Acids, bases and salts – 2021 IGCSE 0620

1. Nov/2021/Paper_11/No.17

Which substances do **not** produce water as a product when they are reacted together?

A calcium hydroxide and ammonium chloride

B calcium carbonate and dilute hydrochloric acid

C copper(II) oxide and dilute nitric acid

D zinc and dilute sulfuric acid

2. Nov/2021/Paper_11/No.18

The surface of magnesium ribbon reacts with the air to form magnesium oxide.

Which statement explains why the layer of magnesium oxide is removed by dilute hydrochloric acid?

A Magnesium is a base.

B Magnesium ribbon reacts with hydrochloric acid.

C Magnesium oxide is a base.

D Magnesium oxide is an acid.

3. Nov/2021/Paper_11&21/No.19

Copper(II) chloride crystals are made by adding solid copper(II) carbonate to dilute hydrochloric acid until no more dissolves.

Which process is used to obtain pure copper(II) chloride crystals from the mixture?

A distillation of the mixture

B evaporation of the mixture

C filtration followed by drying of the residue

D filtration followed by evaporation of the filtrate

4. Nov/2021/Paper_11/No.20

Which statement about aqueous sodium hydroxide is correct?

A When it is added to a solution containing sulfate ions, a white precipitate is formed.

B When it is added to a solution of copper(II) ions, a blue precipitate is formed which dissolves in excess to give deep blue solution.

C When it is added to a solution of iron(II) ions, a green precipitate is formed which does not dissolve in excess.

D When it is added to ammonium chloride, a gas is produced which turns blue litmus red.

5. Nov/2021/Paper_12&22/No.17

Which statements about acids and bases are correct?

1 An acid reacts with a metal to give off hydrogen.

2 A base reacts with an ammonium salt to give off ammonia.

3 An acid reacts with a carbonate to give off carbon dioxide.

4 Alkaline solutions are orange in methyl orange.

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

6. Nov/2021/Paper_12&22/No.18

Oxide 1 is a solid that reacts with dilute hydrochloric acid.

Oxide 2 is a gas that reacts with sodium hydroxide solution.

What are the formulae of the oxides?

	oxide 1	oxide 2
A	CaO	MgO
B	MgO	NO_2
C	NO_2	SO_2
D	SO_2	CaO

7. Nov/2021/Paper_12/No.19

In the preparation of zinc sulfate crystals, excess zinc oxide is added to dilute sulfuric acid.

Why is an excess of zinc oxide added?

A to make sure crystals are formed and not powder

B to avoid filtering the mixture

C to use up all of the sulfuric acid

D to use up all of the zinc oxide

8. Nov/2021/Paper_12&13/No.20

Which statement about aqueous sodium hydroxide is correct?

A When it is added to a solution containing sulfate ions, a white precipitate is formed.

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C When it is added to a solution of iron(II) ions, a green precipitate is formed which does not dissolve in excess.

D When it is added to ammonium chloride, a gas is produced which turns blue litmus red.

9. Nov/2021/Paper_13/No.17

Solution X is tested separately with sodium carbonate and litmus.

Which row shows that X is acidic?

	sodium carbonate	litmus
A	effervescence	blue
B	effervescence	red
C	no change	blue
D	no change	red

10. Nov/2021/Paper_13&23/No.18

Basic oxides are neutralised by acidic oxides.

Which element forms an oxide that neutralises calcium oxide?

A hydrogen

B magnesium

C sodium

D sulfur

11. Nov/2021/Paper_13/No.19

Which method produces a pure sample of copper(II) sulfate crystals?

A Add an excess of copper(II) carbonate to dilute sulfuric acid, filter and evaporate the filtrate until crystals start to appear.

B Add an excess of copper(II) carbonate to dilute sulfuric acid, filter off the remaining solid and dry it in an oven at 100 °C.

C Warm an excess of copper(II) oxide with dilute sulfuric acid and evaporate the mixture to dryness.

D Warm an excess of copper(II) oxide with dilute sulfuric acid and filter off the crystals formed.

12. Nov/2021/Paper_21/No.17

Which row describes the properties of an acid?

	property 1	property 2
A	proton acceptor	pH less than 7
B	proton acceptor	pH more than 7
C	proton donor	pH less than 7
D	proton donor	pH more than 7

13. Nov/2021/Paper_21/No.18

Which element forms an amphoteric oxide?

