

Candidate Name \_\_\_\_\_

| Class | Register No. |
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**PEIRCE SECONDARY SCHOOL  
MID YEAR EXAMINATION 2019  
SECONDARY THREE EXPRESS**

**SCIENCE (CHEMISTRY)  
Paper 1 (Multiple Choice)**

**5076/01, 5078/01  
15 May 2019**

Additional Materials: Multiple Choice Answer Sheet

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

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

Write your name, class and register number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **twenty** 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 Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Data Sheet is printed on page 9.

A copy of the Periodic Table is printed on page 10.

The use of an approved scientific calculator is expected, where appropriate.

|                               |                           |  |
|-------------------------------|---------------------------|--|
| <b>PARENT'S<br/>SIGNATURE</b> | <b>For Examiner's Use</b> |  |
|                               | <b>Total</b>              |  |

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This paper consists of **9** printed pages and 1 blank page.

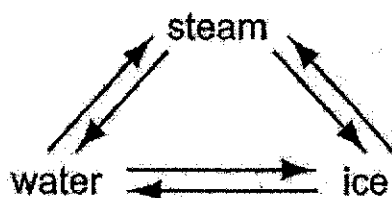
Setter: Mr Tan Kok Heong

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- 1 Which of the statements about the behaviour of the particles in a gas is **not** correct?
- A They move in random directions.  
 B They are arranged in an orderly pattern.  
 C They are spaced far apart from one another.  
 D They spread throughout the vessel in which they are contained.
- 2 In which conversion do water molecules gain speed?



- A ice → steam  
 B steam → ice  
 C steam → water  
 D water → ice
- 3 Three substances have the following properties:

substance 1 is brittle;

substance 2 melts at 8 °C and boils at 180 °C;

substance 3 has a high melting point of 800 °C.

What is the state of each substance at room temperature and pressure?

|          | <i>substance 1</i> | <i>substance 2</i> | <i>substance 3</i> |
|----------|--------------------|--------------------|--------------------|
| <b>A</b> | gas                | liquid             | solid              |
| <b>B</b> | solid              | gas                | solid              |
| <b>C</b> | solid              | liquid             | solid              |
| <b>D</b> | solid              | gas                | gas                |

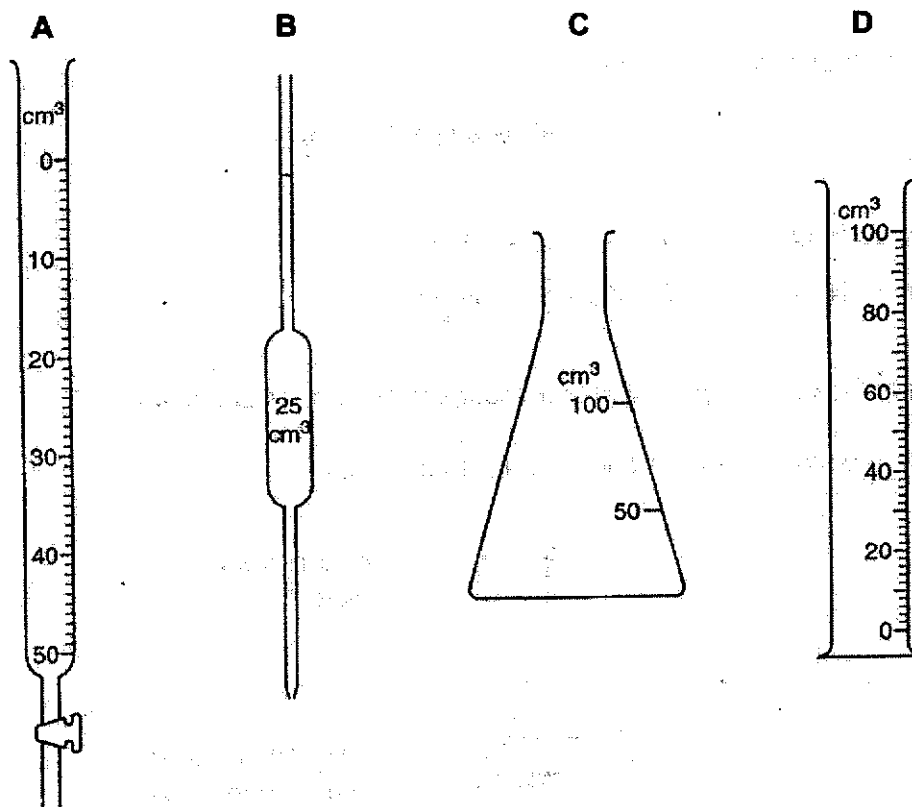
- 4 The table below lists the properties of oxygen and carbon dioxide.

| name of gas    | density                  | solubility of gas     |
|----------------|--------------------------|-----------------------|
| oxygen         | slightly denser than air | very slightly soluble |
| carbon dioxide | denser than air          | slightly soluble      |

Which is the best method to collect each gas?

|          | oxygen                | carbon dioxide        |
|----------|-----------------------|-----------------------|
| <b>A</b> | displacement of water | downward delivery     |
| <b>B</b> | displacement of water | upward delivery       |
| <b>C</b> | upward delivery       | displacement of water |
| <b>D</b> | upward delivery       | downward delivery     |

- 5 Which piece of apparatus is most suitable for accurately measuring out 23.45 cm<sup>3</sup> of water?



6 What is the S.I. unit for measuring volume of a liquid?

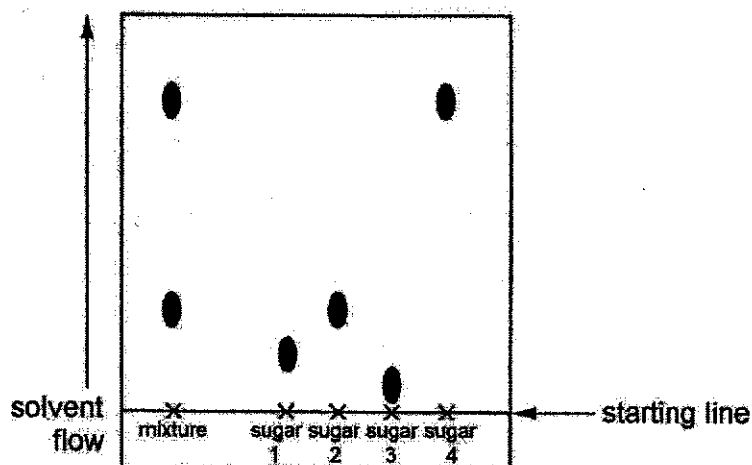
- A  $\text{mm}^3$
- B  $\text{cm}^3$
- C  $\text{dm}^3$
- D  $\text{m}^3$

7 Copper(II) sulfate crystals can be separated from sand by using the processes shown.

What is the correct order for the processes?

|          | <i>first</i> | →         | <i>last</i> |             |
|----------|--------------|-----------|-------------|-------------|
| <b>A</b> | filter       | dissolve  | evaporate   | crystallise |
| <b>B</b> | dissolve     | evaporate | crystallise | filter      |
| <b>C</b> | dissolve     | evaporate | filter      | crystallise |
| <b>D</b> | dissolve     | filter    | evaporate   | crystallise |

8 A mixture of two sugars was compared with four different sugars using chromatography. The results are shown in the diagram.



Which two sugars does this mixture contain?

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

- 9 Which statement about pure sodium chloride, NaCl, is correct?
- A It boils over a range of temperatures.
  - B It decomposes into sodium and chlorine upon heating.
  - C It melts at a fixed temperature.
  - D It is insoluble in water.
- 10 What is the total number of elements present in one unit of chromium(III) picolinate,  $\text{Cr}(\text{C}_6\text{H}_4\text{NO}_2)_3$ ?
- A 5
  - B 6
  - C 17
  - D 40
- 11 Which list contains an element, a compound and a mixture?
- A Air, carbon dioxide, carbon monoxide
  - B Air, distilled water, iron filings
  - C Distilled water, magnesium ribbon, oxygen gas
  - D Tap water, iron filings, magnesium ribbon
- 12 Which statement about the particles  ${}^{19}_9\text{F}^-$ ,  ${}^{20}_{10}\text{Ne}$  and  ${}^{23}_{11}\text{Na}^+$  is correct?
- A They all contain more electrons than protons.
  - B They all contain more neutrons than protons.
  - C They all contain the same number of electrons.
  - D They all contain the same number of protons.
- 13 A particle has 10 electrons, 7 protons and 8 neutrons.
- What is the symbol for the particle?
- A  $\text{N}^{3-}$
  - B  $\text{O}^{2-}$
  - C  $\text{F}^-$
  - D Ne

14 The atoms of element X have the electronic configuration 2, 8, 6.

Which statement about element X is correct?

