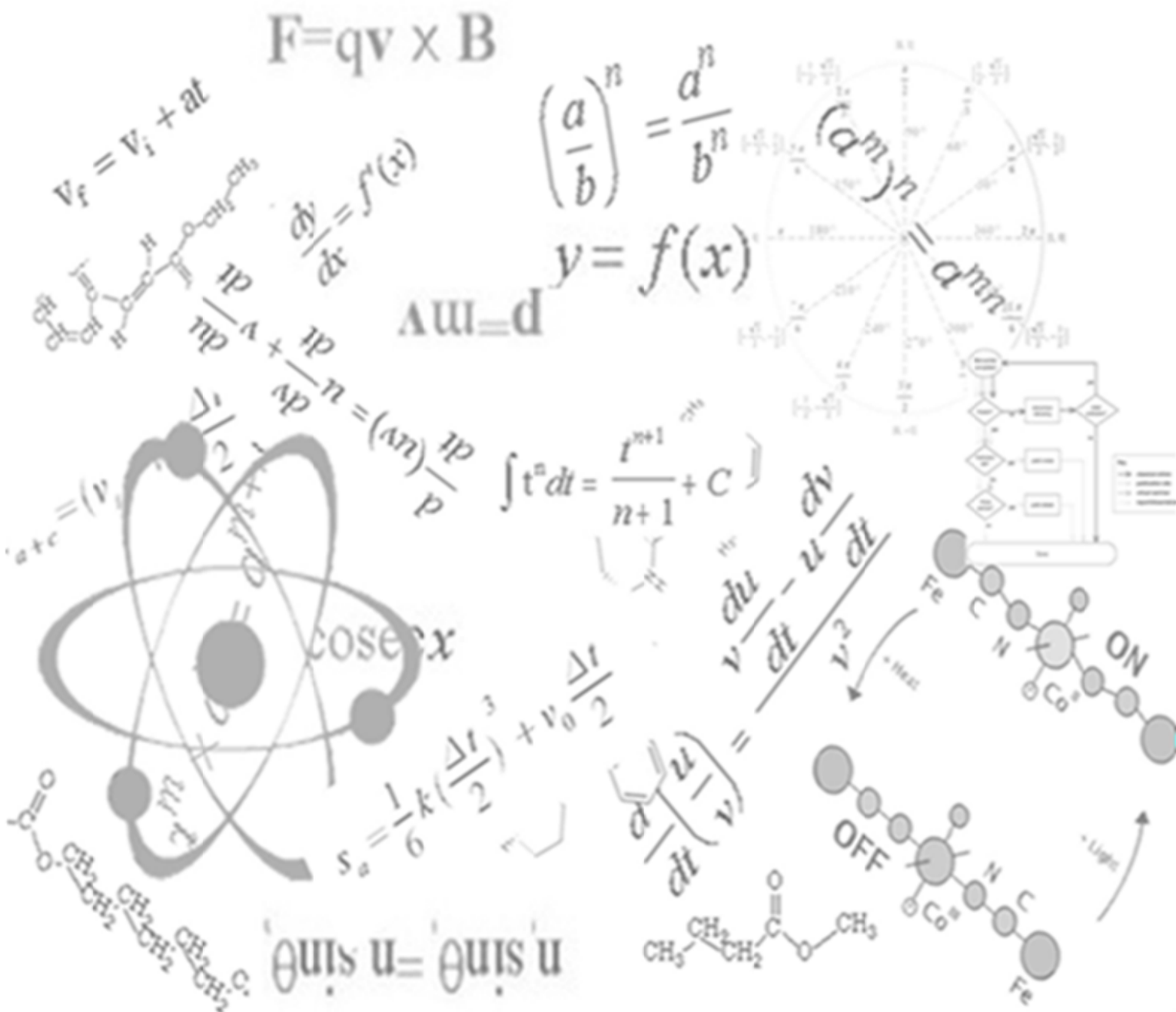


where students come first!



Year 12- Chemistry

Chemical Monitoring & Management



Chemical Monitoring exam 2 – Questions

1. The table below shows the percentage yield of ammonia using the Haber process at a pressure of 30 MPa.

Temperature (Kelvin)	Percentage Yield of Ammonia (%)
200	94
300	66
400	44
500	22
600	9

- Use the table values to predict whether the production of ammonia is endothermic or exothermic. Justify your answer. **2 marks**
- Predict how an increase in temperature would affect the rate of production of ammonia. **1 mark**
- Identify and explain the effect of increased pressure on the production of ammonia. **2 marks**

2. The table below gives the concentration in parts per million, of some substances found in Sydney's tap water, along with the National Health and Medical Research Council (NHMRC) guidelines for maximum safe concentrations of these substances.

