VIDYAJYOTHI

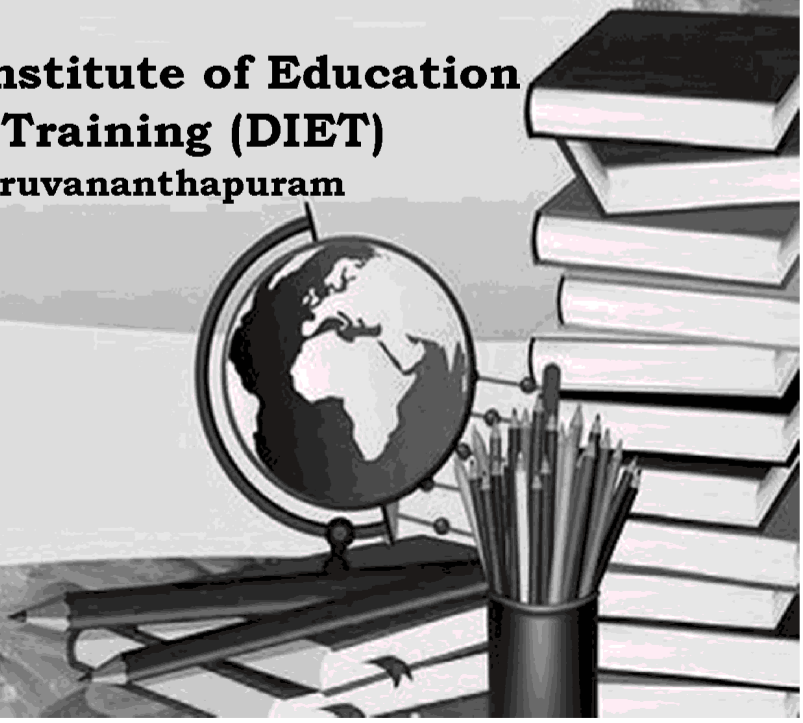
(2021 - 2022)

CHEMISTRY

WORKSHEET

CLASS X

District Institute of Education and Training (DIET)
Thiruvananthapuram



Vidyajyothi

Chemistry

(Worksheet)

First Edition
September 2021

Layout & Cover Design
Kallingal Graphics, Attingal

Concepts & Conceptualisation
District Panchayath, Thiruvananthapuram

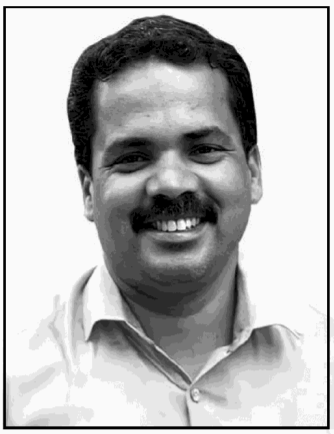
Administrative Charge
Sri. Santhoshkumar. S, Deputy Director of Education, Thiruvananthapuram

Academic Charge
Dr.Sheejakumari T.R , Principal in charge , DIET, Thiruvananthapuram

Coordinator
Smt. Geetha Nair, Senior Lecturer, DIET, Thiruvananthapuram

Subject Charge
Dr.V. Sulabha, Senior Lecturer, DIET, Thiruvananthapuram

Printing
Govt. Press, Thiruvananthapuram



പ്രിയപ്പെട്ട കുട്ടികളേ,

തിരുവനന്തപുരം ജില്ല പഞ്ചായത്ത് പരിധിയിൽ വരുന്ന ഹൈസ്കൂൾ, ഹയർസെക്കണ്ടറി വിഭാഗം കുട്ടികളുടെ പഠനനിലവാരം ഉയർത്താനും പൊതുപരീക്ഷയിൽ ഉയർന്ന ഗ്രേഡ് കരസ്ഥമാക്കാനും ലക്ഷ്യമിട്ടുകൊണ്ട് മുൻ വർഷങ്ങളിൽ ഡയറ്റിന്റെ സഹായത്തോടെ നടപ്പാക്കിയ വിദ്യാജ്യോതി പദ്ധതി ഈ വർഷവും തുടരുന്നതിൽ അതിയായ സന്തോഷവും അഭിമാനവുമുണ്ട്. തിരുവനന്തപുരം ജില്ലയിലെ വിദ്യാഭ്യാസ സ്ഥാപനങ്ങളുടെ അക്കാദമികവും ഭൗതികവുമായ സൗകര്യങ്ങൾ വളരെയേറെ മെച്ചപ്പെട്ടത് പൊതുവിദ്യാഭ്യാസത്തെ സ്നേഹിക്കുന്ന മുഴുവൻ പേർക്കും ആഹ്ലാദം പകരുന്നതാണ്. അപ്രതീക്ഷിതമായി എത്തിയ കോവിഡ് 19 നമ്മുടെ സംസ്ഥാനത്തെയും ബാധിച്ചുവെങ്കിലും കുട്ടികളുടെ വിദ്യാഭ്യാസത്തിലും ജനങ്ങളുടെ ആരോഗ്യത്തിലും വിട്ടുവീഴ്ചയില്ലാത്ത നിലപാടുമായി കേരള ഗവൺമെന്റ് ലോകത്തിന് മാതൃകയായി മാറി. വിക്ടേഴ്സ് ചാനൽ വഴി എല്ലാ ക്ലാസിലെയും പാഠഭാഗങ്ങൾ കുട്ടികളിലെത്തിക്കുകയും അധ്യാപകർ തുടർ പ്രവർത്തനങ്ങൾ നൽകി പഠനനേട്ടം കുട്ടികളിൽ ഉറപ്പിക്കുകയും ചെയ്തിട്ടുണ്ട്. എല്ലാ വിഷയങ്ങളിലെയും പാഠഭാഗങ്ങളിലൂടെ ആവർത്തിച്ചുകടന്നുപോകാനും ചോദ്യമാതൃകകൾ പരിചയപ്പെടാനും പ്രത്യേകം ശ്രദ്ധിക്കണം. ജില്ലയിലെ സമർഥരായ അധ്യാപകരുടെ നേതൃത്വത്തിൽ എല്ലാ പഠനനേട്ടങ്ങളെയും പരിഗണിച്ചുകൊണ്ട് തയ്യാറാക്കിയിട്ടുള്ള വർക്കുഷീറ്റുകളാണ് ഇതോടൊപ്പം നൽകുന്നത്. ഓരോ വർക്കുഷീറ്റിലൂടെയും ശ്രദ്ധാപൂർവം കടന്നുപോകുന്നത് ഉയർന്ന ഗ്രേഡുകൾ വാങ്ങുന്നതിന് നിങ്ങൾക്ക് ഏറെ സഹായകമാകും. എല്ലാവർക്കും ഉയർന്ന വിജയം ആശംസിക്കുന്നു.

സ്നേഹത്തോടെ

അഡ്വ.ഡി.സുരേഷ്കുമാർ
പ്രസിഡന്റ്, തിരുവനന്തപുരം ജില്ല പഞ്ചായത്ത്

സ്നേഹമുള്ള കുട്ടികളേ...

അറിവിന്റെ ശക്തി, അത് വാക്കുകൾക്കപ്പുറമാണ്. ഏതൊരുവനാണോ അവനിഷ്ടപ്പെട്ട വിദ്യയിൽ പരമാവധി ജ്ഞാനം നേടിയത്, പ്രാഗത്ഭ്യം തെളിയിച്ചത് ആ അറിവ് അവനെപ്പോഴും ഒരു രക്ഷാകവചമായി വർത്തിയ്ക്കും. ജില്ല പഞ്ചായത്ത് ഡയറ്റിന്റെ സഹായത്തോടെ നടപ്പിലാക്കുന്ന 'വിദ്യാജ്യോതി' എന്ന പദ്ധതി നമ്മുടെ കുട്ടികൾക്ക് ഒരു രക്ഷാകവചമായി മാറിക്കഴിഞ്ഞിരിയ്ക്കുന്നു. ഈ വർഷവും നമ്മുടെ സ്കൂളുകൾ ഉന്നത വിജയത്തിലെത്താൻ ഈ പദ്ധതിയെ പ്രയോജനപ്പെടുത്തേണ്ടതാണ്. കോവിഡ് സൃഷ്ടിച്ച ആശങ്കകളെ മാറ്റിനിർത്തി ഏകജാലക വിദ്യാഭ്യാസത്തിലൂടെ നമ്മുടെ കുട്ടികൾ പഠിയ്ക്കുന്ന ഈ സാഹചര്യത്തിൽ വിദ്യാജ്യോതി അവർക്ക് ഒരു വെളിച്ചമായി മാറുക തന്നെ ചെയ്യും. അതിനാൽ നമ്മുടെ സ്കൂളുകൾ ഉന്നത വിജയം കരസ്ഥമാക്കുന്ന സ്കൂളുകളായും മാറും. എല്ലാപേർക്കും അഭിനന്ദനങ്ങൾ, ആശംസകൾ....

വി.ആർ.സലൂജ
ചെയർപേഴ്സൺ
(ആരോഗ്യ വിദ്യാഭ്യാസ സ്റ്റാന്റിംഗ് കമ്മിറ്റി)

Message

പ്രിയപ്പെട്ട കുട്ടികളേ

വളരെ വ്യത്യസ്തമായ ഒരു അധ്യയനവർഷത്തിലൂടെയാണ് നാം കടന്നുപോകുന്നത്. കോവിഡ് 19 സൃഷ്ടിച്ച ആശങ്കകൾക്കിടയിലും പഠനം മുടങ്ങാതിരിക്കാനുള്ള എല്ലാ മുൻകരുതലും കേരള സർക്കാരും വിദ്യാഭ്യാസവകുപ്പും സ്വീകരിച്ചിട്ടുണ്ട്. വിക്ടേഴ്സ് ചാനൽ വഴി പ്രക്ഷേപണം ചെയ്യുന്ന ക്ലാസുകൾക്ക് വലിയ സ്വീകാര്യതയാണ് ലഭിക്കുന്നത്. വിവരവിനിമയ സാങ്കേതികവിദ്യയുടെ ഉപയോഗം വിദ്യാഭ്യാസപ്രക്രിയയ്ക്ക് കൂടുതൽ കരുത്ത് പകർന്നിട്ടുണ്ട്. പത്താംക്ലാസ്, ഹയർസെക്കണ്ടറി വിഭാഗം കുട്ടികളുടെ വിജയശതമാനം ഉയർത്താൻ ലക്ഷ്യം വച്ചുകൊണ്ട് തിരുവനന്തപുരം ജില്ലപഞ്ചായത്തും ഡയറ്റും മുൻവർഷങ്ങളിൽ നടപ്പാക്കിയ വിദ്യാജ്യോതി പദ്ധതി ഈ വർഷവും തുടരുകയാണ്. പാഠഭാഗങ്ങളുടെ ഉള്ളടക്കത്തെ ലളിതമായ ആശയങ്ങളാക്കി മാറ്റി എല്ലാ കുട്ടികൾക്കും എളുപ്പത്തിൽ ഗ്രഹിക്കാൻ കഴിയുന്ന വിധം വർക്കുഷീറ്റുകൾ തയാറാക്കി നൽകാനാണ് ഇപ്പോൾ തീരുമാനിച്ചിട്ടുള്ളത്. ഇതിനായി എല്ലാ വിഷയങ്ങളുടെയും വർക്കുഷീറ്റുകൾ തയാറായിട്ടുണ്ട്. എല്ലാ വർക്കുഷീറ്റിലൂടെയും ശ്രദ്ധാപൂർവം കടന്നുപോകണം. എല്ലാവർക്കും മികച്ച വിജയം ആശംസിക്കുന്നു.

സ്നേഹത്തോടെ
സന്തോഷ്കുമാർ. എസ്
വിദ്യാഭ്യാസ ഉപഡയറക്ടർ, തിരുവനന്തപുരം

Message

പ്രിയപ്പെട്ട കുട്ടികളേ,

അപ്രതീക്ഷിതമായി എത്തിയ കോവിഡ് 19 വിദ്യാഭ്യാസമേഖലയിൽ വലിയ വെല്ലുവിളിയാണ് ഉയർത്തിയത്. രോഗവ്യാപനസാഹചര്യത്തിലും വിദ്യാഭ്യാസം സുഗമമാക്കുന്നതിന് വിദ്യാഭ്യാസവകുപ്പും സമൂഹവും ഒന്നുചേർന്ന് പ്രവർത്തിക്കുകയുണ്ടായി. കോവിഡിനെ അതിജീവിക്കാനായി സ്വീകരിച്ച ഓരോ വഴിയും പിന്നീട് സൗകര്യമായും ശീലമായും മാറുമോയെന്ന് ആശങ്കപ്പെടേണ്ടതുണ്ട്. ഓരോന്നിനെയും അതിന്റെ മേന്മ നോക്കി സ്വീകരിച്ചാൽ ഈ പ്രശ്നം പരിഹരിക്കാൻ കഴിയും. ഒരു കാര്യം ഉറപ്പാണ്. മനുഷ്യരാശി കോവിഡിന്റെ പിടിയിൽനിന്ന് മുക്തരാകും. പക്ഷേ കോവിഡിനു മുമ്പുള്ള സാമൂഹ്യസാഹചര്യത്തിലേയ്ക്ക് തിരികെപ്പോകാൻ കഴിയാതെ വന്നേക്കും. എങ്കിലും നമുക്ക് ശുഭപ്രതീക്ഷയാണുള്ളത്. തിരുവനന്തപുരം ജില്ല പഞ്ചായത്തും ഡയറ്റും ചേർന്ന് നടപ്പാക്കുന്ന വിദ്യാജ്യോതി പദ്ധതി ഏറ്റവുമധികം ശ്രദ്ധയാകർഷിച്ച പരിപാടിയാണ്. മുൻവർഷങ്ങളിൽ ആറ് വിഷയങ്ങൾക്കുമാത്രമാണ് പഠനസഹായി തയാറാക്കിയത്. ഈ വർഷം എല്ലാ വിഷയത്തിന്റെയും ഉള്ളടക്കമേഖലകളെ ലളിതമായി വ്യാഖ്യാനിച്ച് കുട്ടികളുടെ മുമ്പിൽ വർക്കുഷീറ്റുകളായി എത്തിക്കാനാണ് ലക്ഷ്യമിട്ടിട്ടുള്ളത്. ഉയർന്ന വിജയം കരസ്ഥമാക്കാൻ ഈ വർക്കുഷീറ്റുകൾ സഹായകമാകും. പരിചയസമ്പന്നരായ അധ്യാപകരാണ് ഓരോ വിഷയത്തിന്റെയും വർക്കുഷീറ്റുകൾ തയാറാക്കുന്നതിന് നേതൃത്വം നല്കിയത്. എല്ലാ വർക്കുഷീറ്റുകളിലൂടെയും കടന്നുപോയി ഉയർന്ന വിജയത്തിലെത്താൻ മുഴുവൻ കുട്ടികൾക്കും കഴിയട്ടെയെന്ന് ആശംസിക്കുന്നു.

വിശ്വസ്തതയോടെ
ഡോ. ടി.ആർ.ഷീജാകുമാരി
പ്രിൻസിപ്പൽ (പൂർണ അധികചുമതല), ഡയറ്റ് തിരുവനന്തപുരം.

പ്രിയപ്പെട്ട കുട്ടികളേ...