- A It forms an ionic compound with sodium.
- B It forms an ion of charge 2+.
- C It has 6 protons in the outer shell of an atom.
- D It only reacts with non-metals.

15 Which statement about isotopes of the same element is correct?

- A They have different atomic numbers.
- B They have different chemical reactivities.
- C They have different nucleon numbers.
- D They have different numbers of electrons.

16 Which statement describes the formation of a fluoride ion from a fluorine atom?

- A The atom gains one electron.
- B The atom gains two electrons.
- C The atom loses one electron.
- D The atom loses two electrons.

17 What is the correct formula of ammonium sulfate?

- A  $\text{NH}_3\text{SO}_4$
- B  $\text{NH}_4(\text{SO}_4)_2$
- C  $(\text{NH}_3)_2\text{SO}_4$
- D  $(\text{NH}_4)_2\text{SO}_4$

18 The elements X and Y form the compound  $X_2Y$ .

What is the correct electronic configuration of the atoms X and Y?

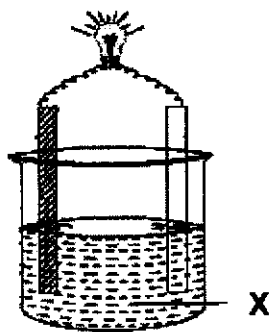
|          | electronic configuration |           |
|----------|--------------------------|-----------|
|          | atom of X                | atom of Y |
| <b>A</b> | 2, 1                     | 2, 7      |
| <b>B</b> | 2, 2                     | 2, 7      |
| <b>C</b> | 2, 1                     | 2, 6      |
| <b>D</b> | 2, 2                     | 2, 6      |

19 Which two elements combine to form an ionic compound?

- A** carbon and oxygen
- B** calcium and fluorine
- C** hydrogen and fluorine
- D** nitrogen and oxygen

20 The diagram below shows an experimental setup. In this experiment, the lamp lights up once water is added to substance X.

Which is most likely to be the identity of substance X?



- A** kerosene
- B** sodium chloride
- C** sugar
- D** sulfur



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**DATA SHEET****Colours of Some Common Metal Hydroxides**

|                      |            |
|----------------------|------------|
| calcium hydroxide    | white      |
| copper(II) hydroxide | light blue |
| iron(II) hydroxide   | green      |
| iron(III) hydroxide  | red-brown  |
| lead(II) hydroxide   | white      |
| zinc hydroxide       | white      |

