Jurong West Secondary School

Pure Chemistry Prelim Exam Paper 1-2011

Q1: compare mr of the gas to look for same mr as C2H4

C2H4=12*2+4=28

O2=16*2=32

CH4=12+4=16

H2S=32+2=34

CO=12+16=28➔ The gas is CO

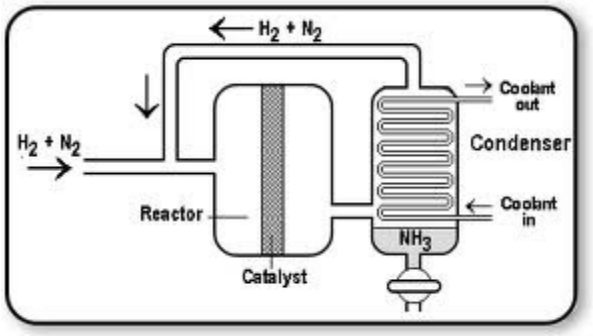
➔Option **D** is correct—Ans

Q2: HCl + NaOH→ no visible reaction thus stop watch, gas syringe and weight cannot be used…the process is exothermic thus monitor the temp to reach the maximum…excess will cause the temp to drop.

➔Option **C** is correct—Ans

Q3: Compare BP of NH3, N2 & H2

NH3 is polarized bond due to hydrogen bond thus the BP of NH3 is higher than N2 & H2, Liquid NH3 can be obtained by cooling the gas mixture to a temperature just below the BP of NH3.



➔Option B is correct—Ans

Q4:

Butanol has higher BP than enthanol, thus the vapor will condense to butanol and return to the flask

A: Pure ethanol

B: High % Ethanol

C: High% butanol vapor + ethanol vapor

D: Pure butanol liquid

➔Option D is correct—Ans

Q5: Fe + Al2O3 (Amphoteric)

I- No reaction with both

II- no reaction with both

III-React with both

VI-dissolve Al2O3 and separate by filtration

➔Option **B** is correct--Ans

Aluminium oxide in its powdered form.

Aluminium oxide is an electrical insulator but has a relatively high thermal conductivity (30 $Wm^{-1}K^{-1}$[5]) for a ceramic material. In its most commonly occurring crystalline form, called corundum or α-aluminium oxide, its hardness makes it suitable for use as an abrasive and as a component in cutting tools.[4]

Aluminium oxide is responsible for the resistance of metallic aluminium to weathering. Metallic aluminium is very reactive with atmospheric oxygen, and a thin passivation layer of alumina (4 nm thickness) forms in about 100 picoseconds on any exposed aluminium surface.[6] This layer protects the metal from further oxidation. The thickness and properties of this oxide layer can be enhanced using a process called anodising. A number of alloys, such as aluminium bronzes, exploit this property by including a proportion of aluminium in the alloy to enhance corrosion resistance. The alumina generated by anodising is typically amorphous, but discharge assisted oxidation processes such as plasma electrolytic oxidation result in a significant proportion of crystalline alumina in the coating, enhancing its hardness.

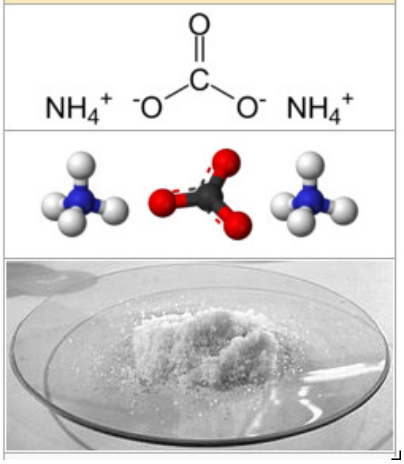
Aluminium oxide is completely insoluble in water. However it is an amphoteric substance, meaning it can react with both acids and bases, such as hydrochloric acid and sodium hydroxide.

$$Al_2O_3 + 6\ HCl \rightarrow 2\ AlCl_3 + 3\ H_2O$$
$$Al_2O_3 + 6\ NaOH + 3\ H_2O \rightarrow 2\ Na_3Al(OH)_6$$

Aluminium oxide was taken off the United States Environmental Protection Agency's chemicals lists in 1988. Aluminium oxide is on EPA's TRI list if it is a fibrous form.[7]

Q6: (NH4)2CO3

Ammonium carbonate



I: False as it has a mixture of ionic and covalent bonds

II: True

III: True $(NH_4)_2CO_3 \rightarrow 2NH_3 (g) + H_2O (g) + CO_2 (g)$

IV: False as ions ratio is 2:1

➔Option **C** is correct—Ans

Q7:

X= 2,7 group 7

Y=2.8.18.18.7 also group 7 halogen

A: False ,,,they form non-metal oxide

B: True…they are halogen

C: False: X more reactive than Y and is a stronger OA

D: False: X more reactive than Y

➔Option **B** is correct—Ans

Q8:

X=Group 4

Y=Group 6

Z=group 5

➔Option **C** is correct—Ans

Q9:

A: False as the molecular formula might be different

B: False as the molecular structure might be different (such as isomer) thus chemical properties different.

