Acids, bases and salts – 2020 O Level

1. Nov/2021/Paper_11/No.5

Compound X is a crystalline solid at room temperature and pressure. An aqueous solution of X is tested as shown.

test	test result
acidify with dilute nitric acid, then add aqueous barium nitrate	no visible change
add aqueous ammonia	white precipitate, soluble in excess

What could be the identity of X?

A ammonium carbonate

B sodium sulfate

C calcium nitrate

D zinc chloride

2. Nov/2021/Paper_11/No.6

When aqueous sodium hydroxide is added to a solution, a white precipitate forms which dissolves when excess sodium hydroxide is added.

Which ion could be present in the solution?

A $Al^{3+}(aq)$ **B** $Ca^{2+}(aq)$ **C** $Cu^{2+}(aq)$ **D** $Na^{+}(aq)$

3. Nov/2021/Paper_11/No.23

Which row correctly describes the solubilities of both ammonium sulfate and sodium carbonate in water?

	solubility of ammonium sulfate	solubility of sodium carbonate
A	insoluble	insoluble
B	insoluble	soluble
C	soluble	insoluble
D	soluble	soluble

4. Nov/2021/Paper_11/No.24

Lead(II) chloride is an insoluble salt.

Which two reagents are used to prepare a pure sample of lead(II) chloride?

A lead(II) carbonate and dilute hydrochloric acid

B lead metal and dilute hydrochloric acid

C aqueous lead(II) nitrate and dilute hydrochloric acid

D lead(II) oxide and dilute hydrochloric acid

5. Nov/2021/Paper_11/No.29

What happens when a strip of silver is immersed in aqueous copper(II) sulfate?

A Bubbles of gas will appear.

B No reaction occurs.

C Pink copper will be deposited on the silver strip.

D The silver strip will start to dissolve.

6. Nov/2021/Paper_12/No.5

Aqueous zinc chloride is tested with various reagents.

Which observation is correct?

A Aqueous ammonia gives a white precipitate which is soluble in excess reagent.

B Copper turnings give a precipitate of zinc.

C Acidified aqueous silver nitrate gives a yellow precipitate.

D Acidified aqueous barium nitrate gives a white precipitate.

7. Nov/2021/Paper_12/No.6

When aqueous sodium hydroxide is added to a solution, a white precipitate forms which dissolves when excess sodium hydroxide is added.

Which ion could be present in the solution?

A $Al^{3+}(aq)$ **B** $Ca^{2+}(aq)$ **C** $Cu^{2+}(aq)$ **D** $Na^{+}(aq)$

8. Nov/2021/Paper_12/No.29

What happens when a strip of silver is immersed in aqueous copper(II) sulfate?

A Bubbles of gas will appear.

B No reaction occurs.

C Pink copper will be deposited on the silver strip.

D The silver strip will start to dissolve.

9. Nov/2021/Paper_12/No.8a(ii)

(ii) Describe how to prepare pure dry crystals of barium nitrate from aqueous barium nitrate.

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..... [3]

10. Nov/2021/Paper_22/No.3b

(b) In the past, ink was made from a mixture containing iron(II) ions and tannic acid.

(i) Describe a test for iron(II) ions.

test .....

observations .....

[2]

(ii) The ink darkens when used on paper. This is because iron(II) ions are oxidised to iron(III) ions.

Write the ionic equation for this reaction.

..... [1]

(iii) After a time, the ink fades because of a hydrolysis reaction which is catalysed by acids.

State how a catalyst increases the rate of a chemical reaction.

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..... [1]

11. Nov/2021/Paper_22/No.6

Methanoic acid and ethanoic acid are weak acids.

(a) What does the term *weak* mean, when applied to acids?

.....

..... [1]

(b) Methanoic acid, HCO_2H, reacts with magnesium powder.

(i) Construct the equation for this reaction.

..... [1]

(ii) State and explain how the rate of this reaction changes when the experiment is repeated using a piece of magnesium ribbon with the same mass as the powder.

