Acids, bases and salts – 2023 IGCSE Chemistry 0620

1. Nov/2023/Paper_0620/11/No.16

Which solids react with dilute sulfuric acid to form aqueous magnesium sulfate?

1 magnesium

2 magnesium hydroxide

3 magnesium nitrate

4 magnesium oxide

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

2. Nov/2023/Paper_0620/11/No.17

Which statements about an aqueous acid are correct?

1 Ammonia is formed when solid ammonium nitrate is added to an aqueous acid.

2 Effervescence is seen when sodium carbonate is added to an aqueous acid.

3 Methyl orange becomes yellow when added to an aqueous acid.

4 Red litmus remains red when added to an aqueous acid.

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

3. Nov/2023/Paper_0620/11/No.18

Copper(II) sulfate is formed by reacting excess solid copper(II) carbonate with dilute sulfuric acid.

Which processes are part of the preparation of solid copper(II) sulfate?

1 crystallisation

2 distillation

3 filtration

4 titration

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

4. Nov/2023/Paper_0620/11/No.19

Element X forms ions with the formula X^{2-}.

Which row describes element X?

	group number	type of element
A	II	metal
B	II	non-metal
C	VI	metal
D	VI	non-metal

5. Nov/2023/Paper_0620/12/No.18

Which products are formed when magnesium carbonate reacts with dilute hydrochloric acid?

A carbon dioxide, hydrogen and magnesium chloride

B carbon dioxide and magnesium chloride only

C carbon dioxide, water and magnesium chloride

D water and magnesium chloride only

6. Nov/2023/Paper_0620/12/No.19

Which element forms an oxide that reacts with an aqueous solution of a base?

A argon

B sulfur

C magnesium

D copper

7. Nov/2023/Paper_0620/12/No.20

Which salt is insoluble?

A barium sulfate

B lead(II) nitrate

C magnesium chloride

D sodium carbonate

8. Nov/2023/Paper_0620/13/No.18

Information about four solutions, P, Q, R and S, is listed.

Solution P reacts with ammonium chloride to form ammonia.

Solution Q reacts with sodium carbonate to form carbon dioxide.

Solution R contains a high concentration of OH^- ions.

Solution S turns litmus red.

Which solutions are alkaline?

A P and Q **B** P and R **C** Q and S **D** R and S

9. Nov/2023/Paper_0620/13/No.19

Which oxides are basic?

1 calcium oxide

2 sodium oxide

3 iron(II) oxide

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

10. Nov/2023/Paper_0620/21/No.17

Which statement about acids is correct?

A A weak acid partially dissociates in aqueous solution.

B An acid accepts protons when added to water.

C Ethanoic acid acts as a strong acid when added to water.

D Hydrochloric acid is a strong acid that ionises in water to form H^- ions.

11. Nov/2023/Paper_0620/21/No.18

Copper(II) sulfate is formed by reacting excess solid copper(II) carbonate with dilute sulfuric acid.

Which processes are part of the preparation of solid copper(II) sulfate?

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

12. Nov/2023/Paper_0620/21/No.19

Which type of reaction is represented by the equation shown?

$$Pb^{2+}(aq) + 2NO_3^-(aq) + 2Na^+(aq) + 2I^-(aq) \rightarrow PbI_2(s) + 2Na^+(aq) + 2NO_3^-(aq)$$

A addition

B redox

C neutralisation

D precipitation

13. Nov/2023/Paper_0620/22/No.19

In which reaction does an acid react with a base?

A Dilute sulfuric acid is added to a piece of magnesium ribbon producing hydrogen.

B Dilute sulfuric acid is added to aqueous barium chloride producing a white precipitate of barium sulfate.

C Aqueous sodium hydroxide is added to aqueous copper(II) sulfate producing a blue precipitate of copper(II) hydroxide.

D Aqueous sodium hydroxide is added to solid ammonium sulfate producing gaseous ammonia.

14. Nov/2023/Paper_0620/22/No.20

Which element forms an oxide that reacts with an aqueous solution of a base?

