St Ives High School

2002
Higher School Certificate
Trial Examination

Chemistry

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Board-approved calculators may be used
- Write using black or blue pen
- Draw diagrams using pencil
- A Data Sheet and Periodic Table are provided at the back of this paper
- Write your student number and/or name at the top of every page

Total marks – 85
This section has two parts, Part A and Part B

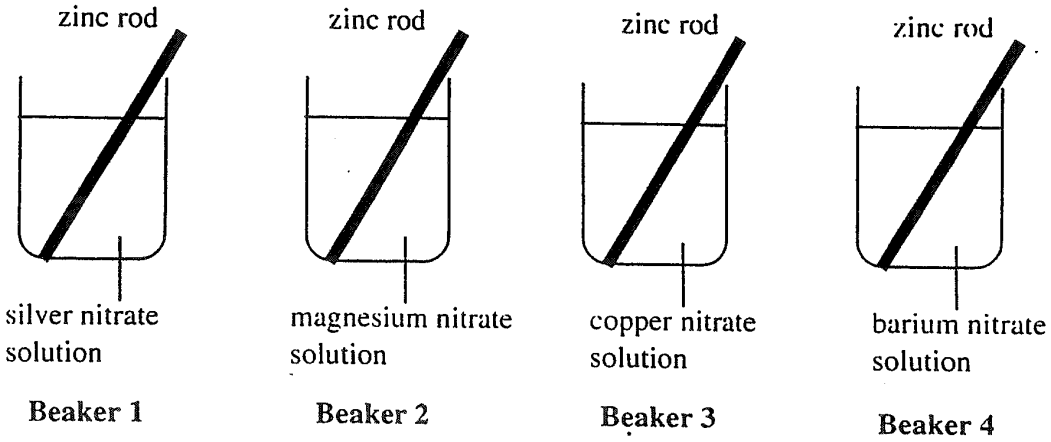
Part A
Total marks (15)
- Attempt Questions 1–15
- Allow about 30 minutes for this part

Part B
Total marks (70)
- Attempt Questions 16-31
- Allow about 2 hours for this part

This paper **MUST NOT** be removed from the examination room

STUDENT NUMBER/NAME: .....

1. A zinc rod is placed in four different solutions, as shown in the diagrams below.



You would notice a displacement reaction in beakers

(A) 1 and 2
(B) 1 and 3
(C) 1 and 4
(D) 2 and 3

2. Bromine water can be used to distinguish between:

(A) ethane and propane
(B) propane and propene
(C) ethene and propene
(D) ethane and ethanol

3. Which of the following metals could reduce iron(II) ions in aqueous solution?

(A) zinc
(B) tin
(C) copper
(D) silver

4. Consider the reaction described by the equation below:

$$C_2H_5OH \rightarrow C_2H_4 + H_2O$$

This reaction is an example of:

(A) polymerisation
(B) hydration
(C) dehydration
(D) addition

5. The table below gives some properties of radioactive isotopes

Name	Radiation emitted	Half Life
Americium-241	α	432 years
Carbon-14	β	5.7×10^3 years
Magnesium-27	β	9.5 minutes
Sodium-24	β,γ	15 hours

The isotope that is most suitable for detecting leaks in water pipes would be.

(A) Americium-241
(B) Carbon-14
(C) Magnesium-27
(D) Sodium-24

Questions 6 and 7 refer to the table below which shows the colour ranges of three acid–base indicators.

Indicator	Very acidic						Neutral						Very basic		
pH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bromothymol blue	yellow						→6.0	7.6←					blue		
Methyl orange	red			→3.1	4.5←				yellow						
Phenolphthalein	colourless								→8.3		10.0←		red		

6. A solution is yellow in bromothymol and methyl orange, and colourless in phenolphthalein. What is the pH range of the solution?

(A) 7.5 to 8.5
(B) 6.0 to 7.5
(C) 4.5 to 6.0
(D) 8.5 to 10.0

7. 0.1 mol L^{-1} citric acid ($C_6H_8O_7$) solution is neutralised with a solution of 0.1 mol L^{-1} sodium hydroxide (NaOH). The best indicator for this titration would be:

(A) methyl orange
(B) phenolphthalein
(C) a mixture of methyl orange and bromothymol blue.
(D) bromothymol blue

8. In the upper atmosphere, the most important radiation absorbed by ozone is

(A) microwaves
(B) infra-red
(C) light
(D) ultra-violet

9. The pH of four acids and their concentrations are shown in the table below.

Acid	Conc. (mol L^{-1})	pH
A	0.1	1.0
B	0.05	1.0
C	0.01	2.0
D	0.1	2.0

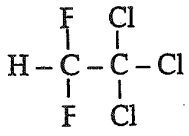
Which acid in the table is the weakest?