# The Periodic Table of Elements

| I                         |                           | Group                    |                             |                            |                                 |                            |                            |                            |                            |                             |                            | VII                          |                              | 0                         |                               |                            |                              |                                 |                            |                              |                           |                            |                              |                                |                               |                               |                              |                             |                               |                              |                              |                            |    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                    |                                |                                |                                |                                |                                |                                |                                |                                |
| 3<br>Li<br>lithium<br>7   | 4<br>Be<br>beryllium<br>9 | 11<br>Na<br>sodium<br>23 | 12<br>Mg<br>magnesium<br>24 | 19<br>K<br>potassium<br>39 | 20<br>Ca<br>calcium<br>40       | 21<br>Sc<br>scandium<br>45 | 22<br>Ti<br>titanium<br>48 | 23<br>V<br>vanadium<br>51  | 24<br>Cr<br>chromium<br>52 | 25<br>Mn<br>manganese<br>55 | 26<br>Fe<br>iron<br>56     | 27<br>Co<br>cobalt<br>59     | 28<br>Ni<br>nickel<br>58     | 29<br>Cu<br>copper<br>64  | 30<br>Zn<br>zinc<br>65        | 31<br>Ga<br>gallium<br>70  | 32<br>Ge<br>germanium<br>73  | 33<br>As<br>arsenic<br>75       | 34<br>Se<br>selenium<br>79 | 35<br>Br<br>bromine<br>80    | 36<br>Kr<br>krypton<br>84 | 37<br>Rb<br>rubidium<br>85 | 38<br>Sr<br>strontium<br>88  | 39<br>Y<br>yttrium<br>89       | 40<br>Zr<br>zirconium<br>91   | 41<br>Nb<br>niobium<br>93     | 42<br>Mo<br>molybdenum<br>96 | 43<br>Tc<br>technetium<br>- | 44<br>Ru<br>ruthenium<br>101  | 45<br>Rh<br>rhodium<br>103   | 46<br>Pd<br>palladium<br>106 | 47<br>Ag<br>silver<br>108  | 48<br>Cd<br>cadmium<br>112 | 49<br>In<br>indium<br>115   | 50<br>Sn<br>tin<br>119       | 51<br>Sb<br>antimony<br>122    | 52<br>Te<br>tellurium<br>128   | 53<br>I<br>iodine<br>127       | 54<br>Xe<br>xenon<br>131       | 55<br>Cs<br>caesium<br>133     | 56<br>Ba<br>barium<br>137      | 57-71<br>lanthanoids           | 58<br>La<br>lanthanum<br>139   | 59<br>Ce<br>cerium<br>140      | 60<br>Pr<br>praseodymium<br>141 | 61<br>Nd<br>neodymium<br>144   | 62<br>Pm<br>promethium<br>-    | 63<br>Sm<br>samarium<br>150    | 64<br>Eu<br>europium<br>152    | 65<br>Gd<br>gadolinium<br>157  | 66<br>Tb<br>terbium<br>159     | 67<br>Dy<br>dysprosium<br>163  | 68<br>Er<br>erbium<br>167      | 69<br>Tm<br>thulium<br>169     | 70<br>Yb<br>ytterbium<br>173   | 71<br>Lu<br>lutetium<br>175    |                                |                                |                                |                                |                                |                                |                    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| 87<br>Fr<br>francium<br>- | 88<br>Ra<br>radium<br>-   | 89-103<br>actinoids      | 89<br>Ac<br>actinium<br>-   | 90<br>Th<br>thorium<br>232 | 91<br>Pa<br>protactinium<br>231 | 92<br>U<br>uranium<br>238  | 93<br>Np<br>neptunium<br>- | 94<br>Pu<br>plutonium<br>- | 95<br>Am<br>americium<br>- | 96<br>Cm<br>curium<br>-     | 97<br>Bk<br>berkelium<br>- | 98<br>Cf<br>californium<br>- | 99<br>Es<br>einsteinium<br>- | 100<br>Fm<br>fermium<br>- | 101<br>Md<br>mendelevium<br>- | 102<br>No<br>nobelium<br>- | 103<br>Lr<br>lawrencium<br>- | 104<br>Rf<br>rutherfordium<br>- | 105<br>Db<br>dubnium<br>-  | 106<br>Sg<br>seaborgium<br>- | 107<br>Bh<br>bohrium<br>- | 108<br>Hs<br>hassium<br>-  | 109<br>Mt<br>meitnerium<br>- | 110<br>Ds<br>darmstadtium<br>- | 111<br>Rg<br>roentgenium<br>- | 112<br>Cn<br>copernicium<br>- | 113<br>Nh<br>nihonium<br>-   | 114<br>Fl<br>flerovium<br>- | 115<br>Lv<br>livermorium<br>- | 116<br>Ts<br>tennessine<br>- | 117<br>Og<br>oganesson<br>-  | 118<br>Xt<br>xtennium<br>- | 119<br>Uu<br>ununium<br>-  | 120<br>Uub<br>ununbium<br>- | 121<br>Uut<br>ununtrium<br>- | 122<br>Uuq<br>ununquadium<br>- | 123<br>Uuq<br>ununquadium<br>- | 124<br>Uuq<br>ununquadium<br>- | 125<br>Uuq<br>ununquadium<br>- | 126<br>Uuq<br>ununquadium<br>- | 127<br>Uuq<br>ununquadium<br>- | 128<br>Uuq<br>ununquadium<br>- | 129<br>Uuq<br>ununquadium<br>- | 130<br>Uuq<br>ununquadium<br>- | 131<br>Uuq<br>ununquadium<br>-  | 132<br>Uuq<br>ununquadium<br>- | 133<br>Uuq<br>ununquadium<br>- | 134<br>Uuq<br>ununquadium<br>- | 135<br>Uuq<br>ununquadium<br>- | 136<br>Uuq<br>ununquadium<br>- | 137<br>Uuq<br>ununquadium<br>- | 138<br>Uuq<br>ununquadium<br>- | 139<br>Uuq<br>ununquadium<br>- | 140<br>Uuq<br>ununquadium<br>- | 141<br>Uuq<br>ununquadium<br>- | 142<br>Uuq<br>ununquadium<br>- | 143<br>Uuq<br>ununquadium<br>- | 144<br>Uuq<br>ununquadium<br>- | 145<br>Uuq<br>ununquadium<br>- | 146<br>Uuq<br>ununquadium<br>- | 147<br>Uuq<br>ununquadium<br>- | 148<br>Uuq<br>ununquadium<br>- | 149<br>Uuq<br>ununquadium<br>- | 150<br>Uuq<br>ununquadium<br>- | 151<br>Uuq<br>ununquadium<br>- | 152<br>Uuq<br>ununquadium<br>- | 153<br>Uuq<br>ununquadium<br>- | 154<br>Uuq<br>ununquadium<br>- | 155<br>Uuq<br>ununquadium<br>- | 156<br>Uuq<br>ununquadium<br>- | 157<br>Uuq<br>ununquadium<br>- | 158<br>Uuq<br>ununquadium<br>- | 159<br>Uuq<br>ununquadium<br>- | 160<br>Uuq<br>ununquadium<br>- | 161<br>Uuq<br>ununquadium<br>- | 162<br>Uuq<br>ununquadium<br>- | 163<br>Uuq<br>ununquadium<br>- | 164<br>Uuq<br>ununquadium<br>- | 165<br>Uuq<br>ununquadium<br>- | 166<br>Uuq<br>ununquadium<br>- | 167<br>Uuq<br>ununquadium<br>- | 168<br>Uuq<br>ununquadium<br>- | 169<br>Uuq<br>ununquadium<br>- | 170<br>Uuq<br>ununquadium<br>- | 171<br>Uuq<br>ununquadium<br>- | 172<br>Uuq<br>ununquadium<br>- | 173<br>Uuq<br>ununquadium<br>- | 174<br>Uuq<br>ununquadium<br>- | 175<br>Uuq<br>ununquadium<br>- | 176<br>Uuq<br>ununquadium<br>- | 177<br>Uuq<br>ununquadium<br>- | 178<br>Uuq<br>ununquadium<br>- | 179<br>Uuq<br>ununquadium<br>- | 180<br>Uuq<br>ununquadium<br>- | 181<br>Uuq<br>ununquadium<br>- | 182<br>Uuq<br>ununquadium<br>- | 183<br>Uuq<br>ununquadium<br>- | 184<br>Uuq<br>ununquadium<br>- | 185<br>Uuq<br>ununquadium<br>- | 186<br>Uuq<br>ununquadium<br>- | 187<br>Uuq<br>ununquadium<br>- | 188<br>Uuq<br>ununquadium<br>- | 189<br>Uuq<br>ununquadium<br>- | 190<br>Uuq<br>ununquadium<br>- | 191<br>Uuq<br>ununquadium<br>- | 192<br>Uuq<br>ununquadium<br>- | 193<br>Uuq<br>ununquadium<br>- | 194<br>Uuq<br>ununquadium<br>- | 195<br>Uuq<br>ununquadium<br>- | 196<br>Uuq<br>ununquadium<br>- | 197<br>Uuq<br>ununquadium<br>- | 198<br>Uuq<br>ununquadium<br>- | 199<br>Uuq<br>ununquadium<br>- | 200<br>Uuq<br>ununquadium<br>- | 201<br>Uuq<br>ununquadium<br>- | 202<br>Uuq<br>ununquadium<br>- | 203<br>Uuq<br>ununquadium<br>- | 204<br>Uuq<br>ununquadium<br>- | 205<br>Uuq<br>ununquadium<br>- | 206<br>Uuq<br>ununquadium<br>- | 207<br>Uuq<br>ununquadium<br>- | 208<br>Uuq<br>ununquadium<br>- | 209<br>Uuq<br>ununquadium<br>- | 210<br>Uuq<br>ununquadium<br>- | 211<br>Uuq<br>ununquadium<br>- | 212<br>Uuq<br>ununquadium<br>- | 213<br>Uuq<br>ununquadium<br>- | 214<br>Uuq<br>ununquadium<br>- | 215<br>Uuq<br>ununquadium<br>- | 216<br>Uuq<br>ununquadium<br>- | 217<br>Uuq<br>ununquadium<br>- | 218<br>Uuq<br>ununquadium<br>- | 219<br>Uuq<br>ununquadium<br>- | 220<br>Uuq<br>ununquadium<br>- | 221<br>Uuq<br>ununquadium<br>- | 222<br>Uuq<br>ununquadium<br>- | 223<br>Uuq<br>ununquadium<br>- | 224<br>Uuq<br>ununquadium<br>- | 225<br>Uuq<br>ununquadium<br>- | 226<br>Uuq<br>ununquadium<br>- | 227<br>Uuq<br>ununquadium<br>- | 228<br>Uuq<br>ununquadium<br>- | 229<br>Uuq<br>ununquadium<br>- | 230<br>Uuq<br>ununquadium<br>- | 231<br>Uuq<br>ununquadium<br>- | 232<br>Uuq<br>ununquadium<br>- | 233<br>Uuq<br>ununquadium<br>- | 234<br>Uuq<br>ununquadium<br>- | 235<br>Uuq<br>ununquadium<br>- | 236<br>Uuq<br>ununquadium<br>- | 237<br>Uuq<br>ununquadium<br>- | 238<br>Uuq<br>ununquadium<br>- | 239<br>Uuq<br>ununquadium<br>- | 240<br>Uuq<br>ununquadium<br>- | 241<br>Uuq<br>ununquadium<br>- | 242<br>Uuq<br>ununquadium<br>- | 243<br>Uuq<br>ununquadium<br>- | 244<br>Uuq<br>ununquadium<br>- | 245<br>Uuq<br>ununquadium<br>- | 246<br>Uuq<br>ununquadium<br>- | 247<br>Uuq<br>ununquadium<br>- | 248<br>Uuq<br>ununquadium<br>- | 249<br>Uuq<br>ununquadium<br>- | 250<br>Uuq<br>ununquadium<br>- | 251<br>Uuq<br>ununquadium<br>- | 252<br>Uuq<br>ununquadium<br>- | 253<br>Uuq<br>ununquadium<br>- | 254<br>Uuq<br>ununquadium<br>- | 255<br>Uuq<br>ununquadium<br>- | 256<br>Uuq<br>ununquadium<br>- | 257<br>Uuq<br>ununquadium<br>- | 258<br>Uuq<br>ununquadium<br>- | 259<br>Uuq<br>ununquadium<br>- | 260<br>Uuq<br>ununquadium<br>- | 261<br>Uuq<br>ununquadium<br>- | 262<br>Uuq<br>ununquadium<br>- | 263<br>Uuq<br>ununquadium<br>- | 264<br>Uuq<br>ununquadium<br>- | 265<br>Uuq<br>ununquadium<br>- | 266<br>Uuq<br>ununquadium<br>- | 267<br>Uuq<br>ununquadium<br>- | 268<br>Uuq<br>ununquadium<br>- | 269<br>Uuq<br>ununquadium<br>- | 270<br>Uuq<br>ununquadium<br>- | 271<br>Uuq<br>ununquadium<br>- | 272<br>Uuq<br>ununquadium<br>- | 273<br>Uuq<br>ununquadium<br>- | 274<br>Uuq<br>ununquadium<br>- | 275<br>Uuq<br>ununquadium<br>- | 276<br>Uuq<br>ununquadium<br>- | 277<br>Uuq<br>ununquadium<br>- | 278<br>Uuq<br>ununquadium<br>- | 279<br>Uuq<br>ununquadium<br>- | 280<br>Uuq<br>ununquadium<br>- | 281<br>Uuq<br>ununquadium<br>- | 282<br>Uuq<br>ununquadium<br>- | 283<br>Uuq<br>ununquadium<br>- | 284<br>Uuq<br>ununquadium<br>- | 285<br>Uuq<br>ununquadium<br>- | 286<br>Uuq<br>ununquadium<br>- | 287<br>Uuq<br>ununquadium<br>- | 288<br>Uuq<br>ununquadium<br>- | 289<br>Uuq<br>ununquadium<br>- | 290<br>Uuq<br>ununquadium<br>- | 291<br>Uuq<br>ununquadium<br>- | 292<br>Uuq<br>ununquadium<br>- | 293<br>Uuq<br>ununquadium<br>- | 294<br>Uuq<br>ununquadium<br>- | 295<br>Uuq<br>ununquadium<br>- | 296<br>Uuq<br>ununquadium<br>- | 297<br>Uuq<br>ununquadium<br>- | 298<br>Uuq<br>ununquadium<br>- | 299<br>Uuq<br>ununquadium<br>- | 300<br>Uuq<br>ununquadium<br>- | 301<br>Uuq<br>ununquadium<br>- | 302<br>Uuq<br>ununquadium<br>- | 303<br>Uuq<br>ununquadium<br>- | 304<br>Uuq<br>ununquadium<br>- | 305<br>Uuq<br>ununquadium<br>- | 306<br>Uuq<br>ununquadium<br>- | 307<br>Uuq<br>ununquadium<br>- | 308<br>Uuq<br>ununquadium<br>- | 309<br>Uuq<br>ununquadium<br>- | 310<br>Uuq<br>ununquadium<br>- | 311<br>Uuq<br>ununquadium<br>- | 312<br>Uuq<br>ununquadium<br>- | 313<br>Uuq<br>ununquadium<br>- | 314<br>Uuq<br>ununquadium<br>- | 315<br>Uuq<br>ununquadium<br>- | 316<br>Uuq<br>ununquadium<br>- | 317<br>Uuq<br>ununquadium<br>- | 318<br>Uuq<br>ununquadium<br>- | 319<br>Uuq<br>ununquadium<br>- | 320<br>Uuq<br>ununquadium<br>- | 321<br>Uuq<br>ununquadium<br>- | 322<br>Uuq<br>ununquadium<br>- | 323<br>Uuq<br>ununquadium<br>- | 324<br>Uuq<br>ununquadium<br>- | 325<br>Uuq<br>ununquadium<br>- | 326<br>Uuq<br>ununquadium<br>- | 327<br>Uuq<br>ununquadium<br>- | 328<br>Uuq<br>ununquadium<br>- | 329<br>Uuq<br>ununquadium<br>- | 330<br>Uuq<br>ununquadium<br>- | 331<br>Uuq<br>ununquadium<br>- | 332<br>Uuq<br>ununquadium<br>- | 333<br>Uuq<br>ununquadium<br>- | 334<br>Uuq<br>ununquadium<br>- | 335<br>Uuq<br>ununquadium<br>- | 336<br>Uuq<br>ununquadium<br>- | 337<br>Uuq<br>ununquadium<br>- | 338<br>Uuq<br>ununquadium<br>- | 339<br>Uuq<br>ununquadium<br>- | 340<br>Uuq<br>ununquadium<br>- | 341<br>Uuq<br>ununquadium<br>- | 342<br>Uuq<br>ununquadium<br>- | 343<br>Uuq<br>ununquadium<br>- | 344<br>Uuq<br>ununquadium<br>- | 345<br>Uuq<br>ununquadium<br>- | 346<br>Uuq<br>ununquadium<br>- | 347<br>Uuq<br>ununquadium<br>- | 348<br>Uuq<br>ununquadium<br>- | 349<br>Uuq<br>ununquadium<br>- | 350<br>Uuq<br>ununquadium<br>- | 351<br>Uuq<br>ununquadium<br>- | 352<br>Uuq<br>ununquadium<br>- | 353<br>Uuq<br>ununquadium<br>- | 354<br>Uuq<br>ununquadium<br>- | 355<br>Uuq<br>ununquadium<br>- | 356<br>Uuq<br>ununquadium<br>- | 357<br>Uuq<br>ununquadium<br>- | 358<br>Uuq<br>ununquadium<br>- | 359<br>Uuq<br>ununquadium<br>- | 360<br>Uuq<br>ununquadium<br>- | 361<br>Uuq<br>ununquadium<br>- | 362<br>Uuq<br>ununquadium<br>- | 363<br>Uuq<br>ununquadium<br>- | 364<br>Uuq<br>ununquadium<br>- | 365<br>Uuq<br>ununquadium<br>- | 366<br>Uuq<br>ununquadium<br>- | 367<br>Uuq<br>ununquadium<br>- | 368<br>Uuq<br>ununquadium<br>- | 369<br>Uuq<br>ununquadium<br>- | 370<br>Uuq<br>ununquadium<br>- | 371<br>Uuq<br>ununquadium<br>- | 372<br>Uuq<br>ununquadium<br>- | 373<br>Uuq<br>ununquadium<br>- | 374<br>Uuq<br>ununquadium<br>- | 375<br>Uuq<br>ununquadium<br>- | 376<br>Uuq<br>ununquadium<br>- | 377<br>Uuq<br>ununquadium<br>- | 378<br>Uuq<br>ununquadium<br>- | 379<br>Uuq<br>ununquadium<br>- | 380<br>Uuq<br>ununquadium<br>- | 381<br>Uuq<br>ununquadium<br>- | 382<br>Uuq<br>ununquadium<br>- | 383<br>Uuq<br>ununquadium<br>- | 384<br>Uuq<br>ununquadium<br>- | 385<br>Uuq<br>ununquadium<br>- | 386<br>Uuq<br>ununquadium<br>- | 387<br>Uuq<br>ununquadium<br>- | 388<br>Uuq<br>ununquadium<br>- | 389<br>Uuq<br>ununquadium<br>- | 390<br>Uuq<br>ununquadium<br>- | 391<br>Uuq<br>ununquadium<br>- | 392<br>Uuq<br>ununquadium<br>- | 393<br>Uuq<br>ununquadium<br>- | 394<br>Uuq<br>ununquadium<br>- | 395<br>Uuq<br>ununquadium<br>- | 396<br>Uuq<br>ununquadium<br>- | 397<br>Uuq<br>ununquadium<br>- | 398<br>Uuq<br>ununquadium<br>- | 399<br>Uuq<br>ununquadium<br>- | 400<br>Uuq<br>ununquadium<br>- |

