# Geylang Methodist School (Secondary)
# End-of-Year Examination 2017

**SCIENCE (CHEMISTRY/ BIOLOGY)** **5078/01**
**Paper 1** **3 Express**

**Additional materials:** Optical Answer Sheet **45 minutes**

**Setters :** Mrs Loh Kim Woon **11 October 2017**
Ms Lam Yuit Kwai

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid on the Optical Answer Sheet.

Write your name, class and index number on the Optical Answer Sheet provided.

There are **thirty** questions in this paper. Answer **all** the 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.

**Read the instructions on the answer sheet very carefully.**

Each correct answer will score one mark. No mark will be deducted for a wrong answer.

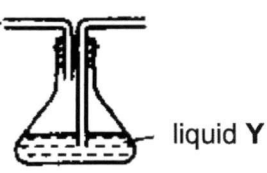
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 15.

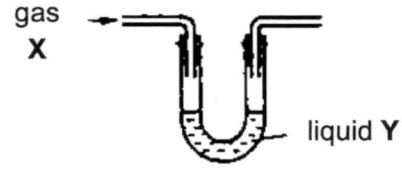
1 Gas **X** may be purified by using liquid **Y**.

Which of the following is the most suitable piece of apparatus to use?

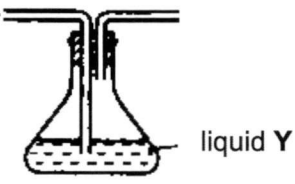
A



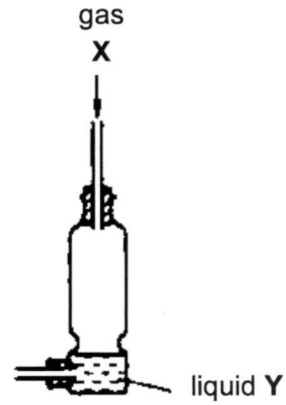

B




C

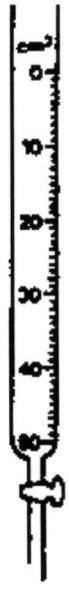



D



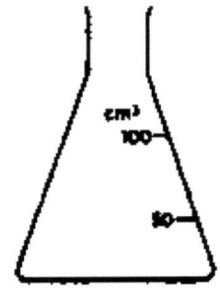

2 Which of the following pieces of apparatus is most suitable for accurately measuring out 23.0 $cm^3$ of water?

A



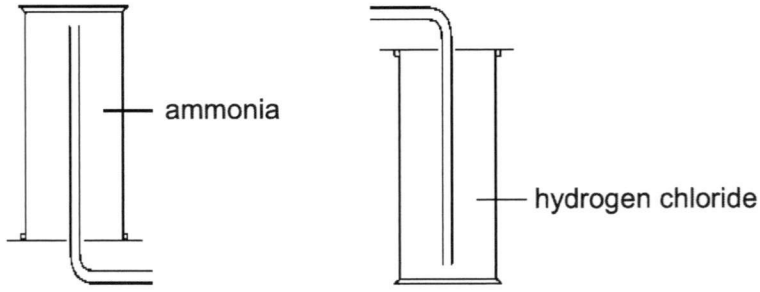
B

C



D

**3** The three main methods of gas collection are by upward displacement of air, downward displacement of air and displacement of water.
Ammonia and hydrogen chloride are collected by the methods shown below.

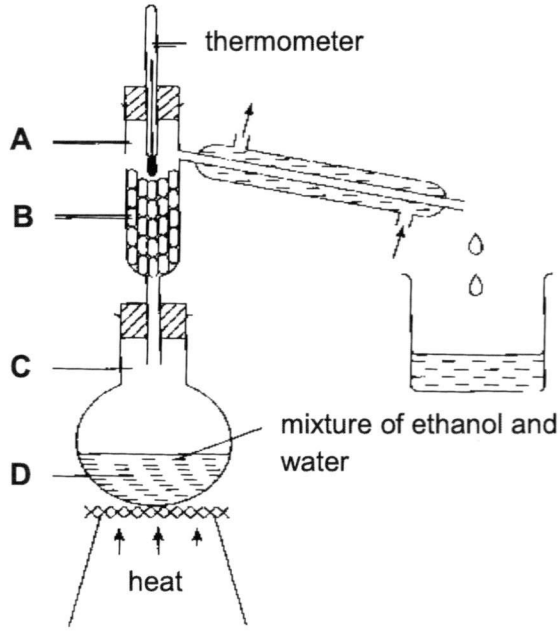



What deduction can be made about the properties of the two gases?

**A** Ammonia is denser than hydrogen chloride.
**B** Both gases are denser than air.
**C** Both gases are highly flammable.
**D** Both gases are soluble in water.

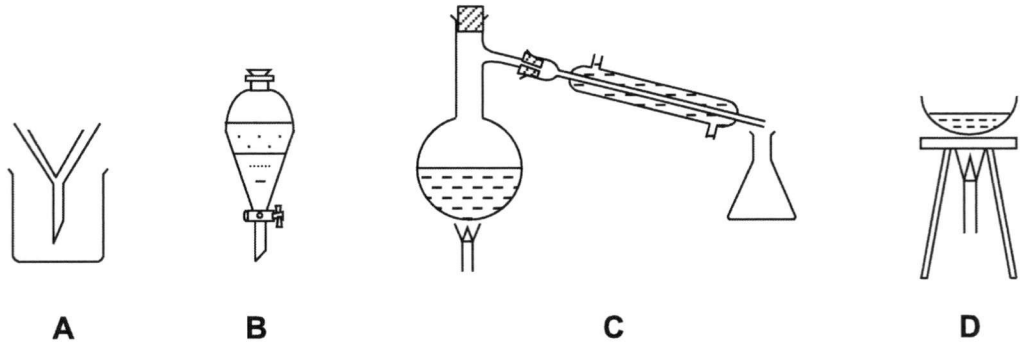
**4** A student set up the following apparatus to separate ethanol (boiling point 78°C) and water (boiling point 100°C).