പത്താംക്ലാസിലെ പഠനവും പരീക്ഷയും വലിയ പ്രാധാന്യത്തോടെയാണ് നാം കാണുന്നത്. മറ്റ് ക്ലാസുകളിലെ പഠനത്തിന് നൽകുന്ന പ്രധാന്യമേ പത്താം ക്ലാസ് പഠനത്തിനും നൽകേണ്ടതുള്ളൂവെങ്കിലും പൊതുപരീക്ഷയെ അഭിമുഖീകരിക്കുന്നുവെന്ന പ്രാധാന്യം പത്താംതര പഠനത്തെ വ്യത്യസ്തമാക്കുന്നുണ്ട്. ഉള്ളടക്കത്തെ സംബന്ധിച്ച കേവല ധാരണകൾക്കു പകരം വിവരവിശകലനവും നിഗമനവുമാകണം പഠനത്തിന് അടിസ്ഥാനമാകേണ്ടത്. വിക്ടേഴ്സ് ചാനൽ വഴിയുള്ള ക്ലാസുകളുടെ തുടർച്ചയായി നിങ്ങളുടെ പ്രിയപ്പെട്ട അധ്യാപകർ നടത്തുന്ന സംവാദാത്മക ക്ലാസുകൾ സംശയദുരീകരണത്തിനുള്ള അവസരമായി പ്രയോജനപ്പെടുത്തണം. ഓൺലൈൻപഠനത്തിന്റെ ശക്തിയും ദൗർബല്യവും തിരിച്ചറിഞ്ഞ് പഠനം അനുഭവാധിഷ്ഠിതമാക്കുന്നതിനുള്ള വ്യക്തിഗതശ്രദ്ധയുമുണ്ടാകണം. പത്താംതരം പാഠപുസ്തകത്തിലെ ഉള്ളടക്കത്തെ ലളിതമായി വിവിധ സങ്കേതങ്ങൾ വഴി അവതരിപ്പിക്കുകയാണ് വിദ്യാജ്യോതിയെന്ന ഈ പുസ്തകത്തിലൂടെ ചെയ്തിരിക്കുന്നത്. ഓരോ യൂണിറ്റിലെയും എല്ലാ ആശയങ്ങളും പരിഗണിച്ച് തയ്യാറാക്കിയിരിക്കുന്ന ഈ പ്രവർത്തനപുസ്തകം നിങ്ങളുടെ ആത്മവിശ്വാസം വർധിപ്പിച്ച് പഠനസന്നദ്ധത നിലനിർത്താൻ സഹായിക്കുന്ന വഴികാട്ടിയാണ്. സ്വയം വിലയിരുത്തലിനു വിധേയമാക്കി കൂടുതൽ കരുത്തോടെ പഠനപുരോഗതിയിലേക്ക് നയിക്കാൻ നിങ്ങളെ ഈ പുസ്തകം സഹായിക്കും. എല്ലാ യൂണിറ്റുകൾക്കും മതിയായ പ്രാധാന്യം നൽകിയാണ് ഇതിലെ പ്രവർത്തനങ്ങൾ തയ്യാറാക്കിയിരിക്കുന്നത്. ഓരോ പ്രവർത്തനത്തിലൂടെയും ശ്രദ്ധാപൂർവം കടന്നുപോവുകയും കുറിപ്പുകൾ തയാറാക്കി റഫറൻസായി പ്രയോജനപ്പെടുത്തുകയും ചെയ്യണം. എല്ലാ പ്രവർത്തനങ്ങളിലും നിങ്ങളെ സഹായിക്കാൻ അധ്യാപകരും രക്ഷിതാക്കളും ഒപ്പമുണ്ടാകും. 2021 – 2022 അക്കാദമിക വർഷത്തിലെ പൊതുപരീക്ഷയെ നേരിടുന്നതിന് നിങ്ങൾക്ക് കരുത്തുപകരാൻ ഈ പ്രവർത്തനപുസ്തകം സഹായകമാകുമെന്ന് വിശ്വസിക്കുന്നു. എല്ലാവർക്കും ഒരു നല്ല വിദ്യാലയവർഷം ആശംസിക്കുന്നു.

സ്നേഹത്തോടെ

ഗീതാനായർ
(അക്കാദമിക ചുമതല, വിദ്യാജ്യോതി)
സീനിയർ ലക്ചറർ, ഡയറ്റ് തിരുവനന്തപുരം

Members participated in the workshop

1. **Smt. Saritha S.S**
   Govt. V&HSS, Kottukal
2. **Smt. Sheeba Krishnan. S**
   Govt. V&HSS, Poovar
3. **Smt. Mary Margaret.R**
   Leo XIII th HSS, Pulluvila
4. **Smt. Rajam. K**
   Govt. BHSS, Neyyattinkara
5. **Dr.L.Divya**
   Govt. HSS, Thonnakkal
6. **Smt. Binu Jackson**
   St.Joseph's HSS, Anchuthengu
7. **Smt. Manjusha. L**
   Govt. VHSS, Pirappancode
8. **Smt. Rahula Devi. O.V**
   GGHSS, Cottonhill
9. **Smt. Jeena A.N**
   GGHSS, Cottonhill
10. **Sri. Unmesh. B**
    GHSS, Kilimanoor
11. **Sri. Vinod C.S**
    Govt. HSS, Elamba
12. **Smt. Pushpa. N**
    Govt. Girls H.S.S, Attingal

CONTENTS

Chapter

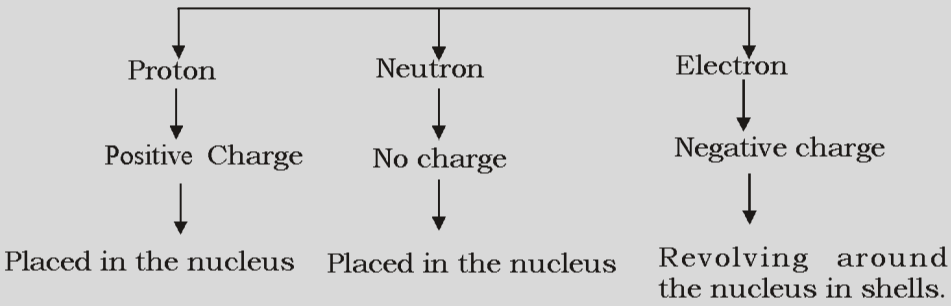
01

PERIODIC TABLE AND ELECTRONIC CONFIGURATION

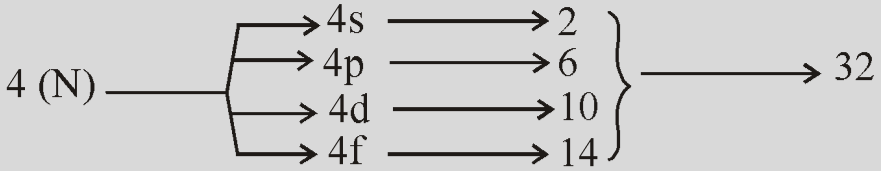
To Remember

The classification of elements by Antoine Lavoisier to Henry Mosely is one of the milestones in the history of chemistry. In this chapter, we analys the arrangement of electrons in atoms

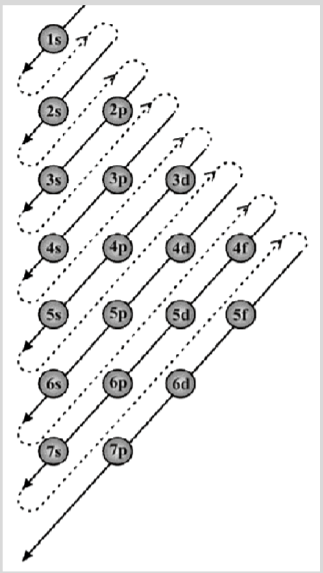
Fundamental particles of an atom



Shells	Sub shells	No.of electrons in sub shells.	Total number of electrons in the shell.
1(K)	1s	2	2
2 (L)	2s	2	8
	2p	6	
3 (M)	3s	2	18
	3p	6	
	3d	10	



⇒ Filling up of electrons in the sub shells is based on the increasing order of their energies.



The arrangement of electrons in the increasing order of their energies in sub shells are

$Is < 2s < 2p < 3s < 3p < 4s < 3d$.....

Activity 1

Which among the subshell has highest energy

2s,4s,3d

Activity 2

Pickout the wrong electronic configuration and correct them

a) $1s^2\,2s^2\,2p^1$

b) $1s^2\,2s^2\,2p^6\,3s^1$

c) $1s^2\,2s^2\,2p^7$

d) $1s^2\,2s^2\,2p^5\,3s^1$

e) $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^2$

f) $1s^2\,2s^1\,2p^2$

Activity 3

The outermost subshell electronic configuration of an element is $3s^2\,3p^5$

a) Write the complete subshell electronic configuration

b) Find the atomic number of the element

c) Write the subshell electronic configuration using the symbol of nearest noble gas

Activity 4

The subshell electronic configuration of an element 'X' is given below.

(Symbol is not real)

X - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$

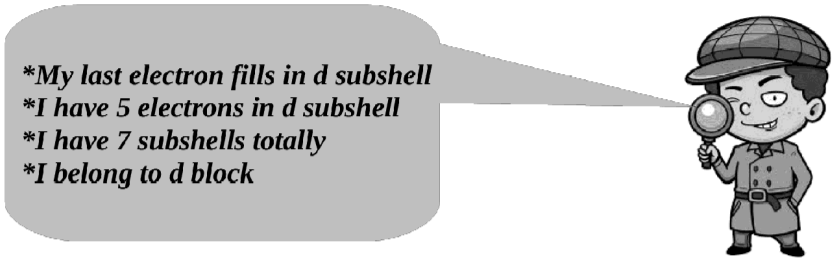
a) Find the total number of electrons in the atom

b) Write the atomic number

c) Check whether the above configuration is right or wrong

d) If wrong correct it and justify your answer.

Activity 5



a) Complete the given table and find whom am I

Subshell electronic configuration	
Atomic number	
Subshell electronic configuration in short form	
Element	
Symbol	

b) If this element undergoes chemical reaction to form an ion with oxidation number +2, then write the symbol of ion and subshell electronic configuration of ion

Activity 6

[Ar]$3d^5\ 4s^2$ is the sub shell electronic configuration of an element.

a. Write the complete sub shell electornic configuration of this element.

b. Name the block to which this element belongs.

Activity 7

The subshell electronic configuration of an element X is.

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^4\ 4s^2$

a) What is the atomic number of this element?

b) Find the number of electrons present in this element?

c) Is the given electronic configuration of X correct? If not, correct it..

d) Write the electronic configuration of element having atomic number - 29?

Activity 8

The sum of oxidation numbers of the elements of compond is zero.

Oxidation state
$Cl \rightarrow -1$

Oxidation state
$O \rightarrow -2$

Atomic Number
Fe-26 Mn-25

Complete the table using the hints given above

Compound	Oxidation State (Fe/Mn)	Symbol of Ion	Subshell Electronic Configuration
$FeCl_2$	+2	Fe^{2+}	$1s^2\ 2s^2 2p^6 3s^2\ 3p^6\ 3d^6$
$FeCl_3$	—(A)—-	—(B)—-	—(C)—-
$MnCl_2$	+2	—(D)—-	$1s^2\ 2s^2 2p^6 3s^2\ 3p^6\ 3d^5$
MnO_2	—(E)—-	—(F)—-	—(G)—-
Mn_2O_7	+7	Mn^{7+}	—(H)—-
Mn_2O_3	—(I)—-	—(J)—-	—(K)—-

Activity 9

Find the odd one

a) Transition elements are d block elements

b) In transition elements last electrons are filled up in penultimate shell

c) Transition elements show variable oxidation state

d) Transition elements are known as representative elements

e) Transition elements form coloured compounds

Activity 10

Element	Subshell Electronic Configuration	Subshell in which last electron enters	Does receive or donate electron?	Valency	Formula of Compound
$_{11}A$	$1s^2 2s^2\ 2p^6\ 3s^1$	s	donate	1	Compound formed between A & X Valency of A – 1 Valency of X – 2 $A^1 X^2$ —> A_2X_1 (after interchanging valency)Formula - A_2X
$_{12}B$	————	————	———	——	Compound formed between B &Y———
$_{16}X$	————	————	receive	——	Compound formed between X & B———
$_{17}Y$	————	————	———	———	Compound formed between Y & A———

Activity 11

Some characteristics of s-block and p-block elements are given below. Classify them suitably

a) Includes metals, nonmetals and metalloids

b) Shows +1 , +2 oxidation states

c) Compounds are mostly ionic

d) Includes alkali metals and alkaline earth metals

e) Element with highest electronegativity is in this block

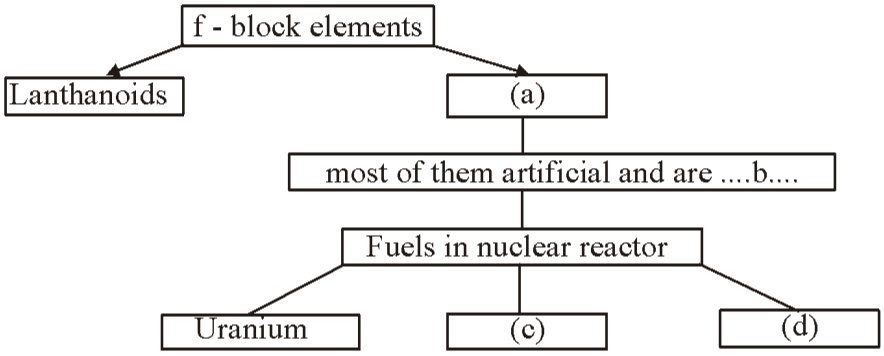
f) High metallic character

g) High ionisation energy

h) Low electronegativity

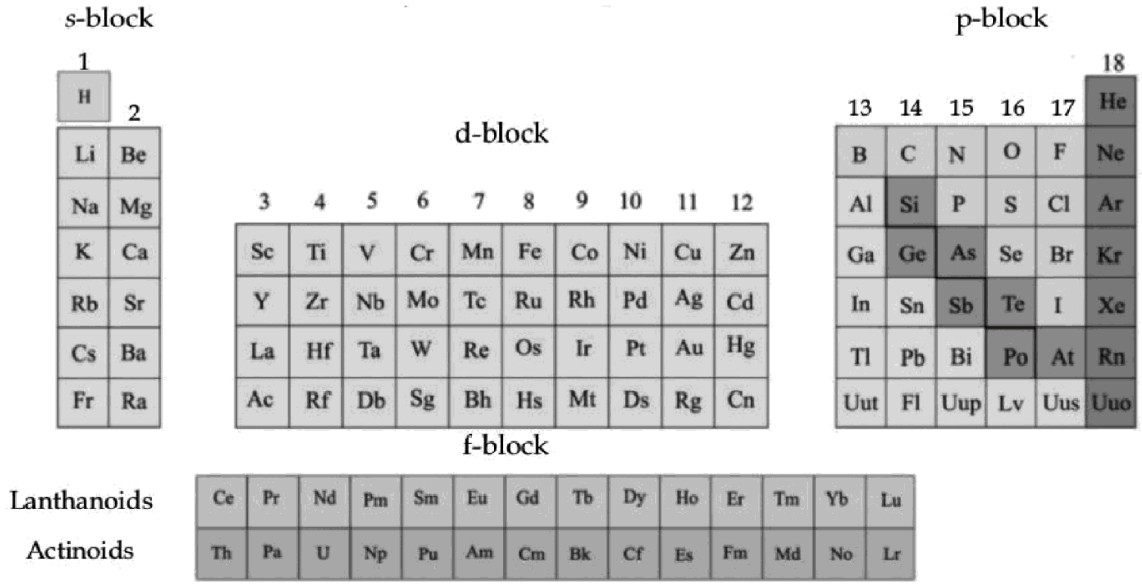
Activity 12

Complete the given flow chart



Activity 13

Based on the subshell eletcronic configuration,elements are classified into four blocks s,p,d and f in the modern periodic table



If the last subshell is 's' and the penultimate subshell of it is 'p' or 's' then it belongs to ***s-block***

If the last subshell is 'p' then it belongs to ***p-block***

If the last subshell is 's' and its penultimate subshell of is 'd' then it belongs to ***d-block***

Complete the table

Element	Atomic number	Subshell electronic configuration	The subshell to which last electron is added	Block
$_{3}Li$	3	$1s^2 2s^1$	s	s block
$_{11}Na$				
$_{8}O$				
$_{21}Sc$				
$_{26}Fe$				
$_{18}Ar$				

Activity 14

The period number is the same as the highest shell number in the subshell electronic configuration.

Example: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3\ p^4$ Period number- 3

Complete the table

Element	Subshell electronic configuration	No.of outer most shell	Period number
$_{4}Be$	$1s^2 2s^2$	2	2
$_{7}N$			
$_{12}Mg$			
$_{20}Ca$			
$_{22}Ti$			

Activity 15

s-block

Group number = No.of electrons present in last s subshell

Example:- $_{3}Li$ - $1s^2\ 2s^1$

Group number - 1

p-block

Group number = 12 + No.of electrons present in last p subshell

Example:- $_{16}S$ - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

Group number - 12 + 4 = 16

d-block

Group number = No.of electrons in the outermost 's' subshell + no. of electrons in the penultimate 'd'subshell

Example:- $_{25}Mn$ - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

Group number - 5 + 2 = 7

Complete the table (symbols are not real)

Element	Subshell electronic configuration	period	Block	Group
$_{16}A$	$1s^2 2s^2 2p^6 3s^2 3p^4$	3	p	4+12=16
$_{11}B$	$1s^2 2s^2 2p^6 3s^1$	3	s	1
$_{23}C$	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$	4	d	3+2=5
$_{10}D$				
$_{26}E$				
$_{20}F$				
$_{6}G$				
$_{13}H$				

Activity 16

Based on the hints given, write down the subshell electronic configuration of elements and find out the atomic number (Symbols used are not real).

i) Element - A

Period – 2
Group - 16

ii) Element - B

Period – 4
Group - 11

Activity 17

An electronic configuration of some elements are given below. (symbols are not real)

A - $[Ar]\ 3s^1$

B - $[Ar]\ 4s^2$

C- $[Ar]\ 3d^6\ 4s^2$

D - [Ne] $3s^2\ 3p^4$

1) What is the atomic number of element B?

2) From the above, which one is the most electro negative element?

3) Which one of the elements produce coloured compounds?

Activity 18

Element X in the 16^{th} group have 3 shells .

a) Write the subshell electronic configuration of the element X

b) Element X belongs to which period?

c) Another element Y has one electron in its s subshell.Write the chemical formula of the compound formed by X & Y.

Activity 19

Go through the given electronic configuration and find the answers

a) $1s^2\ 2s^2\ 2p^5$

b) $1s^2\ 2s^2\ 2p^6 3s^1$

c) $1s^2\ 2s^2 2p^6 3s^2 3d^6 4s^2$

1) Which element shows different oxidation state?

2) Which among these shows high electronegativity?

3) Which element has greater atomic radius?

Chapter

02

GAS LAWS AND MOLE CONCEPT

To Remember

- Each gas contains numerous minute molecules.
- When compared to the total volume of a gas the real volume of molecules is very less.
- The molecules of a gas are in a state of rapid motion in all directions.
- As a result of the rapid random motion of the gas molecules, they collide with each other and also with the walls of the container in which it is kept. This collision with the walls account for the pressure of a gas.
- As the collision of molecules perfectly elastic in nature, there is no loss of energy.
- There is no attraction between the gas molecules and with the walls of the container.

Activity 1

Choose the correct statements regarding gases .

a) Distance between molecules low

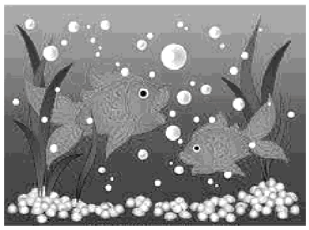
b) Attractive force between molecules low.

c) The freedom of movement of molecules low.

d) Energy of molecules is high

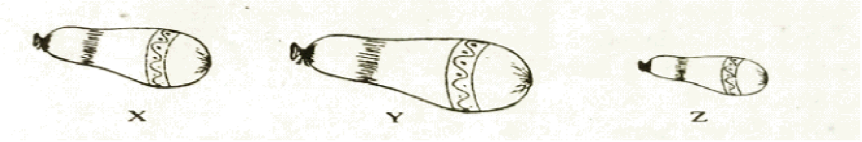
Activity 2

Air bubbles from the bottom of an aquarium is given below. The size of airbubbles rising from the bottom of an aquarium increases. Why?



Activity 3

X, Y, Z are pictures of the same balloons at different heights. Answer the given questions given below by examining the picture



(Hint: imagine the temperature is not changed)

1. Among X, Y, Z which indicates the highest state of the balloon?
2. What is the reason for your answer?
3. Name the Gas law which substantiates your answer?

Activity 4

The data showing relation between the pressure and volume of a fixed mass of gas is given below.

Pressure	Volume
1 atm	80L
_____	40 L
4 atm	_____
8 atm	_____

a) Complete the table.

b) Which is the law applicable here?Write its mathematical expression?

Activity 5

The relation showing the volume and temperature of a fixed mass of gas at constant pressure is tabulated below

VolumeV(L)	TemperatureT
500 ML	250K
800 ML	400K
600 ML	300 K
200 ML	100 K

a) Find V/T

b) State the gas law governing this

c) In summer motor tyres are filled with air at a lower pressure compared to that in winter? Name the law related to this

Activity 6

The properties of certain gases kept at same temperature and pressure is given.

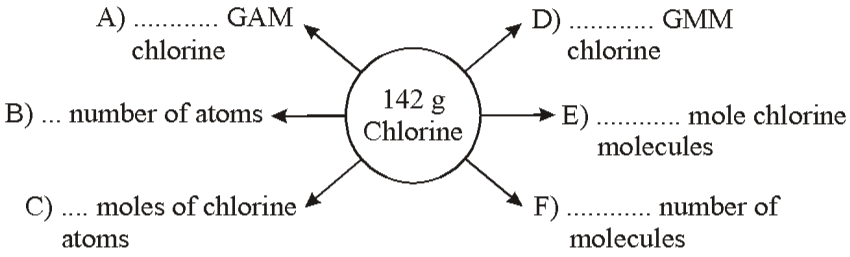
Element	Volume	No of gas molecules
Nitrogen	20L	X
Oxygen	40L	---------
Ammonia	10L	---------
Carbondioxide	---------	4X

a) Complete the table

b) Identify the gas law which agrees with this data.

Activity 7

Complete the word diagram given below atomic mas of C1 = 35.5



Activity 8

Complete the table given below (At STP)

44.8L CO_2	..... moles
44.8L CO_2	.....GMM
44.8L CO_2	.....number of molecules
44.8L CO_2	.....g
44.8L CO_2	.....number of atoms

Activity 9

Find the gas laws related to the following situations.

Situations	Gas laws
The gas bubbles coming up from the bottom of the the reservoir get bigger	
An inflated balloon placed in the sunlight bursts	
As the balloon send for weather forecast go up, the size of balloon increases	
If two moles of hydrogen and nitrogen are taken in STP, the volume of two gases will be equal	
As the balloon is filled with air, its volume increases	
After attaching the balloon to the mouth of a bottle, it is lowered into hot water , then the balloon is seems to be inflated	
When the volume of a given mass of gas at constant temperature is reduced from 100L to 25L , the pressure increases from I atm to 4 atm	
Doubling the number of moleculein gases at the same temperature and pressure, doubles the volume also.	

Activity 10

Complete the following tables

a. The relation between volume and temperature of fixed mass a gas is

given below.(Pressure is kept constant)

Volume V	Temperature T (Kelvin)	V/T
600ml	300K	_____
900ml	_____	2
_____	400K	2

Activity 11

Find the molecular mass of the following compounds (Atomic mass of the elements are

Na - 23, O- 16, H- 1, Ca- 40, C- 12, N- 14)

a) NH_3

b) $CaCO_3$

c) NaOH

Activity 12

128 gm O_2 = ... GMM (Atomic mass of oxygen=16)

Activity 13

Complete the tables.

a.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of atoms
Hydrogen	1	1 g	1 g	6.022×10^{23}
Carbon	12	12 g	.....	6.022×10^{23}
Nitrogen	14	14 g	14 g	6.022×10^{23}
Oxygen	16	.....	16 g	6.022×10^{23}
Sodium	23	23 g	23 g	6.022×10^{23}
Magnesium	24	24 g	.....	6.022×10^{23}
Aluminium	27	27 g	27 g	.....
Chlorine	35.5	35.5 g	35.5g	6.022×10^{23}
Calcium	40	40 g	.....	6.022×10^{23}

b.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms
Hydrogen	1	1 g	1 g	1 GAM	6.022×10^{23}
Carbon	12	12 g	12 g	1 GAM	6.022×10^{23}
Nitrogen	14	14 g	14 g	1 GAM	6.022×10^{23}
Oxygen	16	16 g	16 g	.....	6.022×10^{23}
Sodium	23	23 g	23 g	1 GAM	6.022×10^{23}
Magnesium	24	24 g	24 g	1 GAM	6.022×10^{23}
Aluminium	27	27 g	27 g	1 GAM	6.022×10^{23}
Chlorine	35.5	35.5g	35.5g	1 GAM	6.022×10^{23}
Calcium	40	40 g	.....	1 GAM	.....

c.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms
Hydrogen	1	1 g	1 g	1 GAM	6.022×10^{23}
Hydrogen	**1**	**1 g**	**2 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**
Carbon	12	12 g	12 g	1 GAM	6.022×10^{23}
Carbon	**12**	**12 g**	**.....**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**
Nitrogen	14	14 g	14 g	1 GAM	6.022×10^{23}
Nitrogen	**14**	**14 g**	**42 g**	**.....**	**$3 \times 6.022 \times 10^{23}$**
Oxygen	16	16 g	16 g	1 GAM	6.022×10^{23}
Oxygen	**16**	**16 g**	**80 g**	**5 GAM**	**.....**
Sodium	23	23 g	23 g	1 GAM	6.022×10^{23}
Sodium	**23**	**23 g**	**.....**	**10 GAM**	**$10 \times 6.022 \times 10^{23}$**

d.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms	Number of mole atoms
Hydrogen	**1**	**1 g**	**1 g**	**1 GAM**	6.022×10^{23}	1
Carbon	**12**	**12 g**	**12 g**	**1 GAM**	6.022×10^{23}	.....
Nitrogen	**14**	**14 g**	**14 g**	**1 GAM**	.....	
Oxygen	**16**	**16 g**	**16 g**	**.....**	.....	.....

e.

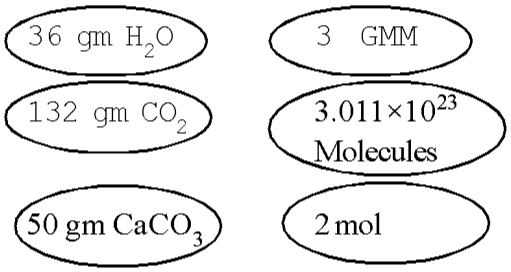
Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms	Number of mole atoms
Hydrogen	1	1 g	1 g	1 GAM	6.022×10^{23}	.....
Hydrogen	**1**	**1 g**	**2 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**	.....
Carbon	12	12 g	12 g	1 GAM	6.022×10^{23}	.....
Carbon	**12**	**12 g**	**24 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**	.....
Nitrogen	14	14 g	14 g	1 GAM	6.022×10^{23}	.....
Nitrogen	**14**	**14 g**	**42 g**	**3 GAM**	.....	.....
Oxygen	16	16 g	16 g	1 GAM	6.022×10^{23}	.....
Oxygen	**16**	**16 g**	**80 g**	**5 GAM**	**$5 \times 6.022 \times 10^{23}$**	.....
Sodium	23	23 g	23 g	1 GAM	.....	.....
Sodium	**23**	**23 g**	**230 g**	**10 GAM**	**$10 \times 6.022 \times 10^{23}$**	.....

f.

Element/ Compound	Molecular mass	Mass in grams	GMM	Number of molecules
Hydrogen (H_2)	2	2 g	1 GMM	6.022×10^{23} H_2 Molecules
Oxygen (O_2)	32	32 g	1 GMM	6.022×10^{23} O_2 Molecules
Nitrogen (N_2)	28	28 g	1 GMM	6.022×10^{23} N_2 Molecules
Water (H_2O)	18	18 g	1 GMM	.....
Ammonia (NH_3)	17	17 g	.....	.....
Carbon dioxide (CO_2)	44	44 g	1 GMM	6.022×10^{23} CO_2 Molecules

Activity 14

Find the pair (Atomic mass O-16, H-1, Ca-40, C-12)



Activity 15

Complete the Table

1 GMM = 1 Mole = 6.022×10^{23} molecules

Element/ Compound	Gram Molecular Mass	Mass in gram	No. of moles	No.of molecules
Hydrogen	**2**	**6**	**3**	**$3 \times 6.022 \times 10^{23}$**
Carbon di Oxide	**44**	**-----**	**2**	**--------**
Sulphuric acid	**---**	**490**	**5**	**$5 \times 6.022 \times 10^{23}$**
Calcium Carbonate	**---**	**500**	**------**	**$5 \times 6.022 \times 10^{23}$**

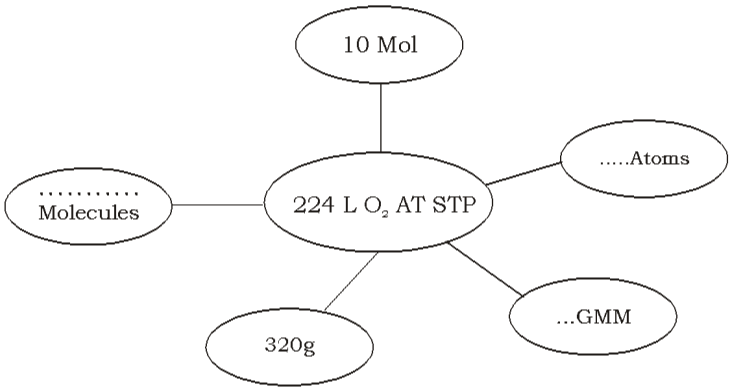
Activity 16

Volume of 1 mole of any gas at STP = 22.4 L

Gas at STP	Gram Molecular Mass	Mass in gram	Moles	Volume at STP
CO_2	44	220	5	5x22.4L
H_2	2	------	6	---------L
NH_3	----	170	10	--------L
N_2	-----	112	-----	4x22.4L

Activity 17

Complete the DIAGRAM



Activity 18

Find the GMM and number of molecules of the following

(a) 720 g of glucose (Molecular mass= 180)

(b) 9 g water (Molecular mass = 18)

Activity 19

One mole of any gas at STP occupies 22.4 L If so,

a. How many moles are present in 44.8 L of a gas ?

b. How many moles are present in 67.2 L of a gas ?

c. How many moles are present in 224 L of a gas ?

Chapter

03

REACTIVITY SERIES AND ELECTROCHEMISTRY

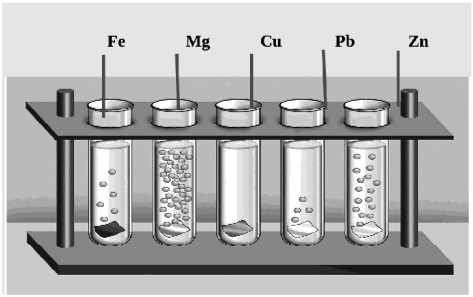
To Remember

Ability to participate in a chemical reaction for each and every metal is different. Electro chemical series is based on this difference in reactivity of metals. Metals having low reactivity are displaced from their salt solution by metals of high reactivity. This reaction is called displacement reaction. These reactions invlove electron movement and there by production or utilization of electrical energy as in the galvanic cell and electrolytic cell. Galvanic cell converts chemical energy to electrical energy and electrolytic cell converts electrical energy to chemical energy. In this chapter we discuss about the chemistry behind these.

- Metals react with air, water and acid in completely different manner.
- Metals are arranged in the reactivity series based on their ability to react.
- Displacement reaction - Metals with low reactivity are displaced from their salt solution by metals of high reactivity.
- Oxidation and reduction takes place in displacement reaction.
- Oxidation is the loss of electron
- Reduction is the gain of electron
- In Redox reaction oxidation and reduction takes place simultaneously.

Activity 1

Same pieces of different metals are added in dilute hydrochloric acid. Observe the figure and answer the following questions.



a) Name the metal which reacts very fast?

b) Which metal reacts slowly?

c) Which metal does not react with acid?

d) Write the chemical equations of these metals reacted with acids.

e) Name the gas obtained here

f) Arrange these metals according to the increasing order of their reactivity?

Activity 2

Sodium reacts vigorously with water containting phenolptithalein pink colour in water But there is no change with copper why?

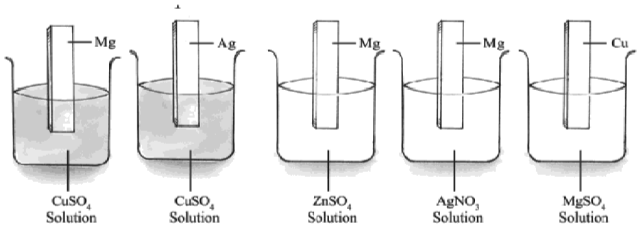
Sodium added to water mixed with phenolphthalein	Copper added to water mixed with phenolphthalein

Activity 3

It seems that the lustre of aluminium vessels diminishes when time passes. In the case of copper vessels it takes months for the loss of its luster by the formation of verdigris. Does the shining of gold fade even after a long time? Give reason.

Activity 4

Observe the picture and the reactivity series given below. Which among these under go a displacement reaction. Complete the table.

