

**A Level Chemistry B (Salters)**  
**H433/02** Scientific literacy in chemistry

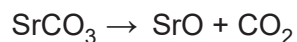
**Question Set 12**

- 1 Strontium carbonate is used in fireworks to colour the flames red.
- (a) The red colour comes from lines of specific frequency in the atomic emission spectrum of strontium.

Explain how these lines are formed.

[3]

- (b) (i) Strontium carbonate decomposes to give strontium oxide when heated.



12.0g of  $\text{SrCO}_3$  are heated.

Calculate the volume of  $\text{CO}_2$  (in  $\text{cm}^3$ ) that would be collected at 290K and 155kPa.

Give your answer to an **appropriate** number of significant figures.

Volume of  $\text{CO}_2$  = ..... $\text{cm}^3$

[4]

- (ii) A student says 'Strontium ions are larger than calcium ions, so the attraction to carbonate ions is weaker. This means that strontium carbonate has a lower thermal stability than calcium carbonate.'

Discuss the student's statement, giving the correct chemistry where necessary.

[4]

- (c) (i) A sample of strontium metal has the isotopic composition shown in the table.

<b>Mass number</b>	84	86	87	88
<b>Abundance / %</b>	0.56	9.86	7.00	82.58

How many neutrons are there in an atom of  $^{84}\text{Sr}$ ?

number of neutrons = ..... [1]

- (ii) Use the data to calculate the relative atomic mass of the strontium sample.

Give your answer to **2** decimal places.

relative atomic mass = ..... [2]

- (d)\* Strontium oxide reacts with water to form strontium hydroxide,  $\text{Sr}(\text{OH})_2$ .

The solubility of strontium hydroxide in water at room temperature is around  $10\text{ g dm}^{-3}$ .

A student is given a saturated solution of strontium hydroxide, normal titration equipment and a variety of different concentrations of hydrochloric acid.

The student wishes to find an accurate value for the concentration of the solution in  $\text{mol dm}^{-3}$ .

Describe in full a suitable procedure and indicate how the result would be calculated. [6]

- (e) (i) Write the equation for the equilibrium that occurs between solid strontium hydroxide and its ions in solution.

Use your equation to write the expression for the solubility product of strontium hydroxide.

Equation with state symbols:

$K_{\text{sp}} =$

[2]

(ii) At 0 °C, the solubility of strontium hydroxide in water is  $3.4 \times 10^{-2} \text{ mol dm}^{-3}$ .

Calculate the solubility product of strontium hydroxide at this temperature.

Give the units in your answer.

solubility product = ..... units ..... [3]

(iii) Explain how the solubility of strontium hydroxide in aqueous NaOH at 0 °C compares with  $3.4 \times 10^{-2} \text{ mol dm}^{-3}$ .

Use the idea of solubility product in your answer. [2]

(f) (i) The melting point of strontium is higher than the melting point of rubidium.

To which block of the Periodic Table do these elements belong? [1]

(ii) Explain the difference in melting point. [2]

**Total Marks for Question Set 12: 30**



### General Information

Molar gas volume =  $24.0 \text{ dm}^3 \text{ mol}^{-1}$  at RTP

Avogadro constant,  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$

Specific heat capacity of water,  $c = 4.18 \text{ J g}^{-1} \text{ K}^{-1}$

Planck constant,  $h = 6.63 \times 10^{-34} \text{ J Hz}^{-1}$

Speed of light in a vacuum,  $c = 3.00 \times 10^8 \text{ m s}^{-1}$

Ionic product of water,  $K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$  at 298 K

1 tonne =  $10^6 \text{ g}$

Arrhenius equation:  $k = Ae^{-E_a/RT}$  or  $\ln k = -E_a/RT + \ln A$

Gas constant,  $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$

---

# OCR

Oxford Cambridge and RSA

## **Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge