Topica Past Papers IGCSE Edexcel

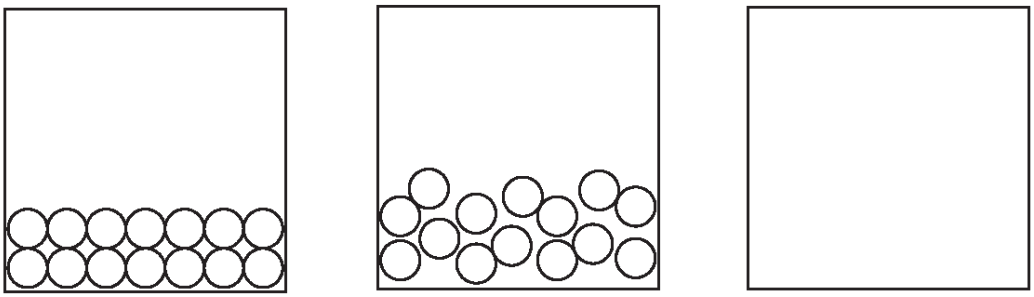
# CHEMISTRY

PAPER 1C, 1CR 2015- Winter 2019

**1** - (4CH0-S 2015-Paper 1C-Q1) - *KINETIC THEORY AND DIFFUSION*

This question is about the states of matter.

(a) The diagram shows the three states of matter for a substance.



solid liquid gas

Each circle represents a molecule of the substance.

(i) Complete the diagram by drawing six circles to represent molecules in the gas state.

**(1)**

(ii) Which statement is correct about the movement or arrangement of the molecules of this substance?

**(1)**

☒ **A** They move randomly in the solid state.

☒ **B** They move randomly in the liquid state.

☒ **C** They are arranged in fixed positions in the liquid state.

☒ **D** They are arranged in fixed positions in the gas state.

(iii) Which term is used for a solid changing to a liquid?

**(1)**

☒ **A** boiling

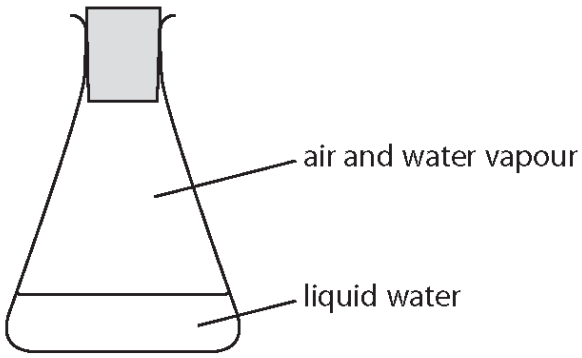
☒ **B** condensing

☒ **C** freezing

☒ **D** melting

(b) Some cold water is poured into a conical flask and a bung inserted.

The diagram shows the flask after a few minutes.




(i) What is occurring in the flask?

**(1)**

☒ **A** boiling and condensing

☒ **B** condensing and evaporating

☒ **C** evaporating and freezing

☒ **D** freezing and melting

(ii) Which formula represents a substance that is **not** present in the flask?

