



SCIENCE

TERM - I **90 Minutes**

CBSE - Class X

**Strictly as per the Latest CBSE Syllabus released on 5th July,
2021 (CBSE Cir.No.Acad-51/2021)**

Salient Features

- ❖ Chapterwise Concept Map and Quick Notes(Term-1).
- ❖ Precise answers for NCERT In-Text MCQ'S, Book back MCQ'S, Exemplar MCQ'S.
- ❖ As per latest NCERT norms, the objective type questions – Assertion and Reason type questions, Choose the best option, and Case- based questions are included.
- ❖ Concept map with important formula and diagrams.
- ❖ Useful for Board Exam 2021-22 (November - December)



SURA PUBLICATIONS
Chennai

2021-22 Edition

All rights reserved © SURA Publications.

No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, digitally, electronically, mechanically, photocopying, recorded or otherwise, without the written permission of the publishers. Strict action will be taken.

ISBN : 978-93-5330-396-9

Code No : CB10_17

Authors

Mrs. S. Gomathidurga, M.Sc.,
Chennai

Mrs. Subha Parthasarathy, M.Sc., M.Phil.
Chennai

Ms. P. Arulmozhi, M.Sc.,
Chennai



केन्द्रीय माध्यमिक शिक्षा बोर्ड
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संगठन)
CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Ministry of Education, Govt. of India)

NO.: F.1001/CBSE-Acad/Curriculum/2021

July 22, 2021
Cir.No. Acad- 53/2021

All the Heads of Schools affiliated to CBSE

Subject: Term wise syllabus for Board Examinations to be held in the academic session 2021-22 for Secondary and Senior Secondary classes and guidelines for the conduct of the Internal Assessment/Practicum/Project.

This is in continuation to Board's circular number Acad 51/2021 dated July 05, 2021 regarding Special Scheme of Assessment for Board Examination for Classes X and XII for the Session 2021- 22. The syllabus for the two terms mentioned in the scheme in all subjects for classes IX to XII are hereby notified vide this circular. In addition to syllabus for term end board examinations, guidelines for the conduct of Internal Assessment/Practicum/Project are also enclosed.

Schools are requested to share the term wise syllabus and guidelines for the conduct of board examinations and Internal Assessment / Practicum / Project available on CBSE Academic Website <http://www.cbseacademic.nic.in> at the link http://cbseacademic.nic.in/Term-wise-curriculum_2022.html with all their teachers and students


Dr Joseph Emmanuel
Director (Academics)



केन्द्रीय माध्यमिक शिक्षा बोर्ड
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संगठन)
CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Ministry of Education, Govt. of India)

CBSE/DIR (ACAD)/2021

Date: July 05, 2021
Circular No: Acad-51/2021

All the Heads of Schools affiliated to CBSE

Subject: Special Scheme of Assessment for Board Examination Classes X and XII for the Session 2021-22

COVID 19 pandemic caused almost all CBSE schools to function in a virtual mode for most part of the academic session of 2020-21. Due to the extreme risk associated with the conduct of Board examinations during the second wave in April 2021, CBSE had to cancel both its class X and XII Board examinations of the year 2021 and results are to be declared on the basis of a credible, reliable, flexible and valid alternative assessment policy. This, in turn, also necessitated deliberations over alternative ways to look at the learning objectives as well as the conduct of the Board Examinations for the academic session 2021-22 in case the situation remains unfeasible.

CBSE has also held stake holder consultations with Government schools as well as private independent schools from across the country especially schools from the remote rural areas and a majority of them have requested for the rationalization of the syllabus, similar to last year in view of reduced time permitted for organizing online classes. The Board has also considered the concerns regarding differential availability of electronic gadgets, connectivity and effectiveness of online teaching and other socio-economic issues specially with respect to students from economically weaker section and those residing in far flung areas of the country. In a survey conducted by CBSE, it was revealed that the rationalized syllabus notified for the session 2020-21 was effective for schools in covering the syllabus and helped learners in achieving learning objectives in a less stressful manner.

In the above backdrop and in line with the Board's continued focus on assessing stipulated learning outcomes by making the examinations competencies and core concepts based, student-centric, transparent, technology-driven, and having advance provision of alternatives for different future scenarios, the following schemes are introduced for the Academic Session for Class X and Class XII 2021-22.



'शिक्षा सदन', 17 राऊज़ एवेन्यू, इंस्टीट्यूशनल एरिया, नई दिल्ली-110002
'Shiksha Sadan', 17, Rouse Avenue, Institutional Area, New Delhi – 110002





केन्द्रीय माध्यमिक शिक्षा बोर्ड
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संगठन)
CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Ministry of Education, Govt. of India)

2. Special Scheme for 2021-22

A. Academic session to be divided into 2 Terms with approximately 50% syllabus in each term:

The syllabus for the Academic session 2021-22 will be divided into 2 terms by following a systematic approach by looking into the interconnectivity of concepts and topics by the Subject Experts and the Board will conduct examinations at the end of each term on the basis of the bifurcated syllabus. This is done to increase the probability of having a Board conducted classes X and XII examinations at the end of the academic session.

B. The syllabus for the Board examination 2021-22 will be rationalized similar to that of the last academic session to be notified in July 2021. For academic transactions, however, schools will follow the curriculum and syllabus released by the Board vide Circular no. F.1001/CBSE-Acad/Curriculum/2021 dated 31 March 2021. Schools will also use alternative academic calendar and inputs from the NCERT on transacting the curriculum.

C. Efforts will be made to make Internal Assessment/ Practical/ Project work more credible and valid as per the guidelines and Moderation Policy to be announced by the Board to ensure fair distribution of marks.

3. Details of Curriculum Transaction

- Schools will continue teaching in distance mode till the authorities permit in-person mode of teaching in schools.
- Classes IX-X: Internal Assessment** (throughout the year-irrespective of Term I and II) would include the *3 periodic tests, student enrichment, portfolio and practical work/ speaking listening activities/ project*.
- Classes XI-XII: Internal Assessment** (throughout the year-irrespective of Term I and II) would include end of topic or unit tests/ exploratory activities/ practicals/ projects.
- Schools would create a student profile for all assessment undertaken over the year and retain the evidences in digital format.
- CBSE will facilitate schools to upload marks of Internal Assessment on the CBSE IT platform.
- Guidelines for Internal Assessment for all subjects will also be released along with the rationalized term wise divided syllabus for the session 2021-22. The Board would also provide additional resources like sample assessments, question banks, teacher training etc. for more reliable and valid internal assessments.





केन्द्रीय माध्यमिक शिक्षा बोर्ड
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संगठन)
CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Ministry of Education, Govt. of India)

4. Term I Examinations:

- At the end of the first term, the Board will organize **Term I Examination** in a flexible schedule to be conducted between November-December 2021 with a window period of 4-8 weeks for schools situated in different parts of country and abroad. Dates for conduct of examinations will be notified subsequently.
- The Question Paper will have Multiple Choice Questions (MCQ) including case-based MCQs and MCQs on assertion-reasoning type. Duration of test will be **90 minutes** and it will cover only the rationalized syllabus of **Term I only** (i.e. approx. 50% of the entire syllabus).
- Question Papers will be sent by the CBSE to schools along with marking scheme.
- The exams will be conducted under the supervision of the External Center Superintendents and Observers appointed by CBSE.
- The responses of students will be captured on OMR sheets which, after scanning may be directly uploaded at CBSE portal or alternatively may be evaluated and marks obtained will be uploaded by the school on the very same day. The final direction in this regard will be conveyed to schools by the Examination Unit of the Board.
- Marks of the **Term I Examination** will contribute to the final overall score of students.

5. Term II Examination/ Year-end Examination:

- At the end of the second term, the Board would organize **Term II or Year-end Examination** based on the rationalized syllabus of Term II only (i.e. approximately 50% of the entire syllabus).
- This examination would be held around **March-April 2022** at the examination centres fixed by the Board.
- The paper will be of **2 hours duration** and have questions of different formats (case-based/ situation based, open ended- short answer/ long answer type).
- In case the situation is not conducive for normal descriptive examination a **90 minute MCQ** based exam will be conducted at the end of the Term II also.
- Marks of the Term II Examination would contribute to the final overall score.





केन्द्रीय माध्यमिक शिक्षा बोर्ड
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संगठन)
CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Ministry of Education, Govt. of India)

6. Assessment / Examination as per different situations

A. In case the situation of the pandemic improves and students are able to come to schools or centres for taking the exams.

Board would conduct Term I and Term II examinations at schools/centres and the theory marks will be distributed equally between the two exams.

B. In case the situation of the pandemic forces complete closure of schools during November-December 2021, but Term II exams are held at schools or centres.

Term I MCQ based examination would be done by students online/offline from home - in this case, the weightage of this exam for the final score would be reduced, and weightage of Term II exams will be increased for declaration of final result.

C. In case the situation of the pandemic forces complete closure of schools during March-April 2022, but Term I exams are held at schools or centres.

Results would be based on the performance of students on Term I MCQ based examination and internal assessments. The weightage of marks of Term I examination conducted by the Board will be increased to provide year end results of candidates.

D. In case the situation of the pandemic forces complete closure of schools and Board conducted Term I and II exams are taken by the candidates from home in the session 2021-22.

Results would be computed on the basis of the Internal Assessment/Practical/Project Work and Theory marks of Term-I and II exams taken by the candidate from home in Class X / XII subject to the moderation or other measures to ensure validity and reliability of the assessment.

In all the above cases, data analysis of marks of students will be undertaken to ensure the integrity of internal assessments and home based exams.


