

Maris Stella High School

Pure Chemistry Prelim Exam Paper 1-2011

Q1: For separation of dissolved solid (Inclusive of salts), the setup could be:

Filtration to remove insoluble solid → Evaporation to dryness to obtain dissolved salts.

→ Option **D** is correct –Ans

Q2: Diffusion rate of ions in water

Compare the size, Charge & Mass of ions:

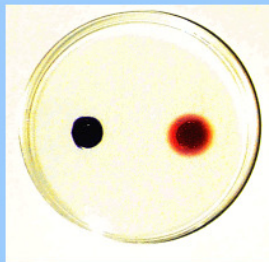
Pb^{2+} move towards Cathode: Ar=207, Charge= 2+

I^- move towards Anode: Ar =127, Charge=1-

Ions with lower mass will diffuse faster → PbCl_2 formed near the Anode

→ Option **A** is correct –Ans

The rate of diffusion depends on the molecular weight of the chemical.



In this demonstration, the blue dye, methylene blue, has a higher molecular weight than the compound potassium permanganate. Smaller, lighter molecules diffuse faster than larger, heavier ones, and the potassium permanganate solution (on the right) has diffused further from the well than the methylene blue (on the left).

Q3: Paper chromatography, the use of relative solubility of solid in a solvent. If the solid is colorless, suitable developing agent could be applied to make it visible after the filter paper was dried .

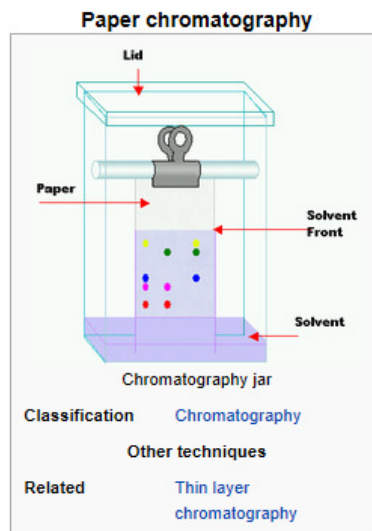
→ Option **B** is essential (ie $R_f < 0$)

Paper chromatography is an [analytical chemistry](#) technique for separating and identifying mixtures that are or can be colored, especially [pigments](#). This can also be used in secondary or primary colors in ink experiments. This method has been largely replaced by [thin layer chromatography](#), however it is still a powerful teaching tool. **Two-way paper chromatography**, also called [two-dimensional chromatography](#), involves using two solvents and rotating the paper 90° in between. This is useful for separating complex mixtures of similar compounds, for example, [amino acids](#).

R_f value

[edit]

The [retention factor](#) (R_f) may be defined as the ratio of the distance traveled by the substance to the distance traveled by the solvent. R_f values are usually expressed as a fraction of two decimal places but it was suggested by Smith that a percentage figure should be used instead. If R_f value of a solution is zero, the solute remains in the stationary phase and thus it is immobile. If R_f value = 1 then the solute has no affinity for the stationary phase and travels with the solvent front. To calculate the R_f value, take the distance traveled by the substance divided by the distance traveled by the solvent (as mentioned earlier in terms of ratios). For example, if a compound travels 2.1 cm and the solvent front travels 2.8 cm, (2.1/2.8) the R_f value = 0.75



Q4: At constant BP temperature, energy added = latent heat of vaporization

The **boiling point** of a substance is the temperature at which the [vapor pressure](#) of the liquid equals the environmental pressure surrounding the liquid.^{[1][2]}

A liquid in a [vacuum](#) has a lower boiling point than when that liquid is at [atmospheric pressure](#). A liquid at high-[pressure](#) has a higher boiling point than when that liquid is at atmospheric pressure. In other words, the boiling point of a liquid varies depending upon the surrounding environmental pressure. For a given pressure, different liquids boil at different temperatures.

The **normal boiling point** (also called the [atmospheric boiling point](#) or the [atmospheric pressure boiling point](#)) of a liquid is the special case in which the vapor pressure of the liquid equals the defined atmospheric pressure at sea level, 1 [atmosphere](#).^{[3][4]} At that temperature, the vapor pressure of the liquid becomes sufficient to overcome atmospheric pressure and allow bubbles of vapor to form inside the bulk of the liquid. The **standard boiling point** is now (as of 1982) defined by [IUPAC](#) as the temperature at which boiling occurs under a pressure of 1 [bar](#).^[5]

The [heat of vaporization](#) is the amount of energy required to convert or vaporize a saturated liquid (i.e., a liquid at its boiling point) into a vapor.

Liquids may change to a vapor at temperatures below their boiling points through the process of [evaporation](#). Evaporation is a surface phenomenon in which molecules located near the liquid's edge, not contained by enough liquid pressure on that side, escape into the surroundings as [vapor](#). On the other hand, boiling is a process in which molecules anywhere in the liquid escape, resulting in the formation of vapor bubbles within the liquid.

