The Particulate nature of matter – 2021 IGCSE 0620

1. June/2021/Paper_11/No.1

Which row describes the arrangement and movement of particles in a liquid?

	arrangement of particles	movement of particles
A	touching and regular	vibrating
B	touching and random	moving around each other
C	touching and regular	moving around each other
D	touching and random	moving very fast

2. June/2021/Paper_12/No.1

Iodine changes directly from a grey solid to a purple gas when it is heated.

What is the name of this process?

A condensation

B evaporation

C separation

D sublimation

3. June/2021/Paper_13/No.1

A 1 cm^3 sample of substance X is taken. This is sample 1.

X is then converted to a different physical state and a 1 cm^3 sample is taken. This is sample 2.

Sample 2 contains more particles in the 1 cm^3 than sample 1.

Which process caused this increase in the number of particles in 1 cm^3?

A boiling of liquid X

B condensation of gaseous X

C evaporation of liquid X

D sublimation of solid X

4. June/2021/Paper_13/No.2

Solid carbon dioxide changes directly into a gas under suitable conditions of temperature and pressure.

Carbon dioxide gas moves from a high concentration to a low concentration.

Which row names these two processes?

	changing from solid to gas	moving from a high concentration to a low concentration
A	evaporation	Brownian motion
B	evaporation	diffusion
C	sublimation	Brownian motion
D	sublimation	diffusion

5. June/2021/Paper_21,22&23/No.1

A gas is released at point P in the apparatus shown.

Which gas turns the damp universal indicator paper red most quickly?

A ammonia, NH_3

B chlorine, Cl_2

C hydrogen chloride, HCl

D sulfur dioxide, SO_2

6. June/2021/Paper_23/No.2

A 1 cm^3 sample of substance X is taken. This is sample 1.

X is then converted to a different physical state and a 1 cm^3 sample is taken. This is sample 2.

Sample 2 contains more particles in the 1 cm^3 than sample 1.

Which process caused this increase in the number of particles in 1 cm^3?

A boiling of liquid X

B condensation of gaseous X

C evaporation of liquid X

D sublimation of solid X

7. March/2021/Paper_12/No.1

In which changes do the particles move further apart?

$$\text{gas} \underset{\text{Y}}{\overset{\text{W}}{\rightleftharpoons}} \text{liquid} \underset{\text{Z}}{\overset{\text{X}}{\rightleftharpoons}} \text{solid}$$

A W and X **B** W and Z **C** X and Y **D** Y and Z

8. March/2021/Paper_12/No.3

Impurities change the melting and boiling points of substances.

Sodium chloride is added to a sample of pure water.

How does the addition of sodium chloride affect the melting point and the boiling point of the water?

	melting point	boiling point
A	increases	increases
B	decreases	decreases
C	increases	decreases
D	decreases	increases

9. March/2021/Paper_22/No.1

Which row about a change of state is correct?

	change of state	energy change	process
A	solid → liquid	heat given out	melting
B	gas → liquid	heat taken in	evaporation
C	solid → gas	heat taken in	sublimation
D	liquid → solid	heat given out	condensing

10. June/2021/Paper_31/No.2

The table shows the masses of some of the ions in 1000 cm^3 of fruit juice.

name of ion	formula of ion	mass of ion in 1000 cm^3 of fruit juice / mg
	NH_4^+	43
calcium	Ca^{2+}	79
chloride	Cl^-	135
lithium	Li^+	1
magnesium	Mg^{2+}	80
nitrate	NO_3^-	35
phosphate	PO_4^{3-}	120
potassium	K^+	575
sodium	Na^+	120
	SO_4^{2-}	105

(a) Answer these questions using only the information in the table.

(i) State which negative ion has the highest mass in 1000 cm^3 of fruit juice.

..... [1]

(ii) Give the formulae of the ions in ammonium sulfate.

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

(iii) Calculate the mass of sodium ions in 200 cm^3 of fruit juice.

mass = ... mg [1]

(b) Describe a test for lithium ions.

test .....

observations .....

[2]

(c) Ions of the element potassium, K, are present in most fertilisers.

State the names of two **other** elements that are in most fertilisers.

1 .....

2 .....

[2]

11. June/2021/Paper_32/No.2

The table shows the masses of some of the ions in 1000 cm^3 of fruit juice.

name of ion	formula of ion	mass of ion in 1000 cm^3 of fruit juice / mg
ammonium	NH_4^+	15
	Ca^{2+}	71
chloride	Cl^-	135
magnesium	Mg^{2+}	160
nitrate	NO_3^-	2
phosphate	PO_4^{3-}	63
potassium	K^+	184
sodium	Na^+	3
	SO_4^{2-}	85

(a) Answer these questions using only the information in the table.

(i) State which positive ion has the lowest mass in 1000 cm^3 of fruit juice.

..... [1]

(ii) Give the formulae of the ions in calcium sulfate.

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

(iii) Calculate the mass of magnesium ions in 250 cm^3 of fruit juice.

mass = ... mg [1]

(b) Describe a test for calcium ions.

test .....

observations .....

[2]

(c) Ammonium ions, NH_4^+, are present in most fertilisers. Ammonium ions contain nitrogen.

Name two **other** elements present in most fertilisers.

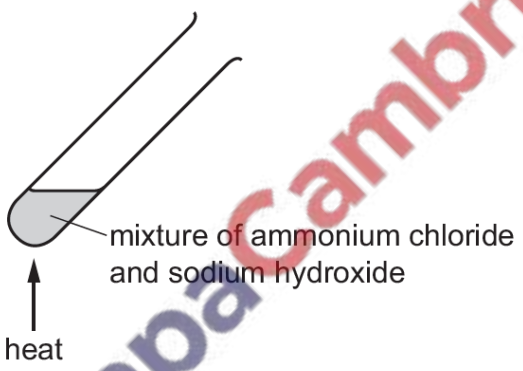
1 .....

2 .....

[2]

(d) A student heated a mixture of ammonium chloride and sodium hydroxide in a test-tube.

$$NH_4Cl + NaOH \rightarrow NH_3 + NaCl + H_2O$$



Pungent-smelling ammonia gas is given off.

Describe one **other** observation that can be made.

..... [1]

(e) Ammonia reacts with chlorine.

Complete the equation for this reaction.

$$.....NH_3 + ...Cl_2 \rightarrow N_2 + 6HCl$$ [2]

(f) A small beaker of aqueous ammonia is placed at the front of a classroom.

At first, the students at the back of the class do not smell the ammonia gas.
After a short time, the students at the back of the class smell the ammonia.

Explain these observations using the kinetic particle model.

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.....

.....

.....

..... [3]

[Total: 13]

12. June/2021/Paper_33/No.2

The table shows the masses of some of the ions in 1000 cm^3 of fruit juice.

name of ion	formula of ion	mass of ion in 1000 cm^3 of fruit juice / mg
ammonium	NH_4^+	6
calcium	Ca^{2+}	73
chloride	Cl^-	238
magnesium	Mg^{2+}	77
	NO_3^-	10
phosphate	PO_4^{3-}	20
potassium	K^+	419
	Na^+	3
sulfate	SO_4^{2-}	10

(a) Answer these questions using only the information in the table.

(i) State which negative ion has the highest mass in 1000 cm^3 of fruit juice.

..... [1]

(ii) Give the formulae of the ions in sodium nitrate.

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

(iii) Calculate the mass of ammonium ions in 250 cm^3 of fruit juice.

mass = ... mg [1]

(b) Describe a test for chloride ions.

test .....

observations .....

[2]

(c) Phosphate ions, PO_4^{3-}, are present in most fertilisers. Phosphate ions contain phosphorus.

(i) State the names of two **other** elements that are in most fertilisers.

1 .....

2 .....

[2]

(ii) Explain why farmers put fertilisers on fields where crops are to be grown.

.....

..... [1]

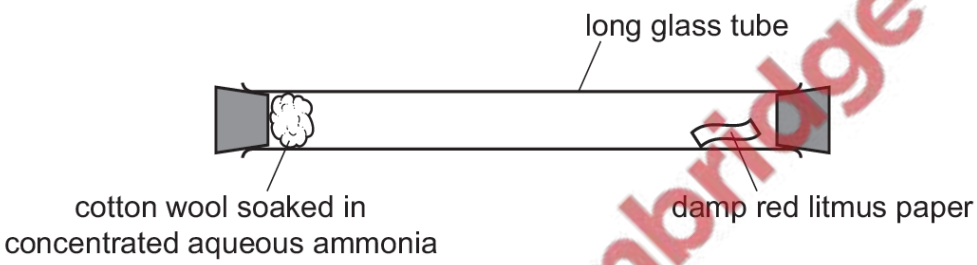
(d) A student heated ammonium sulfate with sodium hydroxide in a test-tube.

(i) Complete the equation for this reaction.

$$(NH_4)_2SO_4 + ...NaOH \rightarrow .....NH_3 + Na_2SO_4 + 2H_2O$$ [2]

(ii) Concentrated aqueous ammonia releases fumes of ammonia gas.

A long glass tube is set up as shown.



At first, the red litmus paper does not turn blue.
After a short time, the litmus paper turns blue.

Explain these observations using the kinetic particle model.

.....

.....

.....

.....

..... [3]

[Total: 13]