Dr. Joseph Emmanuel
Director (Academics)



C

ONTENTS

Chapter	Title	Page No.
1.	Chemical Reactions and Equations	1 - 20
2.	Acids, Bases and Salts	21 - 42
3.	Metals and Non-metals	43 - 64
6.	Life Processes	65 - 83
10.	Light-Reflection and Refraction	84 - 103
11.	The Human Eye and Colourful World	104 - 118

COURSE STRUCTURE Class X (2021-22)

	Term - I	Max. Marks : 40
Unit No.	Units	Marks
I	Chemical Substances-Nature and Behaviour: Chapter 1,2 and 3	16
II	World of Living: Chapter 6	10
III	Natural Phenomena: Chapter 10 and 11	14
	Term - II	Max. Marks : 40
Unit No.	Units	Marks
I	Chemical Substances-Nature and Behaviour: Chapter 4 and 5	10
II	World of Living: Chapter 8 and 9	13
IV	Effects of Current: Chapter 12 and 13	12
V	Natural Resources: Chapter 15	05
Total Theory (Term I+II)		80
Internal Assessment: Term I		10
Internal Assessment: Term II		10
Grand Total		100

TERM - I

THEME: MATERIALS

UNIT I: Chemical Substances - Nature and Behaviour

Chapter - 1 Chemical reactions and equations

Chemical reactions: Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.

Chapter - 2 Acids, Bases and Salts

Acids, bases and salts: Their definitions in terms of furnishing of H^+ and OH^- ions, General properties, examples and uses, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Chapter - 3 Metals and non - metals

Metals and nonmetals: Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds.

THEME: THE WORLD OF THE LIVING

UNIT II: World of Living

Chapter – 6 Life processes

Life processes: 'Living Being'. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

THEME: NATURAL PHENOMENA

UNIT III: Natural Phenomena

Chapter – 10 Light – Reflection and Refraction

Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.

Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula (Derivation not required); Magnification. Power of a lens.

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

Chapter – 11 Human eye and colourful world

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

TERM - II

THEME: MATERIALS

UNIT I: Chemical Substances - Nature and Behaviour

Chapter – 4 Carbon and its compounds

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series.

Chapter – 5 Periodic classification of elements

Periodic classification of elements: Need for classification, early attempts at classification of elements (Dobereiner's Triads, Newland's Law of Octaves, Mendeleev's Periodic Table), Modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.

THEME: THE WORLD OF THE LIVING

UNIT II: World of Living

Chapter – 8 How do organisms reproduce?

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health-need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Chapter – 9 Heredity and Evolution

Heredity: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction;

THEME: NATURAL PHENOMENA

UNIT IV: Effects of Current

Chapter – 12 Electricity

Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Chapter – 13 Magnetic effects of current

Magnetic effects of current: Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Electric Motor, Electromagnetic induction. Induced potential difference, Induced current. Fleming's Right Hand Rule.

THEME: NATURAL RESOURCES

UNIT V: Natural Resources

Chapter – 15 Our Environment

Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

ONLY FOR INTERNAL ASSESSMENT

Note:

Learners are assigned to read the below listed part of Unit V. They can be encouraged to prepare a brief write up on any one concept of this Unit in their Portfolio. This may be an assessment for Internal Assessment and credit may be given (Periodic assessment/Portfolio). This portion of the Unit is not to be assessed in the year-end examination.

Chapter – 16 Management of natural resources: Conservation and judicious use of natural resources. Forest and wild life; Coal and Petroleum conservation. Examples of people's participation for conservation of natural resources. Big dams: advantages and limitations; alternatives, if any. Water harvesting. Sustainability of natural resources.

PRACTICALS

Practical should be conducted alongside the concepts taught in theory classes.

TERM-I

LIST OF EXPERIMENTS

1. A. Finding the pH of the following samples by using pH paper/universal indicator:
 - (i) Dilute Hydrochloric Acid
 - (ii) Dilute NaOH solution
 - (iii) Dilute Ethanoic Acid solution
 - (iv) Lemon juice
 - (v) Water
 - (vi) Dilute Hydrogen Carbonate solution
- B. Studying the properties of acids and bases (HCl & NaOH) on the basis of their reaction with:
 - a) Litmus solution (Blue/Red)
 - b) Zinc metal
 - c) Solid sodium carbonate **Unit-I:(Chapter-2)**
2. Performing and observing the following reactions and classifying them into:
 - A. Combination reaction
 - B. Decomposition reaction
 - C. Displacement reaction
 - D. Double displacement reaction
 - (i) Action of water on quicklime
 - (ii) Action of heat on ferrous sulphate crystals
 - (iii) Iron nails kept in copper sulphate solution
 - (iv) Reaction between sodium sulphate and barium chloride solutions. **Unit-I:(Chapter-1)**

3. A. Observing the action of Zn, Fe, Cu and Al metals on the following salt solutions:
 - (i) $\text{ZnSO}_4(\text{aq})$
 - (ii) $\text{FeSO}_4(\text{aq})$
 - (iii) $\text{CuSO}_4(\text{aq})$
 - (iv) $\text{Al}_2(\text{SO}_4)_3(\text{aq})$
- B. Arranging Zn, Fe, Cu and Al (metals) in the decreasing order of reactivity based on the above result. **Unit-I:(Chapter-3)**
4. Experimentally show that carbon dioxide is given out during respiration. **Unit-II:(Chapter-6)**
5. Determination of the focal length of (i) Concave mirror and (ii) Convex lens by obtaining the image of a distant object. **Unit-III:(Chapter- 10)**
6. Tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. Measure the angle of incidence, angle of refraction, angle of emergence and interpret the result. **Unit-III:(Chapter-10)**
7. Tracing the path of the rays of light through a glass prism. **Unit-III:(Chapter-11)**

TERM-II

LIST OF EXPERIMENTS

1. Studying the dependence of potential difference (V) across a resistor on the current (I) passing through it and determining its resistance. Also plotting a graph between V and I. **Unit-IV:(Chapter-12)**
2. Studying (a) binary fission in Amoeba, and (b) budding in yeast and Hydra with the help of prepared slides. **Unit-II:(Chapter-8)**

ASSESSMENT AREAS (THEORY) 2021-22 (CLASS X) SCIENCE (086)

Theory

TotalMaximum Marks: 80

	Competencies	Marks
	Demonstrate Knowledge and Understanding	46 %
	Application of Knowledge/Concepts	22 %
	Analyze, Evaluate and Create	32 %

Note:

- Internal choice would be provided.

Internal Assessment – Term I and II (10 Marks each)

- Periodic Assessment - 03 marks
- Multiple Assessment – 02 marks
- Subject Enrichment (Practical Work) - 03 marks
- Portfolio - 02 marks

TO ORDER WITH US

SCHOOLS and TEACHERS:

We are grateful for your support and patronage to '**SURA PUBLICATIONS**'

Kindly prepare your order in your School letterhead and send it to us.

For Orders contact: 81242 01000 / 81243 01000

DIRECT DEPOSIT

A/c Name : **Sura Publications**
Our A/c No. : **36550290536**
Bank Name : **STATE BANK OF INDIA**
Bank Branch : **PADI**
IFSC : **SBIN0005083**

A/c Name : **Sura Publications**
Our A/c No. : **21000210001240**
Bank Name : **UCO BANK**
Bank Branch : **Anna Nagar West**
IFSC : **UCBA0002100**

A/c Name : **Sura Publications**
Our A/c No. : **6502699356**
Bank Name : **INDIAN BANK**
Bank Branch : **ASIAD COLONY**
IFSC : **IDIB000A098**

A/c Name : **Sura Publications**
Our A/c No. : **1154135000017684**
Bank Name : **KVB BANK**
Bank Branch : **Anna Nagar**
IFSC : **KVBL0001154**

After Deposit, please send challan and order to our address.

email : orders@surabooks.com / Whatsapp : 81242 01000.

DEMAND DRAFT / CHEQUE

Please send Demand Draft / cheque in favour of '**SURA PUBLICATIONS**' payable at **Chennai**.

The Demand Draft / cheque should be sent with your order in School letterhead.

STUDENTS :

Order via Money Order (M/O) to



SURA PUBLICATIONS

1620, 'J' Block, 16th Main Road, Anna Nagar, Chennai - 600 040.