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

lanthanoids

actinoids

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

Candidate Name \_\_\_\_\_

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**PEIRCE SECONDARY SCHOOL  
MID-YEAR EXAMINATION 2019  
SECONDARY THREE EXPRESS**

**SCIENCE (CHEMISTRY)  
Paper 3**

**5076/03, 5078/03  
7 May 2019**

Candidates answer on the Question Paper.  
No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your name, class and register number.  
You may use an HB pencil for any diagrams, graphs, tables or rough working.  
Write in dark blue or black pen.  
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 in the spaces provided on the question paper.

**Section B**

Answer any **two** questions.  
Write your answers in the spaces provided on the question paper.

A copy of the Data Sheet is printed on page 17.  
A copy of the Periodic Table is printed on page 18.

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.

|   |                           |  |
|---|---------------------------|--|
| <b>PARENT'S<br/>SIGNATURE</b><br><br><div style="border: 1px solid black; width: 150px; height: 50px; margin: 0 auto;"></div> | <b>For Examiner's Use</b> |  |
|   | <b>Section A</b>          |  |
|   | <b>Section B</b>          |  |
|   | <b>Total</b>              |  |

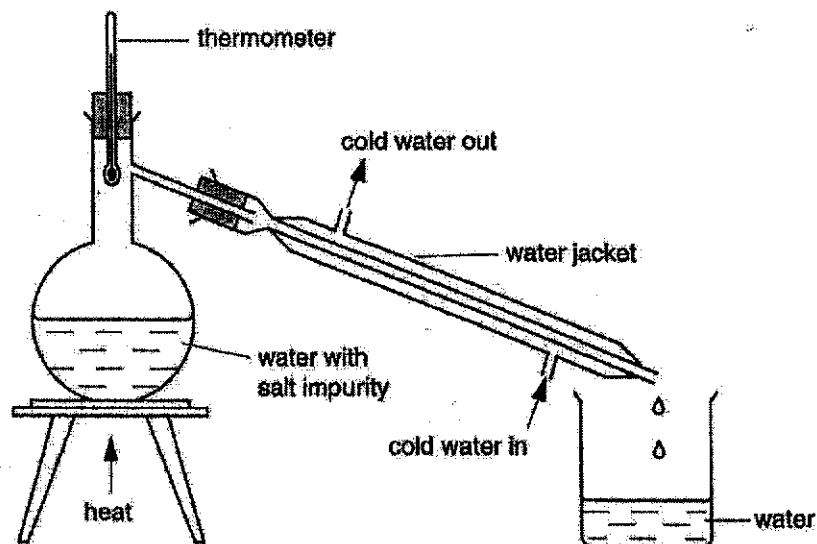
This paper consists of **18** printed pages and **0** blank pages.