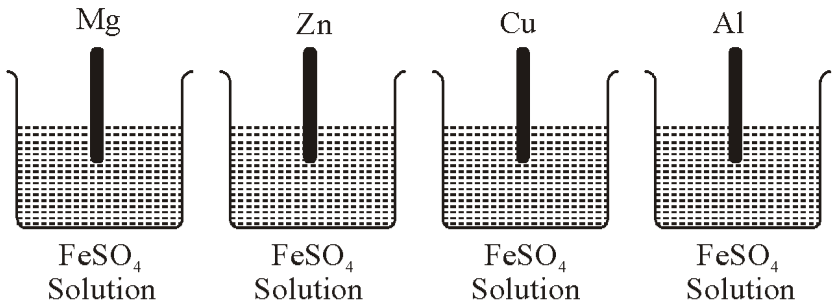


Potassium	K
Sodium	Na
Calcium	Ca
Magnesium	Mg
Aluminium	Al
Zinc	Zn
Iron	Fe
Nickel	Ni
Tin	Sn
Lead	Pb
Hydrogen	H
Copper	Cu
Silver	Ag
Gold	Au

Metal	Solution	Displacement reaction
Mg	$CuSO_4$	Takes place
Ag	$CuSO_4$	.....
Mg	$ZnSO_4$	.....
Mg	$AgNO_3$	.....
Cu	$MgSO_4$	.....

Activity 5

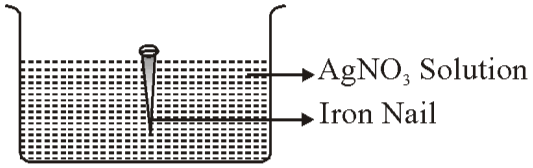
Some metals in the reactivity series are given in the box. Analyse the picture given below and answer the questions.



a) which metals can displace Fe from $FeSO_4$ solution.

b) Which metal cannot displace Fe? Why?

Activity 6



a) What change is seen on the surface of iron nail?

b) Complete the chemical equation

$Fe + 3AgNO_3 \longrightarrow Fe(NO_3)_3 +$ ———

c) Which metal is oxidised in this case?

d) Which metal is reduced?

e) Write the equations showing oxidation and reduction

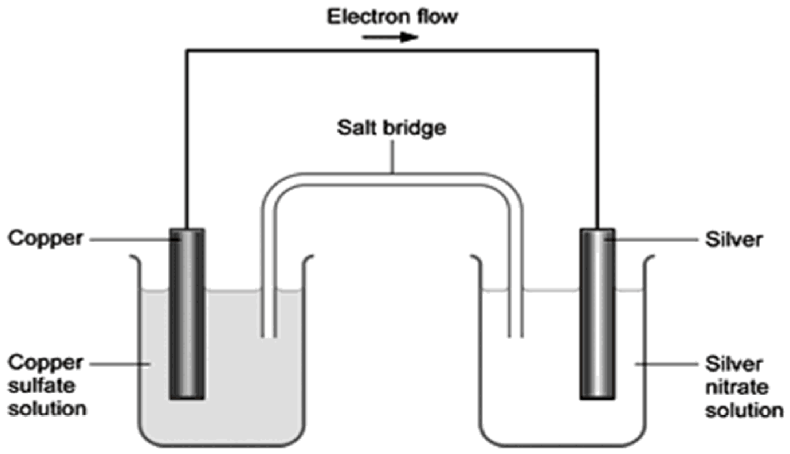
Oxidation ————————

Reduction ————————

f) Which metal is displaced here?

Activity 7

In the Galvanic cell given below



a) Name the anode and cathode ?

b) Write the chemical reaction occurring at anode.

c) Write the chemical reaction occurring at cathode

d) Write the redox reaction

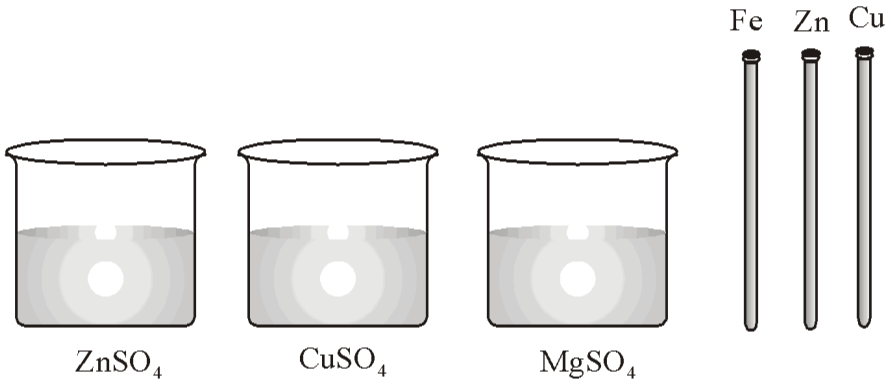
e) What is the direction of electron flow?

Activity 8

Complete the table

Cell	Anode	Cathode	Reaction at Anode	Reaction at cathode	Redox Reaction
Fe-Cu	Fe	.....	$Fe \rightarrow Fe^{2+} + 2\bar{e}$	.....	.....
Cu -Ag	.....	Ag	.....	$2Ag^{+} + 2e \rightarrow 2Ag$	.....

Activity 9



a) Design a Galvanic cell using suitable materials given above.

b) Mark the direction of electron flow.

c) Write the equations of chemical reactions takes place at cathode and anode.

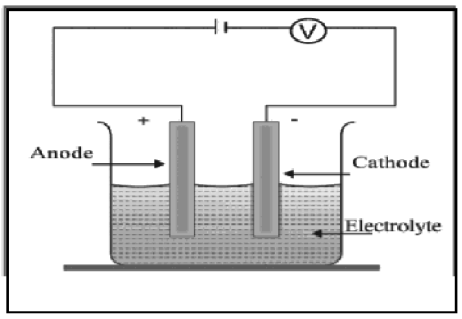
Activity 10

Fill the blanks by comparing Electrolytic cell and Galvanic cell.

Electrolytic cell	**Galvanic cell**
Electrical energy converted to chemical energy	.....
.....	Anode has negative charge
Cathode has negative charge	.....
.....	Oxidation occurs at anode
Reduction occurs at cathode	.....

Activity 11

Observe the figure and answer the questions given below.



a) Identify the given cell.

b) Name the electrode at which reduction takes place.

c) Name the electrode at which oxidation takes place.

d) What do you mean by an electrolyte?

e) If the above electrolyte is molten sodium chloride, write the following

i) Anion

ii) Cation

iii) Name the gas liberated from anode

iv) Name the metal deposited at cathode

v) Write the reaction at anode and cathode

Activity 12

Which are the ions present in sodium chloride solution?

Activity 13

During the electrolysis of sodium chloride solution

a) Which ions are attracted to the positive electrode (anode)?

b) Which ions are attracted to the negative electrode (cathode)?

c) Give the equation of the reaction occurring at anode.

d) Which is the product obtained at anode?

e) Give the equation of the reaction occurring at cathode.

f) Which is the gas liberated at cathode?

g) What is the nature of the solution after electrolysis?

(Acidic, Basic, Neutral)

Activity 14

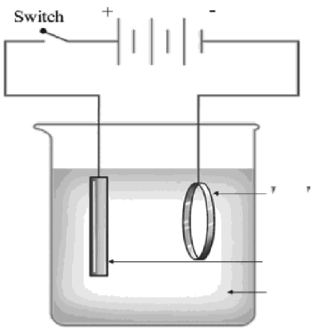
What are the practical utilities of electrolysis?

Activity 15

What are the advantages of electroplating?

Activity 16

Observe the figure shows the electroplating of copper over iron bangle and answer the questions given below.



a) Name the metal which is connected to the negative terminal of the battery?

b) Which metal is connected to the positive terminal of the battery?

c) Which solution is used as electrolyte?

d) Write the chemical equation of the reaction occurring at anode?

e) Write the chemical equation of the reaction occurring at cathode?

f) Is there any change in the colour of the solution after some time? Why?

g) Name the electrolyte used to plate gold over copper bangle?

Chapter

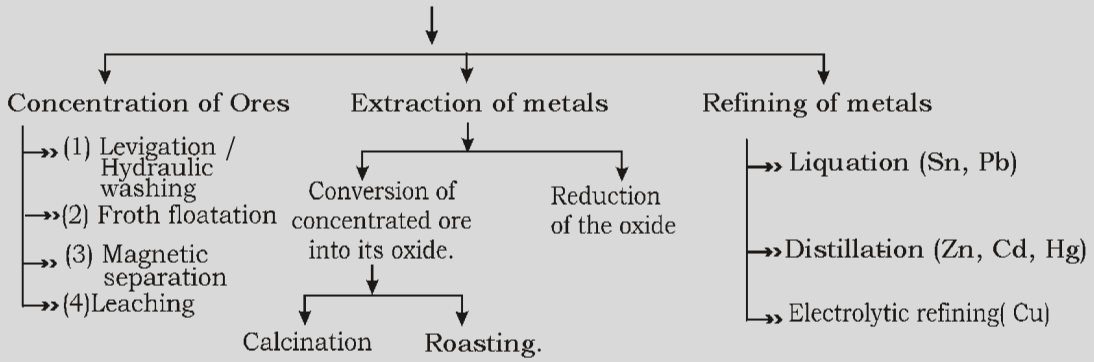
04

PRODUCTION OF METALS

To Remember

Discovery of metals is very significant in the scientific development. Some metals are found free in nature. But majority of metals are extracted from the ores. Extraction of metals from it's ore, refining of the metals, manufacture of Iron and Aluminium are the main concepts in this chapter.

- Mineral, Ore
- Production of metals - Important steps



Activity 1

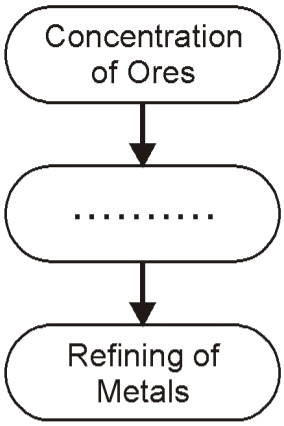
Fill in the blanks suitably.

METALS	ORE	CHEMICAL FORMULA
Aluminium	--------(a)---------	Al_2O_3
-------(b)----------	Haematite	Fe_2O_3
Iron	Magnetite	--------(c)-------
Copper	------(d)----------	$CuFeS_2$
Copper	Cuprite	------(e)----------
Zinc	Zinc blend	--------(f)---------
Zinc	------(g)----------	$ZnCO_3$

Activity 2

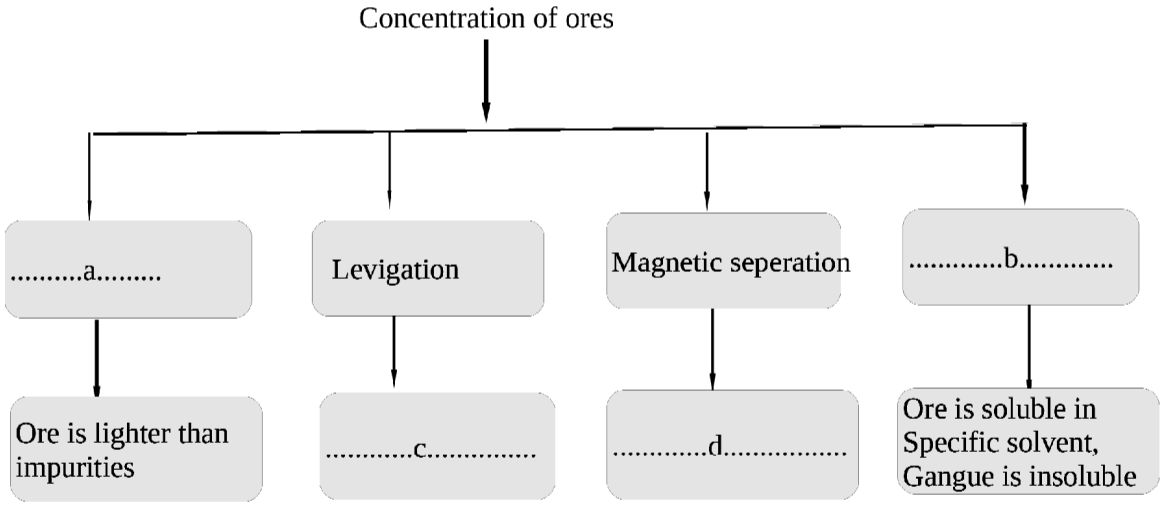
In Metallurgy there are three important stages for the Concetnration of Ores.

Complete the Flow Chart



Activity 3

The process of removing the impurities (gangue) from the ore obtained from the earth's crust is called concetnration of the ores.



Activity 4

Complete the table

Ore	**Method of concetnration**
Ore of gold	.....
.....	Leaching
Tin stone	.....
Zinc blende	.....

Activity 5

Identify the statements which is related to roasting and calcination:

(a) Process of heating the concetnrated ore in the absence of air at a temperature below its melting point.

(b) Process of heating the concetnrated ore in a current of air at a temperature below its melting point.

(c) Sulphide ores such as $CuFeS_2$,Cu_2S combines with oxygen to form oxide.

(d) Carbonates and hydroxides of metals such as $ZnCO_3$, $Cu(OH)_2$ decompose to form their oxides.

Activity 6

Some metals and their method of refining are given below. Match them suitably

Mercury, Tin, Zinc, Lead, Copper, Cadmium, Liquation, Distillation, Eletcrolytic refining

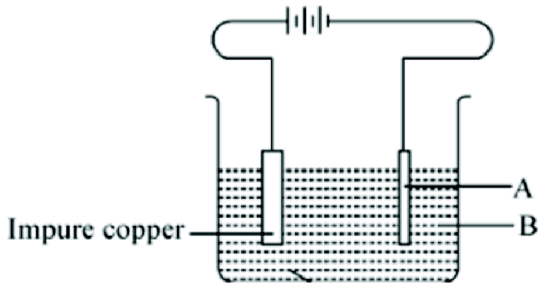
a)

Method of refining	**Metals**
Liquation	
Distillation	
Eletcrolytic refining	

b) What is the reason for selecting the above method of refining for the metals zinc and tin?

Activity 7

See the figure showing the refining of copper .



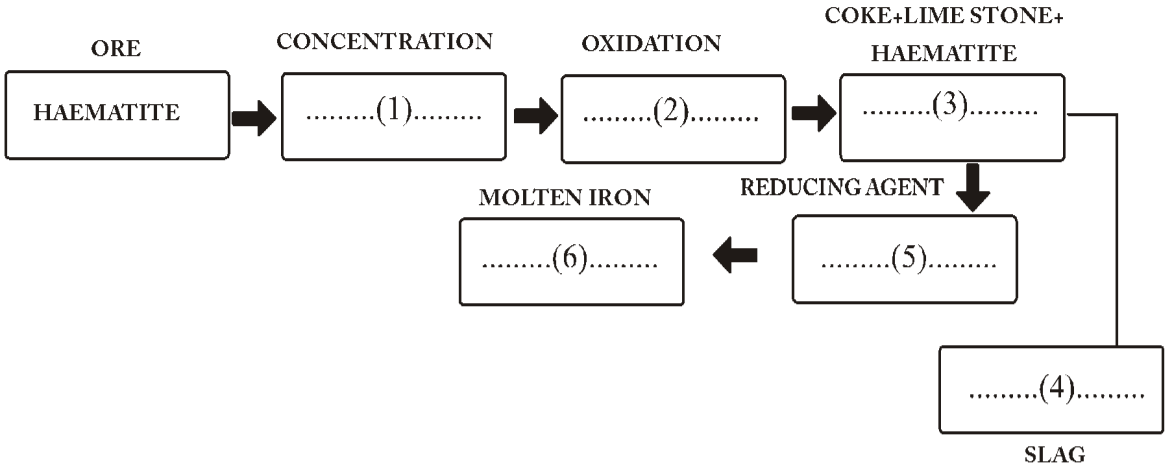
i) Find out A & B

ii) Write the equation of the chemical reaction taking place at cathode ?

iii) Write the equation of the chemical reaction taking place at anode ?

Activity 8

Complete the given flow chart related to the industrial production of Iron by filling up the correct answer from the box given below.



Activity 9

Analyse the reactions taking place in blast furnace and answer the given questions

$C + O_2 \rightarrow CO_2 + heat$

$CO_2 + C + heat \rightarrow 2CO$

$CaCO_3$ (Limestone) $\rightarrow CaO + CO_2$

$CaO + SiO_2 \rightarrow CaSiO_3$ (Calcium Silicate)

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

1. Write the chemical formula of iron ore
2. Name the products obtained during the decomposition of lime stone
3. Write the chemical equation of slag formation
4. Identify and write gangue and flux
5. Write the equation of reduction

Activity 10

Identify the relation and complete the blanks.

i) Stainless steel : Fe, Cr, Ni, C

Nichrome : .....(a).....

ii) Alnico : Permanent magnets

Nichrome : .....(b).....

iii) Stainless steel : Hard

Alnico : .....(c).....

Activity 11

The various stages involved in the concetnration of Bauxite are given below. Arrange these chemical reactions in the correct order.