Phones : 044-48629977, 48627755

Mobile : 80562 94222 / 80562 15222

Email : orders@surabooks.com

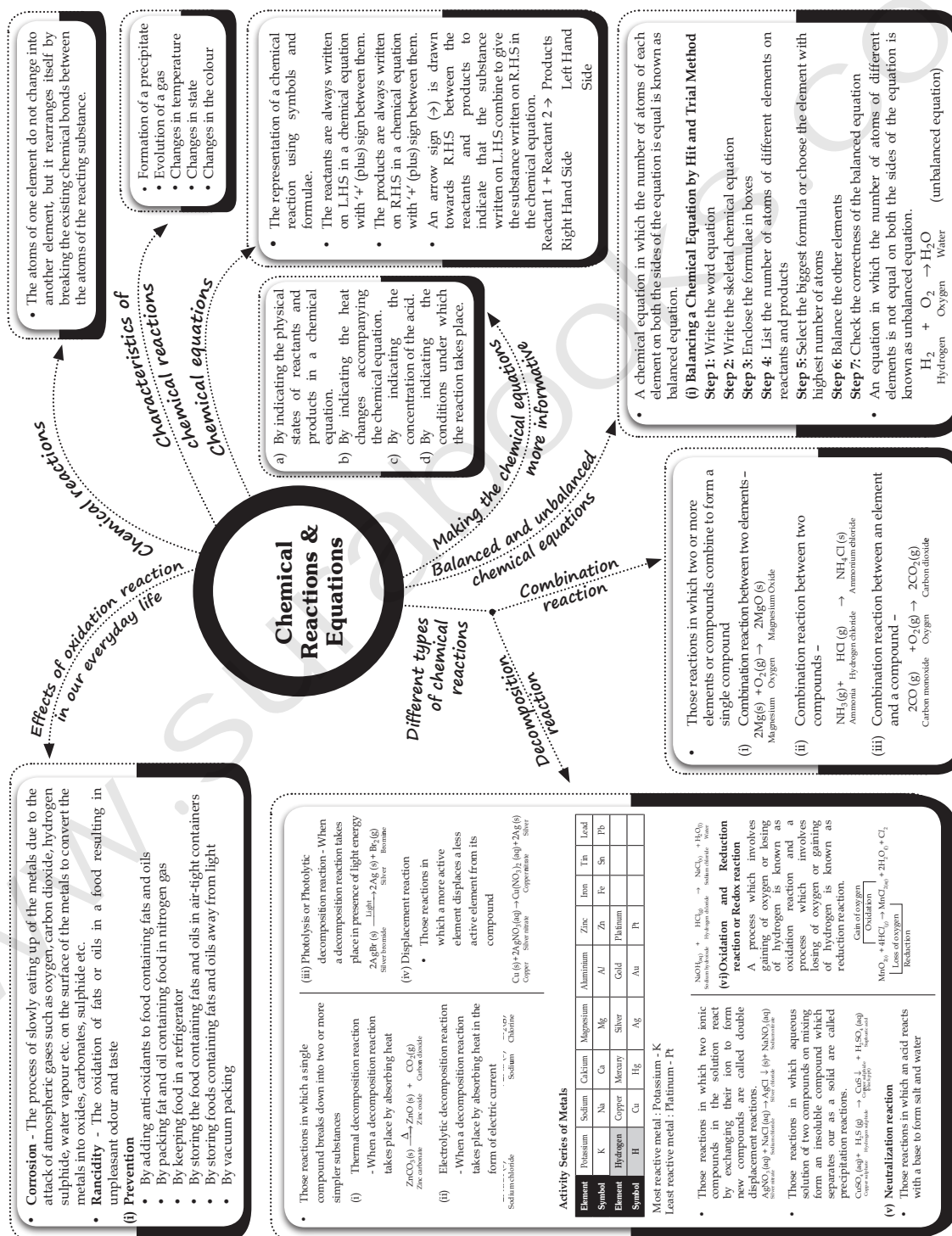
Website : www.surabooks.com

Chapter

1

Chemical Reactions and Equations

Concept Map



**Quick Notes****Physical Change**

- ❖ The process in which no new chemical substances are formed is called physical change.

Chemical Change

- ❖ The process in which the original substances lose their nature and identity to form new chemical substances is called chemical change.

Chemical Reaction

- ❖ The process which involves a chemical change is called a chemical reaction.

Reactants and Products

- ❖ The chemical substances taken are called reactants and the new chemical substances formed are called the products.

Changes Taking Place during a Chemical Reaction/Characteristics of a Chemical Reaction

- ❖ When a chemical reaction takes place, any one or more of the following changes are observed: -
 1. Change in state
 2. Change in colour
 3. Evolution of a gas
 4. Change in temperature

Chemical Equation

- ❖ The short – hand method of representing a chemical reaction in terms of symbols and formulae of the different reactants and products is called a chemical equation.

Writing of a Chemical Equation

1. The symbols and formulae of the reactant are written on the LHS with plus (+) sign between them.
2. The symbols and formulae of the product are written on the RHS with plus (+) sign between them.
3. An arrow (\rightarrow) sign is used between the reactants and products pointing from reactants to products.

Balanced Chemical Equation

- ❖ An equation in which the number of atoms of each element on the two sides of the equation is equal is called balanced chemical equation.

Unbalanced Chemical Equation or Skeletal Equation

- ❖ An equation in which the number of atoms of different elements on the two sides of the equation is not equal is called unbalanced chemical equation.

Law of Conservation of Mass

- ❖ According to which in a chemical reaction, total mass of all the products is equal to the total mass of all the reactants.

Steps Involved in the Balancing of a Chemical Equation

Step 1 – Write the word equation by writing the names of the reactants on the LHS and the products on RHS. This step is not required if the equation is given in terms of symbols and formulas.

Step 2 – Write the skeletal equation by writing the symbols and formulas of the reactants and products.

Step 3 – Now draw boxes around the formula so that nothing is changed while balancing the equation.

Step 4 – List the number of atoms of different elements on LHS and RHS.

Step 5 – Select the biggest formula of different element and start balancing.

Step 6 – Check the correctness of the balanced equation.

Making a Chemical Equation More Informative

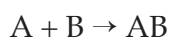
- ❖ To make the chemical equation more informative the following steps can be done : -
- ❖ Symbols of physical state of the reactants and products can be used such as solid (s), liquid (l), gas (g) and aqueous (aq).
- ❖ The gaseous product may be represented by putting an arrow pointing upwards (\uparrow) and a precipitate formed may be represented by putting an arrow pointing downwards (\downarrow).
- ❖ Concentration of acid such as dilute or concentrated can be pointed out by using symbol 'dil' for dilute and 'conc' for concentrated.
- ❖ The presence of catalyst, temperature and heat symbols can be used above the arrow mark between the reactants and products.

Types of Chemical Reactions

1. Combination Reaction
2. Decomposition Reaction
3. Displacement Reaction
4. Double Displacement Reaction
5. Oxidation and Reduction Reaction

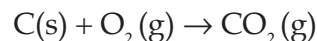
Combination Reaction

- ❖ Those reactions in which two or more elements or compounds combine together to form a single compound are called combination reaction.

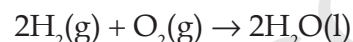


❖ Examples of Combination Reaction

- (a) Combustion or Burning of carbon or Coal – Coal and oxygen reacts readily to form a single product, carbon dioxide.



- (b) Formation of water – Oxygen and hydrogen reacts to form water.



❖ The combination reaction may be of two types,

- (a) Exothermic reaction
- (b) Endothermic reaction

Exothermic Reaction

- ❖ A chemical reaction which is accompanied by evolution of heat is called exothermic reaction.

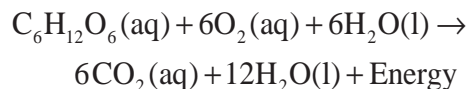
❖ Examples of Exothermic Reaction

- (i) Burning of methane gas – Methane reacts with oxygen readily to form carbon dioxide with the evolution of heat.



- (ii) Rotting of vegetable matter – The decomposition of vegetable matter into compost is also an exothermic reaction.

- (iii) Respiration – Carbohydrates on digestion breaks down into glucose. The air we breathe oxidizes glucose into carbon dioxide and water with the liberation of heat which provides our body required energy. Hence respiration is considered as an exothermic reaction.



Endothermic Reaction

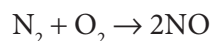
- ❖ A chemical reaction which is accompanied by absorption of heat is called endothermic reaction.

❖ Examples of Endothermic Reaction

- (i) Decomposition of HgO

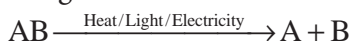


- (ii) Formation of nitric oxide



Decomposition Reaction

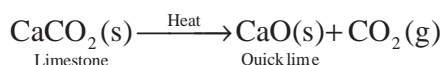
- ❖ Those reactions in which a single compound breaks down to give two or more simpler substances are called decomposition reactions. The decomposition reaction takes place only when the energy is in the form of heat, electricity or light.



- ❖ Depending upon the energy supplied it is classified into 3 types namely,
 - Thermal decomposition reaction,
 - Electrolytic decomposition reaction,
 - Photo decomposition reaction

Thermal decomposition reaction

- ❖ When decomposition reaction takes place by absorption of heat, it is called thermal decomposition reaction.
- ❖ **Example** – Decomposition of calcium carbonate or limestone.

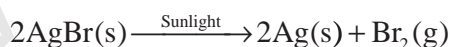
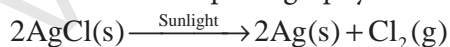


Electrolytic decomposition reaction

- ❖ When decomposition reaction takes place by passing electric current through compound in molten or aqueous solution it is called electrolytic decomposition reaction.
- ❖ **Example** – Electrolysis of water.

Photo decomposition reaction

- ❖ When decomposition reaction takes place by absorption of light it is called photo decomposition reaction.
- ❖ **Example** – Decomposition of silver chloride and silver bromide. This reaction is used in black and white photography



Displacement Reaction

- ❖ Those reactions in which a more active element displaces a less active element from its compound are called displacement reaction.
- ❖ In this reaction, a more active metal may displace a less active metal or more active non-metal displaces a less active non-metal.
- ❖ $A + BC \rightarrow AC + B$
- ❖ The arrangement of metals in order of their decreasing reactivity from top to bottom is called reactivity series or activity series of metals.
- ❖ The order is

Element	Symbol
Potassium	K
Sodium	Na
Calcium	Ca
Magnesium	Mg
Aluminium	Al
Zinc	Zn
Iron	Fe
Tin	Sn
Lead	Pb
Hydrogen	H
Copper	Cu
Mercury	Hg
Silver	Ag
Gold	Au
Platinum	Pt

→ **Most reactive metal**

→ **Least reactive metal**

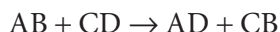
- ❖ Examples of displacement reaction
 - Reaction between zinc and dilute sulphuric acid

$$\text{Zn}(\text{s}) + \text{dil. H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$$
 - Reaction between zinc and dilute hydrochloric acid

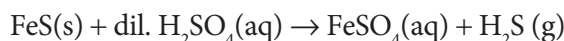
$$\text{Zn}(\text{s}) + \text{dil HCl} + \text{Cl}_2(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$$

Double Displacement Reaction

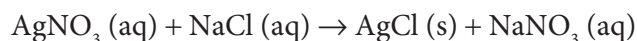
- ❖ Those reactions in which two different atoms or groups of atoms are exchanged to form new compounds are called double displacement reactions.



