

2007 HSC Chemistry Scripts of Andrew Harvey

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Examination Mark: 82/100

Multiple Choice:

- 1.A
- 2.D
- 3.B
- 4.C
- 5.B
- 6.A
- 7.D
- 8.C
- 9.D
- 10.D
- 11.B
- 12.A
- 13.A
- 14.C
- 15.C

	5	2		
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Centre Number

Section I (continued)

1	7	8	0	7	7	0	6	
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Student Number

Marks

Question 16 (5 marks)

ie
Thermos
strat.
Meso
Trop

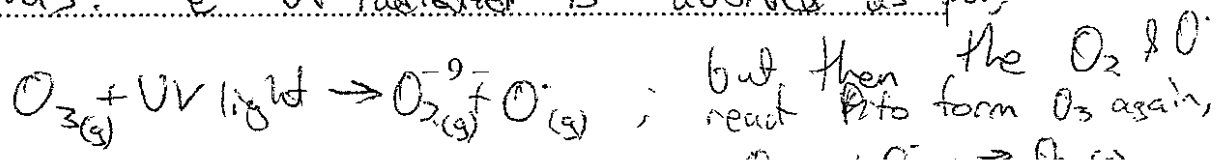
(a) 1

X Troposphere
Y Mesosphere

(b) 4

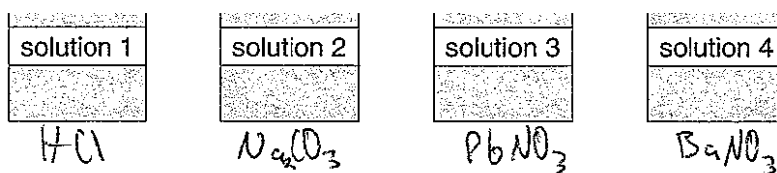
In layer X, ozone (O_3) is considered a pollutant. It causes irritation of people's eyes and causes more respiratory problems such as ~~air~~ asthma.

In layer Y, however, ozone is considered good as it absorbs UV radiation. UV radiation causes increased levels of skin cancer and also can kill plants. The UV radiation is absorbed as per,

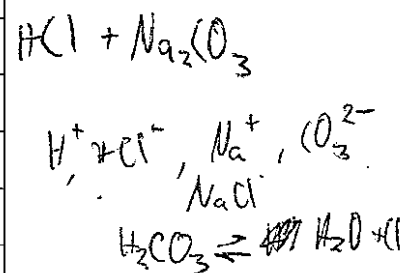


Question 17 (4 marks)

- $Ba(NO_3)_2$
- HCl
- $Pb(NO_3)_2$
- Na_2CO_3 ~~HCl , Na_2CO_3~~

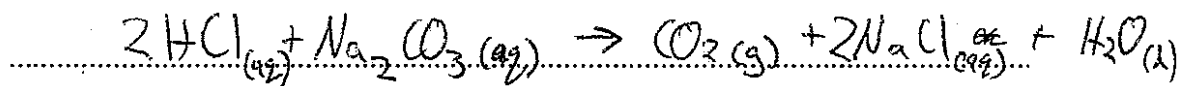


Reactants	Observation
	bubbles HCl, Na_2CO_3
	white precipitate
	no reaction $Ba(NO_3)_2$
	white precipitate
	white precipitate



(a)

1



Question 17 continues on page 11

Question 17 (continued)

(b)

2

<i>Solution</i>	<i>Identity</i>
1	hydrochloric acid
2	sodium carbonate
3	lead nitrate
4	barium nitrate

(c)

1

→ ~~that is not a metal, nitrate~~ Because the nitrate & carbonate would affect the results.

Question 18 (3 marks)

3

Product quality control personnel, in the pharmaceutical industry would test produce to ensure that the correct concentration of substances were in the produce. They would use titrations and AAS. The chemical principle used in AAS is that different elements absorb different wavelengths of light and the intensity of the wavelength is determined by its concentration.

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Question 19 (7 marks)

industry benefits problems
medicine.

7

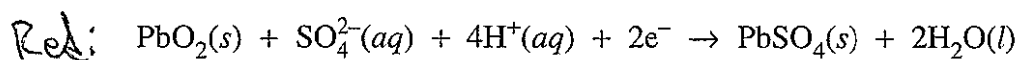
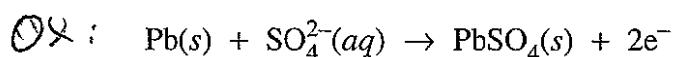
Evaluate impact on society

the

~~radioactive~~ Technetium-99m is used in medicine to detect blood flow abnormalities and cancerous cells. ${}^{99m}_{43}\text{Tc}$ has a short half life of about 6 hours and emits low energy γ radiation, ${}^{99m}_{43}\text{Tc} \rightarrow {}^{99}_{43}\text{Tc} + \gamma$. This γ radiation can be detected and as the Tc attaches to biological carriers, blood flow can be examined. Its use has a positive impact on society as it can help to detect cancers which can be treated with radioactive isotopes such as Cobalt-60. However one of the problems with Tc-99m is that it may cause further cancer, however it is only used when the potential risks of any problems going undiagnosed is greater than the risk of using the Tc-99m.

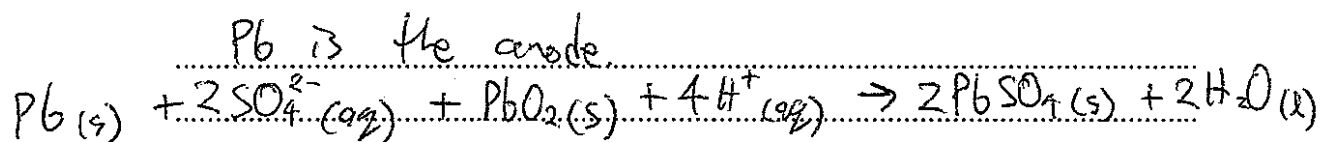
Americium-243 is used industrially in fire alarms in factories. The Am-243 has a large half life of over a century and thus can be used for a long time. Also it is an α emitter (i.e. ${}^4_2\text{He}$). These α rays are stopped by air and the plastic of the fire alarm so they don't pose any dangers. The ${}^4_2\text{He}$ ionises in air in the detector which can be detected, however when smoke is present the ionisation drops and this is detected and the alarm is set off. The use of Am-243 in fire alarms in factories greatly benefits society as it warns employees to evacuate if there is a fire. This potentially saves lives.

Question 20 (4 marks)



(a) An Ox, O.I.L.

2



(b)

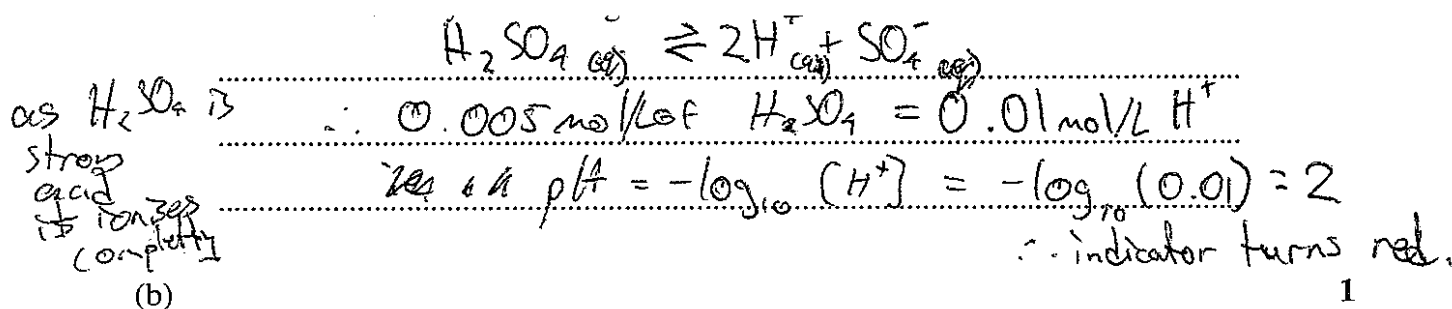
It benefits the environment as less batteries need to be produced/old ones disposed every year and so less are disposed and hence less ~~end~~ end up in landfill where they can cause potential problems such as the lead contaminating water supplies.

Marks

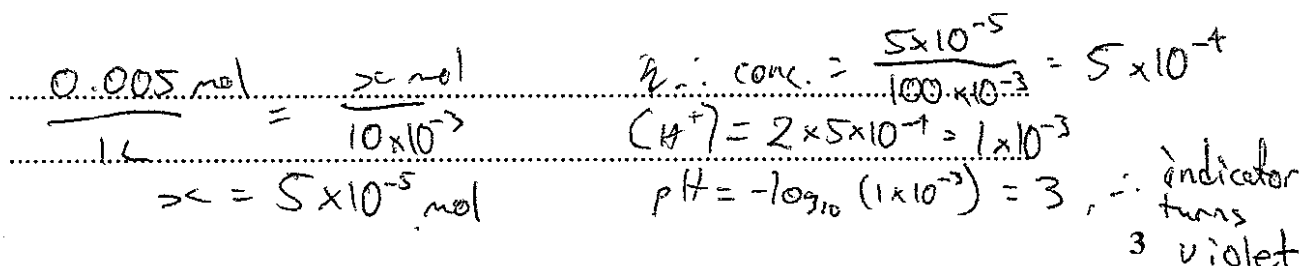
Question 21 (5 marks)

(a)

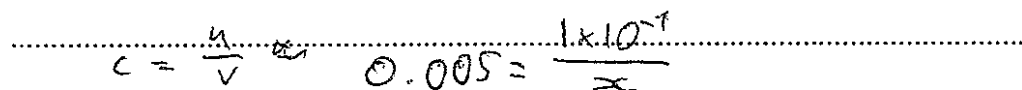
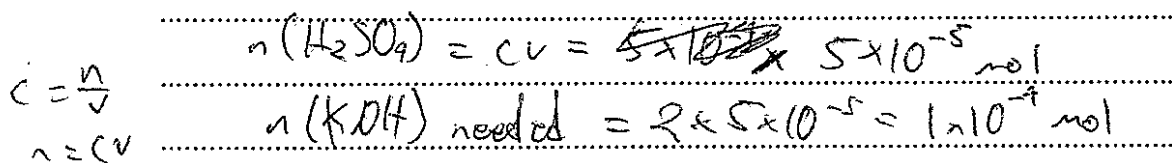
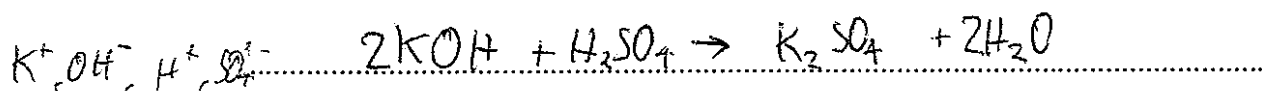
1



(b)



(c)



Question 22 (7 marks)

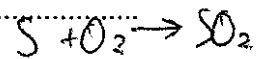
(a)

3

50 ppm of S in diesel.

$$\frac{50 \text{ parts S}}{1,000,000 \text{ parts total}} = \frac{x \text{ g}}{60,000 \text{ g}} \quad ; \quad x = 3 \text{ g of S in } 60 \text{ kg of diesel.}$$

$$n = \frac{3}{32.07} = 0.094 \text{ mol}$$

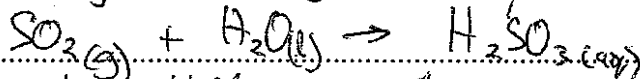


$$V = n \times 24.79 = 2.32 \text{ L}$$

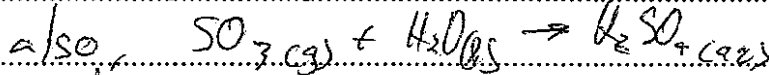
(b)

4

Less sulfur in petrol & diesel would result in less SO_2 and SO_3 in the atmosphere. As SO_2 & SO_3 in the atmosphere causes acid rain,



where H_2SO_3 is acidic as it ionises $\text{H}_2\text{SO}_3(\text{aq}) \rightleftharpoons \text{H}^+ + \text{HSO}_3^-$



and H_2SO_4 is a strong acid, $\text{H}_2\text{SO}_4(\text{aq}) \rightleftharpoons 2\text{H}^+ + \text{SO}_4^{2-}$

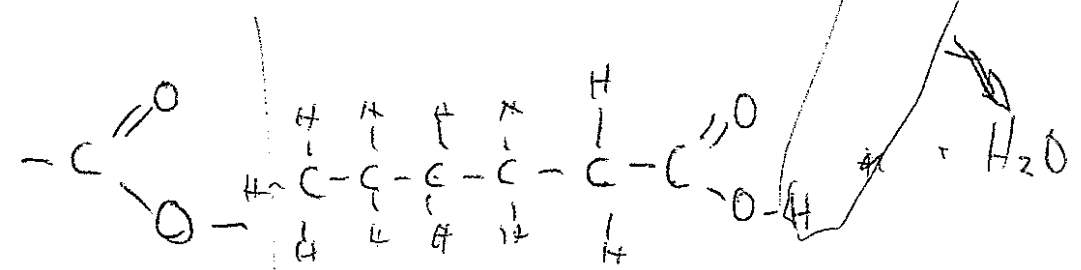
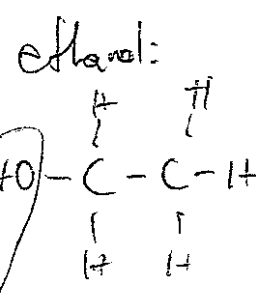
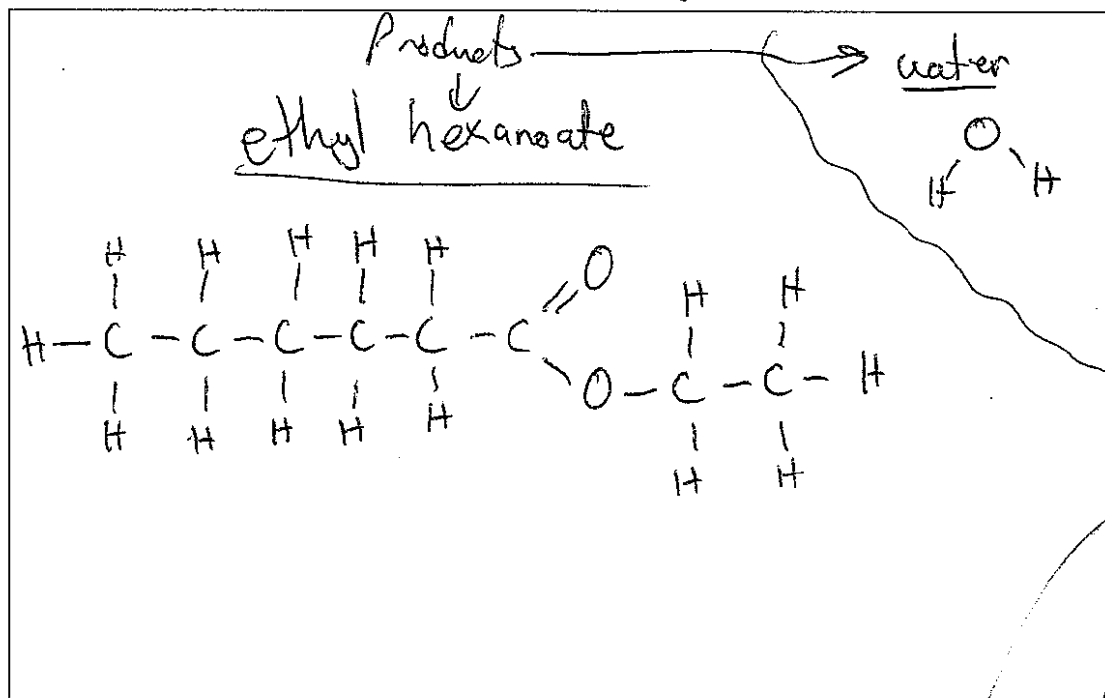
As Acid causes problems like weathering of stone statues, increased acidity of lakes/streams and soil which can cause plants/fish to die. Thus less sulfur oxides in the air will reduce these detrimental effects and hence will have a positive impact on the environment.

Question 23 (3 marks)

ethyl hexanoate.

3

conditions: catalyst of H_2SO_4 which acts as a dehydrating agent.
~~not~~ ~~over~~ temperatures, also possibly boiling chips. ~~to heat the~~
~~water faster~~ products produced from the esterification
 are water and ethyl hexanoate.



C_3 ethanoic CH_3COOH
 C_6 hexanoic CH_5CH_2COOH

Question 24 (5 marks)

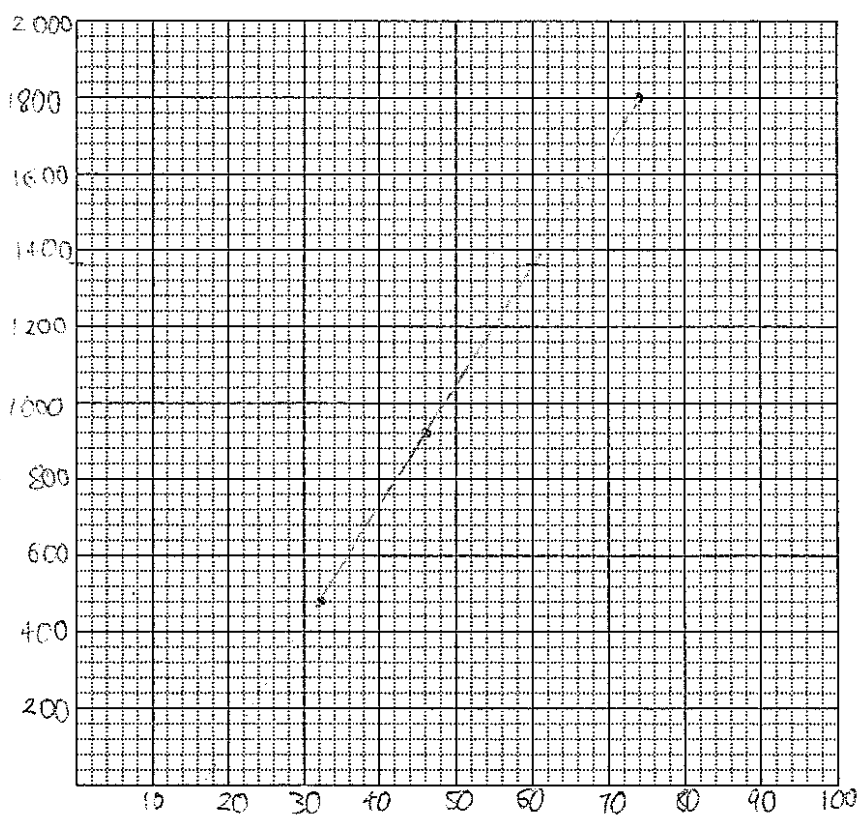
meth	CH_3OH	32.042
eth	$\text{C}_2\text{H}_5\text{OH}$	46.068
prop	$\text{C}_3\text{H}_7\text{OH}$	60.094
but	$\text{C}_4\text{H}_9\text{OH}$	74.12

$y = 1.1 \times 10$
 $x = 1.1 \times 2$

(a)

3

Heat of
Combustion
(kJ mol^{-1})



Molecular weight

Question 24 continues on page 19

Question 24 (continued)

Marks

(b) (i) 1

1

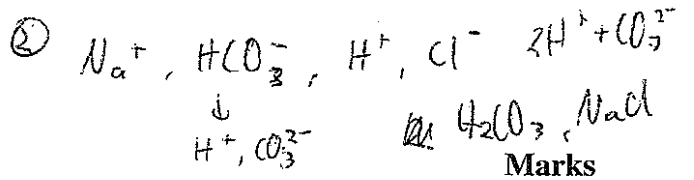
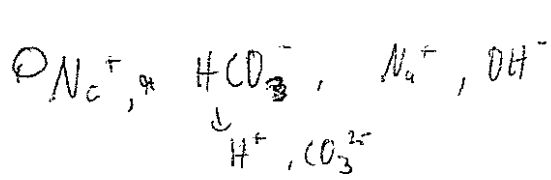
1360 kJ mol⁻¹

→ (ii)

1

Not all the energy from combustion is
disipated in the form of heat. Some
is visible light, which ~~is not measured~~ may
not have been measured in the experiment.