C: False as the molecular formula might be different thus their mr

D; True as the empirical formula is the basic repeated unit of the hydrocarbon thus the % C by mass is determined by the C: H ratio only.

➔Option **D** is correct—Ans

Q10:

Mol $CU(NO_3)_2$= 0.02 Mol NH_3=0.03 ➔ NO excess NH_3

$Cu(NO_3)_2$ (aq) + $2NH_4OH$ (aq)→ $Cu(OH)_2$ (S) + $2NH_4NO_3$ (aq)

Light blue soln light blue ppt

➔Option **C** is correct—Ans

Q11:

NH_4NO_3+ NaOH → NH_3 + $NaNO_3$ + H_2O

The fertilizer contains NH_4^+ & NO_3^- ions

➔Option **D** is correct—Ans

Q12: (Unclear questioning on the intention of the experiment)

2M + Pb(NO3)2→ 2MNO3 + Pb

A: True :Temp rose➔exothermic

B:True: M dissolve and grey Pb precipitated➔displace thus M more reactive than Pb

C: False: Lead(II)ions was displaced with excess M but no proof about all Pb Ions was displaced when the concentration become very low. Also, some reaction, the Pb precipitated could covered the metal M slow down further reaction thus there might be Pb2+ ions in the solution.

D: True: The metal power increases the SOR

➔Option **C** was incorrect—Ans

Q13:

A: 3=0

B : 3=1

C: 11=6

D: 7=2

➔Option **B** has smallest in volume at rtp--Ans

Q14:

I) Zn OS 0 to +2, H OS +1 to 0 redox

II) Precipitation non-redox

III) Cu OS 0 to 2+, S OS +6 to +4 redox

IV) Acid/base reaction non-redox

V) Acid/carbonate reaction non-redox

➔Option **B** is correct –Ans

Q15:

Mol SO4= 0.04*0.25=0.01 mol

Mol H+ = 0.04*0.25*2=0.02 mol

Mol X =0.02

X: SO4=0.02: 0.01=2:1➔ X2SO4

➔Option **A** is correct—Ans

Q16:

A) $MgCO_3 + H_2SO_4 \rightarrow MgSO_4 + H_2O + CO_2$

B) $(NH_4)_2CO_3 + 2HNO_3 \rightarrow 2NH_4NO_3 + H_2O + CO_2$

C) $ZnCO_3 + 2HCl \rightarrow ZnCl_2 + H_2O + CO_2$

D) $PbCO_3 + H_2SO_4 \rightarrow PbSO_4$ (s) + $H_2O + CO_2$ solid $PbSo_4$ prevent further reaction

➔Option **D** is incorrect—Ans

Q17:

A) False : Ethyl-ethanoate is ester non reaction with KOH, Na_2CO_3 & Ethanol

B) False: HCl does not react with ethanol

C) True: Ethanoic is an acid which react with Na_2CO_3 and KOH, it can react with ethanol to form ester Ethyl-ethanoate by condensation reaction.

D) False: NH_3 aqueous does not react with Na_2CO_3 and ethanol

➔Option **C** is correct—Ans

Q18:

Ag^+, NO_3^-, H^+, OH^-

Cathode: $4Ag^+ (aq) + 4e^- \rightarrow 4Ag(s)$

Anode: $4OH^-(aq) \rightarrow 2H_2O + O_2 + 4e$

Left over H^+ & NO_3^- ➔ HNO_3

➔Option **C** is correct—Ans

Q19:

P: Cu dissolves into solution at anode and Cu deposit onto cathode-Color unchanged

Q: Only CU desposit onto cathode thus decolorize

R: Cu dissolves into solution at anode and Cu deposit onto cathode-Color unchanged

➔Option **B** is correct—Ans

Q20: Look for largest spacing apart in the reactivity series

A: Rank 4 B : Rank 3 C : Rank 2 D: Rank 1

➔Option D is correct—Ans

Q21: Cathode reaction

A: $2H^+ + 2e \rightarrow H_2(g)$

B: $Cu^{2+} + 2e^- \rightarrow Cu(s)$

C: $Cu^{2+} + 2e^- \rightarrow Cu(s)$

D: $Ag^+ + e^- \rightarrow Ag(s)$

➔Option A will not produce the graph—Ans

Q22:

I: True Platinum act as catalyst

II: False: Total Ethalpy change for the reaction remain the same

III: False: Platinum no consider as part of the reactants

IV: True: Platinum act as catalyst

➔Option C is correct—Ans

Q23:

Same concentration of H2O2 at 0.05 and same temperature at 20 C➔experiment 1& 2 can be used to show the effect of catalyst surface area.

➔Option **A** is correct—Ans

Q24: Pb2+ 2I- → PbI2(ppt)

EXP1: mol Pb2+ =0.2 mol with 0.1 mol I- (limiting)

EXP2: mol Pb2+ =0.1 mol with 0.1 mol I- (limiting)➔ I- the same mol for both exp thus final mass of PbI2 will be the same

SOR for EXP 2>>>Exp1 due to higher concentration

➔Option **C** is correct—Ans

Q25

➔Option **C** is correct--Ans

Note: 10 g produced higher Volume of H2 when reaction completed, also 10 g has more surface area hence higher initial SOR

Q26:

Mild steel (also known as low carbon steel) is malleable, High carbon steel is hard & high strength, stainless steel is corrosion resistant

➔Option C is correct—Ans

Q27: 3 possible reactions

1) $2Na(s) + 2H_2O(aq) \rightarrow 2NaOH(aq) + H_2(g)$ Bubble of H_2 was formed

2) $Fe^{3+}(aq) + 3OH(aq) \rightarrow Fe(OH)_3$ ppt brown colour

Least likely reaction is :

3) $2Na(s) + FeCl_2(aq) \rightarrow 2NaCl(aq) + Fe(s)$ Displacement reaction Grey metal appear

Since Na is very reactive with H_2O, Only reaction 1 & 2 occus to reach the most stable energy state

➔Option C is correct--Ans

Q28: mr of Zn=65, Fe=56

$3Zn(s) + 2Fe(NO_3)_3(aq) \rightarrow 2Fe(s) + 3Zn(NO_3)_2(aq)$

Consider full mole of reactant to check for mass change

Loose mass 3*65=195 Gain mass=112 Net weight was reduced

The iron may deposit onto the surface of the Zn metal strip thus the weight changes

A) True see above calculation

B) False: weight changes as displacement reaction occur

C) False: More Zn ions formed than Fe ion discharged

D) False: given the short time, not all Fe3+ ions had been discharge thus color reduces but still green.

➔Option **A** is correct—Ans

Q29:

Based on the 4 reactions: their reactivity relations are:

W > Z

X > W

Y > Z

W > Y

Overall: X>W>Y>Z

➔Option **D** is correct—Ans

Q30:

Metal as electrical conductor

Electrons was displaced by incoming electrons, No charge to the lattice of positive ions

➔Option **B** is correct—Ans

Q31:

➔Option **C** is correct—Ans

Q32: K2Cr2O7 is Oxidizing Agent (Use for testing for presence of RA)

I) True :Ethanol will be oxidized to ethanoic acid

II) True: 2I- → I2 oxidation occurred, Color will be green + brown=Dark green

III) False: Cl2 is also a strong Oxidizing agent, so not reaction.

➔Option **B** is correct—Ans

Tests for oxidizing and reducing agents:

All tests are reactions but all reactions are not tests.

1. **Reducing Agents:**
   To the sample to be tested for a reducing agent property, acidified $KMnO_{4\,(aq)}$ is added. If colour changes from pink to colourless, then it is a reducing agent. Also, to the sample, we can add acidified $K_2Cr_2O_7$ (Potassium Dichromate). If colour changes from orange to green, then a reducing agent is present. The reaction can be written as,

   $$Cr^{+6}_{(aq)} \longrightarrow Cr^{+3}_{(aq)}$$

   Note: $K_2Cr_2O_{7\,(aq)}$ is better than $KMnO_{4\,(aq)}$, as its colour change is more prominent when viewed under naked eye.

2. **Oxidizing Agents:**
   To the sample to be tested for the presence of oxidizing agent, $KI_{(aq)}$ is added. If colour changes from colourless to brown, then an oxidizing agent must be present. The reaction can be written as,

   $$KI_{(aq)}\ (\text{Colourless}) \longrightarrow I_{2\,(aq)}\ (\text{Brown})$$

Q33:

Q lower energy level than P

R higher than Q

A) False for Q higher P

B) False for R lower than Q

C) False for there is not activation energy from Q to R

D) True meet all condition with proper activation energy

➔Option **D** is correct—Ans

Q34:

Divide energy/mol by molar mass to get energy/g of compound

A) ethanol=30 kJ/g

B) heptane=48 kJ/g

C) methane=55 kJ/g

D) propane= 50 kJ/g

➔Option **C** is highest—Ans

Q35:

➔Option **C** without C=C double bonds will not react with hydrogen—Ans

Q36:

A) True: It contains C=C so bromination will take place

B) True: It is acidic thus will react with CuO to form salt and water

C) False: $C_4H_4O_4=(CHO)_4$

D) True : 1 $C_4H_4O_4$ molecular will react with 1 H_2 molecule to form $C_4H_6O_4$

➔Option **C** is incorrect—Ans

Q37:

A) False: it is an addition reaction

B) False: addition reaction is due to C=C double bond which is reactive, thus no UV is needed as in the case of substitution reaction

C) False: C2H6 is already full saturated

D) True:$CH_3CH=CH_2 + HCl \rightarrow H_3H_7Cl$

➔Option **D** is correct—Ans

Q38: Isomers of pentane C_5H_{12}

A) True (2 methylbutane)

B) True (2,2 dimethylpropane)

C) false: it is exactly same structure as pentane

D) True, same structure as A.

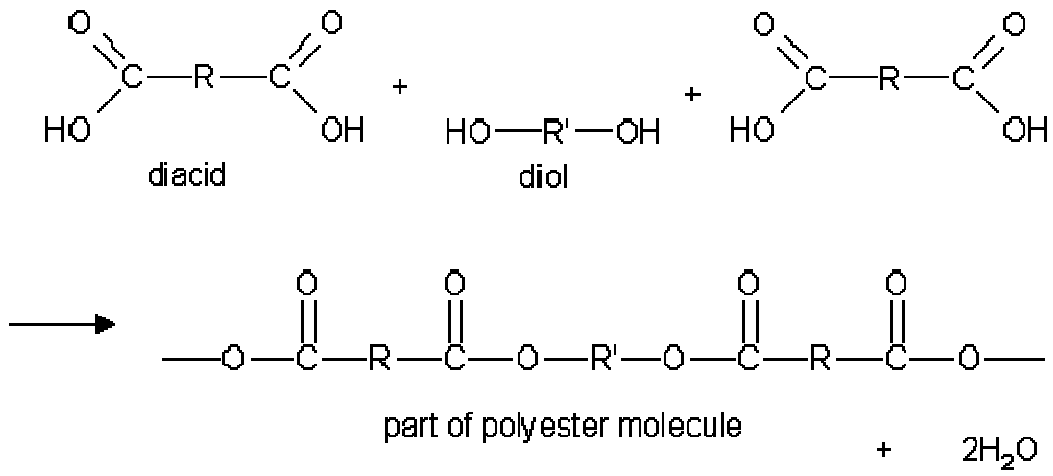
➔Option **C** is incorrect—Ans

Q39:

➔Option **D** is correct—Ans

Q40:

➔Option **A** is correct, condensation reaction $2H_2O$ was eliminated from the polymer



Jurong West Secondary School

Pure Chemistry Prelim Exam Paper 2-2011

A1:

(a) NH4Cl ➔ N-H is covalent bond, Cl- to NH4+ is ionic bond

(b) AgCl insoluble salt prepared by ppt method

© AlCl3➔ Al is 3+

(d) NH4Cl sublime when heated to become HCl & NH3 gases

(e) NH4Cl + NaOH➔ NaCl +NH3 + H2O

A2:

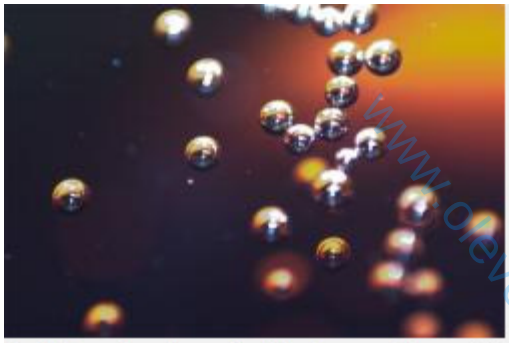
X : NaHCO3 Y: Citric acid

The gas bubble escaping from the solution causing turbulence and help to mix the medicine throughout the solution

You may have seen a television commercial for Alka-Seltzer tablets, or heard one of their advertising slogans: "Plop, plop, fizz, fizz, oh what a relief it is!®" When you drop the tablets in water, they make a lot of bubbles, like an extra-fizzy soda. And like a soda, the bubbles are carbon dioxide gas (CO_2). However, with Alka-Seltzer®, the CO_2 is produced by a chemical reaction that occurs when the tablets dissolve in water.

The main ingredients of Alka-Seltzer tablets are aspirin, citric acid, and sodium bicarbonate ($NaHCO_3$). When sodium bicarbonate dissolves in water, it dissociates (splits apart) into sodium (Na^+) and bicarbonate (HCO_3^-) ions. The bicarbonate reacts with hydrogen ions (H^+) from the citric acid to form carbon dioxide and water. The reaction is described by the following chemical equation:

$$3HCO_3^- + 3H^+ \rightarrow 3H_2O + 3CO_2$$



Bubbles of carbon dioxide float to the surface of a carbonated soft drink.