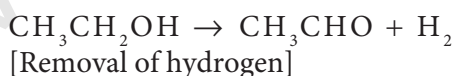
- ❖ **Example** – Reaction between iron sulphide and dil. sulphuric acid.

**Precipitation Reaction**

- ❖ Those reactions in which aqueous solutions of two compounds on mixing react to form an insoluble compound are called precipitation reaction. It is denoted by downward arrow mark.
- ❖ Example – Reaction between silver nitrate and sodium chloride.

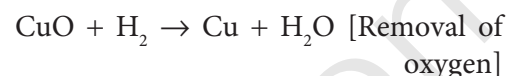
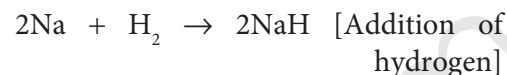
**Oxidation and Reduction Reaction****Oxidation Reaction**

- ❖ It is defined as the process which involves gain or addition of oxygen or loss or removal of hydrogen or addition of an electronegative element.
- ❖ In terms of electronic concept, oxidation is a process in which loss of electrons takes place.

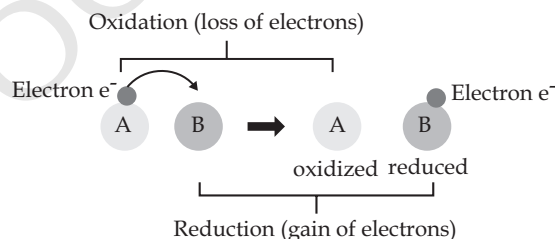
**Reduction Reaction**

- ❖ It is defined as the process which involves gain or addition of hydrogen or loss or removal of oxygen or removal of an electronegative element.

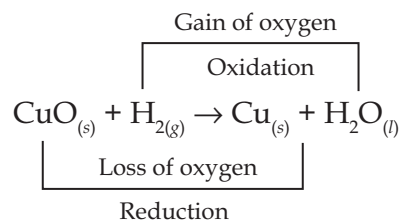
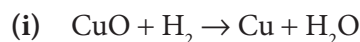
- ❖ In terms of electronic concept, reduction is a process in which gain of electrons takes place.

**Redox Reaction**

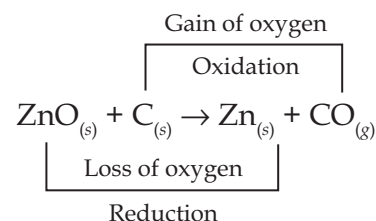
- ❖ The reactions in which oxidation and reduction takes place simultaneously are known as redox reactions.



- ❖ Examples of redox reaction



CuO loses oxygen to become Cu and hence CuO has been reduced. H₂ gains oxygen to become H₂O and hence H₂ has been oxidized.



ZnO loses oxygen to become Zn and hence ZnO has been reduced. C gains oxygen to become CO and hence C has been oxidized.

Corrosion

- ❖ The process of slowly eating up of the metals due to attack of atmospheric gases such as oxygen, carbon dioxide on the surface of the metals so as to convert the metal into oxide is known as corrosion.
- ❖ **Examples** – Corrosion or rusting of iron, Corrosion of copper, silver articles.
 - (a) When an iron article remains exposed to moist air for a long time, its surface is covered with a brown, non-sticky substance called rust, which is mainly $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$. It is formed due to attack of oxygen and water-vapour present in air on the surface of iron.
 - (b) The surface of the copper objects loses their lustre and acquires a green coating of basic copper carbonate when exposed to air. This is due to the attack of oxygen and carbon dioxide and water vapour in the air on the surface of copper.
 - (c) The surface of silver gets tarnished (loses lustre) on exposure to air due to the formation of a coating of black silver sulphide on its surface by the action of hydrogen sulphide gas present in air.

Methods to Prevent Rusting

- ❖ Anyone of the following methods can be used to prevent rusting:
 - (a) Painting
 - (b) Greasing and Oiling
 - (c) Galvanisation
 - (d) Electroplating

Rancidity

- ❖ The oxidation of fats or oils in a food resulting into a bad smell and bad taste is called rancidity.

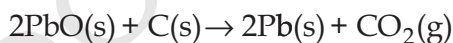
Methods to Prevent Rancidity

- ❖ Anyone of the following methods can be used to prevent rancidity:
 - (a) Adding anti-oxidants
 - (b) Vacuum packing
 - (c) Replacing air by nitrogen or flushing with nitrogen
 - (d) Refrigeration of the food stuff

EXERCISES

I. Choose the Best Option.

1. Which of the following statements about the reaction below are incorrect? [NCERT]



- (a) lead is getting reduced
- (b) carbon disulphide is getting oxidized
- (c) carbon is getting oxidized
- (d) lead oxide is getting reduced.
- (i) (a) and (b) (ii) (a) and (c)
- (iii) (a), (b) and (c) (iv) All of these

[Ans: (i) (a) and (b)]

2. Oxidation is a process which involves

- (a) addition of oxygen
- (b) addition of hydrogen
- (c) removal of oxygen
- (d) removal of hydrogen

[Ans: (a) addition of oxygen]

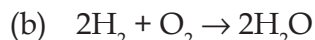
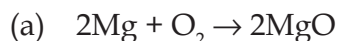
3. Which of the following is not a physical change? [Exemplar]

- (a) boiling of water to give water vapour.
- (b) melting of ice to give water.
- (c) dissolution of salt in water.
- (d) combustion of Liquefied Petroleum Gas (LPG).

[Ans: (d) Combustion of Liquefied Petroleum Gas (LPG).]

Explanation: Combustion of any substance is a chemical change because new substance is formed after combustion.

4. Which among the following reactions is not a combination reaction between two elements?



[Ans: (d) $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$]

5. $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$. The reaction is an example of a [NCERT]

- (a) combination of reaction
(b) double displacement reaction
(c) decomposition reaction
(d) displacement reaction.

[Ans: (d) displacement reaction.]

6. Combustion reactions are always

- (a) exothermic
(b) endothermic
(c) sometimes exothermic
(d) both (a) and (b).

[Ans: (a) exothermic]

7. The following reaction is an example of a $4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$

[Exemplar]

- (i) displacement reaction
(ii) combination reaction
(iii) redox reaction
(iv) neutralisation reaction

- (a) (i) and (iv) (b) (ii) and (iii)
(c) (i) and (iii) (d) (iii) and (iv)

[Ans: (c) (i) and (iii)]

Explanation: In this reaction, oxygen is displacing hydrogen from ammonia. Hence, it is a displacement reaction. Also, nitrogen is getting oxidized and oxygen is getting reduced. Hence, it is also a redox reaction.

8. The catalyst used for the manufacture of methanol is

- (a) CrO_3 (b) ZnO
(c) Both (a) + (b) (d) None of these

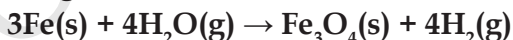
[Ans: (c) Both (a) + (b)]

9. What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer. [NCERT]

- (a) Hydrogen gas and iron chloride are produced.
(b) Chlorine gas and iron hydroxide are produced.
(c) No reaction takes place
(d) Iron salt and water are produced.

[Ans: (a) Hydrogen gas and iron chloride are produced.]

10. Which of the following statements about the given reaction are correct?



[Exemplar]

- (i) Iron metal is getting oxidised
(ii) Water is getting reduced
(iii) Water is acting as reducing agent
(iv) Water is acting as oxidising agent
(a) (i), (ii) and (iii) (b) (iii) and (iv)
(c) (i), (ii) and (iv) (d) (ii) and (iv)

[Ans: (c) (i), (ii) and (iv)]

Explanation: Oxygen is being added to iron, hence iron is getting oxidized. Oxygen is removed from water; hence water is getting reduced. Water is providing oxygen; hence water is the oxidizing agent.

11. Which of the following are exothermic processes? [Exemplar]

- (i) Reaction of water with quick lime
(ii) Dilution of an acid
(iii) Evaporation of water
(iv) Sublimation of camphor (crystals)
(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

[Ans: (a) (i) and (ii)]

Explanation: Exothermic processes are chemical processes which take place with the release of heat. Enormous amount of heat energy is released when dilution of acid takes place and when water reacts with quick lime.

12. The process of reduction involves

- (a) removal of hydrogen
- (b) addition of hydrogen & removal of oxygen
- (c) loss of electron
- (d) addition of oxygen

[Ans: (b) addition of hydrogen & removal of oxygen]

13. Three beakers labelled as A, B and C each containing 25 mL of water was taken. A small amount of NaOH, anhydrous CuSO_4 and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statement(s) is (are) correct?

[Exemplar]

- (i) In beakers A and B, exothermic process has occurred.
 - (ii) In beakers A and B, endothermic process has occurred.
 - (iii) In beaker C exothermic process has occurred.
 - (iv) In beaker C endothermic process has occurred.
- (a) (i) Only (b) (ii) Only
(c) (i) and iv (d) (ii) and (iii)

[Ans: (c) (i) and iv)]

Explanation: Exothermic process will increase the temperature of beaker, while endothermic process will reduce the temperature of beaker.