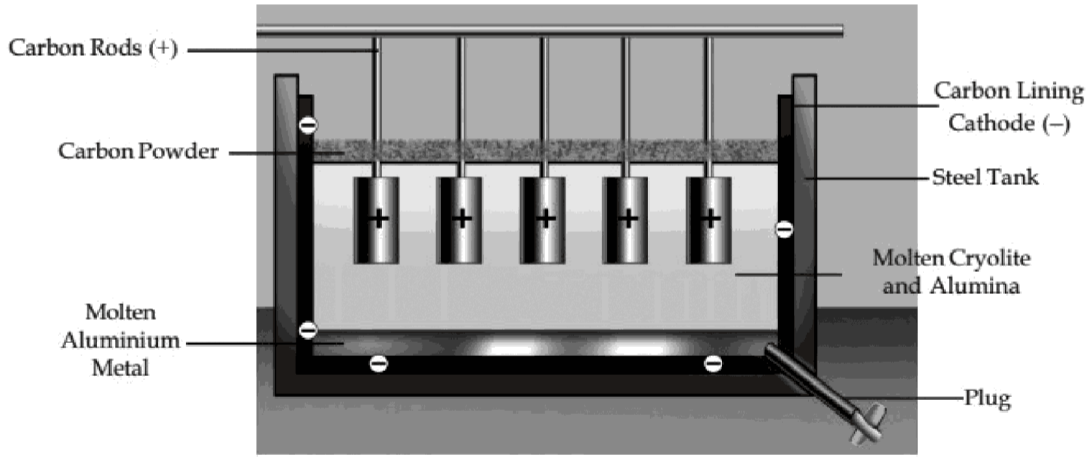
a) $2\,Al(OH)_3$ (Aluminium hydroxide ppt.) $\xrightarrow[\text{Filtering}]{\text{heating}}$ $Al_2O_3 + 3H_2O$ (Alumina)

b) $NaAlO_2$ (Sodium aluminate soln) $\xrightarrow[\text{and stirred well}]{Al(OH)_3 \text{ ppt. and water are added}}$ $Al(OH)_3$

c) $Al_2O_3.2H_2O$ (Bauxite) $\xrightarrow{\text{Dissolved in hot NaOH soln}}$ $NaAlO_2$

Activity 12

The diagram of the eletcrolysis of Alumina is given below.



Observe the diagram carefully and answer the following questions.

a) Name the reducing agent used in the etxraction of Aluminium.

b) What is the role of cryolite in eletcrolysis?

c) Give the chemical equation for the reaction taking place at the cathode.

d) Why do we replace the carbon blocks used as anode at regular intervals?

e) Write down the chemical equation for the reaction taking place at anode.

Chapter

05

COMPOUNDS OF NON-METALS

Points to Remember

- Preparation of Ammonia gas in laboratory

  $2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O + 2NH_3$

- Physical properties of Ammonia
  - Basic Nature
  - Solubility very high
  - No colour
  - Pungent smell
- Liquor Ammonia: Highly concentrated aqueous solution of Ammonia
- Liquid Ammonia: Liquified Ammonia by using high pressure.
- Industrial preparation of Ammonia : Haber Process.
-

Chemical Reaction

Irreversible Reaction

Reactant ⟶ Product

Eg : $NaOH + HCl \longrightarrow NaCl + H_2O$

Reversible Reaction

Forward reactions

Reactant ⇌ Product

Backward reaction

[Eg: . $N_2 + 3H_2 \rightleftharpoons 2NH_3$]

- Chemical Equilibrium
- Le Chatelier's Principle
- In a reversible reaction

a) If the concentration of reactant increases, rate of forward reaction increases. If the concentration of product increases rate of backward reaction increases.

b) If pressure increases, reaction increases in the direction where total number of molecules decreases and vice versa.
Pressure has no effect in a system having same number of molecules of reactants and products in gaseous state.

c) If temperature increases rate of endothermic reaction increases. If temperature decreases rate of exothermic reaction increases.

d) Catalyst increases the rate of both forward and backward reaction to the same extent. As a result the system reaches equilibrium at a faster rate. It is not beneficial to add a catalyst in a system which has already attained equilibrium.

- Physical properties of Sulphuric acid
  - Colourless
  - Comparatively high viscosity
  - Highly corrosive
  - Denser than water
  - Dissolves in water
- Chemical properties of sulphuric acid
  - Dehydrating nature
  - Drying nature
  - Concentrated sulphuric acid Can displace volatile acid from their salts.
- Identification of Sulphate ions.

Activity 1

Take a little ammonium chloride (NH_4Cl) in a watch glass and add a little calcium hydroxide $Ca(OH)_2$ to it and stir well.

a) What change will occur when a wet red litmus paper shows above the watch glass?

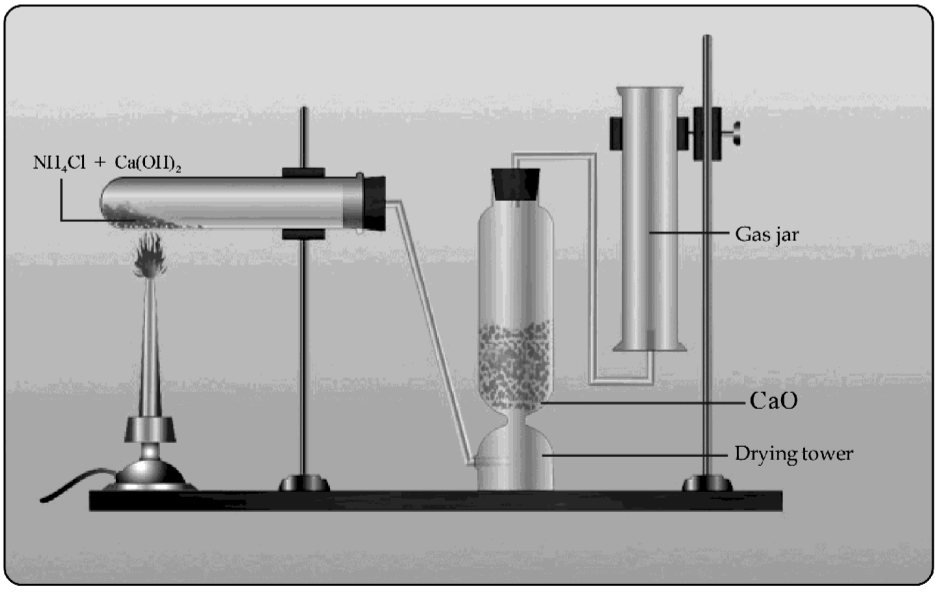
b) Write the reason behind it?

c) Name the gas obtained during this reaction ?

d) Write any two physical properties of this gas.

Activity 2

The figure given below shows the laboratory preparation of ammonia. Observe it and answer the following questions.



a) Which are the reactants used to prepare ammonia in the laboratory ?

b) Write the chemical equation of this reaction

c) Ammonia gas is passed through calcium oxide (CaO) Why?

d) Can we use con. H_2SO_4 instead of CaO, Why ?

e) Ammonia is collecting by keeping the jar inverted, Why ?

Activity 3

When ammonia tanker leaks, water is sprayed to reduce its intensity. What is the reason for this?

Activity 4

What is the difference between Liquor Ammonia and Liquid Ammonia.

Activity 5

Take some ammonium chloride in a boiling tube. Heat it well, show a wet red litmus paper on the mouth of the boiling tube.

a) What change occurs to the red litmus paper.

b) Which gas is evolved here? What is the nature of the gas ?

c) Write any two uses of this gas ?

d) If the litmus paper is placed for a long time at the mouth of the boiling tube, what will happen to the litmus paper? What is the reason?

e) What can be inferred about the density of the gases formed from this experiment?

f) Which is the white substance deposited at the side of the boiling tube?

g) How is this substance formed?

h) On the basis of this experiment choose the type of chemical reaction taking place here. (Irreversible/reversible)

i) Write the balanced equation of the chemical reaction.

Activity 6

Observe the following chemical equations and write the forward and backward reaction in each.

a) $NH_4Cl_{(s)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$

b) $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$

c) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

d) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

Activity 7

Equation showing the industrial preparation of ammonia is given below.

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ + Heat

a) When 1 mole nitrogen reacts with 3 moles hydrogen, how many moles of ammonia is obtained ?

b) What is the effect of following circumstances to the forward reaction ?

(i) Pressure increases

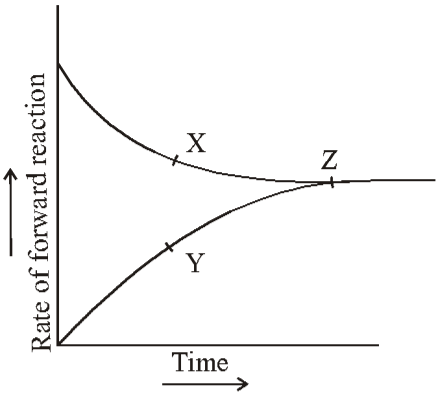
(ii) Concentration of ammonia decreases.

(iii) Concentration of N_2 decreases.

c) Industrial preparaton of ammonia is known as ———?

Activity- 8

The following graph shows a reversible reaction.



a) Identify the reactions X and Y from the graph.

b) Denote the point in which both the forward and backward reactions become equal.

c) What is the name of this stage?

d) Write any two characteristics of this stage.

Activity 9

$2SO_2 + O_2 \rightleftharpoons 2SO_3 + \text{Heat}$

a) Is the forward reacton exothermic or endothermic?

b) What is the effect of increasing temperature at equilibrium?

c) What will happen to the speed of forward reaction if SO_3 is removed at regular intervels from the system in equilibrium?

d) What is the advantage of adding catalyst V_2O_5 in the beginning itself?

e) What changes can be observed if the catalyst is added to the system at equilibrium?

Activity 10

$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$

a) How many number of moles of reactants and products exist here?

b) What is the effect of pressure in this reversible reaction?

Activity 11

Take some copper sulphate crystals in a watch glass. Add a little acid to it. The blue colour disappears.

a) Which acid is used here ?

b) Name the method of industrial preparation of this acid .

c) Write any one use of this acid.

Activity 12

When some con. sulphuric acid is added to sugar, a black substance is obtained.

a) Name the substance obtained

b) Which property of sulphuric acid is shown here ?

c) Complete the following equation

$C_{12}H_{22}O_{11} \xrightarrow{\text{Conc } H_2SO_4} 12C +$ _____

Activity 13

Complete the given chemical equation of Con. H_2SO_4 with Cu

a) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O +$_____

b) Which is the oxidising agent in this reaction ?

Activity 14

Chemical equations regarding the industrial preparation of sulphuric acid is given.

$S + O_2 \rightarrow$ (a) .....

$2SO_2 +$ (b) ..... $\rightleftharpoons$ (c) .....

$SO_3 + H_2SO_4 \rightarrow$ (d) .....

i) Write (a), (b), (c) and (d)

ii) How oleum is converted to sulphuric acid?

iii) Sulphuric acid is formed by the direct dissolution of SO_3 in water. But this method is not used for its industrial preparation. Why ?

Activity 15

Con. Sulphuric acid reacts with salts to form volatile acids.

The chemical equation below shows the reaction between con. sulphuric acid with sodium chloride

$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

a) Which salt is used for the preparation of nitric acid?

b) Write the chemical equation related to this reaction.

Activity 16

a) Which of the following substances are used for the identification of sulphate ion.

[Sodium Chloride, citric acid, barium chloride, beaker, water, hydrochloric acid]

b) Write the procedure

c) Which substance is the white precipitate formed in the reaction?

Chapter

6

NOMENLCATURE OF ORGANIC COMPOUNDS AND ISOMERISM

Points to Remember

Hydrocarbon (Hydrogen + Carbon)

- Open chain compounds
  - Saturated Hydrocarbons
    - Alkane ($C_n H_{2n+2}$)
  - Unsaturated Hydrocarbons
    - Alkene ($C_n H_{2n}$)
    - Alkyne ($C_n H_{2n-2}$)
- Cyclic (Ring) compounds
  - Alicyclic compounds
  - Aromatic compounds

- Homologous Series- characteristics
- Nomenclature of unbranched alkanes

Alkane → Word root+ ane

- Nomenclature of unbranched unsaturated hydrocarbons

Alkene → wordroot+ position of doublebond+ suffix

Alkyne → wordroot+ position of triple bond + suffix

- Nomenclature of branched hydrocarbons.
- Hydrocarbons with only one branch

position number of branch + hyphen + name of radical + word root +suffix

- Hydrocarbon with more than one branch

position numbers of branches + hyphen + word denoting the no.of radical + name of radical + word root+ suffix.

- Nomenclature of organic compounds containing

Functional groups.

1. Hydroxyl Group (–OH) → Alkane-e + o1 → Alkanol
2. Carboxylic Group (–COOH) → Alkane –e + oic acid → Alkanoic acid
3. Halo ($-F, -Cl, -Br, -I$)

Position of the halo group + hyphen+ word denoting the no. of halo groups + Name of halo groups+ Name of alkane.

4. Alkoxy Group (–O–R)

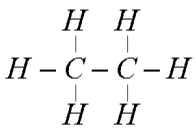
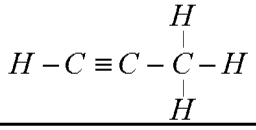
Alkoxy alkane

word root of alkane with least no.of carbon atom + oxy+ name of alkane containing larger no . of carbon atom.

Isomerism →
- Chain Isomerism
- Functional isomerism.
- Position isomerism.

Activity--1

Complete the Table.

Structure of Hydrocarbon	**Condensed formula**	**Molecular formula**	**class of Hydrocarbon**
	CH_3-CH_3	C_2H_6	.....a.....
.....b.....	.....c.....	C_3H_6	Alkene
.....d.....	$CH_2 = CH-CH_2-CH_3$	.....e.....	Alkene
	$CH \equiv C-CH_3$	C_3H_4	.....f.....

Activity- 2

(a) Does the compounds C_3H_8 and C_4H_{10} belong to homologous series.

(b) Write the characteristics of homologous series

(Any two)

Activity- 3

Complete the table.

Compound	IUPAC name
$CH_3-CH_2-CH_3$	Propane
CH_3-CH_3	.....a.....
.....b.....	Pentane
.....c.....	Butane

Activity- 4

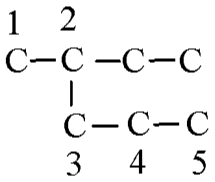
$CH_3-CH=CH-CH_2-CH_3$

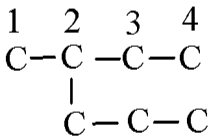
a. The compound belongs to
(Alkane, Alkene, Alkyne)

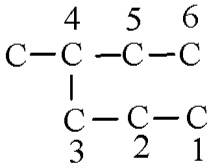
b. Write the IUPAC name of this compound

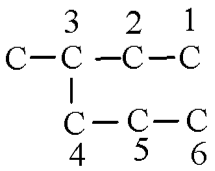
Activity- 5

Choose the correct method of numbering

a)


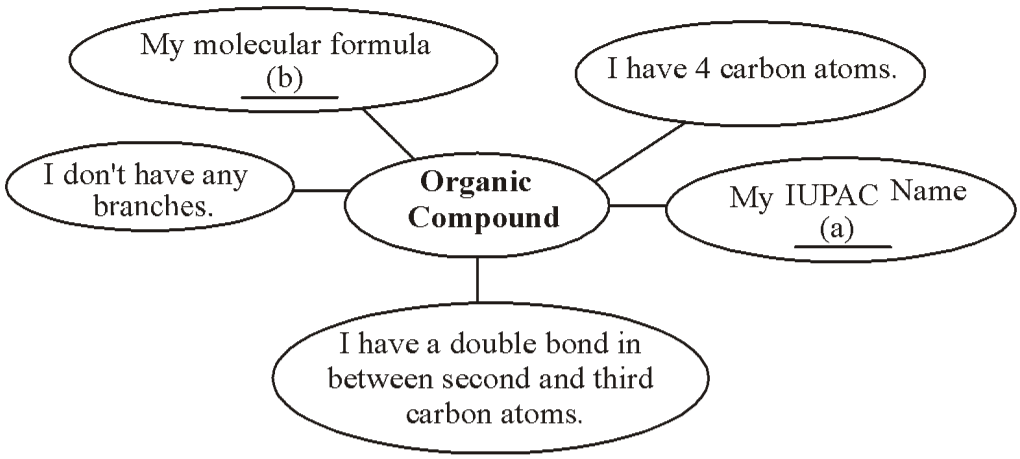
b)


c)


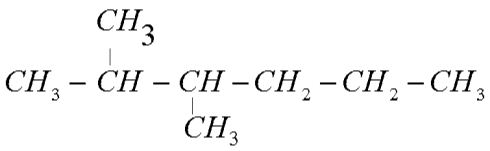
d)


Activity- 6

Fill the word web suitably



Activity- 7



a. How many carbon atoms are present in the main chain of this compound?

b. write the position numbers of branches in chain.

c. write the name of the branch.

d. write the IUPAC name of this compound.