→ Option **D** is correct—Ans

Q5: PT was arrange in ascending order of the proton number, so increasing the proton number produce an isotope of an element to the right of X (when the nucleon number may be different due to different neutrons)

Many elements behave this way: eg Boron → Carbon, Al→ Si etc

→Option D is correct --Ans

Q6:

X & Y are 2 different element as they have different proton (or atomic) number although their nucleon number might be the same. The example given was Cobalt: Nickel

→Option B is correct--Ans

Q7: Conduction of electricity by a metal

Ions lattice unchanged but the electrons added on one side will force (by successive repulsion) an electron to go out on the other in order to maintain a charge balance within the metal lattice structure.

It is not actually electricity that moves through wire and air, it is electrons. Electrically charged particles move through material. Electrons are the most common moving charges.

Every copper atom has one very loose electrons. This is true of all metals. This is what makes them metals. In a copper wire, the energy due to room temperature is enough to break many of these electrons free. They float around inside the metal. When connected to a battery (or outlet), the power source pushes the electrons. They move through the wire like a continuous loop of charge. The atoms themselves stay put.

Air does not have loose electrons. Air molecules tend to move as units. Since the air molecules

have a net charge of zero, The battery pulls the electrons one way and the protons the other. Unless there is enough energy to pull the atoms apart, like lightning, there is not much movement of charge at all.

→ Option **B** is correct—Ans

Q8:

Count the number of shared Bond to determine which group in the PT

X=4 =group 4 eg carbon

Y=2=group 6 eg Oxygen

Z=3=group 5 eg Nitrogen

→ Option **C** is correct—Ans

Q9:

A) 1x7 mol B) 1x8 mol C) 2x4 mol D) 2x4 mol

→ Option **A** is the least —Ans

Q10:

A) 0.5x2 mol B) 0.5*3 mol C) 1x3 mol D) 1x2 mol

→ Option **A** is 1 mol=Av constant —Ans

Q11: X is 2+ ions

$X + 2HCl \rightarrow XCl_2 + H_2$ For the same mass of metals used, compare the number of mole

Zn $m_r=65$ Mg $m_r=24$ \rightarrow Mg will have larger mole thus producing more H_2 gas

\rightarrow Option **A** is correct—Ans

Q12:

Mole of $C_2H_2 = \frac{2}{24} = 0.0833$ mol Mole of $H_2 = \frac{2}{2} = 1$ mol \rightarrow C_2H_2 is limiting

Final volume of gas = 0.0833 mol of C_2H_6 + $(1 - 0.0833 \times 2)$ of H_2

$$= 2 \text{ dm}^3 + 20 \text{ dm}^3$$

$$= 22 \text{ dm}^3$$

\rightarrow Option **C** is correct—Ans

Q13: mol ratio of X : O = 2 : 3

Given mol of X = 0.1, mole of O = $\frac{3}{2} \times 0.1 = 0.15$ mol

Mass of Oxygen = $16 \times 0.15 = 2.4$ g

Mass of X = $8 - 2.4 = 5.6$ g

\rightarrow Option **C** is correct—Ans

Q14: Obtain mol ratio from graph C:F:Cl = 1:2:1 check the options given

A) 1:2:1 B) 1:2:2 C) 2:3:3 D) 2:4:2 A & D are possible thus compare actual mol of C from graph

Mass=24 g Mol =mass/mr=24/12=2 → Option **D** is correct—Ans

Q15:

Mol $\text{Pb}(\text{NO}_3)_2 = 20 \times 0.001 \times 0.5 = 0.01$ mol need 0.02 mol of KI

10 cc Y = $10 \times 0.001 \times 1 = 0.01$ mol KI limiting

20 cc Y = $20 \times 0.001 \times 1 = 0.02$ mol exact

40 cc Y = $40 \times 0.001 \times 1 = 0.04$ mol KI excess

50 cc Y = $50 \times 0.001 \times 1 = 0.05$ mol KI excess

→ Option **C** is correct—Ans

Q16: Zn is limiting and remain the same for 2 experiment → Mol unchanged → mol of H_2 produce the same → same mass of H_2

→ Option **A** is correct—Ans

Q17: Strong acid vs weak acid → Low pH vs High PH

Mol of $\text{HCl} = 0.03$ mol of $\text{CH}_3\text{COOH} = 0.03$ so need same amount of NaOH to neutralize

→ Option **C** is correct—Ans

Q18: selection of titration indicator: weak acid/strong base, select indicator that change color from 7.5 to 11

Two familiar acid-base indicators are **methyl orange** and **phenolphthalein**.

Indicator	Acid	Base	pH range
Methyl Orange	Red	Yellow	3.1 - 4.4
Phenolphthalein	Colourless	Pink	8.3 - 10.0

Explore these ideas below:

25 cm³ of 0.1 mol dm⁻³ acid is titrated with 0.1 mol dm⁻³ alkaline solution.