All other conditions stay the same.

Include in your answer ideas about collisions between particles.

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..... [2]

(c) Methanoic acid reacts with propanol, C_3H_7OH, to form an ester.

Name and draw the structure of this ester, showing all of the atoms and all of the bonds.

name .....

structure

[2]

(d) Ethanoic acid is present in vinegar.

(i) Name the organic compound which is converted to ethanoic acid when vinegar is made.

..... [1]

(ii) What type of chemical reaction is this?

..... [1]

(e) The table shows some properties of four carboxylic acids.

carboxylic acid	formula	density in g/cm^3	boiling point in °C
methanoic acid	HCO_2H	1.22	101
ethanoic acid	CH_3CO_2H		118
propanoic acid	$C_2H_5CO_2H$	0.99	141
butanoic acid	$C_3H_7CO_2H$	0.96	164

(i) Predict the density of ethanoic acid.

..... g/cm^3 [1]

(ii) Describe and explain the change in the boiling point as the number of carbon atoms in a molecule increases.

.....

..... [1]

[Total: 10]

12. Jun/2020/Paper_11/No.4

Aluminium chloride is dissolved in water and the resulting solution is divided between three test-tubes.

Which row gives the reagents for three tests which could be used to confirm the presence of aluminium chloride?

	test-tube 1	test-tube 2	test-tube 3
A	aqueous sodium hydroxide	aqueous ammonia	dilute hydrochloric acid and aqueous silver nitrate
B	aqueous sodium hydroxide	dilute nitric acid and aqueous silver nitrate	dilute hydrochloric acid
C	aqueous ammonia	dilute nitric acid and aqueous silver nitrate	nitric acid and barium nitrate
D	aqueous sodium hydroxide	aqueous ammonia	dilute nitric acid and aqueous silver nitrate

13. Jun/2020/Paper_11/No.19

The oxide of element X reacts with acids to form salts.

Which statement about element X or its oxide is correct?

A X conducts electricity.

B X is a non-metal.

C The oxide is a gas at room temperature and pressure.

D The oxide is covalent.

14. Jun/2020/Paper_11/No.21

Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

A calcium nitrate

B potassium hydroxide

C sodium chloride

D sulfuric acid

15. Jun/2020/Paper_12/No.21

Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

A calcium nitrate

B potassium hydroxide

C sodium chloride

D sulfuric acid

16. Jun/2020/Paper_21/No.5

Hydrochloric acid, HC*l*, reacts with barium hydroxide, $Ba(OH)_2$, as shown.

$$2HCl(aq) + Ba(OH)_2(aq) \rightarrow BaCl_2(aq) + 2H_2O(l)$$

A sample of 25.0 cm^3 of 0.0500 mol/dm^3 $Ba(OH)_2$ is placed in a beaker.

Dilute HC*l* is added slowly, from a burette, to the $Ba(OH)_2(aq)$ in the beaker.

A pH probe is used to measure the pH of the solution in the beaker until a total of 40.0 cm^3 of dilute HC*l* is added.

The table shows how the pH of the solution in the beaker changes.

volume of dilute HC*l* added / cm^3	pH of the solution in the beaker
0.0	13.0
5.0	12.9
10.0	12.5
15.0	11.6
20.0	7.0
25.0	3.0
30.0	1.6
35.0	1.1
40.0	0.9

(a) Explain, in terms of the ions present, why the pH of the solution in the beaker changes from 13.0 to 0.9.

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.....

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..... [2]

(b) Use the data in the table to state the volume of dilute HC*l* that just neutralises all of the sample of $Ba(OH)_2(aq)$.

volume of dilute HC*l* ..... cm^3 [1]

(c) Use your answer to **(b)** to calculate the concentration, in mol/dm^3, of the dilute HC*l*.

concentration of dilute HC*l* ..... mol/dm^3 [3]

[Total: 6]