When the thermometer first shows a steady temperature, at which labelled point will there be the highest proportion of ethanol?



**5** Compound **X** melts at 40°C, boils at 110°C and is not soluble in water.

Which apparatus can be used to obtain pure **X** from a mixture of **X** with water at room temperature?



**A** **B** **C** **D**

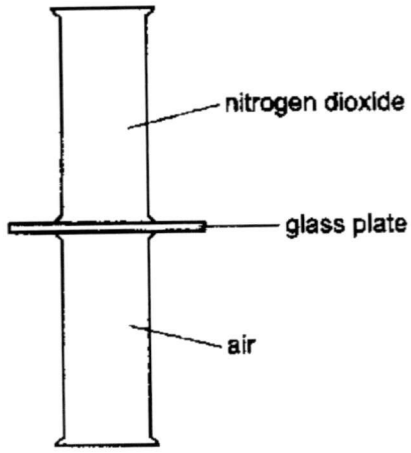
**6** The table gives data about four substances.

In which substance are the particles far apart and move randomly at high speeds at room temperature?

| | melting point / °C | boiling point / °C |
|---|---|---|
| **A** | 1610 | 2230 |
| **B** | 57 | 126 |
| **C** | -18 | 82 |
| **D** | -75 | -18 |

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 Which one of the following statements best supports that air is a mixture?

**A** Air contains different elements.
**B** Air is slightly soluble in water.
**C** The oxygen in the liquid air is easily removed during fractional distillation.
**D** The water vapour has a fixed composition by mass.

**9** Which list contains only compounds?

**A** copper(II) sulfate, pure water, ammonia
**B** lead, air, chlorine
**C** nitrogen, hydrogen, copper(II) sulfate
**D** salt, iron, pure water

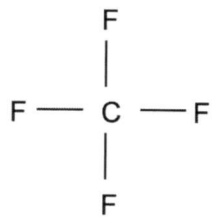
**10** Which atom has the same electronic configuration as the strontium ion?

**A** calcium **B** krypton
**C** rubidium **D** selenium

**11** Which of the following element has an isotope that does not contain neutrons?

**A** neon **B** helium
**C** hydrogen **D** nitrogen

**12** Tetrafluoromethane has the structure as shown below.




How many of the electrons in a molecule of tetrafluoromethane, $CF_4$, are **not** involved in bonding?

**A** 0 **B** 2
**C** 26 **D** 34

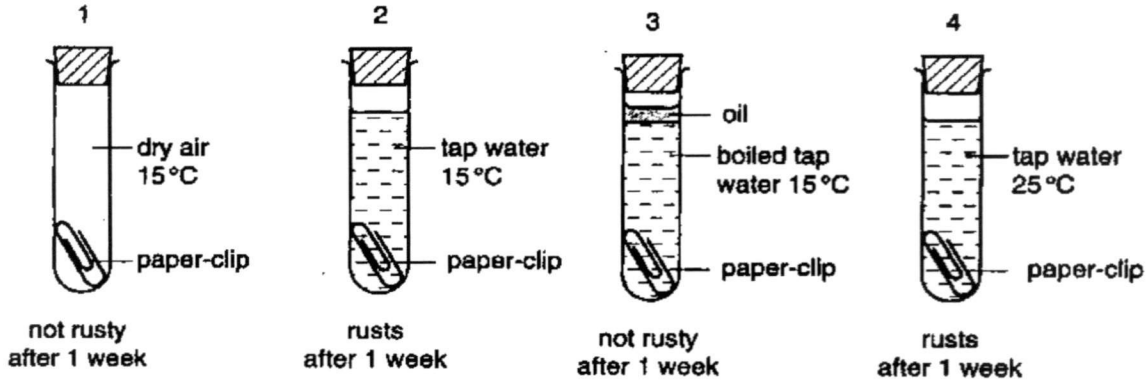
**13** Which element in the table is an alkali metal?

| element | melting point / °C | density / g/cm$^3$ |
|---|---|---|
| **A** | -39 | 13.60 |
| **B** | -7 | 3.10 |
| **C** | 98 | 0.97 |
| **D** | 1083 | 8.92 |

**14** Which statement about noble gases is correct?

**A** The number of protons in the atoms equals the number of neutrons.
**B** Their atoms each have a stable arrangement of electrons.
**C** Their atoms each have eight electrons in their outermost shell.
**D** They exist as molecules containing two atoms.

**15** Four experiments on rusting are shown.




Which experiment(s) can be used to show that water is needed for the iron paper-clip to rust?