14. Magnesium ribbon is rubbed with sand paper before burning because it has a coating of

- (a) basic magnesium carbonate
- (b) basic magnesium oxide

- (c) basic magnesium sulphide
- (d) basic magnesium chloride

[Ans: (a) basic magnesium carbonate]

15. A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears. Which of the following is the correct explanation for the observation?

[Exemplar]

- (a) KMnO_4 is an oxidising agent, it oxidises FeSO_4
- (b) FeSO_4 acts as an oxidising agent and oxidises KMnO_4
- (c) The colour disappears due to dilution; no reaction is involved
- (d) KMnO_4 is an unstable compound and decomposes in presence of FeSO_4 to a colourless compound.

[Ans: (d) KMnO_4 is an unstable compound and decomposes in presence of FeSO_4 to a colourless compound.]

Explanation: Potassium permanganate is a potential oxidizing agent. The purple colour was because of KMnO_4 , which disappears once all the permanganate in the solution is utilized. This is an example of titration.

16. Which type of chemical reactions takes place when electricity is passed through water?

- (a) Displacement
- (b) Combination
- (c) Decomposition
- (d) Double displacement

[Ans: (c) Decomposition]

17. Which among the following is/are double displacement reaction(s)? **[Exemplar]**

- (i) $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$
- (ii) $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
- (iii) $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- (iv) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

- (a) (i) and (iv) (b) (ii) only
(c) (i) and (ii) (d) (iii) and (iv)

[Ans: (b) (ii) only]

Explanation: In this reaction, sodium and barium are displacing each other from their respective salts. Hence, it is a double displacement reaction.

18. Which substance added to food containing fats and oils?

- (a) Oxidant (b) Rancid
(c) Coolant (d) Anti-oxidant

[Ans: (d) Anti-oxidant]

19. Which among the following statement(s) is (are) true? Exposure of silver chloride to sunlight for a long duration turns grey due to [Exemplar]

- (i) the formation of silver by decomposition of silver chloride
(ii) sublimation of silver chloride
(iii) decomposition of chlorine gas from silver chloride
(iv) oxidation of silver chloride
(a) (i) only (b) (i) and (iii)
(c) (ii) and (iii) (d) (iv) only

[Ans: (a) (i) only]

Explanation: When silver chloride is kept in sunlight, it turns to grey because of formation of silver. This is a decomposition reaction.

20. The Colour of the lead nitrate precipitate is

- (a) yellow (b) green
(c) blue (d) white

[Ans: (a) yellow]

21. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following is (are) true about slaking of lime and the solution formed? [Exemplar]

- (i) It is an endothermic reaction
(ii) It is an exothermic reaction

(iii) The pH of the resulting solution will be more than seven

(iv) The pH of the resulting solution will be less than seven

- (a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

[Ans: (b) (ii) and (iii)]

Explanation: Slaking of lime is an exothermic reaction which is evident from liberation of heat. Oxides and hydroxides of metals are alkaline. Hence, pH of the resulting solution will be more than 7.

22. When we say, 'change in temperature' it means

- (a) rise in temperature
(b) fall in temperature
(c) either rise or fall in temperature
(d) none of these

[Ans: (c) either rise or fall in temperature]

23. Barium chloride on reacting with ammonium sulphate forms barium sulphate and ammonium chloride. Which of the following correctly represents the type of the reaction involved? [Exemplar]

- (i) Displacement reaction
(ii) Precipitation reaction
(iii) Combination reaction
(iv) Double displacement reaction
(a) (i) only (b) (ii) only
(c) (iv) only (d) (ii) and (iv)

[Ans: (c) (iv) only]

Explanation: In this reaction, ammonium ion and barium are displacing each other from their respective salts. Hence, it is a double displacement reaction.

24. Generally if carbon burns in sufficient air, it forms

- (a) carbon monoxide
(b) carbon dioxide
(c) both a and b
(d) none of these

[Ans: (b) carbon dioxide]

25. Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is [Exemplar]

- (a) 1:1 (b) 2:1
(c) 4:1 (d) 1:2

[Ans: (b) 2:1]

Explanation: In 1 mole water molecule, there are 2 moles of hydrogen and 1 mole of oxygen.

26. Lemon juice makes the reaction to take place in

- (a) acidic medium
(b) basic medium
(c) both (a) (b)
(d) none of these

[Ans: (a) acidic medium]

27. Which of the following is (are) an endothermic process (es)? [Exemplar]

- (i) Dilution of sulphuric acid
(ii) Sublimation of dry ice
(iii) Condensation of water vapours
(iv) Evaporation of water
(a) (i) and (iii) (b) (ii) only
(c) (iii) only (d) (ii) and (iv)

[Ans: (d) (ii) and (iv)]

Explanation: When a solid change into gas or a liquid change into gas, it happens because of absorption of heat. Hence, these are endothermic processes.

28. When calcium carbonate is heated to form calcium oxide and carbon dioxide which of the following is correct write to the reaction?

- (a) Calcium carbonate and heat on R.H.S
(b) Calcium oxide and carbon oxide on R.H.S
(c) Calcium carbonate and heat on L.H.S
(d) Both (b) and (c)

[Ans: (d) Both (b) and (c)]

29. In the double displacement reaction between aqueous potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate? [Exemplar]

- (a) Lead sulphate (insoluble)
(b) Lead acetate
(c) Ammonium nitrate
(d) Potassium sulphate

[Ans: (b) Lead acetate]

Explanation: We need a source of lead for making lead iodide, hence options (c) and (d) are ruled out. Lead sulphate is insoluble, so it cannot be used.

30. Which of the following gases can be used for storage of fresh sample of an oil for a long time? [Exemplar]

- (a) Carbon dioxide or oxygen
(b) Nitrogen or oxygen
(c) Carbon dioxide or helium
(d) Helium or nitrogen

[Ans: (d) Helium or nitrogen]

Explanation: Oxygen is an oxidizing agent and hence it cannot be used. Helium is an inert gas and hence it can be used. Nitrogen is among the least reactive gases and it is much cheaper than helium. Hence, in most of the cases, Nitrogen is used in packets of oily food to prevent rancidity.

31. When methane reacts with oxygen, it liberates

- (a) hydrogen gas (b) carbon dioxide gas
(c) Oxygen gas (d) both a & b

[Ans: (b) Carbon dioxide gas]

32. The following reaction is used for the preparation of oxygen gas in the laboratory



Which of the following statement(s) is (are) correct about the reaction? [Exemplar]

- (a) It is a decomposition reaction and endothermic in nature
- (b) It is a combination reaction
- (c) It is a decomposition reaction and accompanied by release of heat
- (d) It is a photochemical decomposition reaction and exothermic in nature

[Ans: (a) It is a decomposition reaction and endothermic in nature]

Explanation: Potassium chlorate decomposes to give Potassium chloride and oxygen; hence it is a decomposition reaction. Heat is being supplied to this reaction, so it is an endothermic reaction.

33. $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \dots\dots + 4\text{H}_2$ Which of the following compounds is one of the products in this equation?

- (a) Fe_2O_3 (b) Fe_2O_4
- (c) Fe_3O_4 (d) FeO_3

[Ans: (c) Fe_3O_4]

34. Which one of the following processes involves chemical reactions? [Exemplar]

- (a) Storing of oxygen gas under pressure in a gas cylinder.
- (b) Liquefaction of air.
- (c) Keeping petrol in a china dish in the open.
- (d) Heating copper wire in presence of air at high temperature.

[Ans: (d) Heating copper wire in presence of air at high temperature.]

Explanation: When copper is heated at high temperature in presence of air, it undergoes oxidation to form copper oxide. (black in colour). $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$

35. For one reaction: $2\text{KClO}_3 \xrightarrow{x} 2\text{KCl} + 3\text{O}_2$, x is

- (a) Δ (b) MnO_2
- (c) Both (a) + (b) (d) None of these

[Ans: (c) Both (a) + (b)]

36. In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature? [Exemplar]

- (a) $2\text{H}_2(l) + \text{O}_2(l) \rightarrow 2\text{H}_2\text{O}(g)$
- (b) $2\text{H}_2(g) + \text{O}_2(l) \rightarrow 2\text{H}_2\text{O}(l)$
- (c) $2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(l)$
- (d) $2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(g)$

[Ans: (c) $2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(l)$]

Explanation: At room temperature, hydrogen and oxygen are available as gas, while water is available as liquid.

37. The catalyst used in the manufacture of ammonia is

- (a) Iron
- (b) MnO_2
- (c) Δ
- (d) Light

[Ans: (a) Iron]

38. Which of the following are combination reactions? [Exemplar]

- (i) $2\text{KClO}_3 \xrightarrow{\Delta} 2\text{KCl} + 3\text{O}_2$
- (ii) $\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2$
- (iii) $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
- (iv) $\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$
- (a) (i) and (iii) (b) (iii) and (iv)
- (c) (ii) and (iv) (d) (ii) and (iii)

[Ans: (d) (ii) and (iii)]

Explanation: In these reactions, two reactants react to form a single product.