"Fizz" is a word that is used to describe the action or sound of gas bubbles moving through and escaping from a liquid, or the formation of an emulsion of this gas and liquid at the top of the liquid's container. The word itself is an example of onomatopoeia, derived from the sound the multiple bubbles make together as they "pop" when they escape. A carbonated beverage, such as cola or beer, will form bubbles when the dissolved carbon dioxide is depressurized to form emulsions at the top, and it will make "fizzing" sounds when it is opened or poured into a container.

Fizz can also result from a chemical reaction, such as a solid dissolving in a liquid to produce gas. For example, Alka-Seltzer brand tablets, used to treat stomach indigestion, forms an effervescent solution that fizzes when dropped into water. They were once advertised using the popular jingle, "Plop, plop! Fizz, fizz! Oh, what a relief it is!".

A3:

Sodium fluoride is sold in tablets for cavity prevention.

Fluoride salts are used to enhance the strength of teeth by the formation of fluorapatite, a naturally occurring component of tooth enamel.[7][8] Although sodium fluoride is also used to fluoridate water and, indeed, is the standard by which other water-fluoridation compounds are gauged, hexafluorosilicic acid (H_2SiF_6) and its salt sodium hexafluorosilicate (Na_2SiF_6) are more commonly used additives in the U.S.[9] Toothpaste often contains sodium fluoride to prevent cavities.[10] Alternatively, sodium fluoride is used as a cleaning agent, e.g. as a "laundry sour".[6] A variety of specialty chemical applications exist in synthesis and extractive metallurgy. It reacts with electrophilic chlorides including acyl chlorides, sulfur chlorides, and phosphorus chloride.[11] Like other fluorides, sodium fluoride finds use in desilylation in organic synthesis. The fluoride is the reagent for the synthesis of fluorocarbons.

In medical imaging, fluorine-18-labelled sodium fluoride is used in positron emission tomography (PET). Relative to conventional bone scintigraphy carried out with gamma cameras or SPECT systems, PET offers more sensitivity and spatial resolution. A disadvantage of PET is that fluorine -18 labelled sodium fluoride is less widely available than conventional technetium-99m-labelled radiopharmaceuticals.

a) F is more reactive than Cl thus the reaction would start without the need to heat up the sodium metal.

b) Na+F-

c) See full description of toothpaste as follows:

Although the cleaning process of the oral cavity is generally contributed by mechanically means of a toothbrush, the cleaning process could be greatly enhanced with the aid of toothpaste. To understand the functions of the toothpaste, one should know the common ingredients available in a toothpaste (take note that ingredients differ from different brands, some ingredients might be absent in certain brands, which does not necessarily mean it is inferior to other brands):

Fluoride

Desensitizing agent

Abrasives

Base (alkaline chemicals)

Foaming agent

Antibacterial agents

Tooth whitener

Flavouring

Fluoride

Available in Sodium Fluoride or Sodium Monofluorophosphate

Active ingredient in toothpaste

Prevents decay by incorporating into the enamel crystals which strengthens the tooth

Rebuilds demineralised enamel crystals (early carious lesions)

No ill effects due to fluoride deficiency, but over consumption would cause toxicity. Hence toothpastes are not made to be swallowed.

Desensitizing agent

Available as Strontium chloride / Potassium Nitrate

Also an active ingredient

Reduces sensitivity of the tooth by accelerating the formation of dentine inwards which makes the tooth thicker. (only visible using X-ray)

Does not reduce sensitivity caused by gum diseases.

Available in toothpastes like 'Sensodyne'.

Abrasives

Available as Hydrated Silica / Mica

Polishes the tooth surface

Removes stains

Occurs by causing minor enamel erosion (in micrometers)

Foaming Agent

Available as Sodium Lauryl Sulfate

Adds comfort to tooth brushing.

Also possesses strong antimicrobial properties.

Awful taste (which will be masked by flavouring)

Antibacterial and antifungal agent

Triclosan

Chlorhexidine

Base

Such as Sodium Hydroxide

Alkaline chemical – to neutralize the acid produced by bacteria in dental plaque.

Demotes demineralisation of enamel/dentine.

Tooth whitener

Available as Titanium Dioxide / Hydrogen Peroxide

Tooth whitening effect, works by bleaching

Artificial Sweeteners

Available as Sorbitol /Saccharin

These are complex sugars which can't be consumed by bacteria. Because sugar promotes bacterial growth

Flavouring

Commonly available in mint flavour.

There is some other exotic flavouring available too such as peanut butter, ginger, and whiskey!