Setter: Mr. Tan Kok Heong  
Partner in Learning

## Section A [45 marks]

Answer all the questions in the spaces provided.

- 1 A sample of water contains salt as an impurity. The apparatus shown below is used to produce pure water from the sample.



- (a) (i) Name the method of purification.

\_\_\_\_\_ [1]

- (ii) Suggest the purpose of the water jacket.

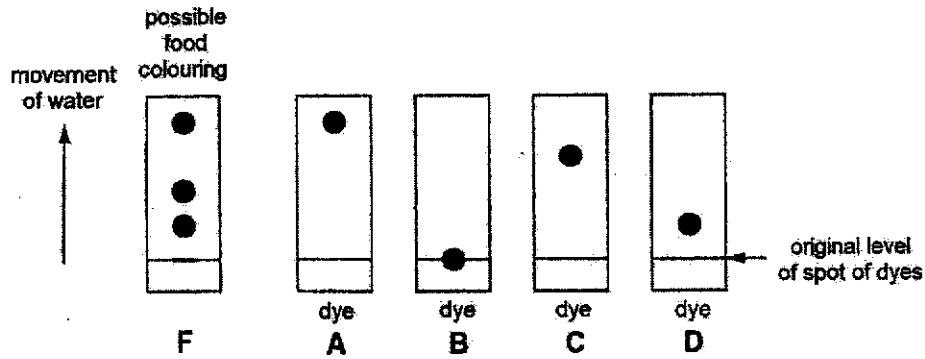
\_\_\_\_\_ [1]

- (b) What would be the reading on the thermometer during the purification?

\_\_\_\_\_ [1]

- (c) Draw a cross (x) on the diagram where the salt would be left after purification is complete. [1]

- 2 **F** is a mixture of dyes. It has been suggested that **F** might be used as a food colouring. Paper chromatography was used to identify the dyes in **F**. The resulting chromatograms are shown below. Dyes **A** and **C** have a bad effect on some people.



- (a) Which of the dyes **A**, **B**, **C** and **D** are present in **F**?

\_\_\_\_\_ [1]

- (b) Suggest which of the dyes is insoluble in water.

\_\_\_\_\_ [1]

- (c) Suggest why the mixture **F** should **not** be used as a food colouring.

\_\_\_\_\_  
 \_\_\_\_\_ [1]

- (d) Dye **B** contains two components. Suggest how you could change this chromatographic technique so as to separate these components.

\_\_\_\_\_  
 \_\_\_\_\_ [1]

3 Using Kinetic Particle Theory, explain why

(a) a solid has more mass than the same volume of gas;

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[1]

(b) a gas is easier to compress than a solid;

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[1]

(c) a liquid takes the shape of its container but a solid does not.

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[1]

4 Use the data in the table to answer the questions that follows.

| chemical name     | melting point/°C | boiling point/°C | chemical formula                 |
|-------------------|------------------|------------------|----------------------------------|
| ethanol           | -114             | 78               | C <sub>2</sub> H <sub>5</sub> OH |
| hydrogen          | -259             | -253             | H <sub>2</sub>                   |
| hydrogen chloride | -114             | -85              | HCl                              |
| iodine            | 114              | 183              | I <sub>2</sub>                   |
| oxygen            | -219             | -183             | O <sub>2</sub>                   |

(a) Which chemical is a liquid at a temperature of 20 °C?

\_\_\_\_\_ [1]

(b) Which chemical is a solid at a temperature of 20 °C and a liquid at a temperature of 150 °C?

\_\_\_\_\_ [1]

(c) Which chemical is a compound containing only two elements?

\_\_\_\_\_ [1]

(d) (i) Which chemical is a gas at a temperature of -200 °C?

\_\_\_\_\_ [1]

(ii) Which of A - D best represents the structure of a molecule of the chemical you have named in (d) (i)?



\_\_\_\_\_ [1]



5 Consider the following list of common substances.

air                      brass                      copper wire                      sea water  
                                 salt                                      sugar                                      water

Choose from this list a substance which

(a) is a mixture containing both elements and compounds,

\_\_\_\_\_ [1]

(b) is a mixture of compounds,

\_\_\_\_\_ [1]

(c) is a mixture of elements,

\_\_\_\_\_ [1]

(d) is a compound containing only two elements,

\_\_\_\_\_ [1]

(e) is a compound which contains carbon.

\_\_\_\_\_ [1]

(f) is an element that can conduct electricity.

\_\_\_\_\_ [1]

6  ${}^{12}_6\text{C}$  and  ${}^{14}_6\text{C}$  represent two different carbon isotopes.

(a) What does the number 12 and 14 represent?

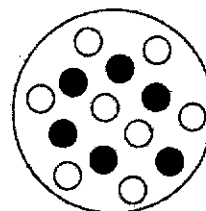
\_\_\_\_\_ [1]

(b) This diagram represents the nucleus in an atom of  ${}^{14}_6\text{C}$ .

Name the particles represent by:

○ \_\_\_\_\_

● \_\_\_\_\_



[2]

(c) How many electrons surround the nucleus of an atom of  ${}^{14}_6\text{C}$ ?

\_\_\_\_\_ [1]

(d) Make a similar drawing of the nucleus of an atom of  ${}^{12}_6\text{C}$ .

[1]

7 (a) Complete the table

| ion       | formula                  | number of protons | number of neutrons | number of electrons |
|-----------|--------------------------|-------------------|--------------------|---------------------|
| potassium | ${}^{39}_{19}\text{K}^+$ |                   |                    |                     |
| oxide     | ${}^{16}_8\text{O}^{2-}$ |                   |                    |                     |

[3]

(b) In a sample of 100 atoms of potassium, there are 94 atoms of  ${}^{39}\text{K}$  and 6 atoms of  ${}^{41}\text{K}$ .

(i) Explain why these two forms of potassium are isotopes.

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[1]

(ii) Find the total mass of the 100 atoms of potassium. Hence find the average relative mass of one atom.

[2]

- 8 The table shows the atomic structure of six particles, represented by the letters L to Q. The particles are atoms or ions. The letters are **not** the symbols of the elements.

| particle | electrons | protons | neutrons |
|----------|-----------|---------|----------|
| L        | 2         | 2       | 2        |
| M        | 6         | 6       | 6        |
| N        | 12        | 12      | 12       |
| O        | 10        | 12      | 12       |
| P        | 6         | 6       | 8        |
| Q        | 10        | 13      | 14       |

Use the letters L to Q to answer the following questions.

- (a) Which two particles are ions?

\_\_\_\_\_ and \_\_\_\_\_ [1]

- (b) Which particle is an atom of a noble gas?

\_\_\_\_\_ [1]

- (c) Which particle is an atom with a nucleon number of 24?

\_\_\_\_\_ [1]

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

\_\_\_\_\_ and \_\_\_\_\_ [1]

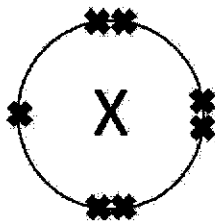
- (e) Which two particles are isotopes of the same element?

\_\_\_\_\_ and \_\_\_\_\_ [1]

- (f) Which particle has the highest atomic mass?

\_\_\_\_\_ [1]

- 9 The diagram below shows the valence shell electrons of an atom of element X.



- (a) What does the term "valence shell" mean?

\_\_\_\_\_ [1]

- (b) To which group of the Periodic Table does X belong to?

\_\_\_\_\_ [1]

- (c) (i) Predict the type of bonding present in the compound of X with sodium.

\_\_\_\_\_ [1]

- (ii) Draw a 'dot and cross' diagram to show the bonding between X and sodium. Your diagram should show valence shell only.

[2]

- (iii) Write the formula for the compound of element X with sodium.

\_\_\_\_\_ [1]

**Section B [20 marks]**

Answer any **two** questions from this section in the spaces provided.

