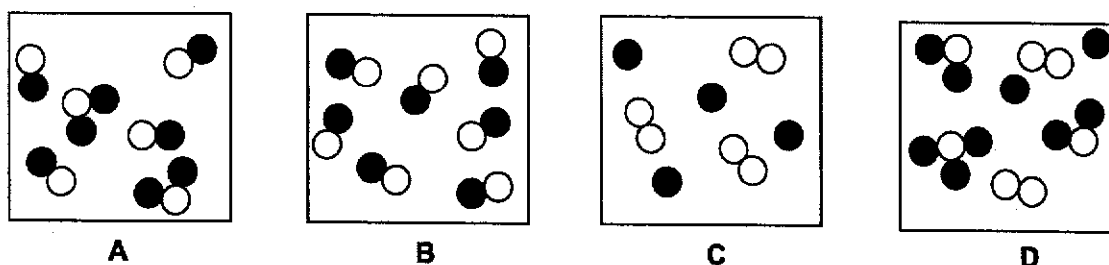
5

- 8 Hydrogen chloride is very soluble in water, whereas chlorine is only slightly soluble in water. Both gases can be dried using concentrated sulfuric acid.

Which diagram represents the correct method of obtaining pure dry chlorine from damp chlorine containing a small amount of hydrogen chloride?



- 9 Which of the following diagrams represents a mixture of compounds?



- 10 Which list contains an element, a compound and a mixture?

- A air, magnesium, soil
- B air, pure water, copper(II) sulfate
- C gold, seawater, sodium chloride
- D mineral water, soil, sugar

6

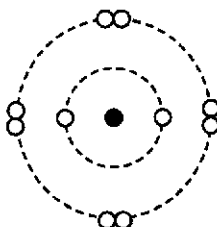
11 A new substance was discovered recently by a scientist.
Which observation suggests that the substance is **not** an element?

- A It dissolves in water to form a colourless solution.
- B When exposed to air, it changes colour gradually.
- C When heated in air, it could form two oxides.
- D Electrolysis of the molten substance gives two products.

12 Which statement about an atom is correct?

- A Each element has only one nucleon (mass) number.
- B The nucleon (mass) number can be equal to the proton number.
- C The nucleon (mass) number can be less than the proton number.
- D The number of neutrons never equals the number of electrons.

13 The diagram shows the arrangement of electrons in a particle with a charge of -1 .



Which group and period does the atom of this particle belong to in the Periodic Table?

	group	period
A	I	2
B	VII	2
C	I	3
D	VII	3

7

- 14 An ion J^{3-} has x protons and y electrons. How many protons are there in an atom of J ?
- A $x - 3$
 B $x + 3$
 C $y - 3$
 D $y + 3$
- 15 The outer shell electrons in a molecule of a liquid, carbon dioxide.

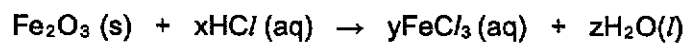


How many electrons in a molecule of carbon dioxide are **not** involved in bonding?

- A 8
 B 10
 C 12
 D 14
- 16 What occurs when silicon dioxide melts?
- A Electrostatic forces of attraction between atoms in a giant lattice are broken.
 B Strong covalent bonds in the macromolecular structure are broken.
 C Electrostatic forces of attraction between ions in a giant lattice are broken.
 D Weak intermolecular forces between silicon dioxide molecules are broken.

9

- 20 The reaction of hydrochloric acid and iron(III) oxide is represented by the equation below.



Which of the following shows the correct values of x, y and z to balance the equation?

	x	y	z
A	3	1	3
B	6	2	3
C	6	1	6
D	6	2	2

Section BAnswer **all** questions in the spaces provided

- 1 Table 1.1 shows some information about atoms of the elements P, Q, R and S. The letters, P to S do not represent the chemical symbols of the elements.

*For
Examiner's
Use*

Table 1.1

element	atomic number	number of protons	number of neutrons	mass number	electronic configuration
P	17	17	18	35	2.8.7
Q	8	8	8	16	2.6
R	1	1	1	2	1
S			20	39	

- (a) (i) Complete Table 1.1 by filling in the information for element S. [1]

- (ii) Is element S a metal or a non-metal? Give a reason for your answer.

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

- (b) Explain why the relative atomic mass of element P has a value of 35.5 and not a whole number?

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

- (c) Describe the change in electronic configuration that occurs to an atom of element Q when it forms an ion.