It also helps in the elimination and/or masking of halitosis (bad breath)

Toothpaste is available in several forms, as its name suggest, it is commonly available in paste form. Gel and powder form are also available in the market. There is another type of toothpaste which is gaining its popularity in recent years – Herbal toothpaste. Herbal toothpaste doesn't contain any synthetic compounds and considered to be an organic product. Though the absence of fluoride kind of defeats its purpose, individuals with allergy to mint or more commonly sodium lauryl sulphate, are suitable candidates to use them.

Conclusion

It is important to understand that excellent oral hygiene can be achieved by merely using the proper tooth brushing technique and skilled manual dexterity of an individual — regardless of toothpaste and toothbrush used. Toothpaste is just an adjunct to facilitate the cleaning process

of the oral cavity, but strongly recommended by dental practitioners as it is a very effective measure in fighting against dental decay.

A4:

a) $3Fe + 4H_2O \rightarrow FeO.Fe_2O_3 + 4H_2$

Shiny Iron filing turn reddish brown due to rusting process

b) $Mg + H_2O \rightarrow MgO + H_2$ vigorous reaction with formation of white MgO

$Cu + H_2O \rightarrow$ No reaction

A5:

a) Different BP of the distillation fractions was the main reason.

b) $C_{11}H_{22}+2= C_{11}H_{24}$

c) $N_2 (g) + O_2 (g) \rightarrow 2NO (g)$ at high temperature jet engine

mol N_2=55,000/(14*2)

mol NO=2*55,000/28

Mass of NO=55,000/14 * (14+16)= 117.9 kg

d) $2NO + O_2 \rightarrow 2NO_2$

$2NO_2 + 2SO_2 \rightarrow 2NO + 2SO_3$

2SO2 + O2 → 2SO3

NO act as catalyst to separate the oxygen atom from oxygen molecule, and itself does not form part of the final products.

NO_x (often written NOx) refers to NO and NO_2. They are produced during combustion, especially at high temperature. These two chemicals are important trace species in Earth's atmosphere. In the troposphere, during daylight, NO reacts with partly oxidized organic species (or the peroxy radical) to form NO_2, which is then photolyzed by sunlight to reform NO:

$NO + CH_3O_2 \rightarrow NO_2 + CH_3O$
$NO_2 + \text{sunlight} \rightarrow NO + O$

The oxygen atom formed in the second reaction then goes on to form ozone; this series of reactions is the main source of tropospheric ozone. CH_3O_2 is just one example of many partly oxidized organic molecules that can react with NO to form NO_2.

These reactions are rather fast so NO and NO_2 cycle, but the sum of their concentration ([NO] + [NO_2]) tends to remain fairly constant. Because of this cycling, it is convenient to think of the two chemicals as a group; hence the term NO_x.

In addition to acting as a main precursor for tropospheric ozone, NO_x is also harmful to human health in its own right

A6:

a) Electrode L: Anode

2Cl- (aq) → Cl2 (g) + 2e- Cl2 dispalce Br2 from the solution causing to turn reddish brown

2Br- (aq) + Cl2 (g)→ 2Cl- (aq) + Br2 (aq)

b) Cathode 4H+ +4e→ 2H2 (g)

Anode 4OH- (aq)→ 2H2O(aq) + O2 (g)+ 4e

c) Stage I as Cu2+ deposited, the blue color solution turn pale as Cu2+ ions reduces

When the concentration of CuCl2 was too low, OH- ions was discharged at anode and H+ ions were discharged at cathode

A7:

a) CFC➔D

b) CO ➔A

c) C4H8➔E

d)CO2➔F

e) Butane is C4H10➔ C

A8:

a) Each monomer is C4H8 ➔Butene CH3CH2CH=CH2➔Poly(butene)

The repeat unit is in case of 1-butene:

$-[-CH_2-CH(CH_2CH_3)-]_n-$

The repeat unit in case of 2-butene is:

$-[-CH(CH_3)-CH(CH_3)-]_n-$

One of the end units in the polymer chain contains a double bond, allowing reactivity with other compounds to provide functional chemistry mainly for lubricant additives for engine oils, fuels, and greases.

There is no C=C double bond into the polymer thus called saturated hydrocarbon

Polybutene is insoluble in water thus remain undestroyed.

Polybutene (Polybutylene, PB)

Descpription:

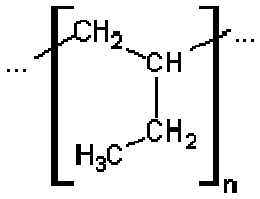
Flexible and linear structured polyolefines; the homopolymers are produced from But-1-en, the copolymers contain ethylenes. Some of their important characteristics are: excellent resistance to creep at room and elevated temperatures, good toughness (high impact-strength, high tensile strength, high puncture resistance) and exceptional resistance to environmental stress cracking. Other important

advantages including good moisture barrier properties, excellent electrical insulation characteristics and resistance to most chemical environments.

