



TEACHING PLAN: CH-102

SCHOOL: SOBAS		ACADEMIC SESSION: 2023-2024		FOR STUDENTS' BATCH: II SEMESTER	
1	Course code	CH-102			
2	Course Title	INORGANIC CHEMISTRY			
3	Credits				
4	Learning Hours	Contact Hours		54	
		Practical Teaching		27	
		Project, Tutorial and Assessment		09	
		Total hours		90	
5	Course Objective	<p>The purpose of this course is to provide:</p> <ol style="list-style-type: none"> 1. Broad and balance knowledge in chemistry in addition to understanding of key chemical concepts, principles and theories. 2. To develop students' ability and skill to acquire expertise over solving both theoretical and applied chemistry problems. 3. To provide knowledge and skill to the students' thus enabling them to undertake further studies in chemistry in related areas or multidisciplinary areas that can be helpful for self-employment/entrepreneurship. 			
6	Course Outcomes	<ol style="list-style-type: none"> 1. To know the conception of different types of hydrogen bonding and the effects of these. To learn about van der Waals forces on properties of substances. 2. To know about the diagonal relationship among s- block elements and about hydrides, oxides, hydroxides and halides of s-block elements. 3. Learn about chemistry of noble gases with emphasizing to xenon. 4. To know about the physical and chemical properties of p-block elements and have knowledge about the boron family elements their structure, preparation and properties of diborane and borazine. 5. Students can gain thorough knowledge about elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons. They will know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur. 			
7	Outline syllabus:				
7.01	Paper Code	Unit	Introduction	Reference number	Teaching methods
7.02	CH-102 UNIT-I HYDORGEN BONDING & VAN DER WALL'S FORCES	(a)	Hydrogen bonding	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(b)	Van Der Waal's forces	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(c)	Metallic Bond	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
7.03	CH-102 UNIT-II	(a)	Basic Properties	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion

	s-BLOCK ELEMENTS CHEMISTRY OF NOBLE GASES	(b)	Diagonal Relationship	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(c)	Chemical Properties	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
7.04	CH-102 UNIT-III P BLOCK ELEMENTS BORON FAMILY CARBON FAMILY	(a)	Basic Properties	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(b)	Diagonal Relationship	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(c)	Chemical Properties	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
7.05	CH-102 UNIT-IV NITROGEN FAMILY OXYGEN FAMILY HALOGEN FAMILY	(a)	Basic Properties	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(b)	Diagonal Relationship	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
		(c)	Chemical Properties	J.D. Lee Puri, Sharma, Kalia	Lecture, Blackboard, PPT, Discussion
8	Course Evaluation				
8.10	CA: 20%				
8.1	Attendance	5%			
8.12	Homework	-			
8.13	Quizzes	4 Quizzes, 5%			
8.14	Projects	1 Project, 5%			
8.15	Presentation	1 Presentation, 5%			
8.16	Any other	--			
8.2	MTE(IA)	20%			
8.3	End-term examination: 60%				
9	Text Books & References				
9.1	Text books	Concise Inorganic Chemistry: J.D. Lee Principles of Inorganic Chemistry: Puri, Sharma, Kalia			
9.2	References	Inorganic Chemistry, J.E. Huheey			
9.3	Video References	https://www.youtube.com/watch?v=b7veCCCo0d0 https://www.youtube.com/watch?v=664YicsoYkg https://www.youtube.com/watch?v=k8tYXDk2yE https://www.youtube.com/watch?v=4Yetd0QIRTo https://www.youtube.com/watch?v=MqJiz_zKnjk https://www.youtube.com/watch?v=pQiZ0UWlg4w https://www.youtube.com/watch?v=qNaBMvJXdJ4 https://www.youtube.com/watch?v=aU6MPFdyjmo https://www.youtube.com/watch?v=yW_C10cEzMk			

Mapping of Outcomes v. Topics

Outcome no. → Syllabus topic↓	1	2	3	4	5
Paper Code. Unit I (a)	Y				
Paper Code. Unit I (b)	Y				
Paper Code. Unit I (c)	Y				
Paper Code. Unit II (a)		Y	Y		
Paper Code. Unit II (b)		Y	Y		
Paper Code. Unit II (c)		Y	Y		
Paper Code. Unit III (a)				Y	
Paper Code. Unit III (b)				Y	
Paper Code. Unit III (c)				Y	
Paper Code. Unit IV (a)					Y
Paper Code. Unit IV (b)					Y
Paper Code. Unit IV (c)					Y

QUESTION BANK

Objective type:

UNIT I:

- In the following which has highest boiling point
(a) HI (b) HF (c) HBr (d) HCl
- The reason for exceptionally high boiling point of water is
(a) Its high specific heat (b) Its high dielectric constant (c) Low ionization of water molecules
(d) Hydrogen bonding in the molecules of water
- Which contains strongest H-bond
(a) O-H.....S (b) S-H.....O (c) F-H.....F (d) S-H.....O
- Which among the following compounds does not show hydrogen bonding?
(a) Chloroform (b) Ethyl alcohol (c) Acetic acid (d) Ethyl ether
- Van der Waals forces are
(a) short-range forces (b) long-range forces (c) null forces (d) depends on the atoms and molecules
- Which bonds can be considered to have Van der waal force of interaction?
(a) Covalent bond (b) Ionic bond (c) Hydrogen bond (d) Coordinate bond
- What causes van der Waals forces?
- What is Vander Wall interaction?
- In a crystal, covalent molecules are held together by
(a) Dipole-dipole attraction
(b) Hydrogen bonds

(c) Van der Waals attraction

(d) Electrostatic attraction

Ans: (c)