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

**16** The following information shows the function of three organelles.

P – contains genetic material
Q – acts as a medium of reaction
R – site of respiration

What are structures P, Q and R?

| | P | Q | R |
|---|---|---|---|
| **A** | cytoplasm | mitochondrion | nucleus |
| **B** | nucleus | cytoplasm | mitochondrion |
| **C** | mitochondrion | nucleus | cytoplasm |
| **D** | nucleus | mitochondrion | cytoplasm |

**17** What is the correct classification of these body components?

1 heart, blood vessels, blood
2 muscles
3 phagocyte
4 liver

| | cell | tissue | organ | system |
|---|---|---|---|---|
| **A** | 2 | 3 | 1 | 4 |
| **B** | 2 | 4 | 3 | 1 |
| **C** | 3 | 2 | 1 | 4 |
| **D** | 3 | 2 | 4 | 1 |

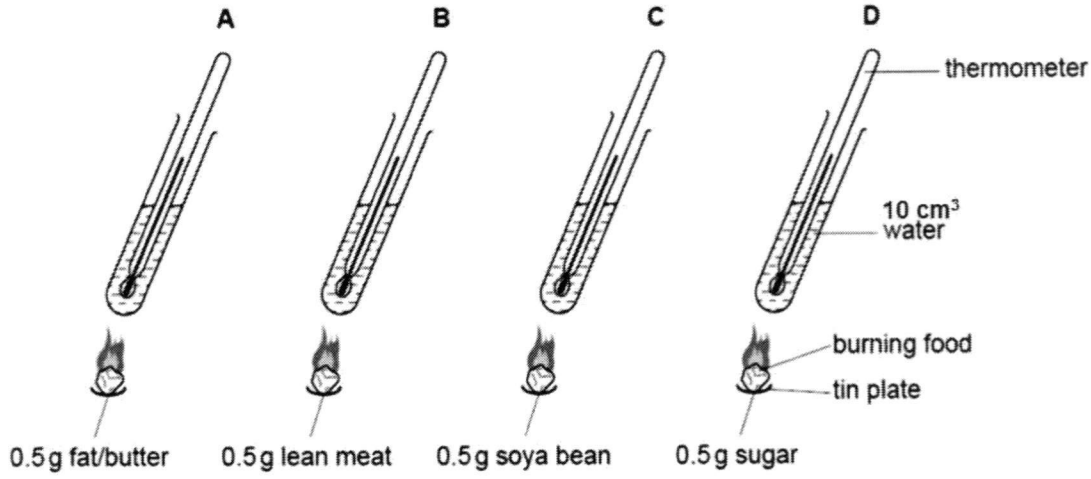
**18** Four cucumber strips of 5 cm in length were left in different concentrations of sugar solution. Its measurements were then taken after 30 minutes.

Which strip was left in the solution which is most hypertonic to the cucumber cells?

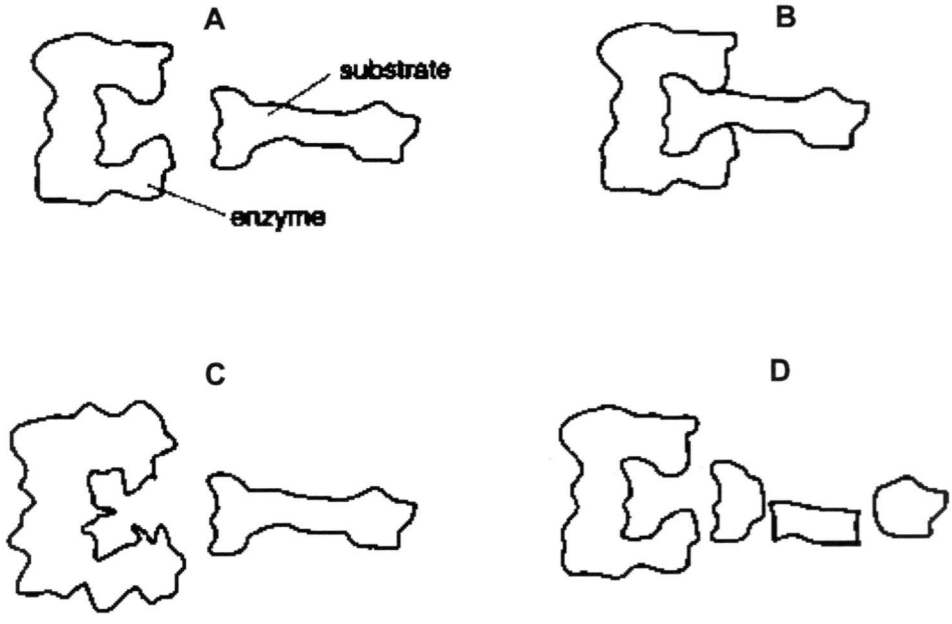
| | length of strip / cm |
|---|---|
| **A** | 4.0 |
| **B** | 4.8 |
| **C** | 5.3 |
| **D** | 5.8 |

**19** The energy value of foods can be compared using the apparatus shown. The same mass of food is burned under each of four tubes containing 10 $cm^3$ of water.

In which tube would the temperature of the water rise the most?

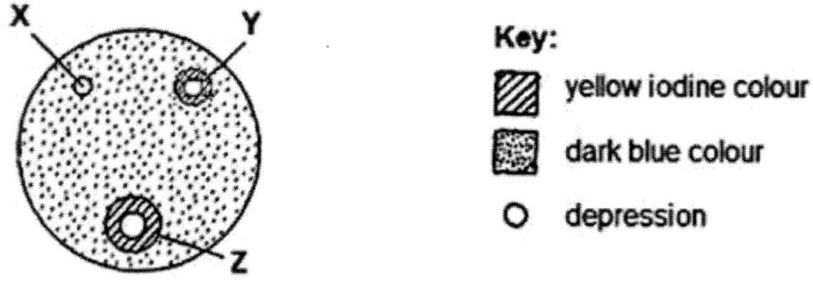



**20** The diagrams represent a molecule of an enzyme and its substrate.




Which diagram shows these molecules after they are heated to 100 °C?