**10 (a)** Name the pieces of apparatus best used to carry out the following procedures.

(i) Add  $180\text{ cm}^3$  of sugar solution to a beaker,

\_\_\_\_\_ [1]

(ii) Collect and measure the volume of more dense gas such as chlorine,

\_\_\_\_\_ [1]

(iii) Measure  $5.50\text{ g}$  of copper(II) oxide powder,

\_\_\_\_\_ [1]

(iv) Measure the boiling point of an ethanol,

\_\_\_\_\_ [1]

(v) Add  $18.90\text{ cm}^3$  of acid to a conical flask.

\_\_\_\_\_ [1]

- (b) Instructions for preparing hydrated crystals of copper(II) sulfate are given below.

Add excess of copper(II) oxide to 50 cm<sup>3</sup> of dilute sulfuric acid. Stir until copper(II) oxide no longer dissolves in the acid. Filter the mixture. Evaporate the filtrate to about one-third its volume. Allow the filtrate to cool. Filter off the crystals. Wash with cold distilled water. Dry them on filter paper. Do not heat the crystals.

Explain the importance on why the five underlined instructions had to be carried out.

- (i) Add excess of copper(II) oxide,

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (ii) Filter the mixture,

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (iii) Evaporate the filtrate to about one-third its volume,

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (iv) Allow the filtrate to cool,

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (v) Do not heat the crystals.

\_\_\_\_\_  
\_\_\_\_\_ [1]

11 (a) In a reaction, magnesium reacts with iron(III) chloride solution to form magnesium chloride solution and iron.

(i) Write the chemical formula for the following solution:

• iron(III) chloride \_\_\_\_\_ [1]

• magnesium chloride \_\_\_\_\_ [1]

(ii) State the type of bonding present in magnesium chloride.

\_\_\_\_\_ [1]

(iii) Describe how the purity of the magnesium chloride can be confirmed.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [1]



- (b) The table below shows properties of different gases at room temperature and pressure. Use the information below to answer the following questions.

| name of gas    | density (g/dm <sup>3</sup> ) | solubility in water |
|----------------|------------------------------|---------------------|
| helium         | 0.179                        | insoluble           |
| ammonia        | 0.681                        | soluble             |
| bromine vapour | 7.14                         | soluble             |

Density of air = 1.28 g/dm<sup>3</sup>

- (i) Sketch the apparatus that you would use to obtain helium from a mixture of helium and ammonia. Explain your choice.

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[3]

- (ii) Sketch the apparatus that you would use to obtain bromine from a mixture of bromine and ammonia. Explain your choice.

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[3]

12 Atoms with two electrons in their valence shell can combine with atoms with seven electrons in their valence shell.

(a) State the type of bonding present between the atoms.

\_\_\_\_\_ [1]

(b) Draw 'dot and cross' diagrams to show the combination between the atoms, showing valence electrons only. Name the compound formed.

Name \_\_\_\_\_ [3]

(c) Explain why

(i) molten ionic compounds will conduct electricity in the molten state,

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(ii) ionic compounds have high boiling point.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

- (d) Elements with proton numbers 3, 11 and 19 are in the same group of the Periodic Table. For these **three** elements, suggest one similarity and one difference in terms of the electronic structure.

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[2]

**DATA SHEET****Colours of Some Common Metal Hydroxides**

|                      |            |
|----------------------|------------|
| calcium hydroxide    | white      |
| copper(II) hydroxide | light blue |
| iron(II) hydroxide   | green      |
| iron(III) hydroxide  | red-brown  |
| lead(II) hydroxide   | white      |
| zinc hydroxide       | white      |