Acid-Base Titration Curves

Vol. (cm³) 0.1 mol dm⁻³ base added to 25 cm³ 0.1 mol dm⁻³ acid

- On** **Strong Acid - Strong Base**
Hydrochloric acid, HCl(aq) - Sodium hydroxide, NaOH(aq)
- On** **Strong Acid - Weak Base**
Hydrochloric acid, HCl(aq) - Ammonia, NH₃(aq)
- On** **Weak Acid - Strong Base**
Ethanoic acid, CH₃COOH(aq) - Sodium hydroxide, NaOH(aq)
- On** **Weak Acid - Weak Base**
Ethanoic acid, CH₃COOH(aq) - Ammonia, NH₃(aq)
- Off** Phenolphthalein
pH 8.3 - 10.0
- Off** Methyl Orange
pH 3.1 - 4.4

Note the pH of salt solutions differ depends on the strength of base & acid.

→ Option **C** is correct—Ans

Q19: Salt preparation

Filtration: Acid + excess solid metal, oxide, carbonate

Titration : 2 solutions → soluble salt

Precipitation : 2 solution → insoluble salt

→ Option **D** is correct—Ans

Q20: Reactivity of Zn & Cu

Zn react with HCL → ZnCL₂ colorless

Cu non-reactive → reddish brown solid

→ Option **D** is correct—Ans

Q21: Color of Carbonate and Oxide

Na : both white Cu: Green, Black Fe: Pale green ,black Pb: White, Yellow

→ Option **C** is correct—Ans

Q22: Solubility of Salts

Ag ppt: AgCl Ba ppt: BaSO₄

→ Option **D** is correct—Ans

Q23: Properties of alloy steel

Mild steel (Low carbon) → malleable

High carbon steel → Brittle

Stainless steel → corrosion resistant

→ Option **D** is correct—Ans

Q24: compare to earth

%CO₂ < 1 %N₂ = 79 %O₂ = 20

→ Option **A** is correct both CO₂ and O₂ is higher than earth--Ans

Q25:

CFC= ozone depletion CO₂=green house effect SO₂=acid rain CO=incomplete combustion of fuel

→ Option **B** is correct—Ans

Q26: Oxidizing agent → high affinity to accept electrons

Halogen in increasing electronegativity : I-Br-Cl-F

→ Option **B** is correct—Ans

Q27: Computation of OS

Os of Sulfur: 4+ → 6+ oxidation

→ Option **D** is correct—Ans

Q28: Electrolysis

- + terminal : Anode which attract anions
- Terminal: Cathode which attract cations

For molten salt, the cathode typically discharge the metal +ion, not gas.

→ Option **D** is correct—Ans

Q29: Electroplating similar to electrolysis, plated object at (-) terminal. No info in the question about the electrode at (+) terminal so do not assume is Cu.

→ Option **D** is correct--Ans

Q30: Sign are from close system point of View :

Sign of E_a always (+), Endothermic (+)

→ Option **C** is correct—Ans

Q31:

Mol of HCL= 0.1 Mol of NaOH= 0.1

Energy release= $-54*0.1=-5.4$ KJ

→ Option **C** is correct—Ans

Q32: Exothermic reaction=combustion

→Option **C** is correct—Ans

Q33: Carbonate in excess, the mol of HCl limit the CO₂ level

$$2 \times 0.025 = 0.05 \text{ mol}$$

I

$$0.05 \times 1 = 0.05 \text{ mol}$$

II

$$0.025 \times 1 = 0.025 \text{ mol}$$

III

→Option **C** is correct—Ans

Q34: Crude oil are hydrocarbon

→Option **B** is correct—Ans

Q35: BP of hydrocarbon

Meth > Eth > Prop > But

Butane will condense first to liquid

→Option **A** is correct—Ans

Q36:

Carboxylic COOH, C=C double bond

C:H ratio is not C_nH_{2n+2}

A) C₁₆H₃₄COO false

B) C₁₇H₃₂COO possible >check full structural diagram below

C) C₁₇H₃₄COO possible

D) C₁₇H₃₆COO false

| | |

C=C-C-.....-COOH → C_nH_{2n}COO

| |

→ Option **C** is correct –Ans

Q37:

C₃H₆Cl₂

Iso1

| | |

Cl-C-C-C-Cl

| | |

Iso2

| | |

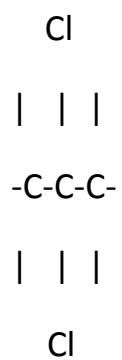
-C-C-C-Cl

| | |

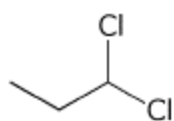
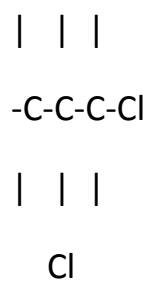
Cl