End of Question 24

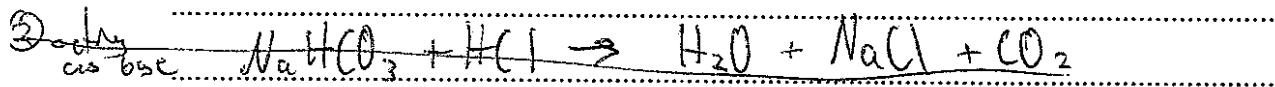
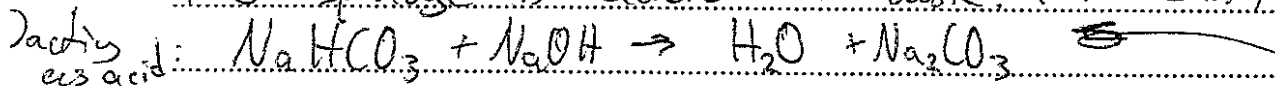


Marks

Question 25 (5 marks)

5

~~NaHCO₃ is amphoteric, that is, it can act as an acid or a base. This makes it excellent for neutralising chemical spills as it doesn't matter if the spillage is acidic or basic. For example.~~



Hence it is very useful in neutralising chemical spills.

Also because it is soluble in water, it can mix and spread easier.

Also, the unreacted NaHCO₃ does not pose any environmental threats.

	5	2		
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Centre Number

Section I - Part B (continued)

1	7	8	0	7	7	0	6	
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Student Number

Marks

Question 26 (4 marks)

4

Polyethylene, $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ | & | & | & | \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ | & | & | & | \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$, is used ~~to~~ in ~~the~~ plastic bag

glad wrap, many plastic pens and many other plastic items. Because it is a thermosoftening plastic it can be easily moulded to shape for use in eg. pens. Also ~~the~~ because of this, and due to its long carbon chain it can be made very thin for use in plastic bags & glad wrap.

~~Polystyrene~~ $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ | & | & | & | \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ | & | & | & | \\ \text{H} & \text{Cl} & \text{H} & \text{Cl} \end{array}$, is used in foam cups

because it is a good insulator of heat. It is used in packaging because it absorbs impact ~~and~~ very good.

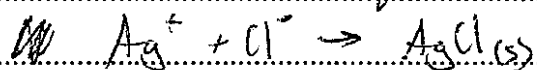
Question 27 (8 marks)

Cl⁻Ag⁺ NO₃⁻

(a)

3

When AgNO₃ (aq) is added to the water, they react



forming a precipitate.

The precipitate can be weighed and hence the moles of Cl⁻ can be determined. The volume of AgNO₃ (aq) added was measured by a burette. And the water sample was weighed before hand. Also the mass of AgNO₃ solution was measured by the balance.

The vacuum pump removes the NO₃⁻.

Question 27 continues on page 23

Question 27 (continued)

Marks

$$n = \frac{\Delta}{mM}$$

3

(b)

$$\frac{3.65 \text{ g}}{50 \text{ mL}} =$$

$$n(\text{AgCl}) = \frac{3.65}{35.45 + 107.9} = 0.025 = n(\text{Cl}^-)$$

$\therefore n(\text{Cl}^-) = 0.025 \times 35 = 0.875$

← cannot convert to gram, as don't know density of Cl^-

$$\frac{0.93 \text{ g}}{46.35 \text{ g}} = \frac{x \text{ parts}}{1,000,000} \quad x = 19,474 \text{ ppm}$$

(c)

Because it is dangerous if humans consume it.
Hence it needs to be monitored to ensure there is not too much.

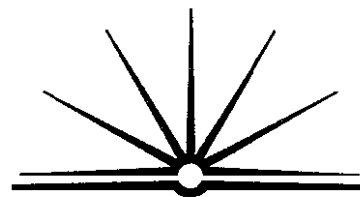
End of Question 27

	5	2		
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Centre Number

1	7	8	0	7	7	0	6	
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Student Number