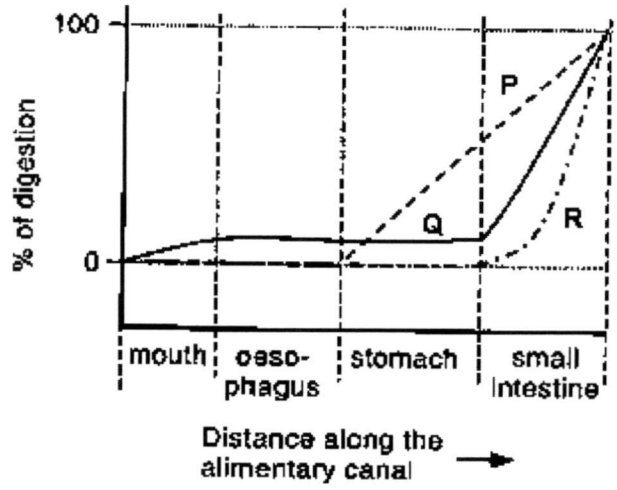
**21** Three circular depressions of equal size were cut in the jelly containing starch. A different solution was used to fill up each depression. Six hours later, the jelly surface was smeared with iodine solution. The diagram below shows the appearance of the jelly with iodine.




Which of the following solutions in the respective depressions will give the results as shown?

| | depression X | depression Y | depression Z |
|---|---|---|---|
| **A** | amylase | boiled amylase | amylase + acid |
| **B** | amylase + acid | amylase | boiled amylase |
| **C** | boiled amylase | amylase + acid | amylase |
| **D** | boiled amylase | amylase | amylase + acid |

**22** The graph below shows the percentage of digestion of four types of food as they move along the human alimentary canal.




What type of nutrients are P, Q and R?

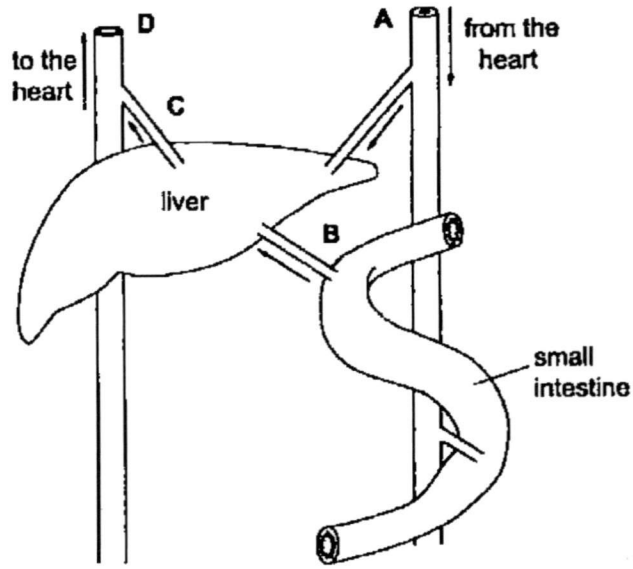
| | P | Q | R |
|---|---|---|---|
| **A** | starch | fat | protein |
| **B** | fat | starch | protein |
| **C** | protein | fat | starch |
| **D** | protein | starch | fat |

**23** Which processes take place in the liver?

1. conversion of glucose to glycogen
2. conversion of glycogen to glucose
3. production of amino acids from urea
4. production of urea from amino acids

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

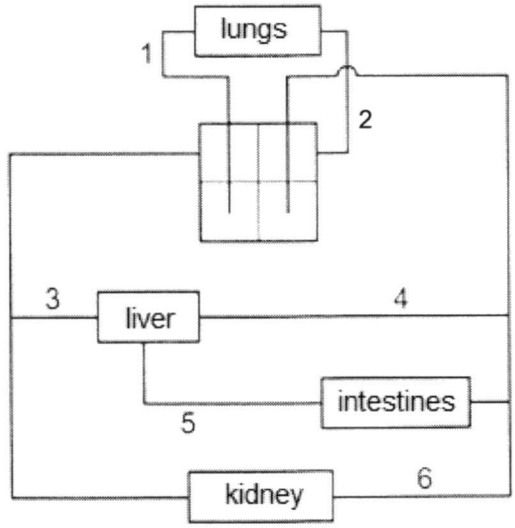
**24** The diagram below shows part of the human digestive system.
After a meal rich in carbohydrates, which blood vessels will contain blood with the highest concentration of glucose?




**25** Which of the following shows the correct function of blood components?

| | white blood cells | platelets | plasma |
|---|---|---|---|
| **A** | transport | protection | clotting |
| **B** | clotting | transport | protection |
| **C** | protection | clotting | transport |
| **D** | clotting | transport | clotting |

**26** The diagram represents part of the circulatory system.

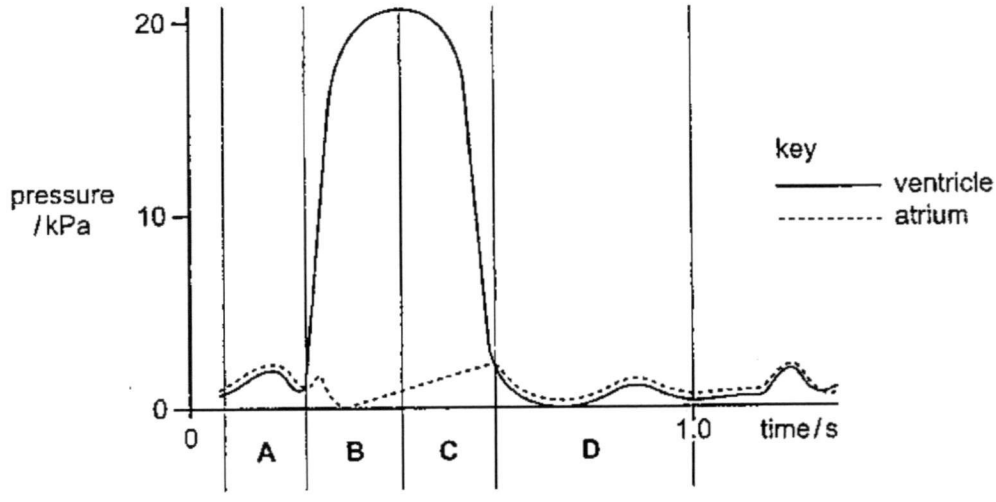



Which row names the blood vessels correctly?