..... [1]

- (d) Elements P and R combine to form a covalent molecule.

Draw a 'dot and cross' diagram to show the bonding in this molecule.
(show outer electrons only)

[2]

[Total: 7]

- 2 (a) Fig.2.1 shows a large beaker filled with methane gas, CH_4 being inverted over a porous pot containing nitrogen gas, N_2 . The water level in the right-arm of the U-tube is observed after 3 hours.

For
Examiner's
Use

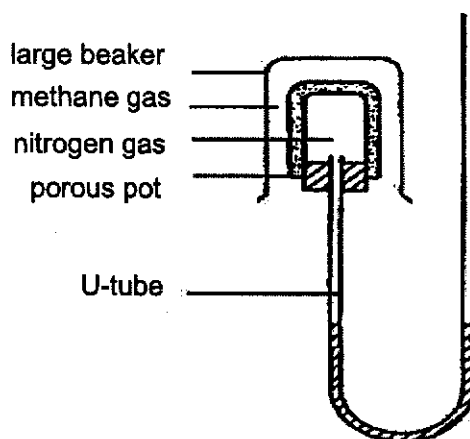


Fig. 2.1

- (i) Deduce whether water level in the right-arm of the U-tube rises or drops? Explain your answer.

.....

 [3]

- (ii) Suggest why ammonia gas is not suitable to be placed in the porous pot.

..... [1]

- (b) Natural gas is stored as a mixture with methane as the main component. The natural gas is stored as Liquefied Natural Gas.

Suggest how natural gas can be liquefied and stored in a cylinder at room temperature.

..... [1]

- (c) Suggest an advantage of storing natural gas in liquid state.

.....
 [1]

[Total: 6]

- 3 Tritium is an isotope of hydrogen. An ion of tritium has the following structure as shown in Fig. 3.1.

For
Examiner's
Use

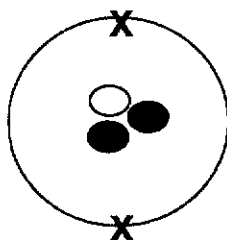


Fig. 3.1

- (a) Complete Table 3.2

Table 3.2

symbol	name of sub-atomic particle	charge
●		0
○	proton	
X		- 1

[3]

- (b) Define isotopes.

.....
 [1]

- (c) Explain why isotopes have similar chemical properties but slightly different physical properties.

.....

 [2]

- (d) Using T to represent tritium, write the formula of

- (i) tritium ion:
 (ii) the compound formed between tritium and magnesium: [2]

[Total: 8]

- 4 The formulae of some substances are given in the following list.

MgCO₃ N₂ Al₂O₃ NH₃ H₂O ZnSO₄ Ar

For
Examiner's
Use

- (a) Choose from the list **all** those substances to answer the following questions. You may use the substance once, more than once or not at all.

- (i) Which substance(s) consist(s) of molecule(s)?

..... [1]

- (ii) Which substance(s) can be classified as elements(s)?

..... [1]

- (iii) Give the substance which contains a triple covalent bond.

..... [1]

- (b) Which substance reacts with hydrochloric acid to form ammonium chloride?

..... [1]

- (c) Write a chemical equation for the reaction in (b).

..... [1]

[Total: 5]

5 Fig. 5.1 shows the structures of graphite and silicon dioxide.

For
Examiner's
Use

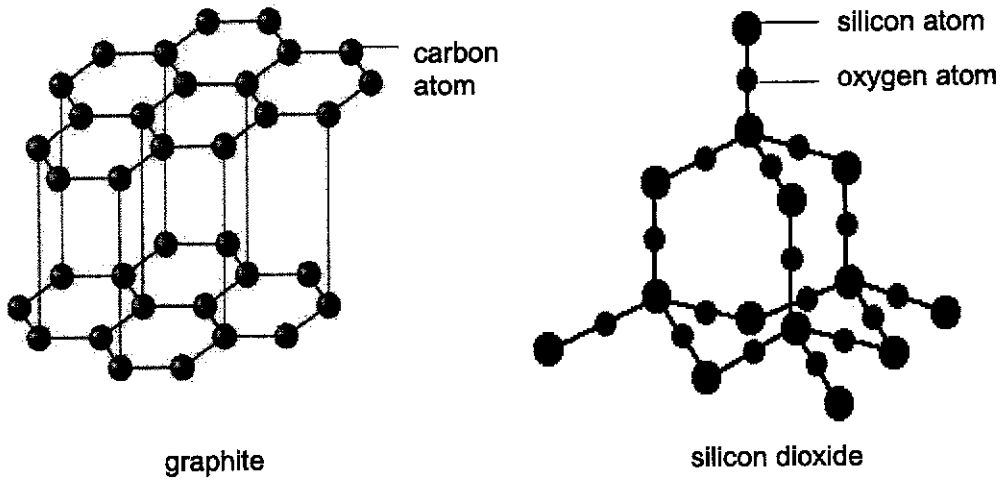


Fig. 5.1

(a) Explain in terms of structure, why graphite conducts electricity but silicon dioxide does not.