**(1)**

☒ **A** $H_2O(g)$

☒ **B** $H_2O(l)$

☒ **C** $N_2(g)$

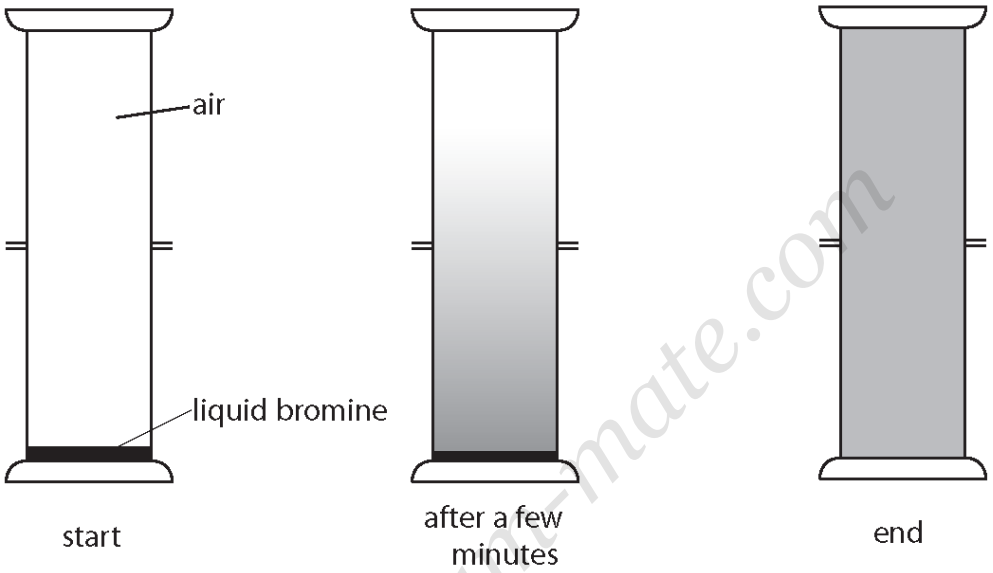
☒ **D** $N_2(l)$

**2** - (4CH0-S 2015-Paper 1C-Q2) - *KINETIC THEORY AND DIFFUSION*

A teacher demonstrates, in a fume cupboard, two experiments to show the movement of particles.

(a) In the first experiment she places some liquid bromine at the bottom of a gas jar. She then places another gas jar containing air on top of it, as shown in the diagram.

The diagram shows the apparatus at the start, after a few minutes and at the end of the experiment.




Place crosses (☒) in **two** boxes to show which statements are correct about this experiment.

**(2)**

☒ **A** All the air particles in the upper gas jar stay there.

☒ **B** Bromine and air react to form bromine oxide.

☒ **C** Bromine has a darker colour than air.

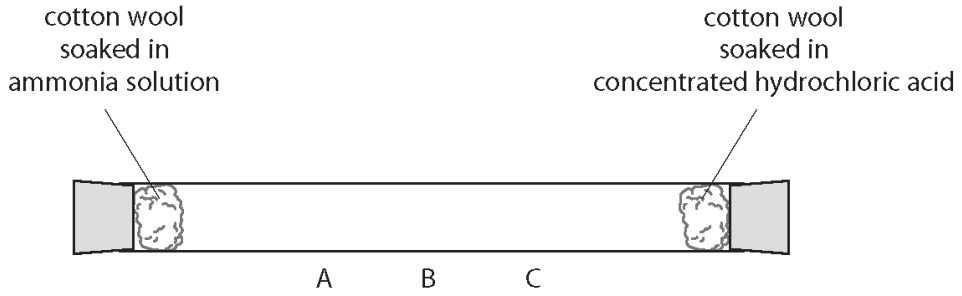
☒ **D** Bromine vapour diffuses upwards.

☒ **E** Liquid bromine sublimes during the experiment.

☒ **F** The concentration of bromine in the lower gas jar does not change.

(b) In the second experiment, she soaks two pieces of cotton wool in different liquids and places them at opposite ends of a glass tube. She immediately seals the tube with bungs.

The diagram shows the apparatus at the start of the experiment.




During the experiment a white ring appears in the tube.

(i) State whether the white ring appears at A, B or C.

**(1)**

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(ii) Explain your choice.

**(2)**

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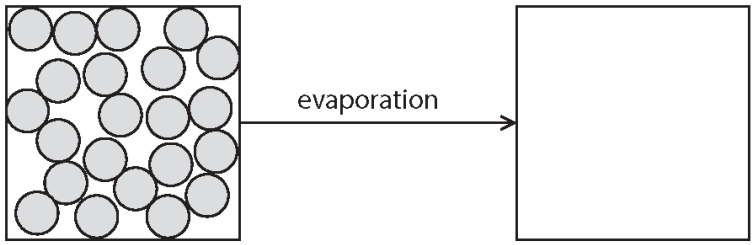
**3** - (4CH0-S 2015-Paper 1CR-Q1) - *KINETIC THEORY AND DIFFUSION*

When a liquid evaporates at room temperature, it changes into a gas.