| | pulmonary artery | hepatic artery | hepatic portal vein |
|---|---|---|---|
| **A** | 2 | 3 | 4 |
| **B** | 1 | 4 | 5 |
| **C** | 1 | 6 | 5 |
| **D** | 2 | 4 | 3 |

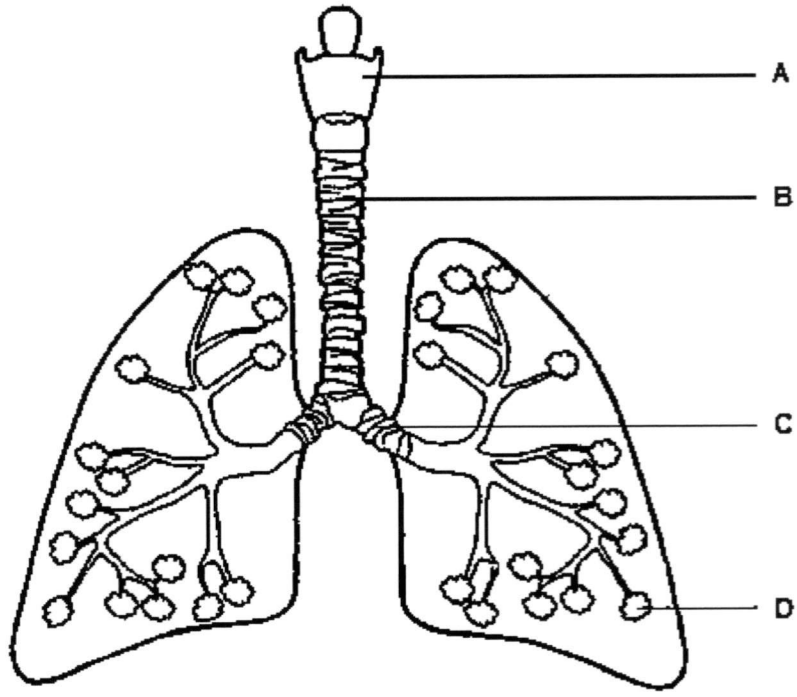
**27** The graph shows pressure change in the left ventricle and the left atrium in one cycle of contraction of the heart.

During which period of time is the ventricle contracting?

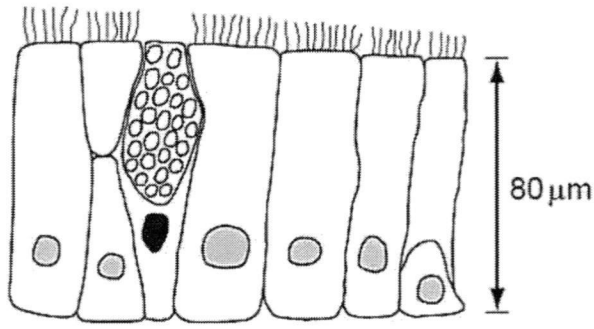


**28** Irritants and tar in tobacco smoke can cause emphysema if a person is a heavy smoker for many years.

Which part of the human respiratory system is directly affected by emphysema?




**29** The diagram shows a section through a type of epithelium.

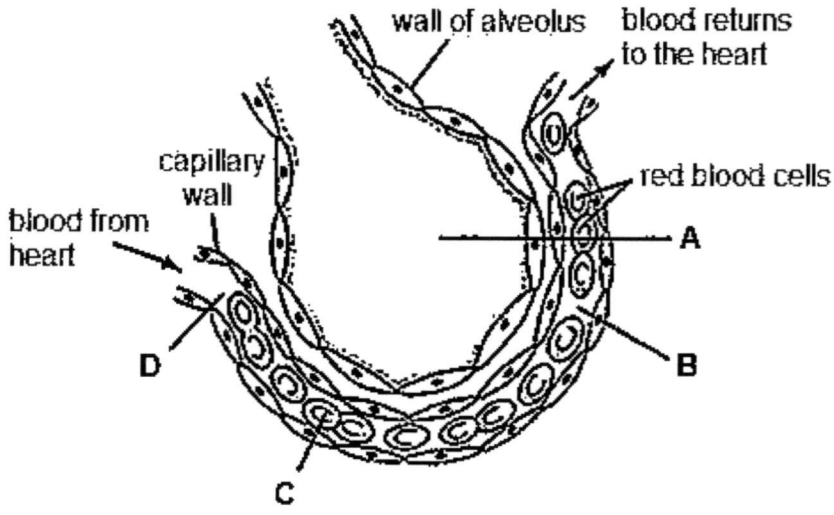



Where is this type of epithelium found in the respiratory system?

| | trachea | bronchus | bronchioles | alveoli |
|---|---|---|---|---|
| **A** | ✓ | ✓ | ✓ | × |
| **B** | ✓ | ✓ | × | × |
| **C** | × | × | ✓ | ✓ |
| **D** | × | × | × | ✓ |

key: ✓ = present
× = absent

**30** The diagram shows a section of an alveolus and a capillary in a lung.




Which labelled part contains the highest concentration of oxygen?