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

(b) Graphite is used to make lubricants for engines. Explain, in terms of its structure, why graphite can act as a lubricant.

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

[Total: 4]

- 6 Use the information in Table 6.1 to answer the following questions.

For
examiner's
use

Table 6.1

substance	conducts electricity when solid	melting point/ °C	boiling point/ °C	soluble in water
sodium chloride	no	808	1413	yes
bromine	no	-7.2	58.8	yes
zinc	yes	419.5	907	no
sugar	no	186	-	yes
wax	no	35 - 50	245 - 270	no

- (a) What is the physical state of bromine at room temperature and pressure?

..... [1]

- (b) Which substance is a mixture? Explain your answer with evidence.

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

- (c) Give a reason why no value was given for the boiling point of sugar.

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

- (d) Describe how the arrangement and movement of particles in zinc change as the temperature increases from 419 °C to 420 °C.

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

(e) Suggest how you could separate a mixture of sodium chloride and zinc to obtain a dry sample of each.

.....
.....
.....
.....
..... [3]

(f) Draw a 'dot-and-cross' diagram to show the bonding in sodium chloride.

[2]

[Total: 10]

End of Paper

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BEDOK VIEW SECONDARY SCHOOL
3E CHEMISTRY 6092 MYE 2019

Paper 1

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







11	12	13	14	15	16	17	18	19	20
D	B	B	C	D	B	A	A	A	B

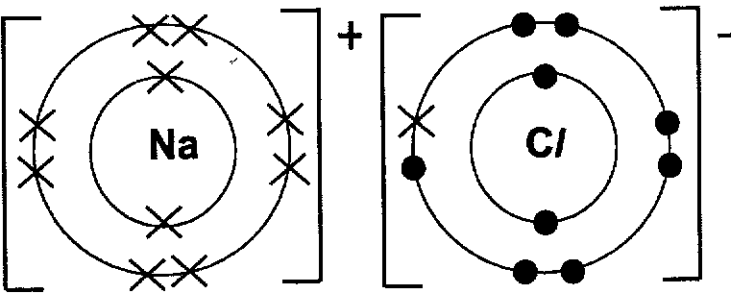
Paper 2

/ – or; A – accept; R – reject; CAO – correct answer only; ECF – error carry forward; only award marks for working; OWTTE – or words to that effect; w/o – without

Section A

Q/No.	Answer	Comments/ Instructions																														
1ai)	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>element</th> <th>atomic number</th> <th>number of protons</th> <th>number of neutrons</th> <th>mass number</th> <th>electronic configuration</th> </tr> </thead> <tbody> <tr> <td>P</td> <td>17</td> <td>17</td> <td>18</td> <td>35</td> <td>2.8.7</td> </tr> <tr> <td>Q</td> <td>8</td> <td>8</td> <td>8</td> <td>16</td> <td>2.6</td> </tr> <tr> <td>R</td> <td>1</td> <td>1</td> <td>1</td> <td>2</td> <td>1</td> </tr> <tr> <td>S</td> <td>19</td> <td>19</td> <td>20</td> <td>39</td> <td>2.8.8.1</td> </tr> </tbody> </table>	element	atomic number	number of protons	number of neutrons	mass number	electronic configuration	P	17	17	18	35	2.8.7	Q	8	8	8	16	2.6	R	1	1	1	2	1	S	19	19	20	39	2.8.8.1	B1
element	atomic number	number of protons	number of neutrons	mass number	electronic configuration																											
P	17	17	18	35	2.8.7																											
Q	8	8	8	16	2.6																											
R	1	1	1	2	1																											
S	19	19	20	39	2.8.8.1																											
aii)	<p>Metal [1]</p> <p>It has 19 protons, potassium, one of the metals in Group I [1]</p> <p>Or It has one outermost shell electron, Group I alkali metal.</p>	B2																														
b)	<p>Atomic mass is calculated as the weighted average of all the naturally occurring isotopes.</p> <p>A: Element P has <u>isotopes</u>. (plural)</p>	B1 Reject: P has an isotope (singular)																														
c)	<p>Q has electronic configuration of <u>2.6</u>.</p> <p>It will <u>gain 2 electrons</u> achieve stable noble gas configuration, (<u>2.8</u>)</p> <ul style="list-style-type: none"> • Must state change in electron configuration from 2.6 to 2.8 • gain 2e 	B1																														
d)		B2 1m for correct H (R) atom 1m for correct Cl (P) atom																														