Substances	Concentration in ppm in Sydney tap water	NHMRC guidelines concentration in ppm
Total dissolved solids	86	1000
Calcium ions	15	200
Chloride ion	19	400
Nitrate ion	0.4	12

- Describe a chemical test you could perform to test for the presence of chloride ion. **1 mark**
- Identify a possible source of nitrate ion in the tap water. **1 mark**
- Identify one other substance which can affect water quality, and describe an adverse effect if this substance is too high a concentration. **2 marks**
- Sydney tap water has chlorine added in varying concentrations. Discuss the purpose of adding this chlorine. **2 marks**

3. The water in Sydney is very soft, but the water in Broken Hill is hard.
 - a. Identify the cause of water hardness. **1 mark**
 - b. Describe how you could quickly tell if a sample of water came from Sydney or Broken Hill. **2 marks**

4. To analyse a white crystalline solid a student makes the following observations:
 - A platinum wire dipped in the solid and held in a Bunsen flame produces a bright red colour.
 - The solid dissolves easily in water. The solution has a pH of approximately 9.
 - In solution the compound has no visible reaction with dilute hydrochloric acid.
 - a. Suggest what the white solid might be, and construct ionic equations for it dissolving in water to produce a basic solution. **3 marks**
 - b. Describe TWO further tests you could perform to test your identification of the solid. Include relevant equations. **2 marks**
 - c. Identify ONE metallic salt which produces an acidic solution in water and ONE in which produces a neutral solution. **2 marks**

5. Many fish recently died in a creek on the NSW North Coast. This was blamed by some local residents on the sewage treatment works which border the creek immediately upstream of the dead fish. Authorities stated that the sewerage plant was operating properly and that the fish deaths were a natural occurrence.
 - a. Outline a procedure for sampling the creek water to detect any contamination from the sewerage plant, including safety precautions. **2 marks**
 - b. Identify TWO chemical tests you would perform on your water samples and the expected results if discharge from the sewerage plant had entered the waterway. **2 marks**

6. Ammonium sulphate is often used as lawn fertiliser. A package is labelled 'more than 90%' ammonium sulphate. Describe a first-hand investigation you have performed which could be used to verify the labelling on this package. Identify safety measures taken during your investigation. **4 marks**

7. The incomplete combustion of octane produces a highly toxic gas.
 - a. Identify this gas. **1 mark**
 - b. Identify two other pollutants found in the lower atmosphere and give a source for each. **2 marks**

8. In the technique of AAs the identify of a metallic cation can be confirmed by a 'fingerprint' of that particular cation.
 - a. In the context of AAS, explain what is meant by a fingerprint of a cation. **2 marks**
 - b. Water samples from oyster farms are regularly checked for heavy metal contamination using AAS. Water samples from a certain oyster farm were found to be contaminated with 9.5 ppm of lead (assume the density of the solution is 1 g mL^{-1}).
 - i. Explain what is meant by 9.5 ppm. **1 mark**
 - ii. Convert 9.5 ppm to a concentration of mol L^{-1} . **1 mark**

9. Oxygen and its allotrope, ozone, are both found in the Earth's atmosphere.
- Explain what is meant by the term allotrope. **1 mark**
 - Draw the Lewis electron dot structures for the oxygen and ozone molecules. **2 marks**
 - Explain any differences between the types of bonding within the two forms of oxygen. **1 mark**
 - Compare the properties of oxygen and ozone. **2 marks**
 - Give one property of the oxygen free radical that is not found in oxygen. **1 mark**
10. A student analysed a 3.25 gram sample of washing powder for its phosphorous content. The phosphorous was precipitated as $\text{Mg}_2\text{P}_2\text{O}_7$. The mass of the precipitate was 0.212 grams.
- To assure accuracy describe TWO procedures that the student needed to undertake after filtration and before determining the mass of the precipitate. **2 marks**
 - Determine the percentage, by mass, of phosphorous in the washing powder. **2 marks**
 - Phosphorous in detergents in the form of phosphates acts as low cost builders, but together with nitrates cause pollution in waterways through the process of eutrophication. Outline and describe the effects of eutrophication in natural waterways. **2 marks**
- 11.
- Identify a factor, which can affect water quality. **1 mark**
 - Describe how this factor can affect the quality of water in a freshwater lake. **3 marks**
12. Describe the conditions under which Haber developed the industrial synthesis of ammonia and evaluate the significance of the development of the Haber process at that time in history. **6 marks**
13. Ozone can be regarded as both a 'friendly' and an 'unfriendly' substance to living things on the Earth's surface.
- Explain the 'friendly' nature of ozone to living things. **1 mark**
 - Explain the 'unfriendly' nature of ozone. **1 mark**
 - Using relevant equations, explain how compounds such as CFC's deplete ozone from the Earth's atmosphere. **2 marks**
- 14.
- Name the following compounds. **2 marks**
- $$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{Br} \\ | \\ \text{Br} \end{array}$$

$$\begin{array}{c} \text{Cl} \quad \text{Cl} \\ | \quad | \\ \text{Cl}-\text{C}-\text{C}-\text{Cl} \\ | \quad | \\ \text{Cl} \quad \text{Cl} \end{array}$$
- Draw the chemical structure for 2-Chloro-1,1,1,2-tetrafluoroethane. **1 mark**
15. Describe and assess the effectiveness of methods used to purify and sanitise mass water supplies. **6 marks**