**END OF PAPER**

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# Geylang Methodist School (Secondary)
# End-of-Year Examination 2017

Candidate Name

Class

Index Number

**SCIENCE** **5076/03**
**5078/03**

Paper 3 Chemistry **Sec 3 Express**

Additional Materials : Writing Papers **1 hour**

**Setter :** Mrs Loh Kim Woon **5 October 2017**

**READ THESE INSTRUCTIONS FIRST**

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

**Section A**
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

**Section B**
Answer **all** questions.
Write your answers on the writing paper provided.

At the end of the examination, hand in your answers to Section A and Section B separately.

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

A copy of the Periodic Table is printed on page 9.

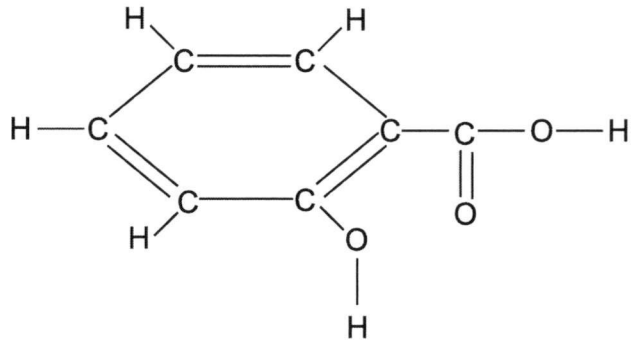
| For Examiner's Use | |
|---|---|
| **Section A** | /35 |
| **Section B** | /20 |
| **Total** | /55 |

## Section A

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

**1** Aspirin is a medicine that is used as a painkiller. It is made from salicylic acid.

**(a)** The diagram shows the structure of a molecule of salicylic acid.




**(i)** Name the elements present in a molecule of salicylic acid.

.....[2]

**(ii)** What type of bonding is present in salicylic acid?

.....[1]

**(iii)** Salicylic acid is found to react with calcium carbonate and sodium oxide.

Give the chemical formula of

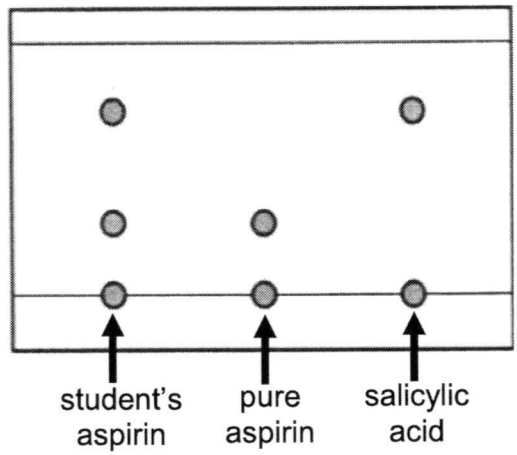
calcium carbonate, .....

sodium oxide. .....

[2]

**(b)** A student makes a sample of aspirin. He wants to find out if it contains impurities. He uses chromatography to compare his own aspirin with pure samples of aspirin and salicylic acid.

The diagram shows his chromatogram.




**(i)** Based on the chromatogram, is the student's aspirin pure or impure? Explain your answer.

.....

.....[2]

**(ii)** Explain why salicylic acid moves further up the filter paper than pure aspirin.

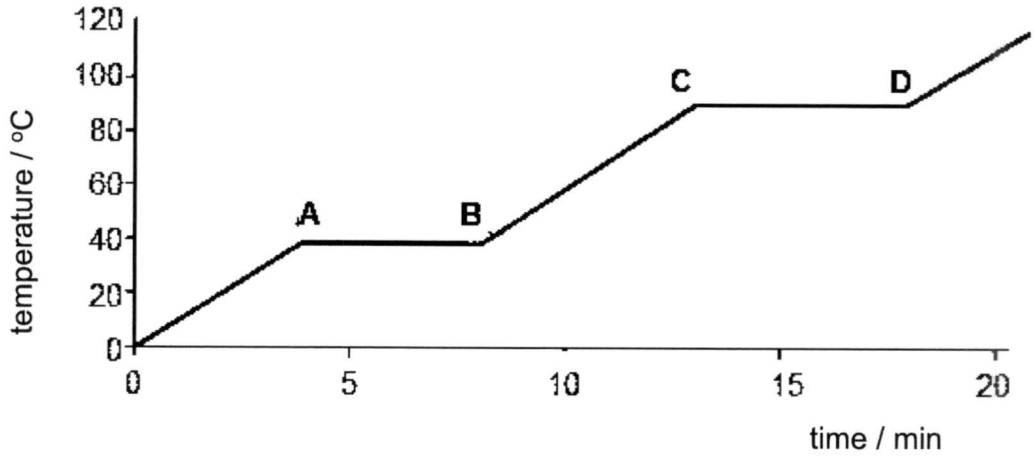
.....

.....[1]

**(iii)** Draw a labelled diagram to show how the chromatography apparatus was set up.

[2]

**2** The graph below shows the heating curve for solid **X**.




**(a)** What is the melting point of **X**?

.....[1]

**(b)** Suggest why the temperature remained constant along the line **AB** and **CD**.

.....

.....

.....[2]

**(c)** Is **X** a pure substance or a mixture? Explain your answer.

.....

.....

.....[2]

**(d)** Could **X** be pure water? Explain your answer.

.....

.....

.....[2]

3 The boxes below contain information about substances, **A**, **B**, **C**, **D** and **E**.

Substance **A** is a grey solid and is attracted to a magnet. It cannot be decomposed into simpler substances.

A chemical reaction takes place and heat is liberated when this white solid, **B**, is formed.

Substance **C** is a red solid and has a fixed composition. It decomposes to mercury and oxygen when heated.

Substance **D** is a blue liquid. When this liquid is distilled, a colourless liquid is collected.