		Total - 7												
2ai)	Water level in the right-arm of the U-tube <u>ris</u> es. As methane has a <u>lower relative molecular mass</u> than nitrogen, methane will <u>diffuse faster</u> into the porous pot than nitrogen gas diffusing out. The <u>increase in pressure</u> in pot then forces the water level to rise in the right arm.	B1 B1 B1												
aii)	Ammonia gas is <u>very soluble</u> in water. Hence, it will dissolve in water instead of diffusing out of the porous pot.	B1												
b)	Use of <u>high pressure</u> .	B1												
c)	<u>More</u> methane can be stored in a given /fixed volume in liquid form	B1												
		Total - 6												
3a)	<table border="1"> <thead> <tr> <th>Symbol</th> <th>Name</th> <th>Charge</th> </tr> </thead> <tbody> <tr> <td></td> <td>neutron</td> <td>0</td> </tr> <tr> <td></td> <td>proton</td> <td>+ 1</td> </tr> <tr> <td>X</td> <td>electron</td> <td>- 1</td> </tr> </tbody> </table>	Symbol	Name	Charge		neutron	0		proton	+ 1	X	electron	- 1	B1 B1 B1
Symbol	Name	Charge												
	neutron	0												
	proton	+ 1												
X	electron	- 1												
b)	Isotopes are atoms of the same element with same number of protons but different number of neutrons/ nucleon number. R: different mass	B1												
c)	Isotopes have <u>similar chemical properties</u> as they have the <u>same number of valence electrons</u> and valence electrons are involved in chemical reactions but <u>Different physical properties</u> as they have <u>different relative atomic masses</u> which determine their physical property such as melting/boiling point.	B1 B1												
d)	tritium ion: T^- the compound formed between tritium and magnesium: MgT_2 R: T_2Mg	B1 B1												
		Total - 8												
4a)	(i) Molecules: N_2 NH_3 H_2O (ii) Elements(s): N_2 and Ar (iii) Triple bond: N_2	B1 B1 B1												
b)	NH_3	B1												
c)	$NH_3 + HCl \rightarrow NH_4Cl$	B1												
		Total - 5												

5a)	<p>In graphite, each carbon atom is covalently bonded to three other carbon atoms and has one electron which is delocalised and moves freely to act as charge carriers.</p> <p>In silicon dioxide, all atoms have used their valence electrons to form covalent bonds and there are no free mobile electrons to act as charge carriers.</p>	B1 B1
b)	<p>A small amount of force is required to overcome the weak intermolecular forces between the layers of carbon atoms in graphite.</p> <p>The layers of carbon atoms can slide past one another easily.</p> <p>R: Energy/heat</p>	B1 B1
		Total - 4
6a)	Bromine is in <u>liquid state</u>	B1
b)	Wax. It melts and boils over a range of temperature	B1
c)	Sugar is not stable to heat, decomposes instead of boiling	B1
d)	<p>At 419 °C, zinc atoms are packed close together in neat regular arrangement and are vibrating at its fixed positions within the metallic lattice.</p> <p>At 420 °C, the zinc atoms are in random arrangement and are slightly further apart. The atoms are able to move by sliding past each other within the liquid.</p>	B1 B1 Mark awarded for comparison
e)	<ol style="list-style-type: none"> 1) <u>Add the mixture</u> of sodium chloride and zinc to <u>water</u> and stir to <u>dissolve</u> sodium chloride. 2) <u>Filter the mixture</u>. 3) <u>Collect zinc as the residue</u> and rinse with distilled water. Dry zinc between filter paper. 4) Collect <u>filtrate</u> from step 2 and <u>evaporate to dryness</u> to obtain sodium chloride. 	B3
f)	 <p>x - electron of Na ● - electron of Cl</p>	B2 1m for charge on Na ion. 1m for transferred electron on Cl ion. Minus 1m for no bracket.
		Total - 10