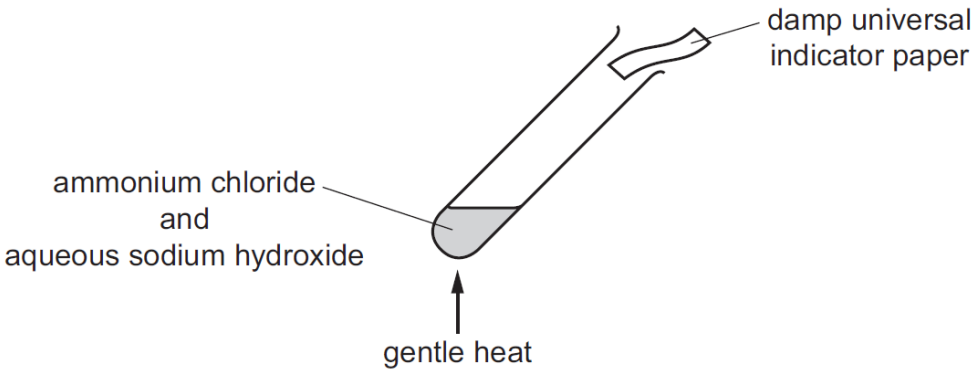
Nitrogen and Compounds – 2021 IGCSE 0620

1. June/2021/Paper_11/No.28

Ammonium chloride is heated with aqueous sodium hydroxide.



A gas is produced which turns damp universal indicator paper blue.

Which gas has been produced?

A ammonia

B hydrogen

C oxygen

D sulfur dioxide

2. June/2021/Paper_11/No.30

A student writes three statements about potassium nitrate, KNO_3.

1 The relative formula mass of KNO_3 is 101.

2 Potassium nitrate contains the three essential elements for plant growth.

3 Potassium nitrate could be used as a fertiliser.

Which statements are correct?

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

3. June/2021/Paper_13/No.29

An NPK fertiliser is made by mixing two compounds.

The first compound has the formula $(NH_4)_2HPO_4$.

What is the formula of the second compound?

A $CaCO_3$ **B** KNO_3 **C** $NaCl$ **D** $(NH_4)_2SO_4$

4. June/2021/Paper_21/No.29

Ammonia is made by reacting nitrogen with hydrogen in the Haber process.

The equation for the process is shown.

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

Which changes in reaction conditions would produce a greater yield of ammonia?

1 adding more iron catalyst

2 increasing the reaction pressure

3 increasing the particle size of the iron catalyst

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

5. June/2021/Paper_22/No.30

Which natural resource **cannot** provide a raw material for the manufacture of ammonia?

A air

B limestone

C petroleum

D water

6. June/2021/Paper_22/No.31

Ammonia is made in the Haber process.

Which conditions are used in the Haber process?

	temperature /°C	pressure / atmospheres	catalyst used
A	450	200	iron
B	450	5	vanadium(V) oxide
C	200	450	iron
D	200	5	vanadium(V) oxide

7. June/2021/Paper_23/No.28

Ammonia is made from nitrogen and hydrogen. The equation for the reaction is shown.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

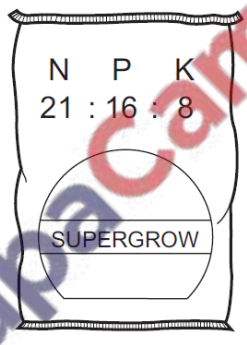
The forward reaction is exothermic.

Which conditions give the greatest equilibrium yield of ammonia?

	temperature / °C	pressure / atm
A	200	15
B	200	150
C	500	15
D	500	150

8. March/2021/Paper_12&22/No.30

Which combination of chemical compounds can be used to produce the fertiliser shown?



A $(NH_4)_3PO_4$, KCl

B NH_4NO_3, $Ca_3(PO_4)_2$

C NH_4NO_3, $CO(NH_2)_2$

D NH_4NO_3, K_2SO_4, $(NH_4)_2SO_4$

9. March/2021/Paper_22/No.29

Petrol burns in a car engine to produce waste gases which leave through the car exhaust.

One of these waste gases is an oxide of nitrogen.

Which statement describes how this oxide of nitrogen is formed?

A Carbon dioxide reacts with nitrogen in the catalytic converter.

B Nitrogen reacts with oxygen in the car engine.

C Nitrogen reacts with oxygen in the catalytic converter.

D Petrol combines with nitrogen in the car engine.

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.

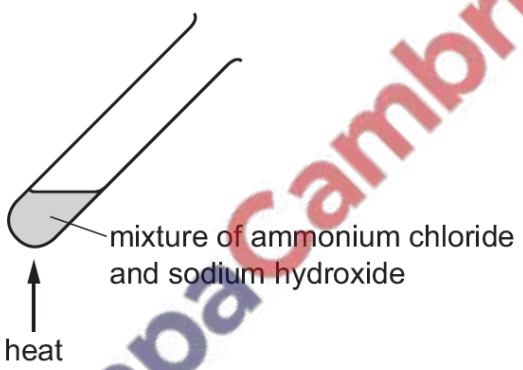
1 .....

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.

.....

.....

.....

.....

..... [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]

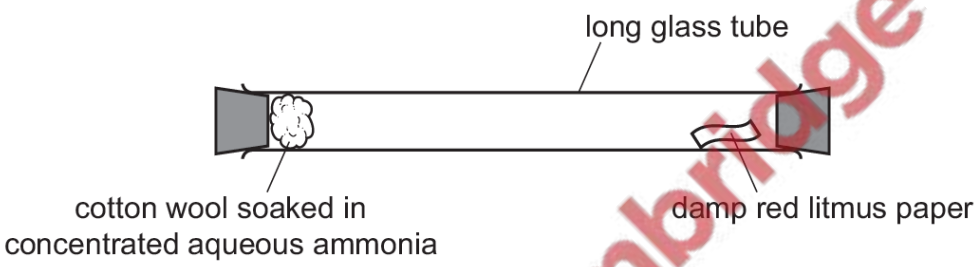
(d) A student heated ammonium sulfate with sodium hydroxide in a test-tube.

(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]