NATIONAL BUSINESS AND TECHNICAL EXAMINATIONS BOARD

(GENERAL EDUCATION EXAMINATION)

QUESTION AND ANSWER

CHEMISTRY

Section B (Essay 100 marks) **Time: 1 hour 40 mins**

1. Starting from bauxite, explain how to obtain pure aluminium metal

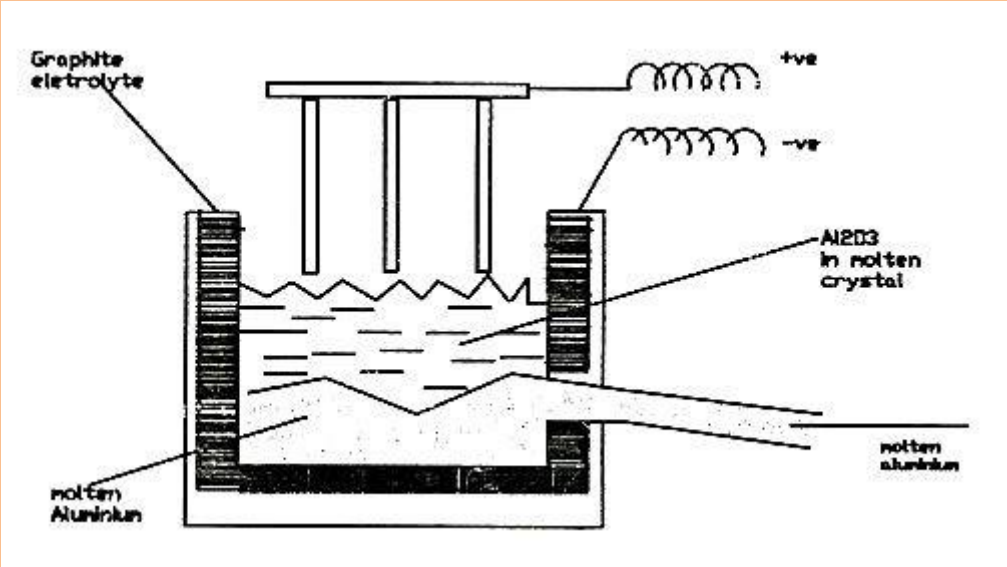
Solution

i. Dissolve the impure bauxite in hot concentrated sodium hydroxide solution/ $2Na\ OH + A1_2\ O_3 + 3H_2\ 0 \rightarrow 2\ NaA1\ (OH)_4$
ii. Filter off the impurities leaving the sodium aluminates solution
iii. Seed the Sodium aluminate solution to obtain pure aluminium hydroxide/$NaA1(OH)_4$ $\geqslant$ $Na\ OH+A1\ (OH)_3$
iv. Filter, wash, dry and heat the precipitate of $A1\ (OH)_3$ / to obtain pure aluminium oxide heat/$2A((OH)_3$ heat $A(_2\ 0_3 + 3\ H_20$.
v. Electrolysis of bauxite $\longrightarrow$

Electrolyte is Alumina (Aluminium Oxide) in molten cryolite Electrodes are graphite as anode and graphite as cathode.

At the cathode, molten aluminum is discharged or $A1^{3+} + 3e = A1(s)$.

At the anode, oxygen gas is discharged/$20^{2-} = 0_2 + 4^{e-}$



bi. Write down the formula and IUPAC name of alum.
ii. Give two uses of alum.
iii. Name THREE metals that can be extracted through electrolysis.

solution

i) $KA1\ (S04)_2\ 12\ H_20$ – (2)
Name: Potassium aluminum III tetra oxosulphate VI duodecahydrate or NH_4
$Fe\ (S04)_2.12H_20$

Ammonium Chromium III tetraoxosulphate VI duodecahydrate

ii) Alum is used for water purification
Alum is used for mordant in dyeing

iii) Metals that can be extracted through electrolysis-sodium, potassium, calcium, magnesium.

Bi. Name THREE important alloys of aluminium.
ii. Give two uses of each of the alloys named.
iii. Give the composition of ONE of the alloys named.

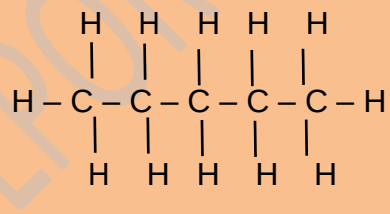
Solution:
Duralumin Composition AL, Mg, Cu, Mn
Use – construction of car, Aeroplane, Railways Coaches, ship.

Aluminium Brass – cu, AL uses for casting coins and medals
Alnico – fe, A1, Ni, Co
Uses – for making permanent Magnets

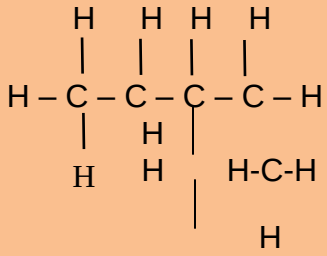
2a. Give correct IUPAC Names and Structures of Isomers of $C_5 H_{,12}$

Solution

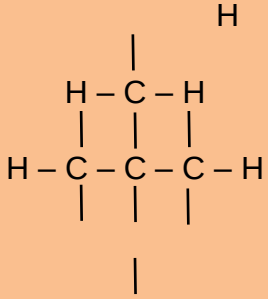
Pentane:



2 methy Butane:



2,2, dimethylpropane



H – C – H

H

2bi State THREE differences between aliphatic and aromatic hydrocarbons
Give THREE uses of Benzene

Solution

Aliphatic	Aromatic
1. C: H ration is low	C: H Ratio is high
2. Burns without soots or luminous flame	Burns with sooting flame
3. Not based on benzene	Based on Benzen Structure
4. Multiple bonds may be included	Multiple bond must be included

ii. Manufacture of synthetic fibers (e.g.) nylon.
Manufacture of pesticides
Manufacture of dyes
Manufacture of drugs

C. Explain using a diagram, how you would prepare ethanoic acid in the laboratory. Write the equation of the reaction solution.

i. Add ethanol from a thistle funnel attached to a reflux flask into a round bottom flask containing concentrated H2 S04 and Na2 Cr2 07.

ii. Put the mixture in a water bath and gently then reflux
$C_2 H_5 OH(hq) + 2\{0\} \longrightarrow CH_3 CO_0 H + H_20$

OR

$C_2 H_5 OH + (0) \longrightarrow CH_3 CH0\ [0]\ CH_3 COOH$

iii. Distil the solution left to collect the ethanoic acid

D. Give correct IUPAC names of the following compounds
i) $CH_3 COOCH_3$
ii) $CH_3 COOC_2H_5$
iii) $(CH_3)_2CHCOOH$

Solutions:
i) Methyl Ethanonate
ii) Ethyl Ethanonate
iii) 2 methyl propanoic acid