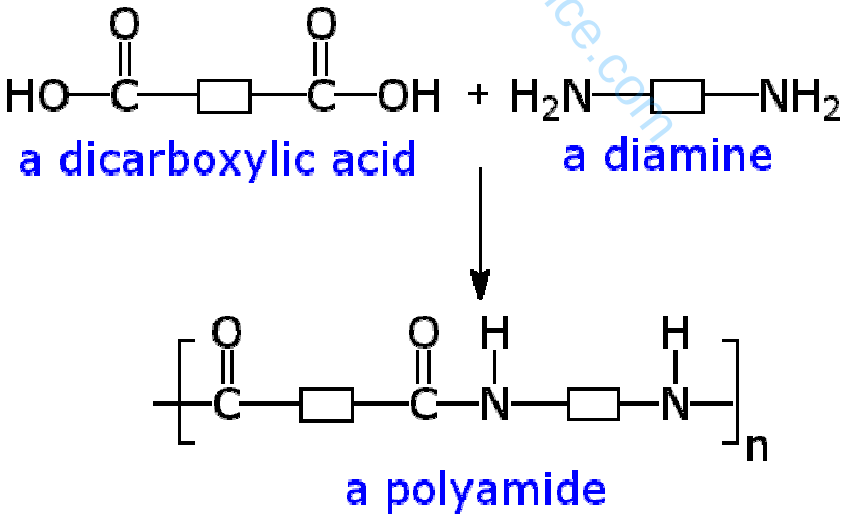
Category:
Thermoplastic

Usage:
A major application sector for polybutene resins is seal-peel or easy-open packagings, e.g. TetraPak®-closings. Other typical examples include carton liners (e.g. cereal packagings) and packs for pre-packed delicatessen products like cold meats, cheeses and smoked salmon. PB can also be used in film modification to increase flexibility and softness without sacrificing clarity. In a similar way, polybutene is used to modify polypropylene fibres to enhance their softness and flexibility as well as to provide a unique feel of the material.

Formula:



b) Nylon was polyamide formed by condensation polymerization with formation of amide linkage:



A9:

a) The heavier the +Ion, the smaller the deflection due to greater mass inertia.

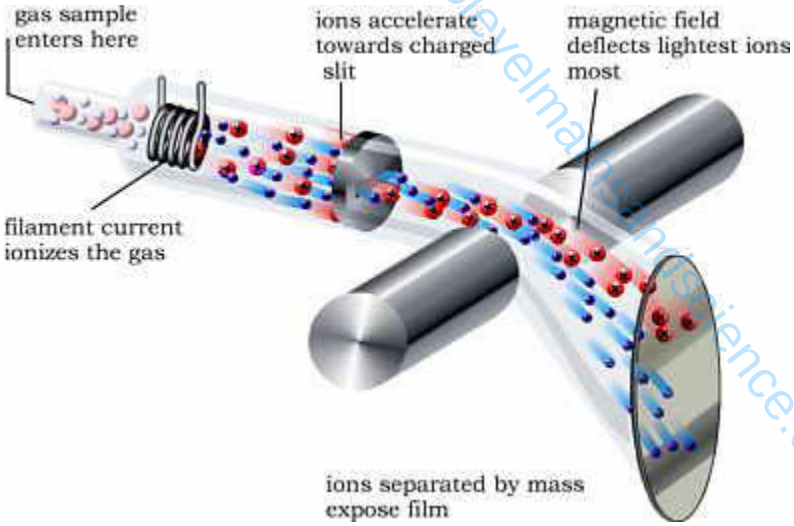
b) 2 Isotopes: Isotope 35 and 37.

c) The % by count of the abundant of each isotopes

d) Cl-35 is more abundant.

e) mr=35*75%+37*25%=35.5 g/mol

f) The high speed Ions will collides with air molecule and the measurement will become invalid.



A10:

a) Zn (s) + HCl (aq) → ZnCl2 (aq) + H2 (g)

b) Speed up speed of reaction by reducing the activation energy

The catalyst itself does not form part of the final product thus their quantity need not be very large amount.

c) CuCl2 & CuSO4 solution act as catalyst.

d) The temperature of the experiment needed to be controlled accurately.

Higher temperature will increase the speed of reaction by increasing the rate of collision.

e) Cu metal is less reactive than Zn thus no displacement reaction was observed. However, when Cu2+ was presence in the solution, the +charge Cu ion (either in OS of +1 or +2) act as catalyst to ionize Zn metal.

f) Cu (s) is brown solid in Exp 2 & 3.

The brown ppt in Exp 4 & 5 is also Cu(s) precipitated from the solution.

