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) ●
2. (A) ● (C) (D)
3. (A) (B) ● (D)
4. (A) (B) ● (D)
5. ● (B) (C) (D)
6. (A) (B) ● (D)
7. (A) (B) ● (D)
8. ● (B) (C) (D)
9. (A) ● (C) (D)
10. (A) ● (C) (D)
11. ● (B) (C) (D)
12. (A) (B) (C) ●
13. (A) (B) (C) ●
14. ● (B) (C) (D)
15. (A) (B) ● (D)

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

Marker's use only

Question 16 (5marks)

Hydrofluorocarbons - contain C-H bonds - susceptible to attack by reactive radicals in troposphere thus decomposed before most get to stratosphere. CFC's dont break down in troposphere (read stratosphere where uv breaks Cl off which reacts with O_3 to form O_2 - reduces ozone layer)

Question 17 (3 marks)

(a) basic to acidic (GIII amphoteric, GVIII neutral) not required

(b) $Na_2O_{(s)} + H_2O_{(l)} \rightarrow 2NaOH_{(aq)}$

$SO_{2(g)} + H_2O_{(l)} \rightarrow H_2SO_{3(aq)}$

Question 18 (4 marks)

Marker's use only

O_2  double bond, linear shape

needs high energy to break bond for O_2 to react. Non-Polar molecule v. low BP (lower than O_2), not very soluble in H_2O, stable

O_3  bent shape, polar molecule 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 (polar), reactive

Question 19 (6 marks)

Three tests to be explained - importance to test for drinking

(any from p255 of text)

"Conquering chemistry"

Marker's use only

Question 20 (4 marks)

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.

Marker's use only

Question 22 (7marks)

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

(ii) $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)}$ or
$MS_{(s)} + 3/2\ O_{2(g)} \rightarrow MO_{(s)} + SO_{2(g)}$

(b) $SO_{2(g)} + \frac{1}{2} O_{2(g)} \rightarrow SO_{3(g)}$

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

or SO_3 $SO_{3(g)} + H_2O_{(l)} \rightarrow H_2SO_{3(aq)}$
or $H_2SO_{3(aq)} + \frac{1}{2} O_{2(g)} \rightarrow H_2SO_{4(aq)}$
or $SO_{3(g)} + H_2O_{(l)} \rightarrow H_2SO_{4(aq)}$

Question 23 (2 marks)

alkanol - contains an OH group (not hydroxide) attached to C which has C or H only attached to it

alkanoic - contains an OH group and =O, attached to C which has C or H only attached to it

Marker's use only

Question 24 (8 marks)

(a) Lewis - broader than L-B, electron pair movement
- base has lone pair e⁻ donates lone pr
- acid is electron pr 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, amphiprotic species

Question 25 (4 marks)

Marker's use only

Advantages: renewable resource (reduce oil dependence)
reduce greenhouse gas

Disadvantages: - large area of Ag land needed
- disposal of large amounts of fermentation liquors
- low yield by fermentation

Question 26 (4 marks)

(a) zeolite - heterogeneous

(b) (i) $CH_3CH_2OH \xrightarrow[H_2SO_4]{conc} CH_2CH_2 + H_2O$

(ii) H_2SO_4 is catalyst - removes H_2O causing dehydration; reaction →

Marker's use only

Question 27 (6 marks)

(a) $^{24}_{11}Na \longrightarrow ^{24}_{12}Mg + ^{0}_{-1}e + \gamma$

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

(c) (i) short lived half life, so H2O/pl can be used shortly after (15 hours)
low range of β allows them only to pass out via cracks

(ii) add Na24 to liquid and scan along pipe with Geiger counter - no leaks = no detection

Marker's use only

Question 28 (6 marks)

(a) (i) amphiprotic

(ii)/(iii) acid: $C_2H_5NH_2 + H_2O \rightarrow C_2H_5NH^- + H_3O^+$

base $C_2H_5NH_2 + H_2O \rightarrow C_2H_5NH_3^+ + OH^-$

(b) make 0.1 mol/L solution, check pH using meter

Question 29 (2 marks)

Nuclear reactors or accelerators

eg. bombard U238 with high speed neutrons

$^{238}_{92}U + {}^{1}_{0}n \rightarrow {}^{239}_{92}U \rightarrow {}^{239}_{93}Np + {}^{0}_{-1}e$

Question 30 (11 marks)

(a) (i) $Zn \rightarrow Zn^{2+} + 2e'$

(ii) $H^+ + e' \rightarrow \frac{1}{2} H_{2(g)}$

(iii) $Zn + 2H^+ \rightarrow Zn^{2+} + H_{2(g)}$

(iv) $0.76\,V + 0.0\,V = 0.76\,V$

(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) N_2 ions flow (or must have electrolyte soln)

(d) It produces electric current (not conserves)

(e) basic of batteries, electricity, electrolysis

- any discussion of batteries, cells, electrical energy etc

Option

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

(b) single line denotes 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

$EMF^{\circ}_{cell} = 0.44\,V + 0.77\,V = 1.21\,V$