



North Sydney Boys High School
Science Faculty
Year 12 Chemistry 2021
Assessment 1

Reading time – 5 minutes

Writing time – 60 minutes

Total Marks - 32

- 5 questions
- 32 marks

General Instructions:

- Attempt all questions
- Write using black or blue pen
- Draw diagrams using pencil
- NESA approved calculators may be used
- Write your student number:
 - at the **top** of this page
 - on the **reverse** side of graph paper

Weighting - 25%

- **10% Knowledge & Understanding**
- **15% Working Scientifically skills**

Section	Mark	Out of
Knowledge & Understanding		11
Working Scientifically skills		21
Total		32

This paper MUST NOT BE REMOVED from the examination room

Question 1 (10 marks)**Marks**

A solid sample of a salt is known to contain one cation and one anion from the following lists:

possible cations

- barium
- calcium
- copper
- lead
- sodium

possible anions

- carbonate
- chloride
- hydroxide
- nitrate
- sulfate

- a) Two students from your class decide to perform a flame test on the salt

Identify any significant risks associated with this procedure.

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- b) A flame test was performed and the colour of the flame observed was described by the two students as “pale blue/white” and “gray”.

Propose which cation was in the salt and justify your choice.

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Question 1 continues on next page

Question 1 (continued)

Marks

- c) Draw and complete a table to show all of the tests that you would perform and the expected results for the identification of the cation in the salt using precipitation tests. **3**

Question 1 continues on next page

Question 1 (continued)

Marks

- d) Some of the salt was dissolved in water and a small amount of concentrated hydrochloric acid was added. A fine white precipitate was observed. However, as excess acid was added, the precipitate dissolved.

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Account for this behaviour.

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- e) Propose the identity of the anion in the salt.

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Question 2 (3 marks)

A sample of seawater was collected and analysed to determine the concentration of chloride ions present as sodium chloride using the following procedure:

Procedure.

1. filter 100 mL of seawater
2. evaporate the filtrate
3. weigh salt collected
4. calculate concentration of chloride ions

Results:

Measurement	Sample
Mass of 100 mL of seawater (g)	101.42
Mass of residue after filtering (g)	0.25
Mass of salt after evaporation (g)	3.75

Calculate the concentration of chloride ions in the seawater (in mol L⁻¹).

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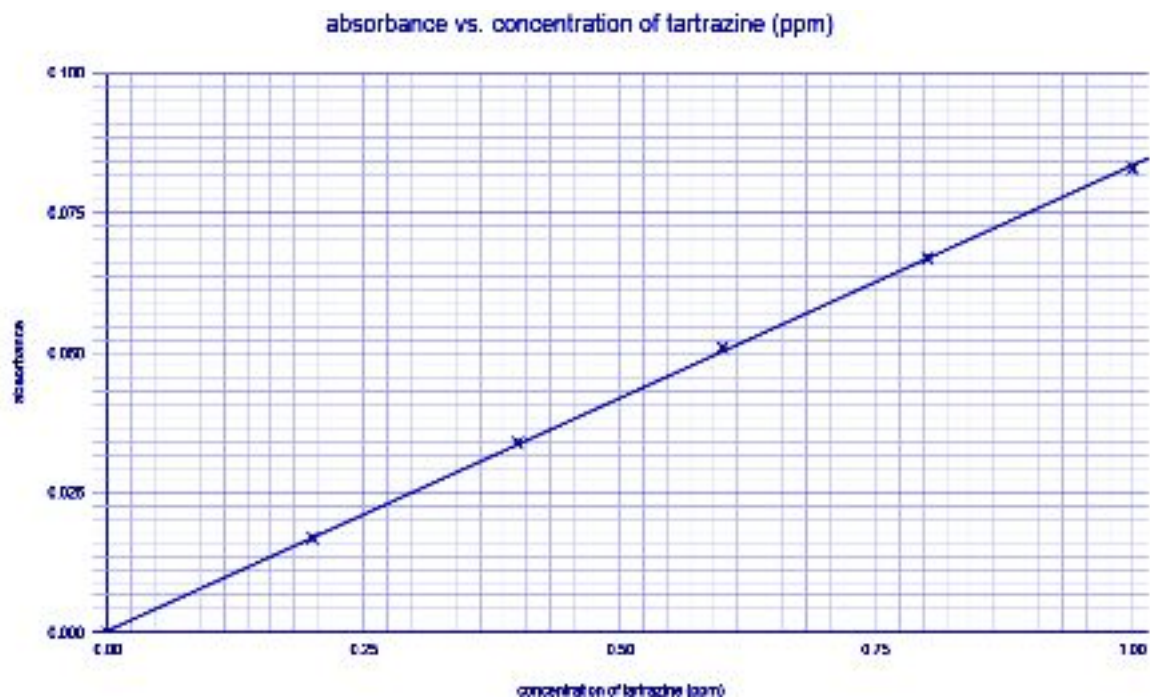
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Question 3 (4 marks)

Tartrazine is a synthetic lemon yellow azo dye primarily used as a food colouring. It is a possible carcinogenic and is linked to hyperactivity in children as well as being a factor in allergies and asthma.

A calibration curve using a colourimeter has been constructed for tartrazine as shown below:



- a) Propose and justify the selection of an appropriate light source in terms of colour or wavelength. 2

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- b) Using the above data, determine the concentration in ppm of tartrazine in a sample of food which has an absorbance of 0.058. 2

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Question 4 (6 marks)

- a) Outline the procedure for analysing a sample for chloride ion concentration using Mohr's method of precipitation titration.

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Question 4 continues on next page

Question 4 (continued)**Marks**

- b) A group of students decided to test a solution using Volhard's method to determine its iodine content.

25.0 mL of the solution was mixed with 50.0 mL of a 0.485 mol L^{-1} silver nitrate solution. The mixture was then filtered to remove all precipitate, retaining all of the filtrate. 25.0 mL of the filtrate was titrated with a 0.505 mol L^{-1} thiocyanate solution using Fe^{3+} as an indicator and 14.1 mL was required to reach the end point.

Determine the concentration of iodine in the original solution.

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Question 5 (9 marks)

Calcium is one of the most important minerals in your body. Calcium is required for healthy bones and teeth.

The calcium content of urine may be determined by atomic absorption spectroscopy. For someone eating a normal diet, the amount of calcium expected in urine is between 100 to 300 mg/day. Values below this may indicate an inadequate diet. The normal range for 24-hour urine volume is 800 to 2000 mL per day.

A 10.0 mL sample of urine was added to a 100 mL volumetric flask which was topped up to the mark with deionised water.

A series of standards and the diluted urine sample were analysed and the results are recorded below:

AAS results for calcium ion concentration		
Solution	Concentration (mol L ⁻¹)	Absorbance
blank	0	0.00
Standard 1	1.00×10^{-4}	1.33
Standard 2	2.00×10^{-4}	2.73
Standard 3	3.00×10^{-4}	4.23
Diluted urine sample		2.56

- a) Plot this data on the graph paper provided.

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Question 5 continues on next page

Question 5 (continued)

Marks

- b) Using your graph, determine the amount of calcium in the original urine sample.
(g/100 mL)

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- c) Using a diagram, explain the operation of an AAS spectrometer.

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End of Assessment

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