Acids, bases and salts – 2021 O Level

1. Nov/2021/Paper_11/No.6

An aqueous solution of zinc chloride is tested by adding reagents.

Which observation is correct?

	reagent added to zinc chloride (aq)	observations
A	acidified aqueous barium nitrate	forms a white precipitate
B	aqueous ammonia	forms a white precipitate, soluble in excess of the reagent
C	aqueous sodium hydroxide	forms a white precipitate, insoluble in excess of the reagent
D	powdered copper	forms a grey precipitate

2. Nov/2021/Paper_11/No.22

Two solutions are prepared.

- Solution P is 0.050 mol / dm^3 hydrochloric acid.
- Solution Q is 0.100 mol / dm^3 butanoic acid.

A 2 cm strip of magnesium ribbon is put into 100 cm^3 of each solution. Fizzing is seen in both solutions but the fizzing is faster in solution P than it is in solution Q.

Which statement helps to explain this observation?

A Magnesium reacts with solution P to form a salt, but does not form a salt with solution Q.

B More particles are dissociated in solution P than are dissociated in solution Q.

C Solution Q contains a stronger acid than solution P.

D The particles are closer together in solution Q than they are in solution P.

3. Nov/2021/Paper_11/No.23

Which compound can be formed by precipitation?

A $NaCl$ **B** K_2SO_4 **C** $Ca(NO_3)_2$ **D** $PbSO_4$

4. Nov/2021/Paper_11/No.24

In a neutralisation reaction, which change in particles occurs?

A atoms → molecules

B ions → molecules

C atoms → ions

D ions → atoms

5. Nov/2021/Paper_12/No.6

An aqueous solution of zinc chloride is tested by adding reagents.

Which observation is correct?

	reagent added to zinc chloride (aq)	observations
A	acidified aqueous barium nitrate	forms a white precipitate
B	aqueous ammonia	forms a white precipitate, soluble in excess of the reagent
C	aqueous sodium hydroxide	forms a white precipitate, insoluble in excess of the reagent
D	powdered copper	forms a grey precipitate

6. Nov/2021/Paper_12/No.22

Which statement about acids and bases is correct?

A A 0.1 mol / dm^3 solution of ethanoic acid has a higher pH than a 0.1 mol / dm^3 solution of hydrochloric acid.

B All bases dissolve in water to produce OH^- ions.

C Bases react with nitrates to produce ammonia.

D Oxides of metals are always acidic in character.

7. Nov/2021/Paper_12/No.23

Which compound can be formed by precipitation?

A $NaCl$ **B** K_2SO_4 **C** $Ca(NO_3)_2$ **D** $PbSO_4$

8. Nov/2021/Paper_12/No.24

Which methods could be used to make a pure sample of copper(II) sulfate?

1 acid + metal carbonate

2 acid + metal oxide

3 acid + metal

4 precipitation

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

9. Nov/2021/Paper_12/No.26

Which statement about sulfur dioxide, SO_2, is correct?

A It is dissolved in water to make sulfuric acid for car batteries.

B It is the final product of the Contact process.

C It is used as a food preservative.

D It turns aqueous potassium iodide brown.

10. Jun/2021/Paper_11/No.4

J is an aqueous solution.

On addition of aqueous sodium hydroxide to J a green precipitate is formed.

The resulting mixture is heated and no gas is formed.

Aluminium foil is added to the warmed mixture. A gas is formed that turns damp red litmus paper blue.

Which ions could be present in J?

A Fe^{3+} and NH_4^+

B Fe^{3+} and NO_3^-

C Fe^{2+} and NH_4^+

D Fe^{2+} and NO_3^-

11. Jun/2021/Paper_11/No.5

Gas X has the following properties.

1 colourless

2 no effect on either damp red or blue litmus papers

3 no effect on limewater

4 flammable

What is gas X?

A ammonia

B chlorine

C hydrogen

D oxygen

12. Jun/2021/Paper_11/No.22

Which row shows the pH values for 0.1 mol / dm^3 solutions of ammonia, hydrochloric acid, sodium chloride and sodium hydroxide?

	pH values			
	NH_3	HCl	$NaCl$	NaOH
A	1	7	13	11
B	7	1	11	13
C	11	1	7	13
D	13	11	7	1

13. Jun/2021/Paper_11/No.24

Two incomplete statements about the preparation of an insoluble salt are given.

.....1..... can be used to prepare insoluble salts, such as .....2..... .

The salt is collected by ..... 3..... and it is then .....4..... .

Which words correctly complete gaps 1–4?

	1	2	3	4
A	precipitation	barium nitrate	filtration	evaporated
B	precipitation	lead sulfate	evaporation	washed and dried
C	precipitation	lead sulfate	filtration	washed and dried
D	titration	barium nitrate	evaporation	washed and dried

14. Jun/2021/Paper_11/No.25

The Haber process is used to make ammonia at a temperature of 400 °C and a pressure of 20 000 kPa. The temperature is changed to 500 °C but the pressure is kept the same.

What will be the effects of this change on the production of ammonia?

A It is made at an increased rate and the position of the equilibrium moves to the left.

B It is made at an increased rate and the position of the equilibrium moves to the right.

C It is made at a decreased rate and the position of the equilibrium moves to the left.

D It is made at a decreased rate and the position of the equilibrium moves to the right.

15. Jun/2021/Paper_12/No.4

An aqueous solution of J is a colourless solution that contains cations and chloride ions.

Separate samples of the solution give a white precipitate with a few drops of aqueous sodium hydroxide and with a few drops of aqueous ammonia.

Which statement about J is correct?

A The cation in J must be Al^{3+}.

B The cation in J must be Fe^{2+}.

C When dilute nitric acid and aqueous barium nitrate are added to an aqueous solution of J, a white precipitate is formed.

D When dilute nitric acid and aqueous silver nitrate are added to an aqueous solution of J, a white precipitate is formed.

16. Jun/2021/Paper_12/No.5

Gas X has the following properties.

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3 no effect on limewater

4 flammable

What is gas X?

A ammonia

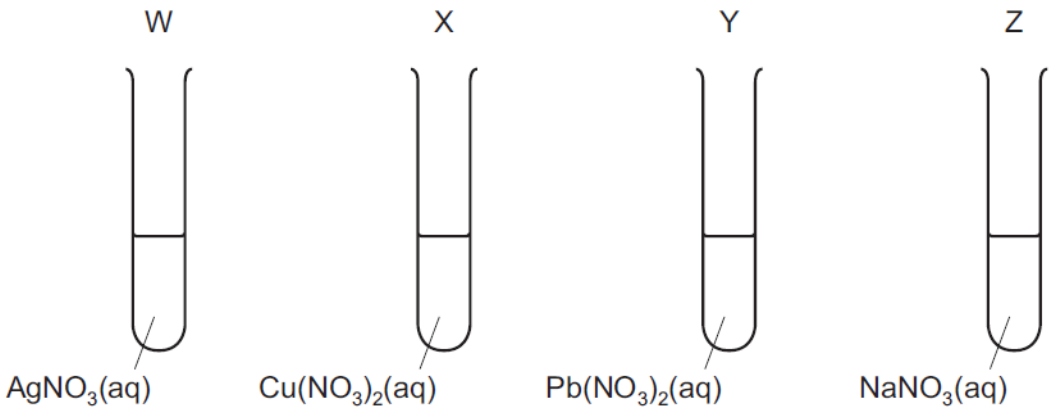
B chlorine

C hydrogen

D oxygen

17. Jun/2021/Paper_12/No.23

Four test-tubes are set up as shown.



What is the effect of adding dilute hydrochloric acid to each test-tube?

	W	X	Y	Z
A	✗	✓	✗	✓
B	✓	✗	✓	✗
C	✓	✗	✓	✓
D	✓	✗	✗	✗

key

✗ = clear solution

✓ = precipitate formed

18. Jun/2021/Paper_12/No.24

Aqueous ammonia reacts with a compound to form a salt, ammonium phosphate.

What type of reaction will ammonia undergo to form ammonium phosphate?

A combustion

B neutralisation

C oxidation

D precipitation

19. Jun/2021/Paper_12/No.25

Sulfuric acid is manufactured in the contact process. Several substances are involved in this process, including vanadium(V) oxide and water.

Which roles are played by vanadium(V) oxide and water in the contact process?

	vanadium(V) oxide	water
A	catalyst	reactant
B	catalyst	solvent
C	reactant	reactant
D	reactant	solvent

20. Jun/2021/Paper_12/No.26

Some properties which indicate the differences in elements are listed.

1 metallic character

2 number of electron shells in an atom

3 number of protons in an atom

4 total number of electrons in an atom

Which two properties increase across a period of the Periodic Table?

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

21. Nov/2021/Paper_21/No.9

This question is about ammonia and nitrates.

(a) State the source of the hydrogen and nitrogen used in the manufacture of ammonia by the Haber process.

source of hydrogen .....

source of nitrogen .....

[2]

(b) Ammonia is formed when aqueous ammonium sulfate is heated with sodium hydroxide.

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

A student adds 4.50 g of sodium hydroxide to 50.0 cm^3 of 1.25 mol/dm^3 aqueous ammonium sulfate.

Show by calculation that the ammonium sulfate is in excess.

[3]

(c) When dilute sodium hydroxide is electrolysed, the hydroxide ions are converted to oxygen and water at the anode.

Construct the ionic equation for the reaction taking place at the anode.

..... [1]

(d) The first stage in the test for nitrate ions is to heat aluminium and sodium hydroxide with a solution containing nitrate ions.

State the type of chemical reaction which occurs when a solution containing nitrate ions is heated with aluminium and sodium hydroxide.

..... [1]

(e) Nitrates from fertilisers cause eutrophication when they are leached from soils into rivers.

Describe the process of eutrophication.

.....

.....

.....

.....

..... [3]

[Total: 10]

22. Nov/2021/Paper_22/No.9

This question is about sulfuric acid and sulfates.

(a) **(i)** Sulfur is one of the raw materials used in the Contact process to make sulfuric acid. Name two other raw materials used to make sulfuric acid.

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

(ii) Name the catalyst used in the Contact process.

..... [1]

(b) The electrolysis of dilute sulfuric acid using inert electrodes produces oxygen at the anode.

(i) Define the term *electrolysis*.

.....

.....

..... [2]

(ii) Construct the equation for the reaction taking place at the cathode.

..... [1]

(c) Dilute sulfuric acid reacts with sodium hydroxide.

$$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$$

A student adds 0.76 g of solid sodium hydroxide to 45 cm^3 of 0.20 mol/dm^3 sulfuric acid.

Show by calculation that the sodium hydroxide is in excess.

[3]

(d) Aqueous sodium hydroxide is warmed with ammonium sulfate.
State the names of the three products formed in this reaction.

1 .....

2 .....

3 .....

[2]

[Total: 10]