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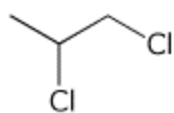
Iso3



Iso4



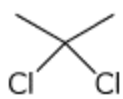
1,1-dichloropropane



1,2-dichloropropane



1,3-dichloropropane



2,2-dichloropropane

→ Option **B** is correct—Ans

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Q38:



ELECTROPHILIC ADDITION REACTIONS OF ALKENES

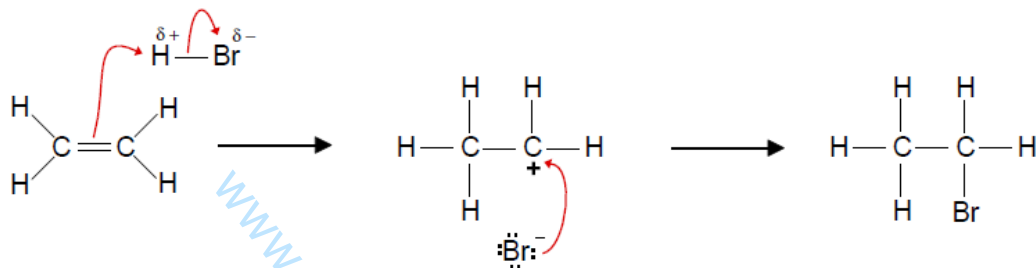
Addition of HBr

Reagent Hydrogen bromide; it is electrophilic because the H is slightly positive

Condition Room temperature.

Equation $\text{C}_2\text{H}_4(\text{g}) + \text{HBr}(\text{g}) \longrightarrow \text{C}_2\text{H}_5\text{Br}(\text{l})$ *bromoethane*

Mechanism



→ Option **A** is correct –Ans

Q39: Condensation polymerization → Formation of H₂O

In Summary:

Monomers involved in condensation polymerization have functional groups. These functional groups combine to form amide and ester linkages. When this occurs, a water molecule is removed. Since water is removed, we call these reactions condensation reactions (water condenses out.). When a condensation reaction involves polymerization, we call it *condensation polymerization*.

→ Option **D** is correct—Ans

Q40: Polyester form by eliminate of H⁺ from -COOH group and -OH

→ Option **D** is correct—Ans

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Pure Chemistry Prelim Exam Paper 3-2011

A1:

a)

1. Cs= good electrical conductor at solid state, react with water to form alkaline.
2. F=diatomic molecule gaseous at rtp, form -1 ion with group 1 metal.

b)

1. AgCl insoluble white ppt → Chlorine Cl⁻ ion
2. Group 5 element can accept 3e⁻ to form -3 anions → N (eg in NH₃)
3. Catalyst from hydrogenation of alkene → Ni

A2:

a) Assume only 1 indicator was allowed: The indicator must change color when pH out of the range 7—7.6

Use Bromothymol blue: colorless is OK else reject.

b) Chlorine was slightly toxic and was used as disinfectant.

Chlorination is the process of adding the element **chlorine** to **water** as a method of **water purification** to make it fit for human consumption as **drinking water**. Water which has been treated with chlorine is effective in preventing the spread of waterborne **disease**.

The chlorination of public drinking supplies was originally met with resistance, as people were concerned about the **health effects** of the practice. The use of chlorine has greatly reduced the prevalence of waterborne disease as it is effective against almost all **bacteria** and **viruses**, as well as **amoeba**.

Chlorination is also used to sanitize the water in **swimming pools** and as a disinfection stage in **sewage treatment**.

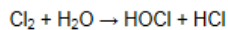
Shock chlorination is a process used in many swimming pools, **water wells**, **springs**, and other water sources to reduce the **bacterial** and **algal** residue in the water. Shock chlorination is performed by mixing a large amount of **sodium hypochlorite**, which can be in the form of a powder or a liquid such as chlorine bleach, into the water. Water that is being shock chlorinated should not be swum in or drunk until the sodium hypochlorite count in the water goes down to three **ppm** or less.

The formation of OH⁻ ions caused the pH value to increase.

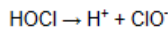
Chemistry in water

[edit]

When chlorine is added to water, it reacts to form a pH dependent equilibrium mixture of chlorine, **hypochlorous acid** and **hydrochloric acid**^[4]:



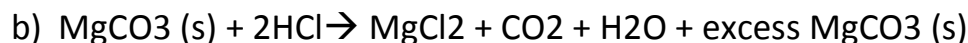
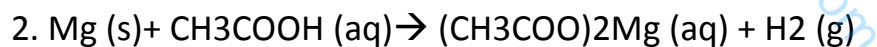
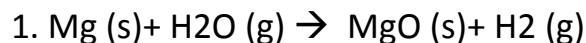
Depending on the pH, hypochlorous acid partly **dissociates** to hydrogen and **hypochlorite** ions:



In acidic solution, the major species are Cl₂ and HOCl while in alkaline solution effectively only ClO⁻ is present. Very small concentrations of ClO₂⁻, ClO₃⁻, ClO₄⁻ are also found.^[5]

A3:

a)



Filtration to remove excess CaCO₃ → evaporation to increase filtrate concentration → Crystallization → rinse → dry on filter paper

c) Decomposition of carbonate.