A aluminium

B carbon

C magnesium

D silicon

14. Nov/2021/Paper_22/No.22

All metal nitrates are soluble in water.

All metal chlorides are soluble except silver and lead.

All metal carbonates are insoluble except sodium and potassium.

Which aqueous solutions produce a precipitate when mixed together?

1 silver nitrate + sodium carbonate

2 silver nitrate + sodium chloride

3 barium nitrate + potassium chloride

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

15. Nov/2021/Paper_23/No.19

Four solid oxides are added to dilute hydrochloric acid and aqueous sodium hydroxide.

Which row describes an amphoteric oxide?

	hydrochloric acid	sodium hydroxide
A	✓	✓
B	✗	✓
C	✓	✗
D	✗	✗

key

✓ = reacts

✗ = does not react

16. Nov/2021/Paper_23/No.20

Which row describes an acid and an oxidising agent?

	acid	oxidising agent
A	proton acceptor	electron acceptor
B	proton acceptor	electron donor
C	proton donor	electron acceptor
D	proton donor	electron donor

17. Nov/2021/Paper_42/No.2

Acids are important laboratory chemicals.

(a) Some acids completely dissociate in water to form ions.

(i) State the term applied to acids that completely dissociate in water.

..... [1]

(ii) Complete the equation to show the complete dissociation of sulfuric acid in water.

$H_2SO_4 \rightarrow$ ..... [2]

(iii) State the colour of methyl orange in sulfuric acid.

..... [1]

(b) The equation for the reaction between powdered zinc carbonate and dilute nitric acid is shown.

$ZnCO_3$..... + $2HNO_3$..... $\rightarrow$ $Zn(NO_3)_2$..... + H_2O..... + CO_2.....

(i) Complete the equation by adding state symbols. [2]

(ii) A student found that 2.5 g of zinc carbonate required 20 cm^3 of dilute nitric acid to react completely.

Calculate the concentration of dilute nitric acid using the following steps:

- calculate the mass of 1 mole of $ZnCO_3$

..... g

- calculate the number of moles of $ZnCO_3$ reacting

..... moles

- determine the number of moles of HNO_3 reacting

..... moles

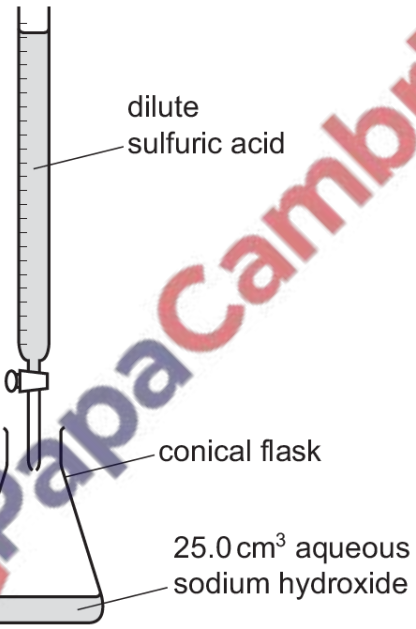
- calculate the concentration of HNO_3.

..... mol/dm^3
[4]

[Total: 10]

18. Nov/2021/Paper_43/No.5

(a) Dilute sulfuric acid and aqueous sodium hydroxide can be used to prepare sodium sulfate crystals using a method that involves titration.



(i) Suggest why universal indicator is **not** suitable for this titration.

..... [1]

(ii) Name an indicator that can be used in this titration.

..... [1]

$20.0\,cm^3$ of dilute sulfuric acid neutralises $25.0\,cm^3$ of $1.00\,mol/dm^3$ aqueous sodium hydroxide. At the end of the titration the conical flask contains aqueous sodium sulfate with the dissolved indicator as an impurity.

(b) Describe how to prepare a **pure** sample of sodium sulfate crystals from the original solutions of dilute sulfuric acid and aqueous sodium hydroxide of the same concentrations.

You are not required to give details of how to carry out the titration.

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..... [5]

(c) Sodium hydrogensulfate, $NaHSO_4$, dissolves in water to produce an aqueous solution, **X**, containing Na^+, H^+ and SO_4^{2-} ions.

State the observations when the following tests are done.

(i) A flame test is carried out on **X**.

..... [1]

(ii) Copper(II) oxide is warmed with an excess of **X**.

.....

..... [2]

(iii) Acidified aqueous barium nitrate is added to **X**.

..... [1]

[Total: 11]