(A) A
(B) B
(C) C
(D) D

10. The pH of a solution of magnesium hydroxide of concentration 4.5×10^{-3} mol L^{-1} is closest to:

(A) 11.9
(B) 11.6
(C) 2.1
(D) 2.4

11. What is the correct systematic name for the following compound?



(A) 1,1,2,2,2 – difluorotrichloroethane
(B) ethane – 1,1 – difluoride – 2,2,2 – trichloride
(C) 1,1,1 – trichloro – 2,2 – difluoroethane
(D) trichlorodifluoroethane

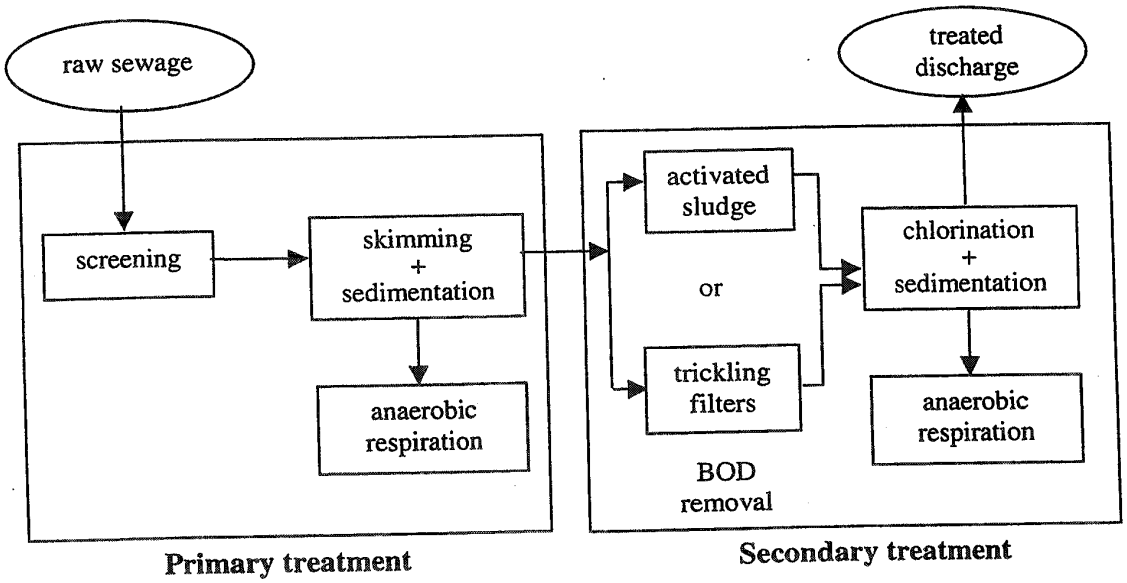
12. A student analysed a sample of water from an underground spring which was suspected to be contaminated with certain metallic ions.

The student added dilute hydrochloric acid to the solution and noted no changes. She then added dilute ammonia to a second sample and also noted no change. She then performed a flame test and noted a faint but distinct red colour.

The ion in the water is most probably:

(A) Fe^{3+}
(B) Ba^{2+}
(C) Cu^{2+}
(D) Ca^{2+}

13. The diagram below represents the stages in the treatment of sewage.



Secondary treatment chlorination would be used to:

(A) adjust the pH
(B) improve the BOD levels
(C) kill pathogens
(D) activate enzymes necessary for sewage digestion

14. The technique best suited to detecting low concentrations of metal ions in solutions would be:

(A) fractional distillation
(B) gas-liquid chromatography (GLC)
(C) atomic absorption spectroscopy (AAS)
(D) nuclear magnetic resonance spectroscopy (NMR)

15. The following table shows the potential release of acid into waterways from some minerals as a result of mining.

Potential acid release from some alunite group minerals		
Mineral	**Formula**	**moles H^+/mole**
Plumbojarosite	$PbFe_6(SO_4)_4(OH)_{12}$	6
Benverite	$Pb(Cu,Fe,Al)_3(SO_4)_2(OH)_6$	0 – 5
Natrojarosite	$NaFe_3(SO_4)_2(OH)_6$	3
Alunite	$KAl_3(SO_4)_2(OH)_6$	0

The most noticeable effect of run off from a mine waste heap with a high concentration of plumbojarosite into a nearby stream would be:

(A) a rapid rise in BOD levels
(B) pH levels would drop
(C) dissolved oxygen levels would drop
(D) eutrophication would begin

Section I - continued

Part B

Total Marks (70)
Attempt Questions 1 – 32
Allow about 2 hours for this part.

Answer the questions in the spaces provided

Show all relevant working in questions involving calculations.

Question 16 (6 marks) **Marks**

Many cosmetic and pharmaceutical preparations require the use of a solvent such as ethanol, which can be produced by the fermentation of sugars.

(a) Relate the use of ethanol as a solvent to the nature of the ethanol molecule. 2

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(b) Describe the conditions required to produce ethanol by the fermentation of glucose. 2

(c) Explain how mass changes can be used to monitor the fermentation reaction. A suitable equation should be included in your answer. 2