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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.

- ☐ A ☐ B ☐ C ☐ D
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1.

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 Cl off which
reacts with O₃ to form O₂ - reduces ozone layer.)

Question 17 (3 marks)

(a) basic to acidic (with amphoteric, GIII metal)
not required

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

2.

Question 18 (4 marks)

O_2 $\overset{\cdot\cdot}{\underset{\cdot\cdot}{O}} \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}}$ double bond, lower than
needs high energy to break bond
for O_2 to react. Non-polar molecule
v. low BP (lower than O_3), not very soluble in
 H_2O , stable
 O_3 $\overset{\cdot\cdot}{\underset{\cdot\cdot}{O}} \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}} \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}}$ 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

Marker's
use only

Question 20 (4 marks)

Student's response must thoroughly describe the
role of a named chemist in industry

Question 21 (6 marks)

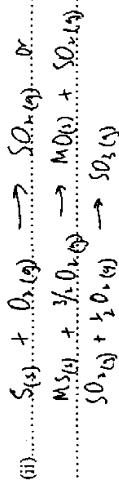
Student's response must thoroughly discuss the reasons
for monitoring the Haber process so to maximise
yield and keep costs low and
- give the chemical reactions for the process and
- briefly explain the equilibrium compromise required
to keep cost low but yield high

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

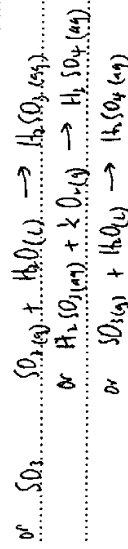
Question 22 (7 marks)

Marker's
use only

- (a) (i) natural: 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)

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

Question 24 (8 marks)

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

Marker's
use only

Advantages: renewable resource (reduce oil dependence)

reduce greenhouse gas

Disadvantages: large areas of Ag. land needed

- disposal of large amount of fermentation

liquors

- low yield by fermentation

Question 26 (4 marks)

(a) Zeolite - heterogeneous

(b) (i) $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{H}_2\text{SO}_4]{\text{conc.}} \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}$

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

Question 27 (6 marks)

(a) $^{23}_{11}\text{Na} \rightarrow ^{23}_{12}\text{Mg} + ^0_{-1}\text{e} + \gamma$

(b) Photographic film: film contains silver = 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, long

GM tube - ionises gas in tube, electrical impulse picked up by detector

(c) (i) Short lived half life, so NaCl can be used

soon after (15 hours)

low range of β allows them only to pass out via Geiger

(ii) Add NaCl to liquid and seal along pipe

with Geiger counter - no leaks = no detection

Question 28 (6 marks)

- (a) (i) amphiprotic
 (ii) acid: $\text{C}_6\text{H}_5\text{NH}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_5\text{NH}_3^+ + \text{OH}^-$
base: $\text{C}_6\text{H}_5\text{NH}_3^+ + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_5\text{NH}_2 + \text{H}_3\text{O}^+$

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

Question 29 (2 marks)

- Nuclear reactors or accelerators
 9. bombard ^{238}U 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)

- (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 with low electrolyte 10^{-1})
 (d) It produces electric current (not completes)
 (e) basis of batteries, electricity, electrolysis
 - any discussion of batteries, cells, electrical energy etc

Option

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

(b) (1) single line denotes phase change
double line " " cell 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+} ions

$$EMF_{cell}^{\circ} = 0.44 V + 0.77 V = 1.21 V$$