The diagram shows the arrangement of the particles in a liquid.




(a) Complete the diagram to show the arrangement of four particles in a gas.

**(1)**

(b) Describe the movement of particles in a gas.

**(1)**

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(c) Explain why heating a liquid causes it to evaporate more quickly.

**(2)**

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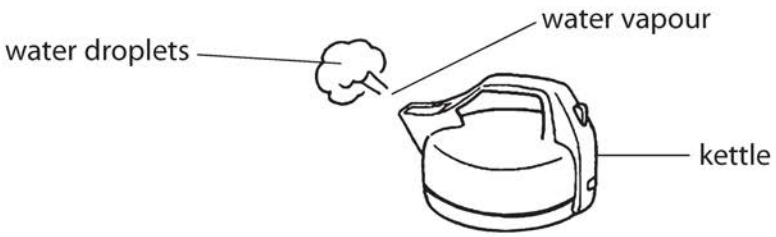
**4 -** (4CH0-S 2016-Paper 1C-Q1) - *KINETIC THEORY AND DIFFUSION*

The diagram shows a kettle of boiling water.




As the water vapour cools it turns into droplets of liquid water.

(a) The change of state when water vapour changes into liquid water is described as

**(1)**

☐ **A** boiling

☐ **B** condensation

☐ **C** evaporation

☐ **D** sublimation

(b) Describe what happens when water vapour cools to form liquid water.

Your answer should include the change in the energy, arrangement and movement of the particles.

**(3)**

change in energy .....

.....

.....

change in arrangement .....

.....

.....

change in movement .....

.....

.....

**5** - (4CH0-S 2016-Paper 1CR-Q2) - *KINETIC THEORY AND DIFFUSION, THE PERIODIC TABLE*

In chemistry, the state symbols (s), (l), (g) and (aq) are often used.

(a) The table shows some changes of state.

Complete the table to show the state symbol before and after the change.

**(3)**

| Change of state | State symbol before change | State symbol after change |
|---|---|---|
| Water boils in a kettle | | |
| Ethene is converted to poly(ethene) | | |
| Crystals of iodine sublime on heating | | |

(b) Some marble chips are added to a solution of hydrochloric acid.

Complete the equation for the reaction that occurs by writing the appropriate state symbol after each formula.

**(2)**

$CaCO_3$(.....) + 2HCl(.....) → $CaCl_2$(.....) + $H_2O$(.....) + $CO_2$(.....)

(c) Which state symbol is used most often for the elements of the Periodic Table at room temperature?

**(1)**

# ANSWERS

**1** - (4CH0-S 2015-Paper 1C-Q1) - *KINETIC THEORY AND DIFFUSION*

| | | | |
|---|---|---|---|
| a i | six circles separated from each other | Accept minimum of 4 complete circles<br>Ignore size and shape of circles<br>Ignore arrows and other symbols implying movement<br>Ignore a pattern<br>Reject any touching circles<br>Reject circles joined by bonds<br>No penalty for half-circles at edges of square | 1 |
| ii | B (They move randomly in the liquid state) | | 1 |
| iii | D (melting) | | 1 |
| b i | B (condensing and evaporating) | | 1 |
| ii | D ($N_2(l)$) | | 1 |
| | | | **Total 5 marks** |

**2** - (4CH0-S 2015-Paper 1C-Q2) - *KINETIC THEORY AND DIFFUSION*

| | | | |
|---|---|---|---|
| a | M1 C (Bromine has a darker colour than air)<br>M2 D (Bromine vapour diffuses upwards) | | 2 |
| b i | C | | 1 |
| ii | M1 ammonia (particles/molecules) travels/diffuses faster / further in same time (than hydrogen chloride)<br>M2 (because of) lower $M_r$ | Do not penalise ammonia atoms / ammonium (ions) / ammonia solution in place of ammonia<br>If incorrect choice in (i), then no marks in (ii)<br>If no answer in (i), mark on<br>If C appears in (ii), mark can be awarded in (i)<br>Accept smaller/lighter / ammonia less dense<br>Reject ammonia molecules etc less dense<br>Ignore references to kinetic energy<br>Accept reverse argument for hydrogen chloride / hydrochloric acid for both M1 and M2 | 2 |
| | | | **Total 5 marks** |