BOARD OF STUDIES
NEW SOUTH WALES

2007

HIGHER SCHOOL CERTIFICATE
EXAMINATION

Examination

Chemistry

8

WRITING BOOKLET

Section	Part	Question Number
II		28

Date

24/10/07

Number of booklets
used for this question

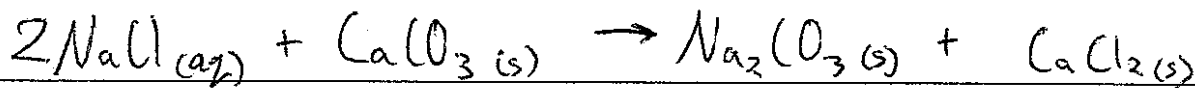
1

Instructions

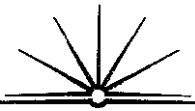
- Write your Centre Number and Student Number at the top of this page and of each page that you use.
- In the boxes provided write the name and date of this examination, and the number(s) of the question(s) attempted in this booklet.
- If you have not attempted the question, you must still hand in the Writing Booklet, with the words 'NOT ATTEMPTED' written clearly on the front cover.
- Write the number of each question or part in the margin at the beginning of each answer.
- Write using black or blue pen.
- Write on the ruled pages only. You may use the unruled pages for rough work.
- You may ask for an extra Writing Booklet if you need more space.
- Do NOT remove any pages from this booklet.
- You may NOT take any Writing Booklets, used or unused, from the examination room.



a) ~~job~~ Solvay process.



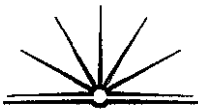
⇒ ii) They are filtered, as Na_2CO_3 forms a solid ~~precipitate~~.
This is done with ^{something such as} filter paper, where the solution passes through and the solid does not. This can be done vertically using gravity which is the case for this situation, or by using centrifuge to provide large forces which cause it to be filtered faster.



6) The mercury process was the first. It produced a good ^{high} concentration of NaOH. However the voltage required to operate was high ~~at~~ about 4-5V. However the main problem was the mercury. Mercury is a heavy metal and is toxic. It can pollute water ways and has huge environmental & health risks.

Next the diaphragm process was used. It ~~only~~ required a lower voltage of 3-4V to operate, which was good. However the concentration of NaOH produced was poor. Also the process used asbestos which is carcinogenic, hence bad for the environment as it could hurt people that come near it.

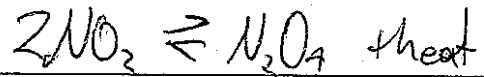
Finally the diaphragm process was used, this ~~produced~~ produced good NaOH concentration, which is good. However it required a slightly higher operating voltage, 4-5V. However the process ~~was~~ was much better than previous processes as it was very clean and there are



d) The products of saponification are glycerol and soap. The soap's impact on society is that it allows people to wash themselves and wash clothes / other items. This lifts the standard of living of people. Thus soap has had a positive impact on society by lifting personal hygiene which reduces many medical problems.

The impact of soap on the environment is not that bad. Because soap is made from natural fats/oil soaps in waterways easily biodegrade and hence are not very problematic. Soaps, in waterways can however cause excessive frothing, which can cause the look (aesthetics) of the environment to be adversely affected, however no real harm is done. The only time when soap in the environment is problematic is when the soap contains phosphate ions, as this can cause eutrophication of the water which results in algal bloom, and poor water quality due to low levels of dissolved oxygen and high BOD.

e) i) Some dinitrogen pentoxide (N_2O_5) was placed in a conical flask. This flask was then placed in hot water then cold water. Because the equilibrium reaction is



and as NO_2 is ~~colourless~~ ^{brown} and N_2O_4 is colourless, we could observe the equilibrium shifting due to changing the temp. Also, by constantly removing the lid we could feel the pressure change due to the equilibrium.

ii) The main risk is that if the pressure becomes too low the glass may shatter, similarly if the pressure becomes too high the glass may also shatter. This ~~glass~~ could create flying shards of glass which can ~~damage~~ cut your skin/eyes.

X/10



(ii) It models equilibrium because we can see how changing the temperature will cause the equilibrium to shift, shown by the different colours of the NO_2 & N_2O_4 and also shown by the pressure which can be determined qualitatively by lifting the lid and feeling the force.

A limitation of this model is that it only shows the effects of a change in temperature. It does not allow us to change pressure, volume, or concentration and observe the effects of that. Also this model is qualitative not quantitative, this is a limitation.

