

S O L U T I O N S

Student Number

CRANBROOK SCHOOL

YEAR 12

TERM 3, 2001

TRIAL HSC COURSE EXAMINATION

Chemistry

Part A Answer Booklet

General Instructions

- Write your Student Number at the top of this page
- Answer Questions 1 - 15 in this answer booklet
- Write using blue or black pen
- Select the alternative A, B, C or D that best answers the question. Fill in the response circle completely.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D

8. A B C D
9. A B C D
10. A B C D
11. A B C D
12. A B C D
13. A B C D
14. A B C D
15. A B C D

Write your answers on the lines or in the spaces provided for each question.

Question 16 (5 marks)

Marker's use only

Hydrofluorocarbons - contain C-H bonds
 - susceptible to attack by reactive radicals in
 troposphere thus decomposed before most get to
 stratosphere. CFC's don't break down in troposphere
 (reach stratosphere where UV breaks C-Cl off which
 reacts with O₃ to form O₂ - reduces ozone layer)

Question 17 (3 marks)

(a) basic to acidic (with amphiprotic, G.III, VIII, VIII, not required)

(b) $\text{Na}_2\text{O}(s) + \text{H}_2\text{O}(l) \rightarrow 2 \text{NaOH}(aq)$
 $\text{SO}_2(g) + \text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{SO}_3(aq)$

Question 18 (4 marks)

Marker's use only

O_2 $\overset{+}{\times} O \overset{-}{\times} O$ $\overset{+}{\times} O \overset{-}{\times} O$ double bond, better than
 needs high energy to break bond
 for O_2 to react. Non-polar molecule.
 \checkmark low BP (lower than O_3), not very soluble in
 H_2O , stable.
 O_3 bent shape, polar molecule.
 $\times O \overset{+}{\times} O \overset{-}{\times} O$ 2 bonds - single bond easily
 broken - lower energy than double bond.
 thus forms O_2 . Higher BP than O_2 , more soluble
 in H_2O (water), reactive.

Question 19 (6 marks)

Three tests to be explained - importance to test for
 drinking
 (any from p255 of text)
 "conquering chemistry"

Question 20 (4 marks)

Marker's use only

student response must thoroughly describe the
 role of a named chemist in industry

Question 21 (6 marks)

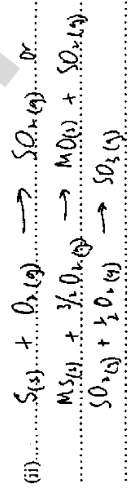
student's response must thoroughly discuss the reasons
 for monitoring the Haber process so to maximise
 yield and keep costs low and
 give the chemical reactions for the process and
 briefly explain the equilibrium compromise required
 to keep cost low but yield high.

Write your answers on the lines or in the spaces provided for each question.

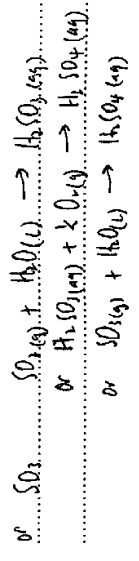
Question 22 (7 marks)

Marker's use only

- (a) (i) included: geothermal hot springs, volcanoes
Industrial: burning processing fossil fuels +
extracting metals from sulfide ores



- (b) SO_2 - irritates respiratory system in humans
 - causes breathing difficulties
 - forms acid rain: increase acidity in lakes, damage to pine trees, erosion of marble, limestone



Question 23 (2 marks)

- alcohol - contains an OH group (not hydroxide)
attached to C which has C or H only attached to it
aldehyde - contains an OH group and =O, attached to C which has C or H only attached to it

Question 24 (8 marks)

- (a) Lewis - molecule than L-B, electron pair movement
 - base has lone pair e⁻ donates lone pair
 - acid is electron pair acceptor
Bronsted-Lowry - more limited
 - acid donates a proton to form conjugate base
 - base accepts a proton to form a conjugate acid

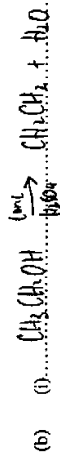
- (b) L-B increased knowledge by showing acidity depends on structure of substance plus its properties relative to solvent or reactant in solution
 - source basis for quantitative treatment
 - idea of conjugates
weak + strong acids, amphoteric species

Question 25 (4 marks)

Advantages: renewable resource. (reduce oil dependence)
 reduce greenhouse gas
 Disadvantages: large areas of Ag land needed
 - disposal of large amounts of fermentation liquids
 - low yield by fermentation

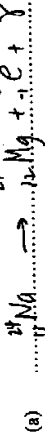
Question 26 (4 marks)

(a) Zeolite - heterogeneous



(ii) H_2SO_4 is catalyst - remove H_2O causing dehydration, reaction \rightarrow

Question 27 (6 marks)



(b) Photographic film: film develops; darker = more radiation
 Cloud chamber: radiation ionises air, H_2O particles condense or ionised air: leaving trail
 α : dense trail, β : less dense, longer... γ : thin, long.
 GM tube - ionises gas in tube, electrical impulse picked up by detector

(c) (i) Short lived half life, so NaCl can be used shortly after (5 hours)
 low range of β allows them only to pass out via seeds
 (ii) Add NaCl to liquid and seal along pipe with Geiger counter - no leaks = no detection

Marker's use only

Marker's use only

Question 28 (6 marks)

- (a) (i) amphiprotic
 (ii) acid: $\text{C}_2\text{H}_5\text{NH}_2 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{NH}_3^+ + \text{OH}^-$
 base: $\text{C}_2\text{H}_5\text{NH}_2 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{NH}_2 + \text{OH}^-$
- (b) make 0.1 mol/L solution, check pH using meter

Question 29 (2 marks)

- Nuclear reactors as accelerators
 9. bombard U238 with high speed neutrons
 $^{238}_{92}\text{U} + {}^1_0\text{n} \rightarrow {}^{239}_{92}\text{U} \rightarrow {}^{239}_{94}\text{Pu} + 2e^-$

Question 30 (11 marks)

- (a) (i) $\text{Zn} \rightarrow \text{Zn}^{2+} + 2e^-$
 (ii) $\text{H}^+ + e^- \rightarrow \frac{1}{2} \text{H}_2(\text{g})$
 (iii) $\text{Zn} + 2\text{H}^+ \rightarrow \text{Zn}^{2+} + \text{H}_2(\text{g})$
 (iv) $0.76 \text{ V} + 0.0 \text{ V} = 0.76 \text{ V}$

(Question 30 continues on next page)

Marker's use only

- (v) no - not 1 mol/L NaCl
 not at 25°C (101.3 kPa)
- (vi) from Anode (Zn plate) to Cathode (Cu plate)
- (b) Zinc plate - oxidation occurs or e⁻ produced
- (c) No ions flow (or will have electrolyte (aq))
- (d) It produces electric current (not compass)
- (e) basis of batteries, electricity, electrolysis
 - any discussion of batteries, cells, electrical energy etc

Option

31. (a) leaching by rain + for groundwater
hydrothermal vents in mid ocean ridges

(b) (1) single line dipole phase change
double line " " salt bridge

LHS anode compartment (oxidation)
RHS cathode compartment (reduction)

LHS iron metal immersed in solution containing Fe^{2+} ions

RHS inert metal (Pt) immersed in solution containing Fe^{2+} , Fe^{3+} ions

$$EMF_{cell} = 0.44 V + 0.77 V = 1.21 V$$