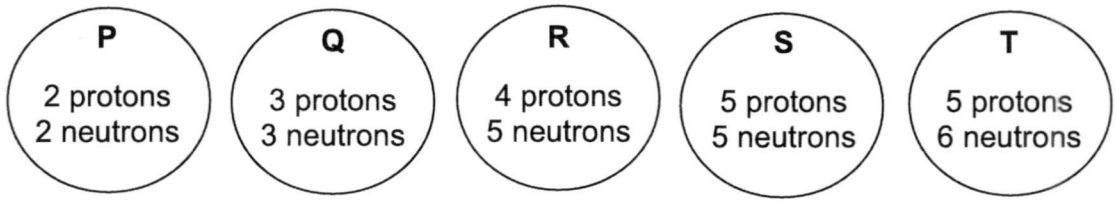
A colourless substance, **E**, has a fixed melting point and a fixed boiling point.

Decide whether each substance should be classified as an element, compound, mixture, or either an element or a compound.
Show your decision by ticking (✓) the correct box for each substance in the table below.

| substance | element | compound | mixture | either an element or a compound |
|---|---|---|---|---|
| **A** | | | | |
| **B** | | | | |
| **C** | | | | |
| **D** | | | | |
| **E** | | | | |

[5]

**4** The diagram shows the nuclei of five different atoms.
The nuclei are labelled **P**, **Q**, **R**, **S** and **T**. These are **not** symbols of elements.




Which letter or letters from **P**, **Q**, **R**, **S** and **T** represent

**(a)** the nucleus of an atom with a mass number of six,

..... [1]

**(b)** the nucleus of an atom of a noble gas,

..... [1]

**(c)** two nuclei from different isotopes of the same element,

..... [1]

**(d)** the nucleus of an atom that will form bonds with two atoms of chlorine,

..... [1]

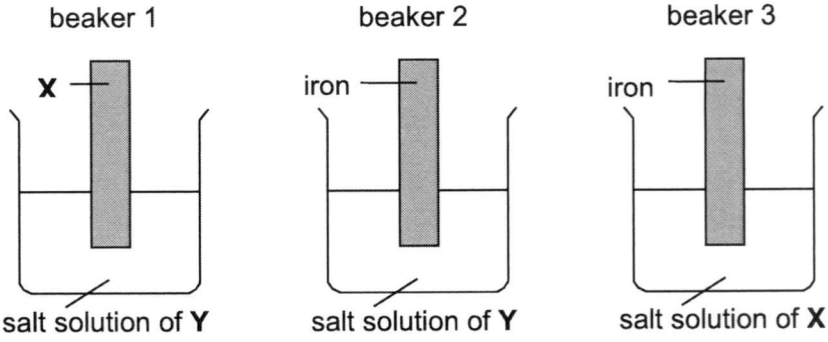
**(e)** the nucleus of an atom with only one electron in its outer shell,

..... [1]

**(f)** the nucleus of an atom in Period 1 of the Periodic Table?

..... [1]

**5** A student wanted to determine the relative reactivity of three metals, **X**, **Y** and iron.
**X** and **Y** are grey and pinkish-brown respectively.
He carried out the experiments as shown in the diagrams below.




| observations: | **Y** displaced and bubbles were seen | **Y** displaced | no visible change |
|---|---|---|---|

**(a)** Place these three metals in order of increasing reactivity.

.....[1]

**(b)** Suggest reasons for the observations made in beaker 1.

.....

.....

.....

.....[2]

**(c)** Suggest the identity of metal **Y**.

.....[1]

**(d)** Stainless steel is an alloy of iron which contains approximately 20% chromium mixed with iron and some small amounts of other metals.
Explain why stainless steel is much harder than pure iron.

.....

.....

.....[2]

**(e)** Describe how iron machinery can be prevented from rusting.

.....[1]

**End of Section A**

## Section B

Answer **all** questions.
Write your answers on the writing paper provided.

**6** Chlorine is an element in Group VII and consists of diatomic molecules. It is a non-conductor of electricity and has a low boiling point.

**(a)** Draw a dot-and-cross diagram to show the bonding in chlorine gas at room temperature and pressure. Show the outer shell electrons only. [2]

**(b)** Explain why chlorine

**(i)** has a low boiling point,

**(ii)** cannot conduct electricity. [2]

**(c)** Chlorine atoms can also combine with atoms of metals such as potassium to form compounds that have high melting points and are good conductors of electricity when molten.

**(i)** Draw a dot-and-cross diagram to show the arrangement of electrons in potassium chloride. Show the outer shell electrons only. [2]

**(ii)** Explain why the melting point of potassium chloride is very high. [1]

**(d)** **(i)** A jet of chlorine gas is bubbled into a solution of potassium bromide and the colourless solution turns brown.

Explain why the potassium bromide solution turns brown. [2]

**(ii)** The experiment in **(d)(i)** is repeated but the chlorine gas is replaced with aqueous iodine.

State what you would expect to see. [1]

**7** **(a)** Elements with atomic numbers 3, 11 and 19 are in the same group of the Periodic Table. Use the electronic structures of these **three** elements to explain why they are found in the same group of the Periodic Table. [2]

**(b)** Elements with atomic numbers 11 and 19 have similar chemical reactions. Describe **two** of these similar reactions. Write chemical equations for **two** of the reactions you have described. Include state symbols. [6]

**(c)** Across a period, the elements show a trend from metallic to non-metallic character. Explain why. [2]

**End of Paper**

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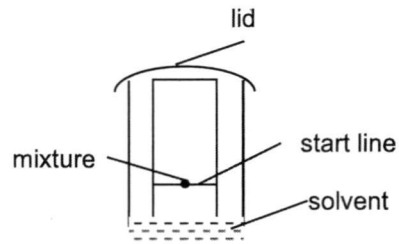
# Marking Scheme