39. Decomposition reactions are opposite of

- (a) displacement reaction
- (b) combination reaction
- (c) double displacement reaction
- (d) precipitation reaction

[Ans: (b) combination reaction]

40. Acid + Base \rightarrow Salt + water is a
 (a) double displacement reaction
 (b) precipitation reaction
 (c) neutralization reaction
 (d) combination reaction

[Ans: (c) neutralization reaction]

41. In the reaction between zinc oxide and carbon, which is reduced?
 (a) Zn
 (b) Zinc oxide
 (c) CO
 (d) C

[Ans: (b) Zinc oxide]

42. In the reaction between hydrogen sulphide and chlorine, one reducing agent is
 (a) Cl_2
 (b) H_2S
 (c) S
 (d) HCl

[Ans: (b) H_2S]

43. According to electronic concept, oxidation is the process of
 (a) gaining of electrons
 (b) losing of electrons
 (c) gaining or losing of electrons
 (d) none of these

[Ans: (b) losing of electrons]

44. PbS reacts with ozone (O_3) and forms $PbSO_4$. As per the balanced equation, molecules of ozone required for every one molecule of PbS is/are
 (a) 4 (b) 3 (c) 2 (d) 1

[Ans: (a) 4]

45. In an electrolytic cell where electrolysis is carried, anode has:
 (a) Positive charge
 (b) Negative charge
 (c) Connected to negative terminal of the battery
 (d) None of these is correct.

[Ans: (a) Positive change]

46. A substance which oxidizes itself and reduces other is known as
 (a) oxidising agent
 (b) reducing agent
 (c) both (a) and (b)
 (d) none of these.

[Ans: (b) reducing agent]

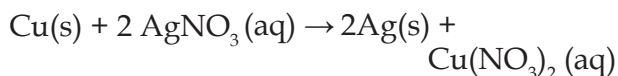
47. Dissolving sugar is an example of-
 (a) physical change
 (b) chemical change
 (c) redox Reaction
 (d) none of these.

[Ans: (a) physical change]

48. When dilute HCl is added to zinc pieces taken in a test tube
 (a) no change takes place
 (b) the colour of the solution becomes yellow.
 (c) a pungent smelling gas gets liberated.
 (d) small bubbles of H_2 gas appear on the surface of zinc pieces

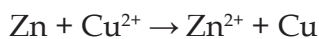
[Ans: (d) small bubbles of H_2 gas appear on the surface of zinc pieces.]

49. The species undergoing oxidation in the following reaction is



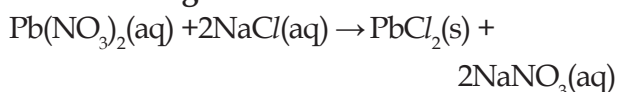
- (a) Cu (b) Cu^{2+}
 (c) $AgNO_3$ (d) Ag [Ans: (a) Cu]

50. The species acting as a reducing agent in the following reaction is



- (a) Zn (b) Cu^{2+}
 (c) Zn^{2+} (d) Cu [Ans: (a) Zn]

51. The white coloured precipitate formed in the following reaction is



- (a) NaCl (b) $PbCl_2$
 (c) $NaNO_3$ (d) $Pb(NO_3)_2$

[Ans: (b) $PbCl_2$]

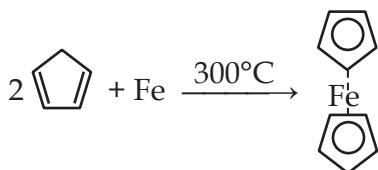
52. In the following reaction
 $\text{H}_2\text{SO}_4 + \text{Ca}(\text{OH})_2 \longrightarrow \text{CaSO}_4 + \text{A}$

What is A?

- (a) $2\text{H}_2\text{O}$ (b) H_3O^+
 (c) H_2O_2 (d) $3\text{H}_2\text{O}$

[Ans: (a) $2\text{H}_2\text{O}$]

53. The following reaction is an example of



- (a) combination reaction
 (b) decomposition reaction
 (c) neutralisation reaction
 (d) double-displacement reaction

[Ans: (a) combination reaction]

II. Assertion and Reason Type Questions

For the following questions, two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c), (d) and (e) as given below:

- (a) Both A and R are true, and R is correct explanation of the assertion.
 (b) Both A and R are true, but R is not the correct explanation of the assertion.
 (c) A is true, but R is false.
 (d) A is false, but R is true.
 (e) Both A and R are false.

1. **Assertion (A):** Nitrogen is flushed in potato chip packets to preserve acidity of potato chips.

Reason (R): Nitrogen prevents contact of chips to air and thus prevents oxidation.

Ans. (d) A is false, but R is true.

Nitrogen is flushed to avoid potato chips getting rancid.

2. **Assertion (A):** The chemical reaction during which hydrogen is lost, is called as reduction reaction.

Reason (R): Reducing agent removes hydrogen.

Ans. (e) Both A and R are false.

3. **Assertion (A):** Rusting of iron is a chemical change.

Reason (R): The chemical properties of hydrated iron oxide are different from iron and oxygen.

Ans. (a) Both A and R are true, and R is correct explanation of the assertion.

4. **Assertion (A):** Calcium carbonate on heating breaks into calcium oxide and carbon dioxide gas.

Reason (R): Calcium carbonate is a base.

Ans. (b) Both A and R are true, but R is not the correct explanation of the assertion.

CaCO_3 breaks due to thermal decomposition and it is an endothermic reaction.

5. **Assertion (A):** The colour of copper sulphate does not change when an iron nail is kept in it.
Reason (R): Iron is more reactive than copper and it displaces copper from copper sulphate.

Ans. (d) A is false, but R is true

The blue colour of Copper Sulphate solution will fade and the iron nail becomes brownish colour.

6. **Assertion (A):** In an endothermic reaction energy is absorbed from the surrounding.

Reason (R): ΔH of an endothermic reactions is positive

Ans. (a) Both A and R are true, but R is not the correct explanation of the assertion.

7. **Assertion (A):** Copper can displace silver from AgNO_3

Reason (R): Copper is more reactive than silver.

Ans. (a) Both A and R are true, and R is correct explanation of the assertion.

8. **Assertion (A):** Silver nitrate solution is kept in coloured reagent bottles in the laboratory.

Reason (R): Silver nitrate gets decomposed by sunlight.

Ans. (a) Both A and R are true, and R is correct explanation of the assertion.

9. **Assertion (A):** Most of the combination reactions are exothermic in nature.

Reason (R): Heat is absorbed when a chemical bond is formed.

Ans. (c) A is true, but R is false.

10. **Assertion (A):** Photosynthesis is an endothermic reaction.

Reason (R): During photosynthesis chlorophyll absorbs light energy from the sun.

Ans. (a) Both A and R are true, and R is correct explanation of the assertion.

III. Case - Based Type Questions

Read the following and answer the questions:

1. When the solution of a substance A is added to the solution of potassium iodide, then a yellow solid separates out from the solution.

(i) The solution A will be

- (a) lead nitrate (b) lead iodide
(c) silver nitrate (d) silver iodide

[Ans: (a) lead nitrate]

(ii) The yellow substance is

- (a) lead nitrate
(b) lead iodide
(c) silver nitrate
(d) silver iodide [Ans: (b) lead iodide]

(iii) Which characteristics of chemical reaction are formed?

- (a) Formation of heat
(b) Formation of precipitate
(c) Formation of gas
(d) Both (b) and (c)

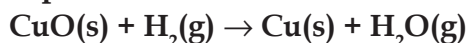
[Ans: (b) Formation of precipitate]

(iv) Which type of reaction is this?

- (a) Decomposition reaction
(b) Double displacement reaction
(c) Thermal decomposition reaction
(d) Redox reaction

[Ans: (b) Double displacement reaction]

2. When copper oxide reacts with hydrogen, it produces reddish brown copper and water vapour.



(i) What type of reaction is this?

- (a) Oxidation reaction
(b) Reduction reaction
(c) Redox reaction
(d) None of these

[Ans: (c) Redox reaction]

(ii) Which is getting oxidized in the above equation?

- (a) Hydrogen (b) Oxygen
(c) Both (d) None of these

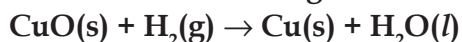
[Ans: (a) Hydrogen]

(iii) Which is getting reduced in the above equation?

- (a) Hydrogen (b) Oxygen
(c) Both (d) None of these

[Ans: (b) Oxygen]

3. Observe the reaction given below:



(i) The oxidising agent is the substance which

- (a) loses oxygen and gains hydrogen
(b) loses hydrogen and gains oxygen
(c) loses oxygen and hydrogen
(d) gains oxygen and hydrogen

[Ans: (a) loses oxygen and gains hydrogen]

(ii) The reducing agent is the substance which

- (a) loses oxygen and gains hydrogen
(b) loses hydrogen and gains oxygen
(c) loses oxygen and hydrogen
(d) gains oxygen and hydrogen

[Ans: (b) loses hydrogen and gains oxygen]

(iii) Is it true that the reduction process is just opposite of the oxidation process?

- (a) Yes
(b) No
(c) Not sure
(d) May be or may not be [Ans: (a) Yes]

(iv) In terms of electron, the substance which loses electron gets

- (a) oxidized (b) reduced
(c) both (a) and (b) (d) none of these

[Ans: (a) oxidized]

4. Corrosion is the process of slowly eating up of the metals due to the attack of atmospheric gases such as oxygen, carbon dioxide, hydrogen sulphide, water vapour etc. on the surface of the metals to convert the metals into oxides, carbonates, sulphides etc.