Activity- 8

Write down the structural formulae of the following compounds.

a. 3, 3 - diethyl hexane

b. 2, 2 - dimethyl propane.

c. 2, 3, 3 - trimethyl pentane.

Activity- 9

a. Write down the structural formula of the compound hex-3-ene.

b. Write down the structural formula of one of its isomer which is an alicyclic compound.

c. Write down the structural and molecular formula of the aromatic compound benzene.

Activity- 10

Some atoms or group of atoms responsible for the chemical properties of organic compounds are functional groups.

a. which functional group is responsible for the chemical properties of alcohols?

b. Name the alcohol which have only one carbon atom.

c. Write the functional group present in vinegar $(CH_3 - COOH)$

Activity- 11

Complete the table.

Structural formula of the compound	Name of the Functional group	IUPAC Name
$CH_3 - CH_2 - CH_2 - OH$	..........a.............	Propan $-1-$ol
$CH_3 - CH_2 - COOH$	........b..........	.........c..............
............d....................	Alkoxy group	Methoxy ethane
$CH_3 - \underset{\underset{Cl}{\mid}}{CH} - CH_3$	........e............	..........f..........

Activity- 12

Write the IUPAC Name of the following

1. $CH_3 - \overset{\overset{Br}{\mid}}{\underset{\underset{Br}{\mid}}{C}} - CH_2 - CH_3$

2. $CH_3 - \overset{\overset{CH_3}{\mid}}{CH} - \underset{\underset{CH_3}{\mid}}{CH} - CH_3$

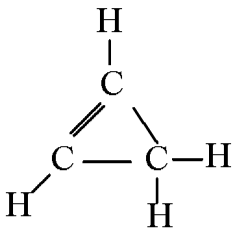
3. $CH_3 - COOH$

4. $CH_3 - CH_2 - O - CH_2 - CH_2 - CH_3$

5. $CH \equiv C - CH_3$

6. $CH_3 - CH_2 - \underset{\underset{\underset{\underset{\underset{\underset{CH_3}{\mid}}{CH_2}}{\mid}}{CH_2}}{\mid}}{CH} - CH_3$

7. $CH_3-CH_2-\underset{\displaystyle OH}{CH}-CH_3$

8. 

9. $CH_3-CH_2-\underset{\displaystyle CH_3}{CH}-CH_2-\underset{\displaystyle CH_3}{CH}-\overset{\displaystyle CH_3}{CH}-CH_3$

10. $CH_3-CH_2-\underset{\displaystyle CH_2-CH_3}{CH}-CH_3$

Activity- 13

Examine the compounds given below and find out the isomeric pairs. To which type do they belong?

a. $CH_3-CH_2-CH_2-CH_3$

b. $CH_3-\underset{\displaystyle Cl}{CH}-CH_3$

c. CH_3-O-CH_3

d. $CH_3-CH_2-CH_2-Cl$

e. $CH_3-CH_2-CH_2-CH_2-OH$

f. CH_3-CH_2-OH

g. $CH_3-\underset{\displaystyle CH_3}{CH}-CH_3$

Activity- 14

$CH_3-CH_2-CH_2-CH_2-CH_2-OH$

a. Write the possible position isomer from the given compound.

b. Write the structural formula and the IUPAC name of any one functional isomer of this compound.

Activity- 15

Draw all the possible isomers of the hydrocarbon with molecular formula C_3H_8O

Chapter

7

CHEMICAL REACTIONS OF ORGANIC COMPOUNDS

Points to Remember

Reaction of organic compounds

Substituion

An atom is replaced by another atom or group of atoms.

Addition

Organic compounds with double or triple bond react with other molecules and finally form single bonded compounds (saturated).

Combustion

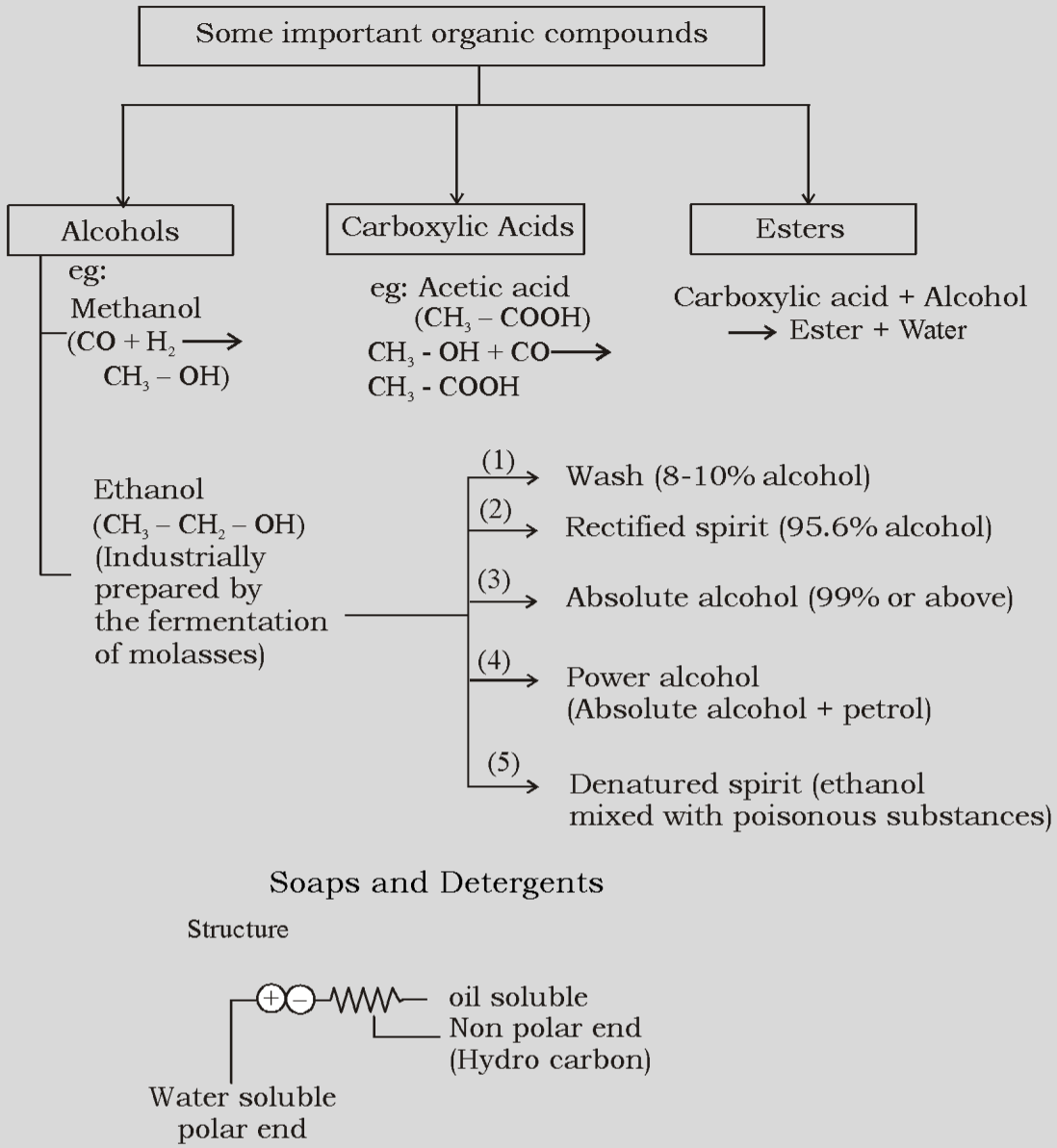
Hydrocarbons combine with oxygen forming CO_2 and H_2O.

Thermal cracking

Hydrocarbons with higher molecular mass when heated in the absence of air or O_2 decomposed to form hydrocarbons with lower molecular masses.

Polymerisation

Large number of simple molecules (monomers) combine under suitable conditions to form complex molecules called polymers.



Soaps and Detergents

Structure

Alcohol + Higher fatty acids (palmitic acid, stearic acid, oleic acid) → Oil and Fats

Oils and fats + Alkali → Soap

- Detergents are salts of sulphonic acids.
- Merits and demerits of detergents

Activity - 1

Fill in the blanks.

i) $C_2H_6 + Br_2 \rightarrow C_2H_5 - Br + HBr$

ii) $C_2H_5Br + Br_2 \rightarrow$ ___(a)___ $+ HBr$

iii) $C_2H_4Br_2 + Br_2 \rightarrow C_2H_3Br_3 +$ ___(b)___

iv) $\underline{\quad(c)\quad} + Br_2 \rightarrow C_2H_2Br_4 + HBr$

v) $C_2H_2Br_4 + \underline{\quad(d)\quad} \rightarrow C_2HBr_5 + HBr$

vi) $C_2HBr_5 + Br_2 \rightarrow \underline{\quad(e)\quad} + \underline{\quad(f)\quad}$

Activity - 2

Complete the table.

Chemical Reaction	Product	IUPAC name of the product
$CH_2 = CH_2 + H_2$	$CH_3 - CH_3$	Ethane
$CH_2 = CH_2 + Br_2$	____(i)____	____(ii)____
$CH_3 - CH = CH_2 + Cl_2$	____(iii)____	____(iv)____
$CH_3 - CH = CH - CH_3 + HCl$	____(v)____	____(vi)____
$CH_3 \equiv CH + HCl$	CH=CH | | Cl Cl	____(vii)____

Activity - 3

Given below includes some polymers and their monomers. Complete the table suitably.

Name of monomer	Structure of monomer	Name of polymer	Structure of polymer
Ethene	__(a)__	Polythene	$\{CH_2 - CH_2\}_n$
__(b)__	$CH_2 = CH$ | Cl	__(c)__	__(d)__
Tetrafluro ethene	__(e)__	__(f)__	$\{CF_2 - CF_2\}_n$

Activity - 4

Butane is the important component of LPG.

a) What are the products formed by the combustion of butane?

b) Write the balanced chemical equation of this reaction?

Activity - 5

"Thermal cracking is the process of decomposition of hydrocarbons with high molecular mass into hydrocarbons of lower molecular masses when heated in the absence of air." Examine the equations related to thermal cracking and fill suitably.

i) $CH_3 - CH_2 - CH_3 \rightarrow CH_2 = CH_2 + \underline{\quad A \quad}$

propane ethane

ii) $\underline{\quad B \quad} \longrightarrow C_4H_{10} + C_3H_6$

Butane Propene

Activity - 6

Match the following appropriately.

Reactants	Products	Name of the reaction
$CH \equiv CH + H_2$	$CH_3 - CH_2 - Cl + HCl$	Combustion
$nCH_2 = CH_2$	$CH_3 - CH_3 + CH_2 = CH_2$	Polymerisation
$CH_3 - CH_3 + Cl_2$	$+CH_2 - CH_2+_n$	Addition
$CH_3 - CH_2 - CH_2 - CH_3$	$CH_2 = CH_2$	Substitution
$C_2H_4 + O_2$	$CO_2 + H_2O$	Thermal cracking

Activity - 7

Complete the given equations.

$$CO + 2H_2 \xrightarrow[\text{High temperature, High pressure}]{\text{Catalyst}} \underline{\quad A \quad}$$

$$\underline{\quad A \quad} + CO \xrightarrow{\text{Catalyst}} \underline{\quad B \quad}$$

Activity - 8

Balanced chemical equations related to the manufacture of ethanol are given below.

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[\text{Invertase}]{} \underline{\quad (A) \quad} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$C_6H_{12}O_6 \xrightarrow{(B)} \underline{\quad (C) \quad} + 2CO_2$$

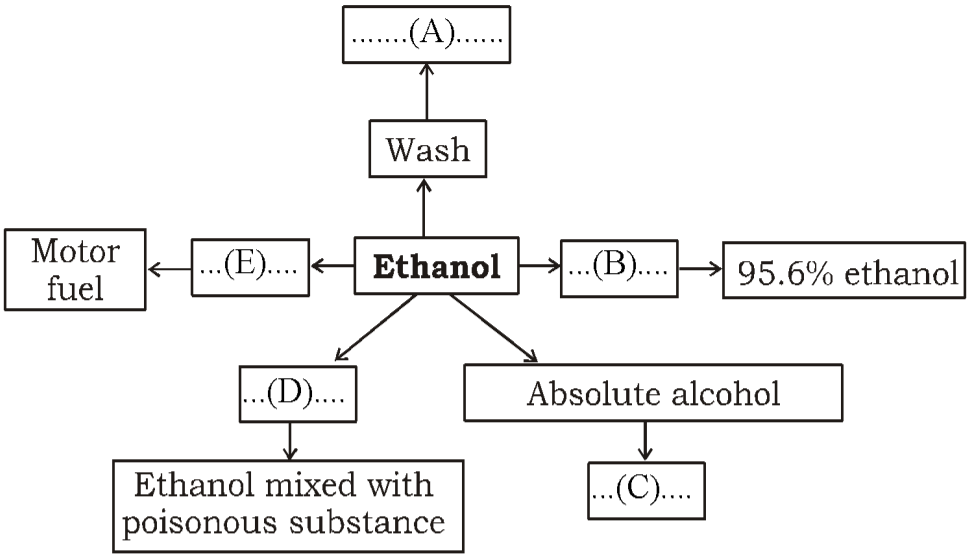
a) Fill A, B and C.

b) Name the isomer of fructose

c) What is the name of ethanol produced by this method?

Activity - 9

Complete the flowchart.



Activity - 10

Most of the fruits contain organic acids.

a) What is the name of 5 - 8 % ethanoic acid? How can this prepared?
b) Write any two uses of ethanoic acid.

Activity - 11

Esters have the pleasant smell of fruits and flowers. They are obtained by the reaction between carboxylic acids and alcohols (esterification). Complete the equations related to esterification.

a) $CH_3COOH + HO - CH_2 - CH_3 \xrightarrow{H_2SO_4} \_\_\_\_ + \_\_\_\_$

b) $\_\_\_\_ + \_\_\_\_ \xrightarrow{H_2SO_4} CH_3 - CH_2 - COO - CH_2 - CH_3$

Activity - 12

Certain hints of some chemical reactions are given below.

i) Carbon monoxide (CO) when reacts with hydrogen in presence of catalyst gives product A.

ii) A reacts with carbon monoxide in presence of catalyst gives product B.

iii) B and A react in the presence of con. sulphuric acid to form a compound C with pleasant smell.

a) Write the chemical equations related to all the three reactions.

b) Reaction (iii) is generally known as .....

c) Identifies A, B and C.

Activity - 13

a) Find A, B and C from the following reactions.

i) $CH_3-CH_2-CH_3 \xrightarrow[\text{Cracking}]{\text{Thermal}} CH_4 + \underline{\quad(A)\quad}$

ii) $(A) + H_2 \xrightarrow[\text{Reaction}]{\text{Addition}} \underline{\quad(B)\quad}$

iii) $(B) + Cl_2 \longrightarrow \underline{\quad(C)\quad}$

b) What is the name of reaction (iii)?

Activity - 14

Some chemical reactions are given.

i) $CH \equiv CH + HCl \longrightarrow \underline{\quad(A)\quad}$

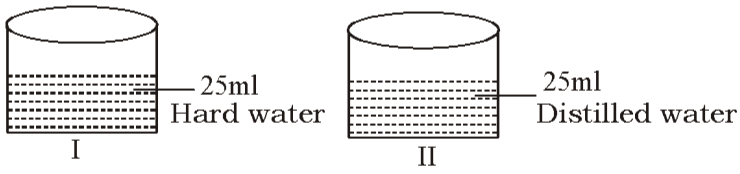
ii) $A \xrightarrow{\text{polymerisation}} \underline{\quad(B)\quad}$

a) Find A and B.

b) Write any one use of B.

Activity - 15

Analyse the given picture.



Add same quantity of soap solution to both beakers and shake well. Which beaker will have more foam and why?

Activity - 16

Detergents are made from hydrocarbons obtained from coal and petroleum. Detergents are salts of sulphonic acid.

a) Detergents are more effective than soap in hard water. Why?

b) List out the merits and demerits of detergents.