A11:

a) Addition reaction➔Hydrolysis reaction

b) CH3CH2CH2-OH Propan-1-ol

c) The Isomers will behave similarly in chemical reaction but their physical properties such as BP differ thus we can use fractional distillation to separate the mixture.

d) The steam should be used in excess to ensure 100% conversion of propene which is more valuable and potentially polluting resource.

e)mol of C3H6= (400*1000*1000)/(12*3+6)=9.5238*10^6

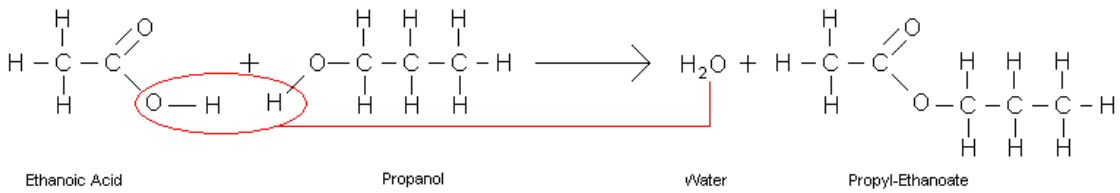
mol of propan-2-ol=mol of C3H6

mass of propan-2-ol=9.5238*10^6*(3*12+16+8)=571.4 tonne

% Yield=200/571.4=35%

e) C3H7OH + CH3COOH → CH3CO-OCH2CH2CH3 + H2O

condensation reaction Propyl-ethanoate



OR

A11:

a)

Hydrogen fuel for transportation is predicted to become a part of our lives in 2010. It will take years before the hydrogen cars become much more successful than fossil fuels, but hydrogen still will have many great advantages over fossil fuels in the following ways:

•Safety: You may think that hydrogen is not a save solution due to the Hindenburg's explosion. Well, it actually is one of the safest fuels that you can find! With the picture bellow, you can see that hydrogen compared to gasoline in an explosion is safer! The hydrogen rises to the top of the car and is on fire while the people are safe inside. With gasoline, the whole car explodes leaving the passengers and driver most likely dead or severely wounded.

•Efficiency: Gasoline powered vehicles are very inefficient. Approximately 85% of the gasoline that is in your gas tank is wasted due to inefficient use of the gasoline. Hybrid cars correct this problem a little bit where instead of a wasted 85%, you are only wasting 65%. This is still not a big improvement. With hydrogen technology, virtually all of the hydrogen is stored is used in the process of running the car. Hydrogen fuel cells can be 40 to 60 times more efficient than gas, and it only wastes 10% to 15% of the energy put into the tank.

•Pollution: The hydrogen car does not pollute the atmosphere with byproducts of using the energy. The hydrogen is combined with oxygen from the air to create water, a safe alternative to carbon monoxide, carbon dioxide, and other dangerous byproducts of fossil fuels. The use of hydrogen technology will also reduce the number of green house emissions in our atmosphere. This will be discussed in further detail in our next sections.

•National Security and Economy: Half of the gas that is in your tank is probably imported oil. A hydrogen economy would reduce the reliance on foreign oil reservations to provide our energy. This will allow countries to become more "energy independent."

b) Though many believe that hydrogen fuel cells are the future in transportation, others do not wish for hydrogen technology to be used for transportation, or for fuel itself. The people against hydrogen claim to have good reason for it. Here are some reasons:

•Storage: Storage is currently a problem with hydrogen technology in transportation. The hydrogen fuel must be heavily compressed to store enough to be suitable to drive within a 300 mile radius. This problem is currently being worked out by companies such as GM and Honda.

•Safety: Although the hydrogen is proven to be safe for transportation during an explosion, many still are not satisfied with the safety aspect of the hydrogen car due to the Heidelburg explosion in WWII.

•Technology: Many scientists agree that the technology is not yet there to provide hydrogen fuel in transportation. These scientists believe that we should focus on maybe providing hydrogen fuel for homes first, and then turn to transportation

•Refueling: Right now, there are not enough refueling stations to be able to realistically provide hydrogen fuel for the masses. This should change, but it would not meet the demands of the hydrogen car. This is another downside to hydrogen fuel.

c)

i) Oxidation of H_2 to water➔redox reaction

ii) $2H_2O\ (aq) + O_2\ (g) + 4e \rightarrow 4OH^-\ (aq)$

d) $2H_2\ (g) \rightarrow 4H^+\ (aq) + 4e$

$O_2\ (g) + 4H^+\ (aq) + 4e \rightarrow 2H_2O\ (l)$

$2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (l)$

e) Magnesium more reactive than Copper thus Mg become anode loosing electrons.

Silver is less reactive than H^+ ions thus will be discharge at the cathode depleting Ag^+ ions in the electrolyte.

End of paper