# The Periodic Table of Elements

|                         |                           | Group                    |                             |                            |                           |                            |                            |                           |                            |                             |                        |                          |                          |                          |                        |                           |                             |                           |                            |                           |                           |                            |                             |                          |                             |                           |                              |                             |                              |                            |                              |                           |                            |                           |                        |                             |                              |                          |                          |                            |                           |                      |                            |                             |                            |                            |                           |                            |                             |                         |                            |                             |                         |                            |                           |                           |                        |                           |                         |                     |                                 |                           |                              |                           |                           |                              |                                |                               |                               |       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|          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
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| I                       | II                        | III                      | IV                          | V                          | VI                        | VII                        |                            |                           |                            |                             |                        | 0                        |                          |                          |                        |                           |                             |                           |                            |                           |                           |                            |                             |                          |                             |                           |                              |                             |                              |                            |                              |                           |                            |                           |    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| 3<br>Li<br>lithium<br>7 | 4<br>Be<br>beryllium<br>9 | 11<br>Na<br>sodium<br>23 | 12<br>Mg<br>magnesium<br>24 | 19<br>K<br>potassium<br>39 | 20<br>Ca<br>calcium<br>40 | 21<br>Sc<br>scandium<br>45 | 22<br>Ti<br>titanium<br>48 | 23<br>V<br>vanadium<br>51 | 24<br>Cr<br>chromium<br>52 | 25<br>Mn<br>manganese<br>55 | 26<br>Fe<br>iron<br>56 | 27<br>Co<br>cobalt<br>59 | 28<br>Ni<br>nickel<br>59 | 29<br>Cu<br>copper<br>64 | 30<br>Zn<br>zinc<br>65 | 31<br>Ga<br>gallium<br>70 | 32<br>Ge<br>germanium<br>73 | 33<br>As<br>arsenic<br>75 | 34<br>Se<br>selenium<br>79 | 35<br>Br<br>bromine<br>80 | 36<br>Kr<br>krypton<br>84 | 37<br>Rb<br>rubidium<br>85 | 38<br>Sr<br>strontium<br>88 | 39<br>Y<br>yttrium<br>89 | 40<br>Zr<br>zirconium<br>91 | 41<br>Nb<br>niobium<br>93 | 42<br>Mo<br>molybdenum<br>96 | 43<br>Tc<br>technetium<br>- | 44<br>Ru<br>ruthenium<br>101 | 45<br>Rh<br>rhodium<br>103 | 46<br>Pd<br>palladium<br>106 | 47<br>Ag<br>silver<br>108 | 48<br>Cd<br>cadmium<br>112 | 49<br>In<br>indium<br>115 | 50<br>Sn<br>tin<br>119 | 51<br>Sb<br>antimony<br>122 | 52<br>Te<br>tellurium<br>128 | 53<br>I<br>iodine<br>127 | 54<br>Xe<br>xenon<br>131 | 55<br>Cs<br>caesium<br>133 | 56<br>Ba<br>barium<br>137 | 57-71<br>lanthanoids | 72<br>Hf<br>hafnium<br>178 | 73<br>Ta<br>tantalum<br>181 | 74<br>W<br>tungsten<br>184 | 75<br>Re<br>rhenium<br>186 | 76<br>Os<br>osmium<br>190 | 77<br>Ir<br>iridium<br>192 | 78<br>Pt<br>platinum<br>195 | 79<br>Au<br>gold<br>197 | 80<br>Hg<br>mercury<br>201 | 81<br>Tl<br>thallium<br>204 | 82<br>Pb<br>lead<br>207 | 83<br>Bi<br>bismuth<br>209 | 84<br>Po<br>polonium<br>- | 85<br>At<br>astatine<br>- | 86<br>Rn<br>radon<br>- | 87<br>Fr<br>francium<br>- | 88<br>Ra<br>radium<br>- | 89-103<br>actinoids | 104<br>Rf<br>rutherfordium<br>- | 105<br>Db<br>dubnium<br>- | 106<br>Sg<br>seaborgium<br>- | 107<br>Bh<br>bohrium<br>- | 108<br>Hs<br>hassium<br>- | 109<br>Mt<br>meitnerium<br>- | 110<br>Ds<br>darmstadtium<br>- | 111<br>Rg<br>roentgenium<br>- | 112<br>Cn<br>copernicium<br>- | 113<br>Nh<br>nihonium<br>- | 114<br>Fl<br>flerovium<br>- | 115<br>Lv<br>livermorium<br>- | 116<br>Ts<br>tennessine<br>- | 117<br>Og<br>oganeson<br>- | 118<br>- | 119<br>- | 120<br>- | 121<br>- | 122<br>- | 123<br>- | 124<br>- | 125<br>- | 126<br>- | 127<br>- | 128<br>- | 129<br>- | 130<br>- | 131<br>- | 132<br>- | 133<br>- | 134<br>- | 135<br>- | 136<br>- | 137<br>- | 138<br>- | 139<br>- | 140<br>- | 141<br>- | 142<br>- | 143<br>- | 144<br>- | 145<br>- | 146<br>- | 147<br>- | 148<br>- | 149<br>- | 150<br>- | 151<br>- | 152<br>- | 153<br>- | 154<br>- | 155<br>- | 156<br>- | 157<br>- | 158<br>- | 159<br>- | 160<br>- | 161<br>- | 162<br>- | 163<br>- | 164<br>- | 165<br>- | 166<br>- | 167<br>- | 168<br>- | 169<br>- | 170<br>- | 171<br>- | 172<br>- | 173<br>- | 174<br>- | 175<br>- | 176<br>- | 177<br>- | 178<br>- | 179<br>- | 180<br>- | 181<br>- | 182<br>- | 183<br>- | 184<br>- | 185<br>- | 186<br>- | 187<br>- | 188<br>- | 189<br>- | 190<br>- | 191<br>- | 192<br>- | 193<br>- | 194<br>- | 195<br>- | 196<br>- | 197<br>- | 198<br>- | 199<br>- | 200<br>- | 201<br>- | 202<br>- | 203<br>- | 204<br>- | 205<br>- | 206<br>- | 207<br>- | 208<br>- | 209<br>- | 210<br>- | 211<br>- | 212<br>- | 213<br>- | 214<br>- | 215<br>- | 216<br>- | 217<br>- | 218<br>- | 219<br>- | 220<br>- | 221<br>- | 222<br>- | 223<br>- | 224<br>- | 225<br>- | 226<br>- | 227<br>- | 228<br>- | 229<br>- | 230<br>- | 231<br>- | 232<br>- | 233<br>- | 234<br>- | 235<br>- | 236<br>- | 237<br>- | 238<br>- | 239<br>- | 240<br>- | 241<br>- | 242<br>- | 243<br>- | 244<br>- | 245<br>- | 246<br>- | 247<br>- | 248<br>- | 249<br>- | 250<br>- | 251<br>- | 252<br>- | 253<br>- | 254<br>- | 255<br>- | 256<br>- | 257<br>- | 258<br>- | 259<br>- | 260<br>- | 261<br>- | 262<br>- | 263<br>- | 264<br>- | 265<br>- | 266<br>- | 267<br>- | 268<br>- | 269<br>- | 270<br>- | 271<br>- | 272<br>- | 273<br>- | 274<br>- | 275<br>- | 276<br>- | 277<br>- | 278<br>- | 279<br>- | 280<br>- | 281<br>- | 282<br>- | 283<br>- | 284<br>- | 285<br>- | 286<br>- | 287<br>- | 288<br>- | 289<br>- | 290<br>- | 291<br>- | 292<br>- | 293<br>- | 294<br>- | 295<br>- | 296<br>- | 297<br>- | 298<br>- | 299<br>- | 300<br>- | 301<br>- | 302<br>- | 303<br>- | 304<br>- | 305<br>- | 306<br>- | 307<br>- | 308<br>- | 309<br>- | 310<br>- | 311<br>- | 312<br>- | 313<br>- | 314<br>- | 315<br>- | 316<br>- | 317<br>- | 318<br>- | 319<br>- | 320<br>- | 321<br>- | 322<br>- | 323<br>- | 324<br>- | 325<br>- | 326<br>- | 327<br>- | 328<br>- | 329<br>- | 330<br>- | 331<br>- | 332<br>- | 333<br>- | 334<br>- | 335<br>- | 336<br>- | 337<br>- | 338<br>- | 339<br>- | 340<br>- | 341<br>- | 342<br>- | 343<br>- | 344<br>- | 345<br>- | 346<br>- | 347<br>- | 348<br>- | 349<br>- | 350<br>- | 351<br>- | 352<br>- | 353<br>- | 354<br>- | 355<br>- | 356<br>- | 357<br>- | 358<br>- | 359<br>- | 360<br>- | 361<br>- | 362<br>- | 363<br>- | 364<br>- | 365<br>- | 366<br>- | 367<br>- | 368<br>- | 369<br>- | 370<br>- | 371<br>- | 372<br>- | 373<br>- | 374<br>- | 375<br>- | 376<br>- | 377<br>- | 378<br>- | 379<br>- | 380<br>- | 381<br>- | 382<br>- | 383<br>- | 384<br>- | 385<br>- | 386<br>- | 387<br>- | 388<br>- | 389<br>- | 390<br>- | 391<br>- | 392<br>- | 393<br>- | 394<br>- | 395<br>- | 396<br>- | 397<br>- | 398<br>- | 399<br>- | 400<br>- | 401<br>- | 402<br>- | 403<br>- | 404<br>- | 405<br>- | 406<br>- | 407<br>- | 408<br>- | 409<br>- | 410<br>- | 411<br>- | 412<br>- | 413<br>- | 414<br>- | 415<br>- | 416<br>- | 417<br>- | 418<br>- | 419<br>- | 420<br>- | 421<br>- | 422<br>- | 423<br>- | 424<br>- | 425<br>- | 426<br>- | 427<br>- | 428<br>- | 429<br>- | 430<br>- | 431<br>- | 432<br>- | 433<br>- | 434<br>- | 435<br>- | 436<br>- | 437<br>- | 438<br>- | 439<br>- | 440<br>- | 441<br>- | 442<br>- | 443<br>- | 444<br>- | 445<br>- | 446<br>- | 447<br>- | 448<br>- | 449<br>- | 450<br>- | 451<br>- | 452<br>- | 453<br>- | 454<br>- | 455<br>- | 456<br>- | 457<br>- | 458<br>- | 459<br>- | 460<br>- | 461<br>- | 462<br>- | 463<br>- | 464<br>- | 465<br>- | 466<br>- | 467<br>- | 468<br>- | 469<br>- | 470<br>- | 471<br>- | 472<br>- | 473<br>- | 474<br>- | 475<br>- | 476<br>- | 477<br>- | 478<br>- | 479<br>- | 480<br>- | 481<br>- | 482<br>- | 483<br>- | 484<br>- | 485<br>- | 486<br>- | 487<br>- | 488<br>- | 489<br>- | 490<br>- | 491<br>- | 492<br>- | 493<br>- | 494<br>- | 495<br>- | 496<br>- | 497<br>- | 498<br>- | 499<br>- | 500<br>- |

1  
H  
hydrogen  
1

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

|                              |                            |                                 |                              |                             |                             |                             |                               |                            |                               |                              |                           |                               |                              |                              |
|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| 57<br>La<br>lanthanum<br>139 | 58<br>Ce<br>cerium<br>140  | 59<br>Pr<br>praseodymium<br>141 | 60<br>Nd<br>neodymium<br>144 | 61<br>Pm<br>promethium<br>- | 62<br>Sm<br>samarium<br>150 | 63<br>Eu<br>europium<br>152 | 64<br>Gd<br>gadolinium<br>157 | 65<br>Tb<br>terbium<br>159 | 66<br>Dy<br>dysprosium<br>163 | 67<br>Ho<br>holmium<br>165   | 68<br>Er<br>erbium<br>167 | 69<br>Tm<br>thulium<br>169    | 70<br>Yb<br>ytterbium<br>173 | 71<br>Lu<br>lutetium<br>175  |
| 89<br>Ac<br>actinium<br>-    | 90<br>Th<br>thorium<br>232 | 91<br>Pa<br>protactinium<br>231 | 92<br>U<br>uranium<br>238    | 93<br>Np<br>neptunium<br>-  | 94<br>Pu<br>plutonium<br>-  | 95<br>Am<br>americium<br>-  | 96<br>Cm<br>curium<br>-       | 97<br>Bk<br>berkelium<br>- | 98<br>Cf<br>californium<br>-  | 99<br>Es<br>einsteinium<br>- | 100<br>Fm<br>fermium<br>- | 101<br>Md<br>mendelevium<br>- | 102<br>No<br>nobelium<br>-   | 103<br>Lr<br>lawrencium<br>- |

lanthanoids

actinoids

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



**PEIRCE SECONDARY SCHOOL  
MID-YEAR EXAMINATION 2019  
SECONDARY THREE EXPRES  
MARKING SCHEME**

**SCIENCE (CHEMISTRY)  
Paper 1 (Multiple Choice)**

5076/01  
15 May 2019

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| B  | A  | C  | A  | A  | D  | D  | D  | C  | A  |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| B  | C  | A  | A  | C  | A  | D  | C  | B  | B  |