1 PERIODIC TABLE AND ELECTRONIC CONFIGURATION

Activity 1

3d

Activity 2

Wrong		Correct
c) $1s^2\ 2s^2\ 2p^7$	→	$1s^2\ 2s^2\ 2p^6\ 3s^1$
d) $1s^2\ 2s^2\ 2p^5\ 3s^1$	→	$1s^2\ 2s^2\ 2p^6$
f) $1s^2\ 2s^1\ 2p^2$	→	$1s^2\ 2s^2\ 2p^1$

Activity 3

a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

b) 17

c) $[Ne]3s^2\ 3p^5$

Activity 4

a) 29

b) 29

c) Wrong

d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$

The completey filled configuration (d^{10}) or the half filled configuration (d^5) of this subshell is more stable than the others.

Activity 5

Subshell eletcronic configuration	$1s^2\ 2s^2 2p^6 3s^2\ 3p^6\ 3d^5 4s^2$
Atomic number	25
Subshell eletcronic configuration in short form	$[Ar]3d^5 4s^2$
Element	Manganese
Symbol	Mn

b) Mn^{2+}, $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$

Activity 6

a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5 4s^2$

b) d

Activity 7

a) 24 b) 24 c) No. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$ (d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$

Activity 8

A - +3

B- Fe^{3+}

C - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6 3d^5$

D - Mn^{2+}

E - +4

F - Mn^{4+}

G - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$

H - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

I - +3

J - Mn^{3+}

K - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^4$

Activity 9

d) Transition elements are known as representative elements

Activity 10

Element	Subshell Electronic Configuration enters	Subshell in which last electron electron?	Does receive or donate	Valency	Formula of Compound
$_{11}A$	$1s^2 2s^2\ 2p^6\ 3s^1$	s	donate	1	Formula - A_2X
$_{12}B$	$1s^2 2s^2\ 2p^6\ 3s^2$	s	donate	2	Compound formed between B & Y Valency of B – 2 Valency of Y – 1 $B^2 Y^1 \rightarrow B_1Y_2$ (after interchanging valency) Formula - BY_2
$_{16}X$	$1s^2 2s^2\ 2p^6\ 3s^2 3p^4$	p	receive	2	Compound formed between X & B Valency of B – 2 Valency of X – 2 $B^2 X^2 \rightarrow B_2X_2$ (after interchanging valency)Formula - BX

$_{17}Y$	$1s^2 2s^2 2p^6 3s^2 3p^5$	p	receive	1	Compound formed between Y &A Valency of A – 1 Valency of Y – 1 $A^1 Y^1 \rightarrow A_1Y_1$ (after interchanging valency) Formula - AY

Activity 11

s-block

b) Shows +1, +2 oxidation states

c) Compunds are mostly ionic

d) Includes alkali metals and alkaline earth metals

f) High metallic character

h) Low eletcronegativtiy

p-block

a) Includes metals, nonmetals and metalloids

e) Element with highest eletcronegativtiy is in this block

g) High ionisation energy

Activity 12

a) Actinoids

b) Radioactive elements

c) Thorium

d) Plutonium

Activity 13

Element	Atomic number	Subshell electronic configuration	The subshell to which last electron is added	Block
$_3Li$	3	$1s^2 2s^1$	s	sblock
$_{11}Na$	11	$1s^2 2s^2 2p^6 3s^1$	s	sblock
$_8O$	8	$1s^2 2s^2 2p^4$	p	pblock
$_{21}Sc$	21	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^1 4s^2$	d	dblock
$_{26}Fe$	26	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$	d	dblock
$_{18}Ar$	18	$1s^2 2s^2 2p^6 3s^2 3p^6$	p	pblock

Activity 14

Element	Subshell electronic configuration	No.of outer most shell	Period number
$_4Be$	$1s^2 2s^2$	2	2
$_7N$	$1s^2 2s^2 2p^3$	2	2
$_{12}Mg$	$1s^2 2s^2 2p^6 3s^2$	3	3
$_{20}Ca$	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$	4	4
$_{22}Ti$	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$	4	4

Activity 15

Element	Subshell electronic configuration	period	Block	Group
$_{16}A$	$1s^2 2s^2 2p^6 3s^2 3p^4$	3	p	4+12=16
$_{11}B$	$1s^2 2s^2 2p^6 3s^1$	3	s	1
$_{23}C$	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$	4	d	3+2=5
$_{10}D$	$1s^2 2s^2 2p^6$	2	p	6+12 = 18
$_{26}E$	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$	4	d	6+2 = 8
$_{20}F$	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$	4	s	2
$_6G$	$1s^2 2s^2 2p^2$	2	p	2+12 = 14
$_{13}H$	$1s^2 2s^2 2p^6 3s^2 3p^1$	3	p	1+12 = 13

Activity 16

i) A - $1s^2 2s^2 2p^4$ Atomic number - 8

ii) B - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ Atomic number – 29

Activity 17

1) 20 2) D 3) C

Activity 18

a) $1s^2 2s^2 2p^6 3s^2 3p^4$

b) 3

c) Y_2X

Activity 19

a) c b) a c) c

2 GAS LAWS AND MOLE CONCEPT

Activity 1

b) Attractive force between molecules low.

d) Energy of molecules high.

Activity 2

From bottom to top pressure decreases so volume of air bubble increases. This is according to Boyle's law

Activity 3

a. Y

b. As altitude increases Pressure decreases. At constant temperature, the volume increases as pressure decreases. Since Balloon Y has maximum volume it is highest.

c Boyle's law

Activity 4

a)

Pressure	Volume
1 atm	80L
2 atm	40 L
4 atm	20 L
8 atm	10 L

b) Boyle's law.

At a constant temperature, volume of a definite mass of gas is inversely proportional to its pressure. If P is the pressure and V the volume, then P × V is a constant.

Activity 5

a) 2

b) At Constant pressure, the volume of a definite mass of a gas is directly proportional to thepressure.

c) Charles law

Activity 6

a.

Element	Volume	No of gas molecules
Nitrogen	20L	X
Oxygen	40L	2X
Ammonia	10L	X/2
Carbondioxide	80L	4X

b. Avogadro's law. At constant temperature and pressure, the volume of a gas is directly proportional to the number of molecules.

Activity 7

A=4

B = $4\times6.022\times10^{23}$

C=4

D=2

E=2

F =$2\times6.022\times10^{23}$

Activity 8

44.8L CO_2	2 mol CO_2
44.8L CO_2	2 GMM CO_2
44.8L CO_2	$2 \times 6.022 \times 10^{23}$ Number of molecules
44.8L CO_2	88 g CO_2
44.8L CO_2	$3 \times 2 \times 6.022 \times 10^{23}$ Number of atoms

Activity 9

Situations	Gas laws
The gas bubbles coming up from the bottom of the the reservoir get bigger	Boyle's law
An inflated balloon placed in the sunlight bursts	Charles law
As the balloon send for weather forecast go up, the size of balloon increases	Boyle's law
If two molecules of hydrogen and nitrogen are taken in STP, the volume of two gases will be equal	Avogadro's law
As the balloon is filled with air, its volume increases	Avogadro's law
After attaching the balloon to the mouth of a bottle, it is lowered into hot water , then the balloon is seems to be inflated	Charles law
When the volume of a given mass of gas at constant temperature is reduced from 100L to 25L , the pressure increases from 1 atm to 4 atm	Boyle's law
Doubling the number of moleculein gases at the same temperature and pressure, doubles the volume also.	Avogadro's law

Activity 10

Volume V	Temperature T	(Kelvin)V/T
600ml	300K	2
900ml	450	2
800ml	400K	2

Activity 11

a) NH_3 = 14+3 =17

b) $CaCO_3$ = 40+12+(3×16) =100

c) NaOH =23+16+1 = 40

Activity 12

128 gm O_2 = 4 GMM

Activity 13

a.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of atoms
Hydrogen	1	1 g	1 g	6.022×10^{23}
Carbon	12	12 g	12 g	6.022×10^{23}
Nitrogen	14	14 g	14 g	6.022×10^{23}
Oxygen	16	16 g	16 g	6.022×10^{23}
Sodium	23	23 g	23 g	6.022×10^{23}
Magnesium	24	24 g	24 g	6.022×10^{23}
Aluminium	27	27 g	27 g	6.022×10^{23}
Chlorine	35.5	35.5 g	35.5g	6.022×10^{23}
Calcium	40	40 g	40 g	6.022×10^{23}

b.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms
Hydrogen	1	1 g	1 g	1 GAM	6.022×10^{23}
Carbon	12	12 g	12 g	1 GAM	6.022×10^{23}
Nitrogen	14	14 g	14 g	1 GAM	6.022×10^{23}
Oxygen	16	16 g	16 g	1 GAM	6.022×10^{23}
Sodium	23	23 g	23 g	1 GAM	6.022×10^{23}
Magnesium	24	24 g	24 g	1 GAM	6.022×10^{23}
Aluminium	27	27 g	27 g	1 GAM	6.022×10^{23}
Chlorine	35.5	35.5g	35.5g	1 GAM	6.022×10^{23}
Calcium	40	40 g	40 g	1 GAM	6.022×10^{23}

c.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms
Hydrogen	1	1 g	1 g	1 GAM	6.022×10^{23}
Hydrogen	**1**	**1 g**	**2 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**
Carbon	12	12 g	12 g	1 GAM	6.022×10^{23}
Carbon	**12**	**12 g**	**24 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**
Nitrogen	14	14 g	14 g	1 GAM	6.022×10^{23}
Nitrogen	**14**	**14 g**	**42 g**	3 GAM	**$3 \times 6.022 \times 10^{23}$**
Oxygen	16	16 g	16 g	1 GAM	6.022×10^{23}
Oxygen	**16**	**16 g**	**80 g**	**5 GAM**	**$5 \times 6.022 \times 10^{23}$**
Sodium	23	23 g	23 g	1 GAM	6.022×10^{23}
Sodium	**23**	**23 g**	230 g	**10 GAM**	**$10 \times 6.022 \times 10^{23}$**

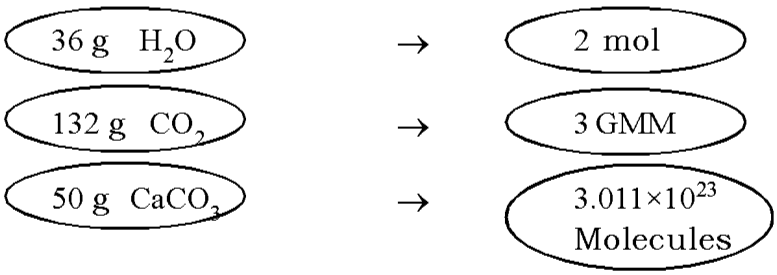
d.

Element	Atomic mass	Atomic mass in grams	Given mass	Number of GAM	Number of atoms	Number of mole atoms
Hydrogen	1	1 g	1 g	1 GAM	6.022×10^{23}	1
Hydrogen	**1**	**1 g**	**2 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**	**2**
Carbon	12	12 g	12 g	1 GAM	6.022×10^{23}	1
Carbon	**12**	**12 g**	**24 g**	**2 GAM**	**$2 \times 6.022 \times 10^{23}$**	**2**
Nitrogen	14	14 g	14 g	1 GAM	6.022×10^{23}	1
Nitrogen	**14**	**14 g**	**42 g**	**3 GAM**	**$3 \times 6.022 \times 10^{23}$**	**3**
Oxygen	16	16 g	16 g	1 GAM	6.022×10^{23}	1
Oxygen	**16**	**16 g**	**80 g**	**5 GAM**	**$5 \times 6.022 \times 10^{23}$**	**5**
Sodium	23	23 g	23 g	1 GAM	**6.022×10^{23}**	1
Sodium	**23**	**23 g**	**230 g**	**10 GAM**	**$10 \times 6.022 \times 10^{23}$**	**10**

e.

Element/ Compound	Molecular mass	Mass in grams	GMM	Number of molecules
Hydrogen (H_2)	2	2 g	1 GMM	6.022×10^{23} H_2 Molecules
Oxygen (O_2)	32	32 g	1 GMM	6.022×10^{23} O_2 Molecules
Nitrogen (N_2)	28	28 g	1 GMM	6.022×10^{23} N_2 Molecules
Water (H_2O)	18	18 g	1 GMM	6.022×10^{23} **H_2O** Molecules
Ammonia (NH_3)	17	17 g	1 GMM	6.022×10^{23} **NH_3** Molecules
Carbon dioxide (CO_2)	44	44 g	1 GMM	6.022×10^{23} CO_2 Molecules

Activity 14



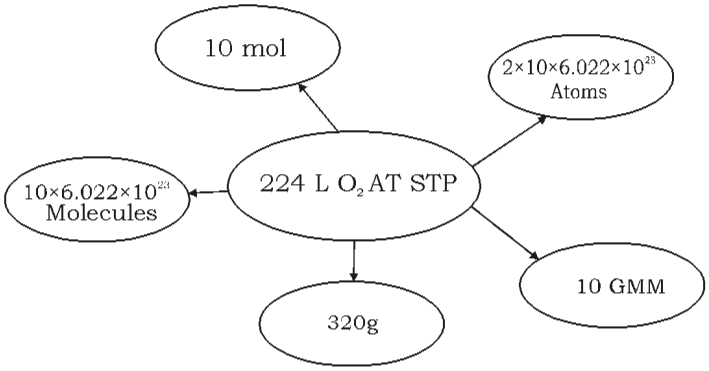
Activity 15

Element/ Compound	Gram Molecular Mass	Mass in gram	No. of moles	No.of molecules
Hydrogen	**2**	**6**	**3**	**$3 \times 6.022 \times 10^{23}$**
Carbon di Oxide	**44**	**88**	**2**	**$2 \times 6.022 \times 10^{23}$**
Sulphuric acid	**98**	**490**	**5**	**$5 \times 6.022 \times 10^{23}$**
Calcium Carbonate	**100**	**500**	**5**	**$5 \times 6.022 \times 10^{23}$**

Activity 16

Gas at STP Mass	Gram Molecular Gram	Mass in	Moles	Volume at STP
CO_2	44	220	5	5 ×22.4L
H_2	2	12	6	6 × 22.4L
NH_3	17	170	10	10 × 22.4L
N_2	28	112	4	4 × 2 2.4L

Activity 17



Activity 18

(a) 4, 4 × N A

(b) 0.5, 0.5 × N A

Activity 19

a 2

b. 3

c. 10

3 REACTIVITY SERIES AND ELECTRO CHEMISTRY

Activity 1

a) Mg

b) Pb

c) Cu

d) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

$Fe + 2HCl \rightarrow FeCl_2 + H_2$

$Pb + 2HCl \rightarrow PbCl_2 + H_2$

e) Hydrogen

f) Cu < Pb < Fe < Zn < Mg

Activity 2

Sodium reacts with water to form NaOH and Hydrogen. Copper does not react with water.

Activity 3

No. Gold does not react with atmospheric air.

Activity 4

Metal	Solution	Displacement reaction
Mg	$CuSO_4$	Takes place
Ag	$CuSO_4$	Does not take place
Mg	$ZnSO_4$	Takes place
Mg	$AgNO_3$	Takes place
Cu	$MgSO_4$	Does not take place

Activity 5

a) Mg, Al, Zn.

b) Cu. Cu is less reactive than Fe

Activity 6

a) Silver is deposited on the surface of iron nail.

b) $Fe + 3AgNO_3 \rightarrow Fe(NO_3)_3 + 3Ag$

c) Fe

d) Ag

e) Oxidation : $Fe \rightarrow Fe^{3+} + 3e^-$

Reduction : $Ag^+ + 1e^- \rightarrow Ag$

f) Silver is displaced by Fe.

Activity 7

a) Anode – Copper

Cathode – Silver

b) $Cu \rightarrow Cu^{2+} + 2e^-$

c) $Ag^+ + 1e^- \rightarrow Ag$

d) $Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$

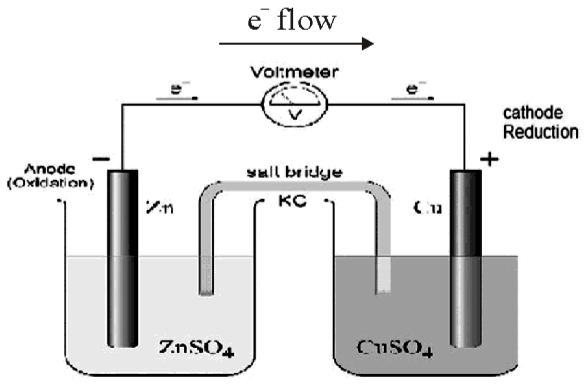
e) Copper to Silver.

