

AQA – Acids and bases – A2 Chemistry P31. **June/ 2020/Paper_3/No.7**

When heated, a sample of potassium chlorate(V) (KClO_3) produced 67.2 cm^3 of oxygen, measured at 298 K and 110 kPa



What is the amount, in moles, of potassium chlorate(V) that has decomposed?

The gas constant, $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$

[1 mark]

A 9.95×10^{-4}

B 1.99×10^{-3}

C 2.99×10^{-3}

D 4.48×10^{-3}

2. **June/ 2020/Paper_3/No.13**

Which statement about pH is correct?

[1 mark]

A The pH of a weak base is independent of temperature.

B At temperatures above 298 K, the pH of pure water is less than 7.

C The pH of 2.0 mol dm^{-3} nitric acid is approximately 0.30

D The pH of 0.10 mol dm^{-3} sulfuric acid is greater than that of 0.10 mol dm^{-3} hydrochloric acid.

3. June/ 2020/Paper_3/No.14

A 0.10 mol dm^{-3} aqueous solution of an acid is added slowly to 25 cm^3 of a 0.10 mol dm^{-3} aqueous solution of a base.

Which acid–base pair has the highest pH at the equivalence point?

[1 mark]

A CH_3COOH and NaOH

B CH_3COOH and NH_3

C HCl and NaOH

D HCl and NH_3

4. June/ 2020/Paper_3/No.32

Which is the concentration of $\text{NaOH}(\text{aq})$, in mol dm^{-3} , that has $\text{pH} = 14.30$?

$K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ at 25°C

[1 mark]

A -1.16

B 5.01×10^{-15}

C 2.00×10^{14}

D 2.00

5. June/ 2020/Paper_3/No.34

What is the pH of $0.015 \text{ mol dm}^{-3}$ sulfuric acid?

[1 mark]

A -1.82

B -1.52

C 1.52

D 1.82

6. June/ 2020/Paper_3/No.36

A student rinsed the apparatus before starting an acid-base titration. The results of the titration showed that the volume of acid added from the burette was larger than expected.

Which is a possible reason for this?

[1 mark]

A The conical flask was rinsed with water before the titration.

B The walls of the conical flask were rinsed with water during the titration.

C The pipette was rinsed only with water.

D The burette was rinsed only with water.

7. June/ 2019/Paper_3/No.2

0 2

This question is about sulfuric acid and its salts.

0 2 . 1

Draw the displayed formula of a molecule of H_2SO_4

[1 mark]

0 2 . 2

In aqueous solution, sulfuric acid acts as a strong acid. The H_2SO_4 dissociates to form HSO_4^- ions and H^+ ions.

The HSO_4^- ions act as a weak acid and dissociate to form SO_4^{2-} ions and H^+ ions.

Give an equation to show each stage in the dissociation of sulfuric acid in aqueous solution.

Include appropriate arrows in your equations.

[2 marks]

Equation 1 _____

Equation 2 _____

0 2 . 4 A solution that contains 605 mg of NaHSO_4 in 100 cm^3 of solution has a pH of 1.72

Calculate the value of K_a for the hydrogensulfate ion (HSO_4^-) that is behaving as a weak acid.

Give your answer to three significant figures.

State the units of K_a

[6 marks]

K_a _____ Units _____

0 2 . 5 Some sodium sulfate is dissolved in a sample of the solution from question 02.4.

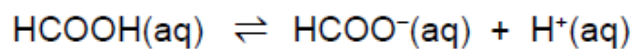
Explain why this increases the pH of the solution.

[2 marks]

8. June/2021/Paper_3/No.5

A mixture of methanoic acid and sodium methanoate in aqueous solution acts as an acidic buffer solution.

The equation shows the dissociation of methanoic acid.



Calculate the mass, in g, of sodium methanoate (HCOONa) that must be added to 25.0 cm^3 of $0.100 \text{ mol dm}^{-3}$ methanoic acid to produce a buffer solution with $\text{pH} = 4.05$ at 298 K

For methanoic acid, $\text{p}K_{\text{a}} = 3.75$ at 298 K

Assume that the volume of the solution remains constant.

[5 marks]

Mass _____ g