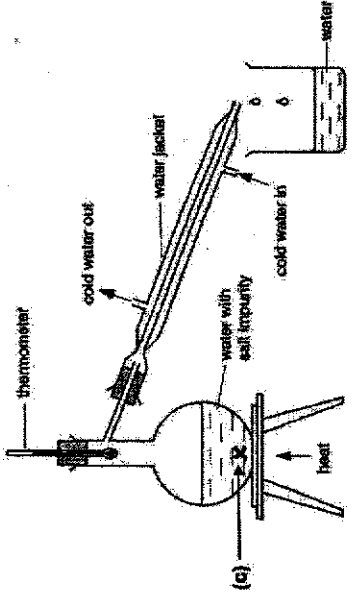
**Paper 3 (Theory)**

5076/03  
7 May 2019

| S/No             | Answers                                     | Remarks |
|------------------|---|---------|
| <b>Section A</b> |   |         |
| 1(a)(i)          | Simple distillation                         | [1]     |
| 1(a)(ii)         | To cool/condense the vapour into pure water | [1]     |

Setter: Mr Tan Kok Heong

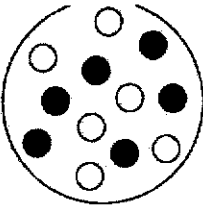


| S/No | Answers   | Remarks |
|------|---|---------|
| 1(b) | 100 °C  | [1]     |
| 1(c) |  | [1]     |
| 2(a) | A and D   | [1]     |
| 2(b) | B   | [1]     |
| 2(c) | It contains dye A which has a bad effect on some people.                            | [1]     |

|         | Answers  | Remarks |
|---------|--|---------|
| 2(d)    | Another solvent such as ethanol instead of water could be used   | [1]     |
| S/No    |  |         |
| 3(a)    | Solid particles are very closely packed and hence denser, gas particles are spread far apart and less dense. Therefore there are more particles per unit volume in a solid.                      | [1]     |
| 3(b)    | Gas particles have lots of spaces between them as the particles are spread far apart, solid particles are packed very closely together in an orderly manner with hardly any spaces between them. | [1]     |
| 3(c)    | Liquid particles slide over each other and flow throughout the liquid, solid particles can only vibrate about its fixed position.  | [1]     |
| 4(a)    | ethanol  | [1]     |
| 4(b)    | Iodine   | [1]     |
| 4(c)    | hydrogen chloride  | [1]     |
| 4(d)(i) | Hydrogen   | [1]     |

| 4(d)(ii) | B           | [1] |         |
|----------|-------------|-----|---------|
| S/No     | Answers     |     | Remarks |
| 5(a)     | air         | [1] |         |
| 5(b)     | sea water   | [1] |         |
| 5(c)     | brass       | [1] |         |
| 5(d)     | water/salt  | [1] |         |
| 5(e)     | sugar       | [1] |         |
| 5(f)     | copper wire | [1] |         |

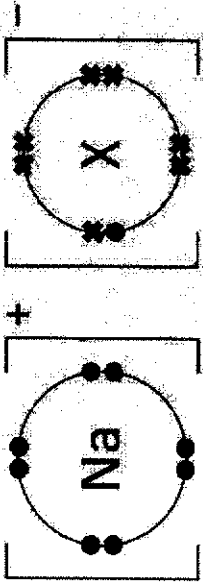
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| S/No | Answers  | Remarks |
|------|--|---------|
| 6(a) | Nucleon number/mass number/total number of proton and number of neutrons             | [1]     |
| 6(b) | ○ <u>neutrons</u><br>● <u>protons</u>  | [2]     |
| 6(c) | 6  | [1]     |
| 6(d) |  | [1]     |

| S/No     | Answers   |                          |                   |                    |                     |     | Remarks |
|----------|---|--------------------------|-------------------|--------------------|---------------------|-----|---------|
| 7(a)     | ion   | formula                  | number of protons | number of neutrons | number of electrons | [3] |         |
|          | potassium   | ${}^{39}_{19}\text{K}^+$ | 19                | 20                 | 18                  |     |         |
|          | oxide   | ${}^{16}_8\text{O}^{2-}$ | 8                 | 8                  | 10                  |     |         |
| 7(b)(i)  | This is because they are both atoms of the same element with the same number of protons but different number of neutrons. |                          |                   |                    |                     |     | [1]     |
| 7(b)(ii) | Mass of 100 atoms of K = $(94 \times 39) + (6 \times 41) = 3912$<br>Average relative mass of K = $3912 \div 100 = 39.1$   |                          |                   |                    |                     |     | [2]     |

7

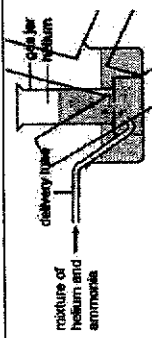
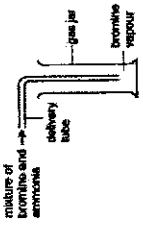
| S/No | Answers |     | Remarks |
|------|---------|-----|---------|
| 8(a) | O and Q | [1] |         |
| 8(b) | L       | [1] |         |
| 8(c) | N       | [1] |         |
| 8(d) | N and O | [1] |         |
| 8(e) | M and P | [1] |         |
| 8(f) | Q       | [1] |         |

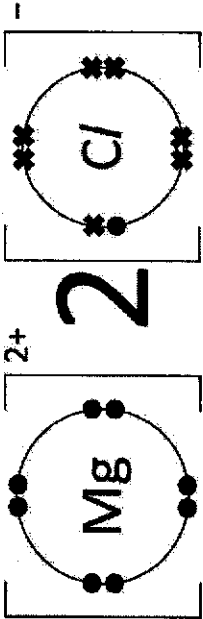
| S/No      | Answers  | Remarks |
|-----------|--|---------|
| 9(a)      | It refers to the outer electron shell  | [1]     |
| 9(b)      | Group VII  | [1]     |
| 9(c)(i)   | Ionic bonding  | [1]     |
| 9(c)(ii)  |  | [2]     |
| 9(c)(iii) | NaX  | [1]     |

| S/No             | Answers            | Remarks |
|------------------|--------------------|---------|
| <b>Section B</b> |                    |         |
| 10(a)(i)         | Measuring cylinder | [1]     |
| 10(a)(ii)        | Gas syringe        | [1]     |
| 10(a)(iii)       | Electronic balance | [1]     |
| 10(a)(iv)        | Thermometer        | [1]     |
| 10(a)(v)         | Burette            | [1]     |



| S/No       | Answers  | Remarks |
|------------|--|---------|
| 10(b)(i)   | Ensure all the sulfuric acid has been completely reacted or used up. | [1]     |
| 10(b)(ii)  | Separate the excess/unreacted copper(II) oxide from the mixture.     | [1]     |
| 10(b)(iii) | Obtain a saturated solution.   | [1]     |
| 10(b)(iv)  | Allow crystals of copper(II) sulfate to form through slow cooling.   | [1]     |
| 10(b)(v)   | Ensure crystals of copper(II) sulfate do not decompose.              | [1]     |

| S/No       | Answers   | Remarks |
|------------|---|---------|
| 11(a)(i)   | <ul style="list-style-type: none"> <li>iron(III) chloride <math>\underline{\text{FeCl}_3}</math></li> <li>magnesium chloride <math>\underline{\text{MgCl}_2}</math></li> </ul>  | [2]     |
| 11(a)(ii)  | Ionic bonding   | [1]     |
| 11(a)(iii) | The melting point of magnesium chloride can be tested to see if it is a constant.   | [1]     |
| 11(b)(i)   |  <p>Displacement of water is used as helium is insoluble in water while ammonia is soluble in water.</p>  | [3]     |
| 11(b)(ii)  |  <p>Downward delivery is used as bromine vapour is denser than air, hence it will sink while ammonia is less denser than air and will escape out of the gas jar.</p> | [3]     |

| S/No      | Answers   | Remarks  |
|-----------|---|--|
| 12(a)     | Ionic bonding   | [1]  |
| 12(b)     |  <p>magnesium chloride [1]</p>   | Choice of positive and negative ions can be any Gp II and VII elements respectively.<br>[1] per ion, for negative ion it must be stated that 2 ions are required to score the mark |
| 12(c)(i)  | Molten ionic compounds have mobile ions [1]. These free-moving positive and negative ions act as charge carriers that can conduct electricity [1].            | [2]  |
| 12(c)(ii) | There are strong electrostatic forces of attraction between the oppositely charged ions [1], hence a large amount of energy is required to overcome them [1]. | [2]  |
| 12(d)     | These three elements have 1 valence (outer) electron [1] but different number of electron shells [1].   | [2]  |