Activity 8

Cell	Anode	Cathode	Reaction at anode	Reaction at Cathode	Redox reaction
Fe-Cu	Fe	Cu	$Fe \rightarrow Fe^{2+} + 2e^-$	$Cu^{2+} + 2e^- Cu$	$Fe + Cu^{2+}$ $Fe^{2+} + Cu$
Cu-Ag	Cu	Ag	$Cu \rightarrow Cu^{2+} + 2e^-$	$2Ag^+ + 2e^- \rightarrow$ 2Ag	$Cu + 2Ag^+ \rightarrow$ $Cu^{2+} + 2Ag$

Activity 9

a) a and b)



c) Reaction at anode : $Zn \rightarrow Zn^{2+} + 2e^-$

Reaction at cathode : $Cu^{2+} + 2e^- \rightarrow Cu$

Activity 10

Electrolytic cell	**Galvanic cell**
Electrical energy is converted to chemical energy	Chemical energy is converted to eletcrical energy
Anode has positive charge	Anode has negative charge
Cathode has negative charge	Cathode has positive charge
Oxidation occurs at anode	Oxidation occurs at anode
Reduction occurs at cathode	Reduction occurs at cathode

Activity 11

a) Electrolytic cell

b) Cathode

c) Anode

d) Electrolytes are substances which conduct electricity in molten states or in aqueous solutions and undergo chemical change.

e) (i) Cl^-

(ii) Na^+

(iii) Cl_2

(iv) Na

(v) Anode : $2Cl^- \rightarrow Cl_2 + 2e^-$

Cathode : $Na^+ + 1e^- \rightarrow Na$

Activity 12

Na^+ , Cl^-, H_3O^+, OH^-

Activity 13

a) Cl^-, OH^-

b) Na^+, H_3O^+

c) $2Cl^- \rightarrow Cl_2 + 2e^-$

d) Chlorine

e) $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$

f) Hydrogen

g) Basic

Activity 14

Production of metal

Production of nonmetal

Production of compounds

Refining of metals

Activity 15

Improving the appearance of the metal.

Preventing metallic corrosion.

Activity 16

a) Iron bangle

b) Copper

c) $CuSO_4$ Solution.

d) $Cu \rightarrow Cu^{2+} + 2e^-$

e) $Cu^{2+} + 2e^- \rightarrow Cu$

f) No change. Since there is no change in concetnration of Cu^{2+}.

g) Mixture of gold cyanide and sodium cyanide solution.

4 PRODUCTION OF METALS

Activity 1

(a) Bauxite

(b) Iron

(c) Fe_3O_4

(d) Copper pyrites

(e) Cu_2O

(f) ZnS

(g) Calamine

Activity 2

Etxraction of metal from concenterated Ore

Activity 3

(a) Froth floatation

(b) Leaching

(c) Ore is heavier than impurities.

(d) If either the ore or the impurtiy has magnetic nature

Activity 4

Ore	Method of concetnration
Ore of gold	Levigation/ Hydraulic washing
Bauxite	Leaching
Tin stone	Magnetic separation
Zinc blend	Froth floatation

Activity 5

Roasting	Calcination
Process of heating the concetnrated ore in a current of air at a temperature below its melting point.	Process of heating the concetnrated ore in the absence of air at a temperature below its melting point.
Sulphide ores such as $CuFeS_2$,Cu_2S combines with oxygen to form oxide.	Carbonates and hydroxides of metals such as $ZnCO_3$, $Cu(OH)_2$ decompose to form their oxides.

Activity 6

a)

Method of refining	**Metals**
Liquation	Tin, Lead
Distillation	Zinc, Cadmium, Mercury
Eletcrolytic refining	Copper

b) Zinc – Low boiling point
Tin – Low melting point

Activity 7

i) A – Pure copper
B– Copper sulphate solution

ii) $Cu \rightarrow Cu^{2+} + 2e$

iii) $Cu^{2+} + 2e \rightarrow Cu$

Activity 8

1. Hydraulic washing
2. Roasting
3. Blast furnace
4. $CaSiO_3$
5. CO
6. Pig iron

Activity 9

1. Fe_2O_3
2. CaO, CO_2
3. $CaO+SiO_2 \rightarrow CaSiO_3$
4. Gangue-SiO_2, Flux-CaO
5. $Fe_2O_3+3CO \rightarrow 2Fe+3CO_2$

Activity 10

a) Fe, Ni, Cr, C

b) Heating coils

c) Magnetic Nature

Activity 11

Correct Order - c, b, a

Activity 12

a) Eletcrictiy

b) Cryolite is used to reduce the melting point of alumina and also to increase the conductivtiy.

c) $Al^{3+} + 3e^- \rightarrow Al$

d) The oxygen formed during the eletcrolysis react with carbon blocks and forms CO_2 gas .Hence thicknes of blocks decreases and we have to replace it regularly.

e) $2O^{2-} \rightarrow O_2 + 4e^-$

$C + O_2 \rightarrow CO_2$

5 COMPOUNDS OF NON-METALS

Activity- 1

a) The red litmus changes to blue

b) Because the gas is basic in nature

c) Ammonia

d) Basic nature, very high solubility, colourless, pungent smell

Activity -2

a. Ammonium chloride and calcium hydroxide

b. $2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O + 2NH_3$

c. To remove the moisture present in ammonia gas.

d. No, Ammonia is basic in nature. So it reacts with H_2SO_4 and formed salt.

e. Because ammonia is less denser than air.

Activity - 3

Solubility of ammonia in water is very high.

Activity - 4

Liquor Ammonia : Highly concentrated aqueous solution of Ammonia

Liquid Ammonia : Ammonia gas liquified by applying pressure.

Activity - 5

a) Red litmus turns blue

b) Ammonia, Basic nature

c) (i) For the manufacture of chemical fertilisers like ammonium sulphate, ammonium phosphate, urea etc.

(ii) As a refrigerant in ice plants.

(iii) To clean tiles and window panes (Any two)

d) Blue litmus turns back to red in presence of HCl gas.

e) The density of NH_3 is less than that of HCl. So NH_3 comes out first then the denser HCl comes out.

f) NH_4Cl (Ammonium chloride)

g) The evolving ammonia and hydrogen chloride recombine together to form ammonium chloride.

h) Reversible reaction

i) $NH_4Cl \rightleftharpoons NH_3 + HCl$

Activity - 6

Forward reaction	Backward reaction
$NH_4Cl_{(s)} \rightarrow NH_{3(g)} + HCl_{(g)}$	$NH_{3(g)} + HCl_{(g)} \rightarrow NH_4Cl_{(g)}$
$2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$	$2SO_{3(g)} \rightarrow 2SO_{2(g)} + O_{2(g)}$
$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$	$2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$
$H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$	$2HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$

Activity - 7

a) 2 Moles

b) (i) Increases

(ii) Increases

(iii) Decreases

c) Haber process

Activity - 8

a) X- Forward reaction

Y- Backward reaction

b) Z

c) Equilibrium state

d) (i) At the equilibrium both the product and reactant co-exist.

(ii) The rate of forward and backward reaction become equal at equilibrium.

(iii) Chemical equilibrium is dynamic at the molecular level.

(iv) Chemical equilibrium in attained in closed systems. (Any two)

Activity - 9

a) Exothermic

b) Rate of backward reaction increases (Rate of forward reaction decreases)

c) Rate of forward reaction increases.

d) V_2O_5 increases the rate of both forward and backward reactions to the same extent. As a result the system reaches equilibrium at a faster rate.

e) Catalyst has no effect in a system at equilibrium.

Activity - 10

a) Total number of moles of reactants - 2 moles

Total number of moles of products - 2 moles

b) Since the total number of moles of gaseous reactants and products are equal, pressure has no effect in this reaction.

Activity- 11

a) Sulphuric acid

b) Contact process

c) Manufacture of explosives, manufacture of paints, refining of petroleum (Any one)

Activity- 12

a) Carbon

b) Dehydration property

c) 11 H_2O

Activity- 13

a) SO_2

b) H_2SO_4

Activity - 14

i) a) SO_2 b) O_2 c) SO_3 d) $H_2S_2O_7$

ii) When oleum is diluted with water, sulphuric acid is obtained.

$$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$$

iii) The dissolution of SO_3 in water is an exothermic process. It may turn H_2SO_4 initialy formed into smog which badly affect further dissolution.

Activity- 15

a) Pottassium nitrate (KNO_3) (Any nitrate)

b) $KNO_3 + H_2SO_4 \rightarrow KHSO_4 + HNO_3$

Activity - 16

a) Barium chloride, water, beaker, hydrochloric acid.

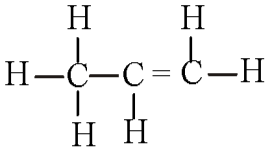
b) Procedure : Take the given solution in a test tube. Add three or four drops of barium chloride solution. Add four or five drops of dil. hydrochloric acid to the white precipitate obtained. If the white precipitate does not disappear, then we can confirm that the given salt is sulphate.

c) Barium sulphate ($BaSO_4$)

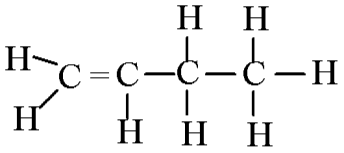
6 NOMENLCATURE OF ORGANIC COMPOUNDS AND ISOMERISM

Activity- 1

a) Alkane

b) 

c) $CH_3 - CH = CH_2$

d) 

e) C_4H_8

f) Alkyne

Activity- 2

a) yes

b)
- The members can be represented by a general formula.
- Successive members differ by a $-CH_2$ - group
- Members show similarity in chemical properties.
- There is a regular gradation in their physical properties.

Activity- 3

a) Ehane

b) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

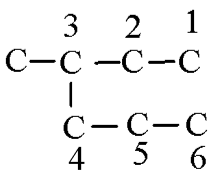
c) $CH_3 - CH_2 - CH_2 - CH_3$

Activity- 4

a) Alkene

b) Pent - 2 - ene

Activity- 5

d) 

Activity- 6

a) But - 2 - ene

b) C_4H_8

Activity- 7

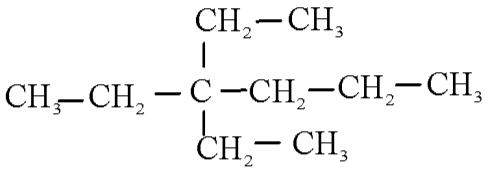
a) 6

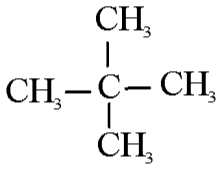
b) 2, 3

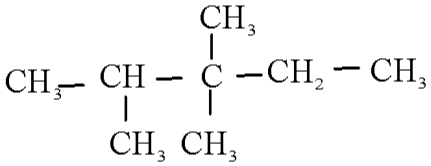
c) methyl

d) 2, 3 - dimethyl hexane

Activity- 8

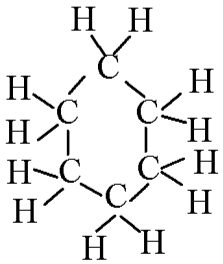
a)


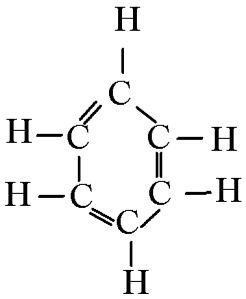
b)


c)


Activity- 9

a) $CH_3-CH_2-CH=CH-CH_2-CH_3$

b)


c)


Molecular formula – C_6H_6

Activity- 10

a) Hydroxyl group – OH

b) Methanol, CH_3 – OH

c) Carboxylic group (–COOH)

Activity- 11

a) Hydroxyl group

b) Carboxylic group

c) Propanoic acid

d) $CH_3-O-CH_2-CH_3$

e) Halo group

f) 2 - chloropropane

Activity- 12

1 2, 2 - dibromo butane

2 2, 3 - dimethyl butane

3 Ethanoic acid

4 Ethoxy propane

5 propyne

6 3 - methyl hexane

7 Butan - 2 - ol

8 Cyclopropene

9 2, 3, 5 - trimethyl heptane

10 3 - methyl pentane

Activity- 13

1 a, g - chain isomerism

2 b, d - Position isomerism

3 c, f - Functional isomerism

Activity- 14

a) $CH_3-CH_2-\underset{\underset{OH}{|}}{CH}-CH_2-CH_3$ $\quad$ $CH_3-\underset{\underset{OH}{|}}{CH}-CH_2-CH_2-CH_3$

b) $CH_3-CH_2-O-CH_2-CH_2-CH_3$ $\quad$ $CH_3-O-CH_2-CH_2-CH_2-CH_3$

(write any one) Ethoxy propane $\quad$ methoxy butane

Activity- 15

1) $CH_3-CH_2-CH_2-OH$

2) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$

3) $CH_3-O-CH_2-CH_3$

7 CHEMICAL REACTION OF ORGANIC COMPOUNDS

Activity- 1

a) $C_2H_4Br_2$

b) HBr

c) $C_2H_3Br_3$

d) Br_2

e) C_2Br_6

f) HBr

Activity- 2

i) CH_2Br-CH_2Br

ii) 1, 2 - Dibromo ethane

iii) $CH_3-\underset{Cl}{CH}-\underset{Cl}{CH_2}$

iv) 1, 2 - Dichloro propane

v) $CH_3-CH_2-\underset{Cl}{CH}-CH_3$

vi) 2- chloro butane

vi) 1, 2 -dichloro ethene

Activity- 3

a) $CH_2=CH_2$

b) Vinylchloride

c) poly vinylchloride

d) $\left\{CH_2-\underset{Cl}{CH}\right\}_n$

e) $CF_2=CF_2$

f) Teflon

Activity- 4

a) CO_2, H_2O

b) $2C_4H_{10}+13O_2 \rightarrow 8CO_2+10H_2O$

Activity- 5

i) A- CH_4

ii) B - C_7H_{16}

Activity- 6

Reactants	Products	Name of the reaction
$CH \equiv CH + H_2$	$CH_2 = CH_2$	Addition
$nCH_2 = CH_2$	$\{CH_2\text{-}\ CH_2\}_n$	Polymerisation
$CH_3 - CH_3 + Cl_2$	$CH_3 - CH_2 - Cl + HCl$	Substitution
$CH_3 - CH_2 - CH_2 - CH_3$	$CH_3 - CH_3 + CH_2 = CH_2$	Thermal cracking
$C_2H_4 + O_2$	$CO_2 + H_2O$	Combustion

Activity- 7

A) $CH_3 - OH$

B) $CH_3 - COOH$

Activity- 8

a) A - $C_6H_{12}O_6$

B - Zymase

C - $2C_2H_5OH$

b) Glucose

c) Wash

Activity- 9

A. 8-10% ethanol

B. Rectified spirit

C. Above 99% ethanol

D. Denatured spirit

E. Power alcohol

Activity- 10

a) Vinegar

Vinear is obtained when ethanol is subjected to fermentation in the presence of air using the bacteria acetobacter.

b) In the manufacture of rayon

In rubber and silk industry.

Activity- 11

a) $CH_3 - COO - CH_2 - CH_3 + H_2O$

b) $CH_3 - CH_2 - COOH + CH_3 - CH_2 - OH$

Activity- 12

a) i) $CO + 2H_2 \xrightarrow{\text{Catalyst}} CH_3 - OH$ (A)

ii) $CH_3OH + CO \xrightarrow{\text{Catalyst}} CH_3 - COOH$ (B)

iii) $CH_3 - COOH + CH_3OH \xrightarrow[H_2SO_4]{\text{Con.}} CH_3 - COO - CH_3 + H_2O$ (C)

b) Esterification

c) A- Methanol

B- Ethanoic acid

C- Methyl ethanoate

Activity- 13

a) A - $CH_2 = CH_2$

B - $CH_3 - CH_3$

C - $CH_3 - CH_2 - Cl$

b) Substitution reaction

Activity- 14

a) A. $CH_2 = CH - Cl$ (Vinylchloride)

B. $\left[CH_2 - \underset{Cl}{CH}\right]_n$ PVC (polyvinyl chloride)

b) For making pipes and taps (any other uses)

Activity- 15

Second beaker

Soap, does not lather well in hard water. Hardness of water is due to the dissolved calcium and magnesium salts in it. These salts react with soap to form insoluble compounds resulting in the decrease of lather.

Activity- 16

a) Detergents do not form insoluble compounds on reaction with calcium and magnesium salts dissolved in hard water.

b)

Merits	Demerits
• Effective in hard water too	• Excessive use of the detergents causes environmental problems.
• Dot not form insoluble compounds	• Micro organisms can not decompose detergents.
• More convenient to use	• The detergents released into water leads to the destruction of aquatic life
• Detergent can also be used in acidic condition	• Detergents which contain phosphate increases the growth of algae and limits the quantity of oxygen in water