The amount of solid and the temperature must be kept constant for fair comparison.

The result show that the higher the metal's reactivity, the more stable will be the carbonate during heating. Cu ion exerts a larger attraction to e- to polarize the CO₃ ions cause it to decompose faster upon heating.

Reactivity of Group II elements increases down the group.

This can be explained by the increase in ease at losing two outer electrons as we descend the group. The loss of electrons becomes easier due to the decreasing ionisation energy required.

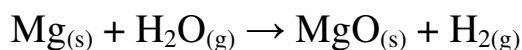
Ionisation energy decreases due to extra shielding from inner shells and increase in distance from the nucleus.

Group II elements are less reactive than the corresponding Group I element in the same period, since two rather than one electron need to be lost in order to gain noble gas configuration.

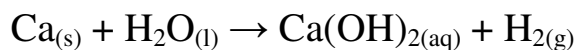
Reaction with Water

Reactivity increases down the group. This is clearly seen if we observe the reactions of magnesium and calcium in water:

a) Virtually no reaction occurs between magnesium and cold water. However, in a reaction with steam it forms magnesium oxide and hydrogen.

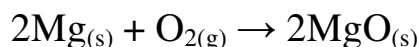


b) Calcium is more reactive. It reacts with cold water to produce an alkaline solution of calcium hydroxide and hydrogen gas is released.



Reaction with Air and Water

All group II elements react in air to form an oxide layer. Again the reactivity increases down the group, all forming a white oxide.



Thermal stability of carbonates and nitrates

Carbonates

The thermal stability of Group II carbonates increases as we descend the group. Beryllium carbonate decomposing most easily.



Where M is a Group II element.

This trend is explained in terms of the Group II metal ions ability to polarise the anion, the carbonate ion. Small highly charged positive ions distort the electron cloud of the anion.

The larger the anion the easier the distortion, as seen with the carbonate ion. Hence polarising ability of the M^{2+} ion decreases down the group.

The greater the distortion caused by the polarising ion the less stable the compound is to heat. This means that beryllium carbonate decomposes at a lower temperature to the rest of the group.

Nitrates

The thermal stability of the nitrates follows the same trend as that of the carbonates, with thermal stability increasing with proton number.

The reason, once more, is that the polarising power of the M^{2+} decreases as ionic radius increases.

Solubility of group II sulphates

The solubility of these sulphates decreases as we descend the group, with barium sulphate being insoluble in water.

Two factors are involved in dissolving:

1. Lattice energy
2. Enthalpy of hydration.

Due to the large size of the sulphate anion there is little difference between the lattice energies for these compounds. However, due to the change in ionic radius (i.e. charge density), there is significant difference in terms of their ability to hydrate.

The greater the charge density the easier it is for the cation to hydrate and hence dissolve in water due to greater attraction with the polar water molecules.

Magnesium sulphate dissolves in water whereas barium sulphate does not.

A4:

a) The released of H₂ gas bubbles tend to left the Mg metal strip upwards.

Cu was nonreactive with HCl as compared to Zn & Fe which are reactive to produce H₂ as well.

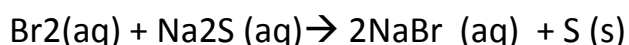
b) The reaction involved Cu is faster.

Cu Vs Mg cause Mg to loose e⁻ similar to a chemical cell setup (The copper act as wire as well as electrode) leading to a faster reaction rate.

c) Propanoic acid is weak acid (low dissociation to form H⁺ ions) thus the reaction rate would be slower but the final H₂ level remains the same.

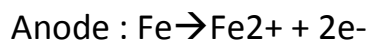
A5:

a) Reddish Brown solution change to colorless solution with ppt



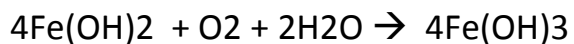
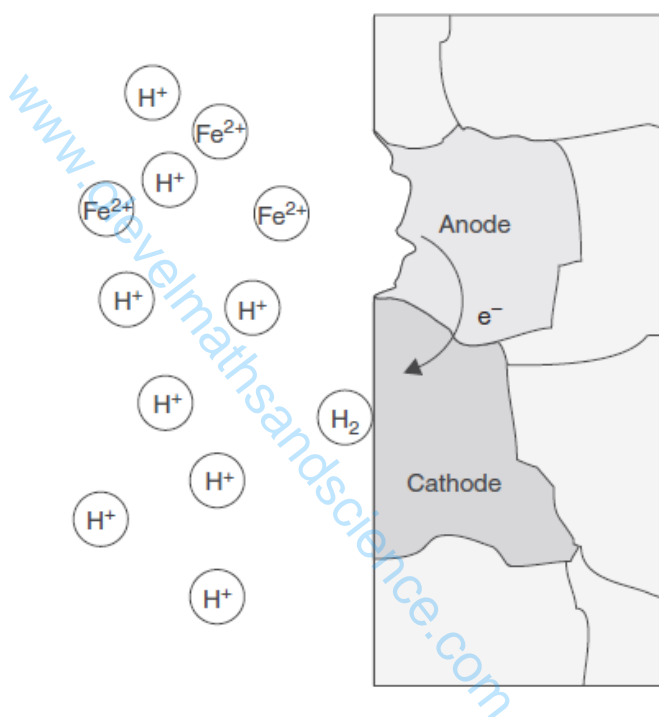
OS of Br changed from 0 to -1 ==reduction its act as OA to change OS 2- to 0.

b) Chemical cell reaction



Note that formation of H₂ gas does not always occur and is also not a condition for rust formation.

FIGURE 3.7
Formation of ions at an anodic area and release of hydrogen at a cathodic area in a local cell on an iron surface.



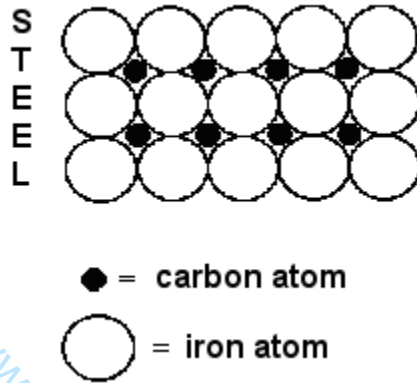
OS of Fe change from 2+ to 3+ increase → Oxidation

When Zn is present, Zn being a more reactive metal loses electrons and forms Zn²⁺ ions, the excess electrons protect iron from oxidation.

Reference Notes:

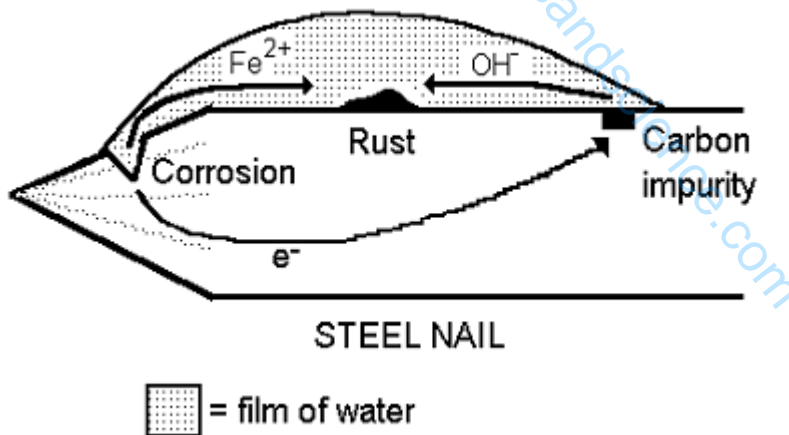
Rusting is the corrosion of iron and readily occurs in the alloy steel. The formation of a reddish brown flakes which loosely adheres to the iron is called rust.

Steel is an alloy made of iron and carbon. The carbon atoms in steel greatly increase the strength of the metal. They prevent the iron atoms in the crystal lattice from slipping over one another.

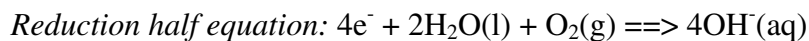


Steel is widely used in the manufacture of cars, white goods and the construction industry because it is much stronger than iron.

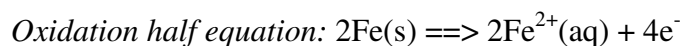
The carbon atoms in steel however, greatly decrease the ability of iron to resist corrosion.



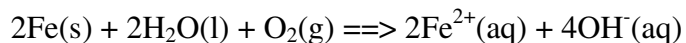
In the presence of oxygen and water a series of internal galvanic cells or batteries are created. The carbon impurities become the site of reduction.



The nail is most easily oxidised at points of stress, i.e. the tip or the head. At these points the crystal lattice is distorted and the iron atoms are easily oxidised.



The overall or net equation is



$\text{Fe}^{2+}\text{(aq)}$ and $\text{OH}^-\text{(aq)}$ ions migrate through the water by diffusion. Refer to the above diagram. When they meet they combine to produce the precipitate, iron(II) hydroxide, Fe(OH)_2 , which is further oxidised to iron (III) hydroxide, Fe(OH)_3 , and finally dehydrated to produce rust.