A argon

B sulfur

C magnesium

D copper

15. Nov/2023/Paper_0620/22/No.21

Which method is used to produce insoluble salts?

A addition of excess insoluble base to an acid

B addition of excess metal to an acid

C precipitation using two aqueous solutions

D titration using an acid and an alkali

16. Nov/2023/Paper_0620/23/No.15

Statements about four different acids are listed.

- A 0.0100 mol / dm^3 solution of hydrochloric acid has a pH of 2.
- A 0.0100 mol / dm^3 solution of ethanoic acid has a pH of 3.4.
- Hydrobromic acid, HBr, is a strong acid.
- Ethanoic acid is a slightly stronger acid than trimethylethanoic acid.

What are the pH values of 0.0100 mol / dm^3 HBr and 0.0100 mol / dm^3 trimethylethanoic acid?

	pH of 0.0100 mol / dm^3 HBr	pH of 0.0100 mol / dm^3 trimethylethanoic acid
A	2	3.3
B	2	3.5
C	3.4	3.3
D	3.4	3.5

17. Nov/2023/Paper_0620/31/No.1(a, c)

(a) Fig. 2.1 shows the distillation apparatus that can be used to separate water from aqueous copper(II) sulfate.

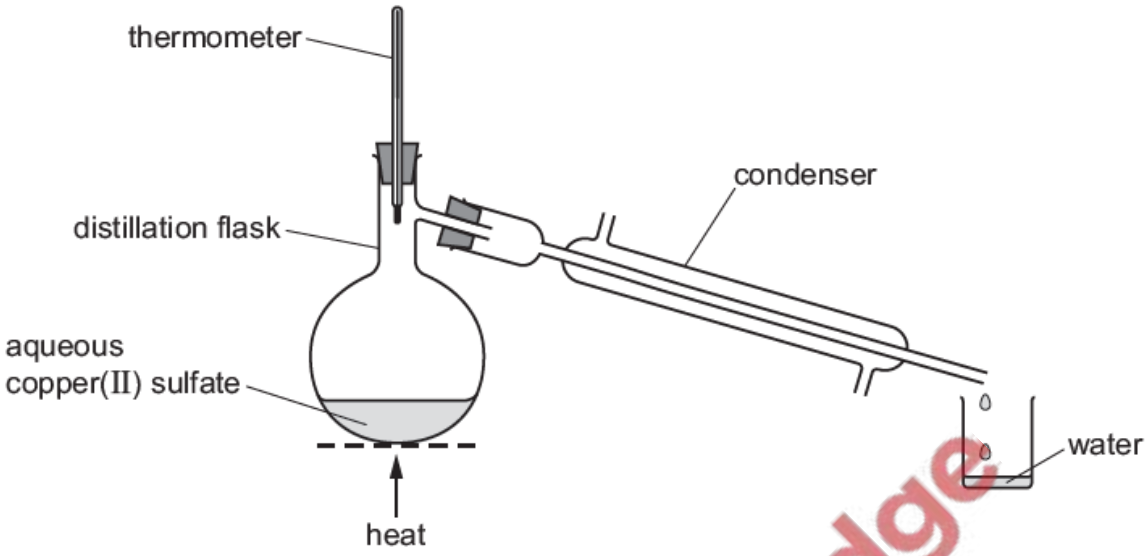

Fig. 2.1

Explain how distillation separates water from aqueous copper(II) sulfate.

.....

.....

..... [2]

18. Nov/2023/Paper_0620/31/No.3(c)

(c) Ammonia forms an alkaline solution in water.

(i) Give the formula of the ion that is present in all alkaline solutions.

..... [1]

(ii) Choose from the list the pH value for an alkaline solution.

Draw a circle around your chosen answer.

pH 1 **pH 4** **pH 7** **pH 13** [1]

19. Nov/2023/Paper_0620/32/No.1(c)

A list of compounds is shown.

ammonia
carbon dioxide
carbon monoxide
cobalt(II) chloride
ethane
ethene
glucose
methane
potassium sulfate
sodium phosphate
sulfur dioxide

Answer the following questions using only the compounds from the list.
Each compound may be used once, more than once or not at all.