(i) The conditions for corrosion to take place is/are

- (a) air (b) moisture
(c) soil (d) both (a) and (b)

[Ans: (d) both (a) and (b)]

(ii) Rust is

- (a) hydrated ferric hydride
(b) hydrated ferric carbonate
(c) hydrated ferric oxide
(d) hydrated ferric sulphate

[Ans: (c) hydrated ferric oxide]

(iii) The formula of rust is

- (a) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ (b) $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$
(c) $x\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (d) $x\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

[Ans: (a) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$]

(iv) Which is the most corroding metal?

- (a) Lead (b) Iron
(c) Aluminium (d) Zinc

[Ans: (b) Iron]

5. You would have noticed that a food containing oil or fat, if left for a considerable time develops a bad taste and smell. This is because the oils and the fats in the food get oxidized on passage of time. The product formed i.e., the stale food are volatile and have bad odour.

(i) Which gas is used for packing fat and oil food?

- (a) Nitrogen (b) Hydrogen
(c) Helium (d) All of these

[Ans: (a) Nitrogen]

(ii) Anti-oxidants are

- (a) oxidising agents
(b) reducing agents
(c) both (i) and (ii)
(d) none of these

[Ans: (b) reducing agents]

(iii) Which is NOT followed in rancidity?

- (a) By storing foods containing fats and oils away from light
(b) By vacuum packing
(c) By keeping food in a refrigerator
(d) All of these

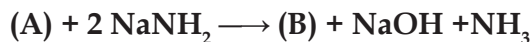
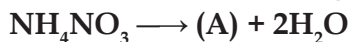
[Ans: (d) All of these]

(iv) Which are the anti-oxidants?

- (a) BHA and BTH
(b) BTH and Toluene
(c) BHA and Toluene
(d) BHT and BHA

[Ans: (d) BHT and BHA]

6. In an industrial scale, laughing gas (A) is prepared by heating ammonium nitrate at about 250°C . Even though laughing gas (A) is inert at room temperature, it reacts with NaNH_2 to give compound (B), which is used as a propellant in airbags.



(i) What is (A) and (B)?

- (a) $\text{A} = \text{NO}_2$ and $\text{B} = \text{NaN}_2$
(b) $\text{A} = \text{N}_2\text{O}$ and $\text{B} = \text{NaN}_3$
(c) $\text{A} = \text{NO}$ and $\text{B} = \text{NaN}_3$
(d) $\text{A} = \text{N}_2\text{O}$ and $\text{B} = \text{NaN}_2$

[Ans: (b) $\text{A} = \text{N}_2\text{O}$ and $\text{B} = \text{NaN}_3$]

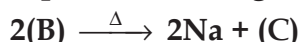
(ii) Which of the following method is not useful in the preparation of laughing gas?

- (a) The treatment of zinc with dilute nitric acid
(b) The action of hydroxylamine hydrochloride on sodium nitrite

- (c) The decomposition of ammonium nitrate
(d) The treatment of formic acid with sodium nitrate

[Ans: (d) The treatment of formic acid with sodium nitrate]

- (iii) Compound (B) decomposes on heating to give gas (C) which is used to quickly expand the air bag



The decomposition of (B) on heating is an example of

- (a) an endothermic reaction
(b) an exothermic reaction
(c) a precipitation reaction
(d) an acid-base reaction

[Ans: (a) an endothermic reaction]

- (iv) What is C?

- (a) 3N_2 (b) 4N_2
(c) 2O_2 (d) 2N_2

[Ans: (a) 3N_2]

7. When quicklime reacts with water it forms slaked lime with evolution of enormous amount of heat and energy. We can notice this reaction on touching the apparatus used for the reaction. Slaked lime is used to prepare the ammonia gas

- (i) The correct equation for the formation of slaked lime from quicklime is

- (a) $\text{CaO} + 2\text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2 + \text{H}_2\uparrow$
(b) $\text{CaO}_2 + \text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2 + \frac{1}{2}\text{O}_2$
(c) $\text{Ca}(\text{OH})_2 \longrightarrow \text{CaO} + \text{H}_2\text{O}$
(d) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$

[Ans: (c) $\text{Ca}(\text{OH})_2 \rightarrow \text{CaO} + \text{H}_2\text{O}$]

- (ii) The reaction between quicklime and water is

- (a) an exothermic reaction
(b) an endothermic reaction
(c) a decomposition reaction
(d) substitution reaction

[Ans: (a) an exothermic reaction]

- (iii) The correct chemical equation for the preparation of ammonia gas from slaked lime is

- (a) $\text{Ca}(\text{OH})_2 + 2\text{NH}_4\text{Cl} \longrightarrow 2\text{NH}_3 + \text{CaCl}_2 + 2\text{H}_2\text{O}$
(b) $\text{Ca}(\text{OH})_2 + \text{CO}_2 \longrightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
(c) $\text{CaO} + 2\text{NH}_4\text{Cl} \longrightarrow \text{CaCl}_2 + 2\text{NH}_3 + \text{H}_2\text{O}$
(d) $\text{CaCO}_3 + 2\text{NH}_4\text{Cl} \longrightarrow \text{CaCl}_2 + 2\text{NH}_3 + \text{H}_2\text{CO}_3$

[Ans: (a) $\text{Ca}(\text{OH})_2 + 2\text{NH}_4\text{Cl} \rightarrow 2\text{NH}_3 + \text{CaCl}_2 + 2\text{H}_2\text{O}$]

- (iv) Slaked lime is commonly used in the preparation of ____.

- (a) soda ash (b) washing soda
(c) lime mortar (d) vinegar

[Ans: (c) lime mortar]

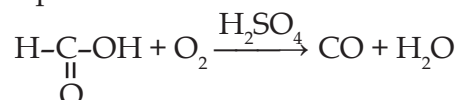
8. A 27-year old female was found unconscious in the front seat of her car. On the car floor was a five gallon plastic drum containing a funnel and hose. The drum contained a green oily fluid assumed to be a mixture of sulphuric acid and formic acid

- (i) Treatment of formic acid with concentrated sulphuric acid gives _____ (JAM - 2020)

- (a) $\text{CO} + \text{H}_2\text{O}$ (b) $\text{CO}_2 + \text{H}_2$
(c) $\text{HCHO} + \frac{1}{2}\text{O}_2$ (d) No product

[Ans: (a) $\text{CO} + \text{H}_2\text{O}$]

Explanation:



- (ii) How did the product of sulphuric acid and formic acid caused unconsciousness?

- (a) By increasing the stability of the bond between haemoglobin and the product
(b) By decreasing the stability of the bond between haemoglobin and the product
(c) By decreasing the stability of the bond between haemoglobin and Oxygen
(d) None of these

[Ans: (a) By increasing the stability of the bond between haemoglobin and the product]

Explanation:

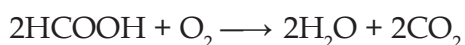
When the stability of haemoglobin and oxygen bond is increased, the ability of haemoglobin to release oxygen is reduced. Thus the supply of oxygen is decreased causing unconsciousness.

(iii) Formic acid upon combustion gives ____.

- (a) $2\text{H}_2\text{O} + 2\text{CO}_2$ (b) $\text{H}_2\text{O} + \text{CO}$
 (c) $\text{H}_2\text{O} + \text{CH}_4$ (d) $\text{CH}_4 + \text{CO}_2$

[Ans: (a) $2\text{H}_2\text{O} + 2\text{CO}_2$]

Explanation:



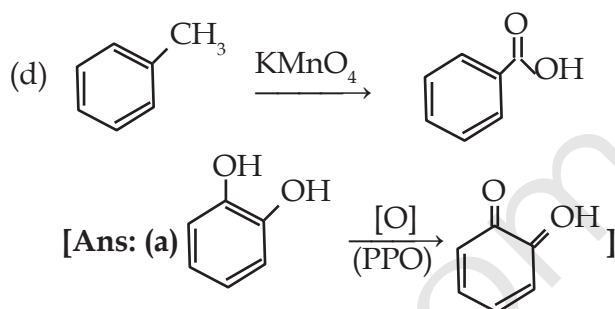
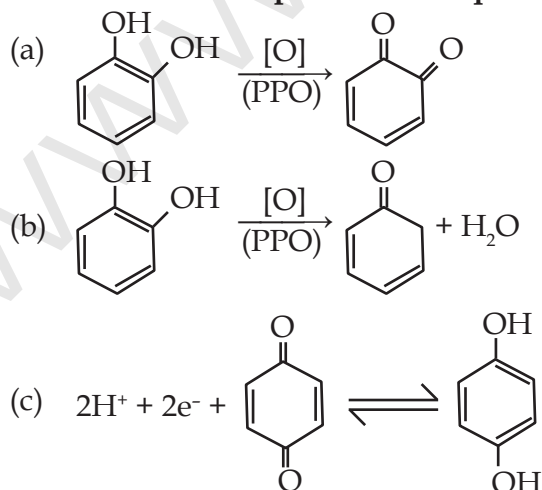
(iv) Combustion of formic acid is an ____.

- (A) Exothermic reaction
 (B) Endothermic reaction
 (C) Decomposition reaction
 (D) decarboxylation reaction
 (a) (A) and (B) (b) (B) and (C)
 (c) (C) and (D) (d) (A) and (D)

[Ans: (d) (A) and (D)]

9. When an apple is cut, oxygen is introduced into the injured plant tissues. When oxygen is present in cells, PPO (enzyme) rapidly converts the phenolic compounds present in apple to O - quinones, a colorless precursor to the brown coloured secondary products.

(i) Choose the correct a reaction for the conversion of phenols to O-quinone



(ii) PPO reacts best at the pH of ____.

- (a) 7 (b) 6
 (c) 3 (d) 8 [Ans: (a) 7]

(iii) The conversion of polyphenol to O-quinone is a ____.

- (a) Oxidation reaction
 (b) reduction reaction
 (c) redox reaction
 (d) combustion reaction

[Ans: (a) Oxidation reaction]

(iv) The individual O-quinone connect together to form a larger molecule. This process is called ____.

- (a) precipitation (b) polymerisation
 (c) sublimation (d) reduction

[Ans: (b) polymerisation]

10. Thermonuclear bomb also called hydrogen bomb or H-bomb, produces enormous amount of energy by performing an uncontrolled self-sustaining chain reaction. The high temperatures that required for the reaction are produced by the detonation of an atomic bomb.

(i) The detonation of H-bomb is an ____.

- (a) exothermic reaction
 (b) endothermic reaction
 (c) slow reaction
 (d) redox reaction

[Ans: (a) exothermic reaction]

(ii) A chain reaction is initiated in H-bomb by ____.

- (a) nuclear fission (b) nuclear fusion
 (c) redox reaction (d) reduction

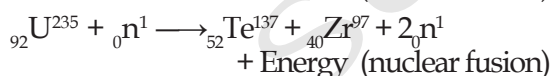
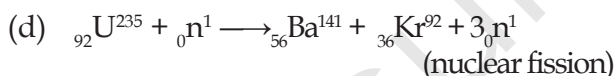
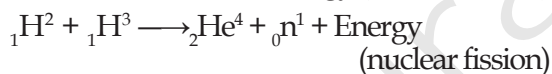
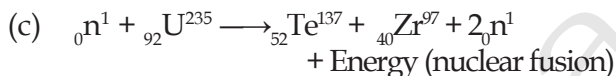
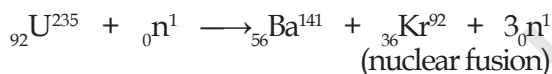
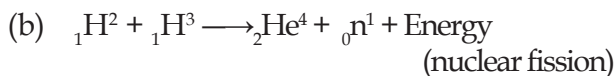
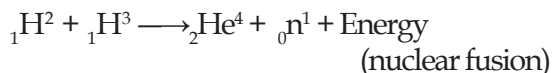
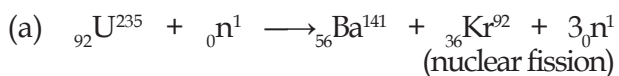
[Ans: (b) nuclear fusion]

(iii) The energy produced by nuclear fusion is

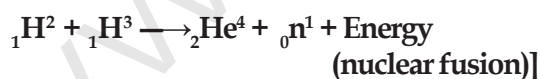
- (a) greater than the energy produced by nuclear fission
- (b) less than the energy produced by nuclear fission
- (c) equal to the energy produced by nuclear fission
- (d) None of these

[Ans: (a) greater than the energy produced by nuclear fission]

(iv) Choose the correct set of examples for the nuclear fission and nuclear fusion reaction?



[Ans: (a) ${}_{92}\text{U}^{235} + {}_0\text{n}^1 \longrightarrow {}_{56}\text{Ba}^{141} + {}_{36}\text{Kr}^{92} + 3{}_0\text{n}^1$
(nuclear fission)]



Explanation:

In nuclear fission reactions, the nucleus of an atom splits into two or more smaller nuclei with the release of energy. In nuclear fusion reactions, two or more atomic nuclei combine to form one or more different atomic nuclei and subatomic particles with the evolution of energy. ${}_{92}\text{U}^{235}$ atom splits into K and Ba thus it is a nuclear fission reaction. Whereas ${}_1\text{H}^2$ and ${}_1\text{H}^3$ atoms joins together to form ${}_2\text{He}^4$ thus it is a nuclear fusion reaction.

11. Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings. [CBSE-QBank]

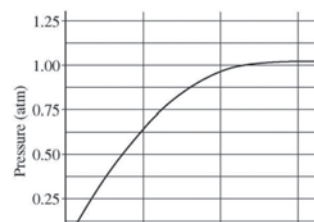


(i) The substance not likely to contain CaCO_3 is

- (a) Dolomite
- (b) A marble statue
- (c) Calcined gypsum
- (d) Sea shells.

[Ans: (a) white precipitate is obtained]

(ii) A student added 10g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?



- (a) 15-20 min
- (b) 10-15 min
- (c) 5-10 min
- (d) 0-5 min

[Ans: (d) 0-5 min]

(iii) Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process -

- (a) Respiration
- (b) Photosynthesis
- (c) Transpiration
- (d) Photolysis [Ans: (b) Photosynthesis]

- (iv) Marble statues are corroded or stained by rain water. Identify the main reason



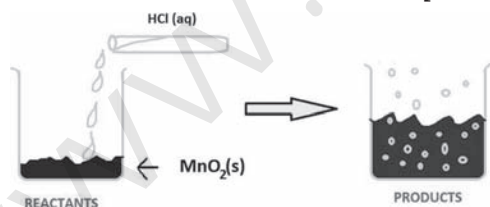
- (a) decomposition of calcium carbonate to calcium oxide
 (b) polluted water is basic in nature hence it reacts with calcium carbonate
 (c) polluted water is acidic in nature hence
 (d) calcium carbonate dissolves in water to give calcium hydroxide.

[Ans: (b) polluted water is basic in nature hence it reacts with calcium carbonate]

- (v) Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?
- (a) Sodium
 (b) Sodium oxide
 (c) Calcium
 (d) Calcium oxide

[Ans: (d) calcium oxide]

12. The reaction between MnO_2 with HCl is depicted in the following diagram. It was observed that a gas with bleaching abilities was released. [CBSE-QBank]



- (i) The chemical reaction between MnO_2 and HCl is an example of:
- (a) displacement reaction
 (b) combination reaction
 (c) redox reaction
 (d) decomposition reaction.

[Ans: (c) redox reaction]

- (ii) Chlorine gas reacts with _____ to form bleaching powder.

- (a) dry Ca(OH)_2
 (b) dil. solution of Ca(OH)_2
 (c) conc. solution of Ca(OH)_2
 (d) dry CaO

[Ans: (a) dry Ca(OH)_2]

- (iii) Identify the correct statement from the following:

- (a) MnO_2 is getting reduced whereas HCl is getting oxidized
 (b) MnO_2 is getting oxidized whereas HCl is getting reduced.
 (c) MnO_2 and HCl both are getting reduced.
 (d) MnO_2 and HCl both are getting oxidized.

[Ans: (a) MnO_2 is getting reduced whereas HCl is getting oxidized]

- (iv) In the above discussed reaction, what is the nature of MnO_2 ?

- (a) Acidic oxide
 (b) Basic oxide
 (c) Neutral oxide
 (d) Amphoteric oxide

[Ans: (b) Basic oxide]

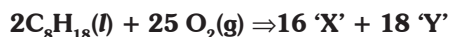
- (v) What will happen if we take dry HCl gas instead of aqueous solution of HCl ?

- (a) Reaction will occur faster.
 (b) Reaction will not occur.
 (c) Reaction rate will be slow
 (d) Reaction rate will remain the same.

[Ans: (b) Reaction will not occur]

13. For an internal combustion engine to move a vehicle down the road, it must convert the energy stored in the fuel into mechanical energy to drive the wheels. In your car, the distributor and battery provide this starting energy by creating an electrical "spark", which helps in combustion of fuels like gasoline.

Below is the reaction depicting complete combustion of gasoline in full supply of air:



[CBSE-QBank]

(i) Which of the following are the products obtained from the reaction mentioned in the above case?

- (a) $\text{X}=\text{CO}_2$ and $\text{Y}=\text{H}_2\text{O}_2$
- (b) $\text{X}=\text{H}_2\text{O}$ and $\text{Y}=\text{CO}$
- (c) $\text{X}=\text{CH}_3\text{OH}$ and $\text{Y}=\text{H}_2\text{O}$
- (d) $\text{X}=\text{CO}_2$ and $\text{Y}=\text{H}_2\text{O}$

[Ans: (d) $\text{X}=\text{CO}_2$ and $\text{Y}=\text{H}_2\text{O}$]

(ii) Identify the types of chemical reaction occurring during the combustion of fuel:

- (a) Oxidation & Endothermic reaction
- (b) Decomposition & Exothermic reaction
- (c) Oxidation & Exothermic reaction
- (d) Combination & Endothermic reaction

[Ans: (c) Oxidation & Exothermic reaction]

(iii) On the basis of evolution/absorption of energy, which of the following processes are similar to combustion of fuel?

- (A) Photosynthesis in plants
 - (B) Respiration in the human body
 - (C) Decomposition of vegetable matter
 - (D) Decomposition of ferrous sulphate.
- (a) (B) & (C) (b) (A) & (B)
- (c) (C) & (D) (d) (B) & (A)

[Ans: (a) Photosynthesis in plants]

(iv) 'A student while walking on the road observed that a cloud of black smoke belched out from the exhaust stack of moving trucks on the road.' Choose the correct reason for the production of black smoke:

- (a) Limited supply of air leads to incomplete combustion of
- (b) Rich supply of air leads to complete combustion of fuel.
- (c) Rich supply of air leads to a combination reaction.
- (d) Limited supply of air leads to complete combustion of fuel.

[Ans: (a) Limited supply of air leads to incomplete combustion of]

(v) 'Although nitrogen is the most abundant gas in the atmosphere, it does not combustion'. Identify the correct reason for this statement.

- (a) Nitrogen is a reactive gas
- (b) Nitrogen is an inert gas
- (c) Nitrogen is an explosive gas
- (d) Only hydrocarbons can take part in combustion

[Ans: (b) Nitrogen is an inert gas]