**3 -** (4CH0-S 2015-Paper 1CR-Q1) - *KINETIC THEORY AND DIFFUSION*

| | | |
|---|---|---|
| (a) | Diagram shows four circles well-spaced apart | accept minimum of 3 complete circles<br>ignore size and shape of circles<br>ignore arrows and other symbols implying movement<br><br>ignore a pattern<br>reject any touching circles<br>reject circles joined by bonds<br>no penalty for half-circles at edges of square |
| (b) | move freely/randomly | Accept fast OWTTE<br>ignore references to vibrate |
| (c) | **M1** – (average kinetic) energy of the particles increases<br><br>**M2** – more particles have enough energy to escape / particles can escape more easily<br>OR<br>more particles overcome the forces (of attraction) holding them together (in the liquid)<br>OR<br>the forces (of attraction) between the particles are overcome more often | accept particles move faster/more rapidly/more quickly<br>allow the energy of the liquid increases<br><br>accept particles escape more quickly<br><br>accept molecules/atoms for particles for both M1 and M2<br><br>allow bonds for force of attraction |

**4 -** (4CH0-S 2016-Paper 1C-Q1) - *KINETIC THEORY AND DIFFUSION*

| | | | |
|---|---|---|---|
| (a) | **B** (condensation) | | 1 |
| (b) | **M1** (the particles/they) lose (kinetic) energy / have less energy<br><br>**M2** (the particles/they) move closer together / pack more closely<br><br>**M3** (the particles/they) do not move as freely / move more slowly / move less randomly<br><br>**NB M1, M2** and **M3** can be scored anywhere across the whole answer | ACCEPT lose potential/heat energy<br><br>ACCEPT not as many gaps / smaller gaps<br>REJECT refs to density<br><br>ACCEPT molecules for particles<br><br>REJECT atoms **once only**. | 3 |

**5 -** (4CH0-S 2016-Paper 1CR-Q2) - *KINETIC THEORY AND DIFFUSION, THE PERIODIC TABLE*

<table>
<tr><td>a</td><td>
<table>
<tr><th>Change of state</th><th>State symbol before change</th><th>State symbol after change</th></tr>
<tr><td>Water boils in a kettle</td><td>l</td><td>g</td></tr>
<tr><td>Ethene is converted to poly(ethene)</td><td>g</td><td>s</td></tr>
<tr><td>Crystals of iodine sublime on heating</td><td>s</td><td>g</td></tr>
</table>
</td><td>M1 l AND g in first row<br>M2 g AND s in second row<br>M3 s AND g in third row<br>Accept upper case letters, eg S in place of s<br>Accept words, eg liquid in place of l<br>Accept answers in brackets</td><td>3</td></tr>
<tr><td>b</td><td>$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$</td><td>Award 1 mark for s and g correct<br>Award 1 mark for other 3 correct<br>Accept upper case<br>Reject words</td><td>2</td></tr>
<tr><td>c</td><td>s / solid</td><td>Accept upper case S in place of s</td><td>1</td></tr>
</table>

**6 -** (4CH0-S 2017-Paper 1CR-Q1) - *KINETIC THEORY AND DIFFUSION, FORMULAE AND EQUATIONS, SEPARATING AND ANALYSING*

| | | | |
|---|---|---|---|
| (a) | **D** ($Br_2$)<br>**The only correct answer is D**<br>A is not correct because Br is the symbol for bromine<br>B is not correct because the 2 is a superscript not a subscript<br>C is not correct because the 2 is not a subscript | | 1 |
| (b) (i) | **B** (diffusion)<br>**The only correct answer is B**<br>A is not correct because condensation is the change of state from a gas to liquid<br>C is not correct because evaporation is change of state from a liquid to gas<br>D is not correct because the change of state from sublimation is solid to gas | | 1 |
| (ii) | | **ALLOW** particles evaporate | 2 |