Give the name of the compound that:

(c) is a gas which turns damp red litmus paper blue

..... [1]

20. Nov/2023/Paper_0620/32/No.6(c)

(c) (i) Oxides of nitrogen contribute to acid rain.

Choose from the list the pH value for an acidic solution.

Draw a circle around your chosen answer.

pH 5 **pH 7** **pH 9** **pH 13** [1]

(ii) Complete the sentence about removing oxides of nitrogen from car exhausts by choosing **two** words from the list.

agent **catalytic** **compound** **converter**

distillation **filter** **oxidising** **pump**

The emission of oxides of nitrogen from car exhausts is reduced by using a

.... [1]

(iii) Oxides of nitrogen can be formed by the action of bacteria on nitrates.

Name the aqueous solution and the metal used in the test for nitrate ions.

aqueous solution .....

metal .....

[2]

21. Nov/2023/Paper_0620/33/No.3(c)

(c) Nitrogen dioxide is an acidic oxide.

Choose an oxide from the list which is also an acidic oxide.

Tick (✓) **one** box.

copper(II) oxide	☐
magnesium oxide	☐
phosphorus(V) oxide	☐
sodium oxide	☐

[1]

22. Nov/2023/Paper_0620/41/No.1(b)

(b) The relative atomic mass of boron to one decimal place is 10.8.

(i) Determine the relative abundance of ^{10}B present in boron. Give your answer as a percentage.

..... % [1]

(ii) Use the relative atomic mass of boron to calculate the number of atoms in 0.540 g of boron. Give your answer in standard form.

number of atoms = ... [2]

23. Nov/2023/Paper_0620/42/No.4(a)

This question is about lead(II) chloride, $PbCl_2$.

(a) A student prepares a sample of insoluble lead(II) chloride, $PbCl_2$, by mixing aqueous solutions of **two** salts in a beaker.

(i) Identify **two** soluble salts suitable for making lead(II) chloride when mixed together.

.....

..... [2]

(ii) Write the ionic equation for the formation of lead(II) chloride by mixing aqueous solutions.

Include state symbols.

..... [3]

(iii) List the steps the student should take in preparing a pure sample of lead(II) chloride from the mixture in the beaker.

.....

.....

..... [3]

24. Nov/2023/Paper_0620/43/No.1(c)

A list of substances is shown.

barium nitrate
carbon monoxide
hydrated cobalt(II) chloride
copper(II) oxide
anhydrous copper(II) sulfate
ethane
potassium iodide
propene
sodium bromide
sulfur dioxide
zinc oxide

Answer the following questions using only the substances from the list.
Each substance may be used once, more than once or not at all.

Give the name of the substance that:

(a) gives a lilac colour in a flame test

..... [1]

25. Nov/2023/Paper_0620/43/No.4(a, b)

This question is about sulfuric acid and salts that are made from sulfuric acid.

(a) Zinc reacts with dilute sulfuric acid. Aqueous zinc sulfate is one of the products.

Powdered zinc is added to dilute sulfuric acid. The mixture is stirred. More zinc is added, with stirring, until the zinc is in excess.

$$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$$

The mixture is then filtered.

(i) Name the limiting reactant.

..... [1]

(ii) State two **observations** that indicate the zinc is in excess.

1 .....

2 .....

[2]

(iii) Name the filtrate.

..... [1]

(iv) Name **two** compounds which both react with dilute sulfuric acid to produce aqueous zinc sulfate.

1 .....

2 .....

[2]

(b) Zinc sulfate crystals are produced by heating aqueous zinc sulfate until a saturated solution is formed. When the saturated solution cools down, crystals of zinc sulfate start to form.

(i) State what is meant by the term saturated solution.

.....

..... [2]

(ii) Explain why crystals form when the saturated solution cools down.

..... [1]