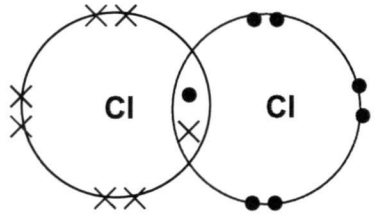
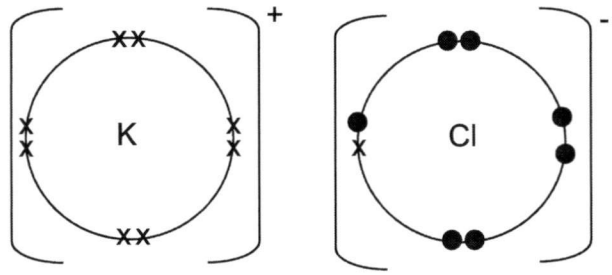
**Geylang Methodist School (Secondary)**
**End-of-Year Exam 2017**
**Sec 3 Express**
**Science(Chemistry) 5076 / 5078**

**Pqper 1**

| | | | | | |
|---|---|---|---|---|---|
| 1 | C | 6 | D | 11 | C |
| 2 | A | 7 | A | 12 | D |
| 3 | D | 8 | C | 13 | C |
| 4 | A | 9 | A | 14 | B |
| 5 | A | 10 | B | 15 | B |

**Paper 3**

| Qns | Answers | Marks |
|---|---|---|
| 1a(i) | carbon, hydrogen, oxygen | minus 1 mark for each mistake |
| (ii) | covalent bond | 1 |
| (iii) | $CaCO_3$<br>$Na_2O$ | 1<br>1 |
| b(i) | Impure.<br>It consists of aspirin and salicylic acid. | 1<br>1 |
| (ii) | Salicylic acid is <u>more soluble</u> in the solvent will <u>move further up</u> the filter paper than aspirin that is less soluble in the same solvent. | 1 |
| (iii) |  | 1 – label<br>1 – suitable diagram |
| | | |
| 2a | 40 °C | 1 |
| b | <u>Energy is absorbed</u> to <u>overcome the forces of attraction between particles instead of increasing the temperature of the substance</u> to change the physical states during melting and boiling. | 1<br>1 |
| c | X is a pure substance.<br>It has a fixed melting point and boiling point. | 1<br>1 |
| d | No.<br>The boiling point of water is 100 °C but the boiling point of substance X is 90 °C. | 1<br>1 |

| Qns | Answers | Marks |
|---|---|---|
| 3 | Substance A: Element<br>Substance B: Compound<br>Substance C: Compound<br>Substance D: Mixture<br>Substance E: Either an element or a compound | 1<br>1<br>1<br>1<br>1 |
| | | |
| 4a | Q | 1 |
| b | P | 1 |
| c | S and T | 1 |
| d | R | 1 |
| e | Q | 1 |
| f | P | 1 |
| | | |
| 5a | Y, Fe, X | 1 |
| b | Y was displaced from its salt solution because metal X is more reactive than Y.<br><br>Bubbles were produced because X is a very reactive metal which reacts with water in the solution. | 1<br><br>1 |
| c | copper (do not accept any metal less reactive than Fe) | 1 |
| d | Atoms of different sizes are added to make alloys.<br><br>Orderly arrangement of metal atoms is disrupted, making it difficult for the layers of atoms to slide over one another. | 1<br><br>1 |
| e | Using surface protection eg oiling or greasing | 1 |
| | | |
| 6a |  | 2<br>(deduct 1m for each mistake) |
| b(i) | A small amount of energy is needed to overcome the weak intermolecular forces between the chlorine molecules. | 1 |
| (ii) | There are no ions or free electrons in chlorine molecules. | 1 |
| c |  | 1<br><br>1 |
| (ii) | Ions are held by very strong attractive forces. | 1 |

| Qns | Answers | Marks |
|---|---|---|
| d(i) | Chlorine displaces the bromine from potassium bromide solution as chlorine is more reactive than bromine. | 1<br>1 |
| (ii) | No visible reaction | 1 |
| | | |
| 7a | lithium: 2.1<br>sodium: 2.8.1<br>potassium: 2.8.8.1<br><br>They have the same number of valence electrons. All the elements have one valence electron. | } 1 |
| b | They react with water to form metal hydroxides and hydrogen gas.<br>They react with acids to form salts and hydrogen gas.<br>They react with oxygen to form metal oxides.<br>(any 2 reactions)<br><br>$2Na\ (s) + 2H_2O\ (l) \rightarrow 2NaOH\ (aq) + H_2\ (g)$<br>$2Na\ (s) + 2HCl\ (aq) \rightarrow 2NaCl\ (aq) + H_2\ (g)$<br>$4Na\ (s) + O_2\ (g) \rightarrow 2Na_2O\ (s)$<br><br>$2K\ (s) + 2H_2O\ (l) \rightarrow 2KOH\ (aq) + H_2\ (g)$<br>$2K\ (s) + 2HCl\ (aq) \rightarrow 2KCl\ (aq) + H_2\ (g)$<br>$4K\ (s) + O_2\ (g) \rightarrow 2K_2O\ (s)$<br><br>(any 2 equations) | 1<br><br>1 or<br>1<br><br>correct equations – 1m each<br>correct state symbols – 1m |
| c | Across a period, there is an increase in number of valence electrons.<br>The elements tend to accept electrons instead of giving away electrons. | 1<br><br>1 |