The chemistry of the reaction resulting in the formation of rust can be summarized as follows.

The chemical equations for rust formation

1. $2\text{Fe(s)} + 2\text{H}_2\text{O(l)} + \text{O}_2\text{(g)} \rightleftharpoons 2\text{Fe}^{2+}\text{(aq)} + 4\text{OH}^-\text{(aq)}$
2. $\text{Fe}^{2+}\text{(aq)} + 2\text{OH}^-\text{(aq)} \rightleftharpoons \text{Fe(OH)}_2\text{(s)}$
3. $\text{Fe(OH)}_2\text{(s)} \xrightarrow{\text{O}_2} \text{Fe(OH)}_3\text{(s)}$
4. $\text{Fe(OH)}_3\text{(s)} \xrightarrow{\text{dehydrates}} \text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O(s)}$ or rust

The chemical formula for rust is $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$

A6:

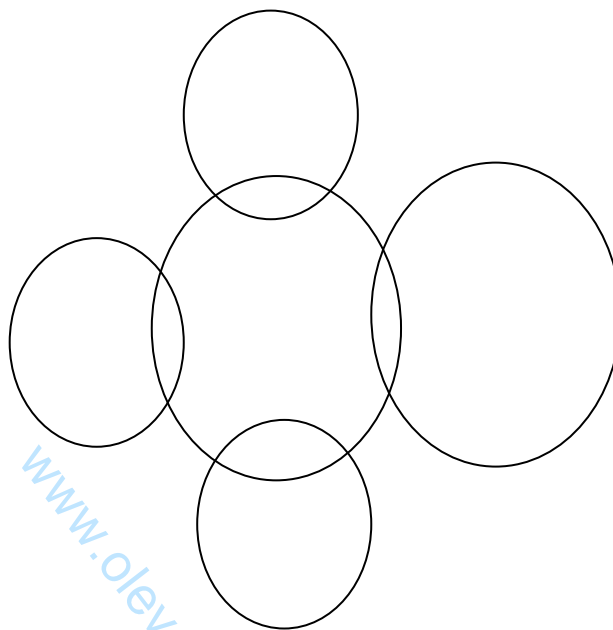
a) One isomer will be : -C-C-C-C-



Dibromobutane will be : -C-C-C-C-Br



b) CH₃Cl



c) $C_4H_7Br + H_2O \rightarrow C_4H_7OH + HBr$ Butanol was the product

d) Displacement reaction of halogen, Br displace iodine in the solution producing the darkbrown solution of I₂.

$Br_2 (g) + 2I^- (aq) \rightarrow I_2 (aq) + 2Br^- (aq)$ Note I₂ has limited solubility, if in excess will form black ppt in the dark brown solution.

d) Iodobutane \rightarrow Bromobutane \rightarrow Chlorobutane

Experiment B had higher concentration of organic halide \rightarrow more chance of molecular collision \rightarrow shorter time to form ppt

B7:

1) Oxygen level drop to 0 after the rubbish was introduced due to the decomposition of rubbish by bacteria activity, instead the level of CH₄ increase steadily to a very high level.

2) CH₄ is a powerful greenhouse gas which trap reflected sun-light radiation causing global warming, thus it is better to burn it to convert to H₂O and CO₂.

3) most solid rubbish are slow degrading causing environmental pollution, converting the rubbish to usable gas speed up the decomposition as well as harvesting the else wasted energy.

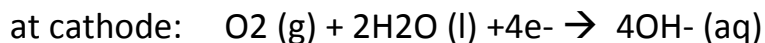
b) CO₂ in biodiesel was obtained from the atmospheric air, burning of biodiesel simply return the CO₂ to the atmosphere ready for recycle. The Net result in the fuel cycle is the trapping and utilization of solar energy.

B8:

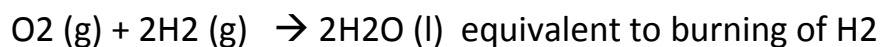
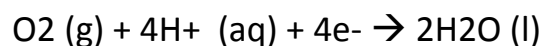
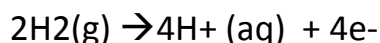
a) Hydrogen is clean fuel, it does not produce CO₂ (Greenhouse gas), CO (toxic) or shoot.

b) The main disadvantage of using hydrogen is cost of producing H₂ gas as well as difficulty to store and carry it as a fuel (required gas cylinder compared to normal liquid fuel tank.)

c) Fuel cell: redox reactions



d) Overall reaction



A possible electrolyte will be HCl or H₂SO₄ or salt of weakbase such as NH₄NO₃ which is acidic in aqueous solution.

e) Mg more reactive than Cu thus current flows from Mg to Cu electrode (Think in terms of internal sea of electrons exerting a pressure from Mg to Cu electrode)

Silver is less reactive than H⁺ thus silver will be deposited onto the cathode which will be difficult to recover.

B9:

a) Saturated : only C-C bonding, Unsaturated contain C=C bond which are more reactive.

Hydrocarbon: Organic Compound which consists entirely of carbon and hydrogen atoms.

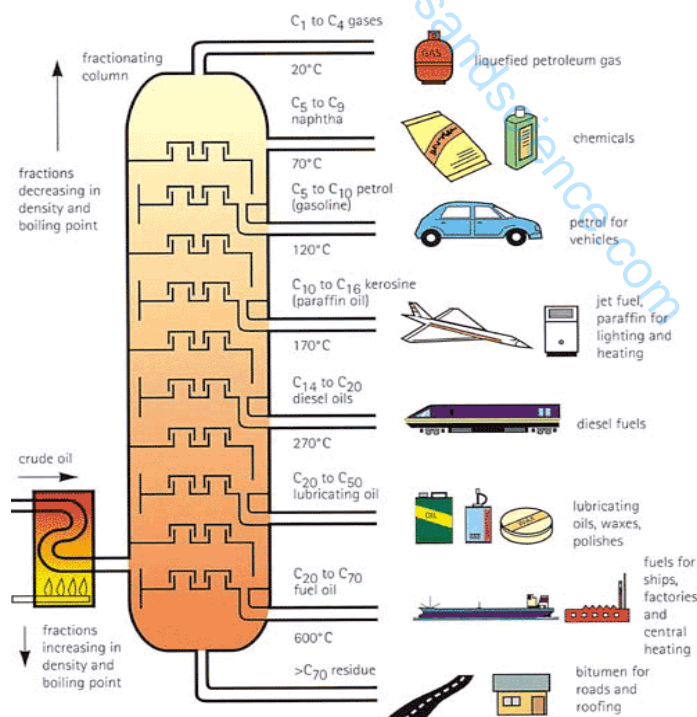
Types of hydrocarbons

The classifications for hydrocarbons defined by IUPAC nomenclature of organic chemistry are as follows:

1. Saturated hydrocarbons (**alkanes**) are the simplest of the hydrocarbon species and are composed entirely of single bonds and are saturated with hydrogen. The general formula for saturated hydrocarbons is C_nH_{2n+2} (assuming non-cyclic structures).^[5] Saturated hydrocarbons are the basis of petroleum fuels and are found as either linear or branched species. Hydrocarbons with the same **molecular formula** but different **structural formulae** are called **structural isomers**.^[6] As given in the example of 3-methylhexane and its higher **homologues**, branched hydrocarbons can be **chiral**.^[7] Chiral saturated hydrocarbons constitute the side chains of biomolecules such as **chlorophyll** and **tocopherol**.^[8]
2. **Unsaturated hydrocarbons** have one or more double or triple bonds between carbon atoms. Those with double bond are called **alkenes**. Those with one double bond have the formula C_nH_{2n} (assuming non-cyclic structures).^[9] Those containing triple bonds are called **alkynes**, with general formula C_nH_{2n-2} .^[10]
3. **Cycloalkanes** are hydrocarbons containing one or more carbon rings to which hydrogen atoms are attached. The general formula for a saturated hydrocarbon containing one ring is C_nH_{2n} .^[6]
4. **Aromatic hydrocarbons**, also known as **arenes**, are hydrocarbons that have at least one **aromatic ring**.

Hydrocarbons can be **gases** (e.g. **methane** and **propane**), **liquids** (e.g. **hexane** and **benzene**), waxes or low melting **solids** (e.g. **paraffin wax** and **naphthalene**) or **polymers** (e.g. **polyethylene**, **polypropylene** and **polystyrene**).

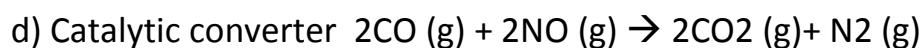
b)



c)Cracking : breaking of heavy hydrocarbon molecule into smaller molecules of Alkene, Alkane or hydrogen (usually in the presence of catalysts such as Nickel)



Demand for heavy hydrocarbon are not as high as the lighter one thus higher economic return to produce more lighter hydrocarbon by cracking.



OR

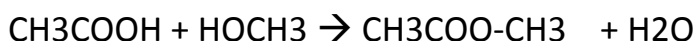
A, B ,C are isomer

a) **A** is $C_3H_6O_2 \rightarrow C_2H_5COOH$ propanoic acid



Note the naming convention of Ester—The -thyl group was from the alcohol with the -OH- removed attached to the -O- link of the carboxylic group.

B is $CH_3COOCH_3 \rightarrow$ Methyl-ethanoate (ester functional group)



C is $CH_3CH_2OOCH \rightarrow$ Ethyl methanoate (ester functional group)



Esters formed by reaction between an alcohol and a carboxylic acid forming esters and water molecules (a form of condensation reaction).

End of paper