10. The Atoms of solid Ar are held together by

(a) Van der Waals forces

(b) Hydrogen bonds

(c) Ionic bonds

(d) Hydrophobic forces

Ans: (a)

UNIT II

1. Which of the compounds is known as Slaked lime?

(a) CaO (b) CaSO₄ (c) Ca(OH)₂ (d) CaCO₃

2. Which of the ions have maximum hydration energy?

(a) Sr⁺² (b) Ca⁺² (c) Mg⁺² (d) Be⁺²

3. As compared to K, Na has

(a) higher ionization potential (b) lower melting point (c) lower electronegativity (d) larger atomic radius

4. Which one is the most stable carbonate?

(a) BaCO₃ (b) MgCO₃ (c) CaCO₃ (d) BeCO₃

5. Which oxide is amphoteric?

(a) BaO (b) CaO (c) BeO (d) MgO

6. Which of the ions have maximum hydration energy?

(a) Sr²⁺, (b) Ca²⁺, (c) Mg²⁺, (d) Be²⁺

Answer: (d)

7. The tendency to lose their valence electron easily by alkali metals makes them

(a) strong reducing agent (b) weak reducing agent (c) strong oxidising agent (d) weak oxidising agent

8. Find the incorrect trend for alkaline earth metals

(a) atomic size Be < Mg < Ca < Sr

(b) second ionization energy Be < Mg < Ca < Sr

(c) Hydration enthalpy Sr < Ca < Mg < Be

(d) Density Ca < Mg < Be < Sr

9. Be shows the diagonal relationship with

(a) Na (b) Al (c) Mg (d) B

10. Partial hydrolysis of XeF₆ yields:

(a) Xenon trioxide (b) Xenon tetrafluoride (c) Xenon dioxydifluoride (d) Xenon oxyfluoride

11. Which of the following noble gases do not occur in the elemental state in the atmosphere?

(a) Helium (b) Neon (c) Argon (d) Radon

12. Which of the following statements is incorrect about noble gases?

(a) They are monoatomic (b) They are colourless (c) They are odourless (d) They all have an outer electronic configuration of ns^2np^6

UNIT III

1. The structure of diborane (B_2H_6) contains

- a) four 2C - 2e bonds and two 3C - 2e bonds
- b) two 2C - 2e bonds and four 3C - 2e bonds
- c) two 2C - 2e bonds and two 3C - 2e bonds
- d) four 2C - 2e bonds and four 3C - 2e bonds

Ans: (a)

2. The type of hybridisation of boron in diborane is?

- a) sp^3 -hybridisation
- b) sp^2 -hybridisation
- c) sp-hybridisation
- d) sp^3d^2 -hybridisation

Ans: (a)

3. The tendency of BF_3 , BCl_3 and BBr_3 to behave as Lewis acid decreases in the sequence?

- a) $BCl_3 > BF_3 > BBr_3$
- b) $BBr_3 > BCl_3 > BF_3$
- c) $BBr_3 > BF_3 > BCl_3$
- d) $BF_3 > BCl_3 > BBr_3$

Ans: (b)

4. Boron compounds behave as Lewis acids, because of their?

- a) ionisation property
- b) electron deficient nature
- c) acidic nature
- d) covalent nature

Ans: (b)

5. The boiling points of hydrides of group 16 are in the order

- (a) $H_2O > H_2Te > H_2S > H_2Se$
- (b) $H_2O > H_2S > H_2Se > H_2Te$
- (c) $H_2O > H_2Te > H_2Se > H_2S$
- (d) None of these

6. In the manufacture of sulphuric acid by contact process Tyndall box is used to

- (a) convert SO_2 and SO_3
- (b) test the presence of dust particles
- (c) filter dust particles
- (d) remove impurities

7. Fluorine differs from rest of the halogens in some of its properties. This is due to

(a) its smaller size and high electronegativity (b) lack of d-orbitals (c) low bond dissociation energy
(d) All of the these

8. The increasing order of reducing power of the halogen acids is

(a) $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$ (b) $\text{HI} < \text{HBr} < \text{HCl} < \text{HF}$ (c) $\text{HBr} < \text{HCl} < \text{HF} < \text{HI}$

(d) $\text{HCl} < \text{HBr} < \text{HF} < \text{HI}$.

9. The ionic carbide is

(a) ZnC (b) TiC (c) SiC (d) CaC_2

10. Which of the following oxidation States to group 14 elements exhibit?

(a) +1, +5 (b) +5, +2 (c) +2, +4 (d) +3, +5

11. Purification of aluminium, by electrolyte refining, is known as

(a) Hall's process (b) Baeyer's process (c) Hoopé's process (d) Serpeck's process

12. Which of the following is the most basic oxide?

(a) Al_2O_3 (b) Sb_2O_3 (c) Bi_2O_3 (d) SeO_2

UNIT IV

1. The laughing gas is

a) Nitrous oxide

b) Dinitrogen trioxide

c) Nitric oxide

d) Nitrogen peroxide

Ans: (a)

2. Which of the following is most metallic

a) P

b) As

c) Sb

d) Bi

Ans: (d)

3. In aqua-regia the ratio of conc. HNO_3 and conc. HCl present is

a) 1 : 3

b) 3 : 1

c) 2 : 3

d) 3 : 2

Ans: (a)

4. Which of the following is most acidic?

(a) N_2O_5 (b) P_2O_5 (c) As_2O_5 (d) Sb_2O_5

5. Which of the following phosphorus, is the most reactive?

- (a) Red phosphorus (b) White phosphorus (c) Scarlet phosphorus (d) Violet phosphorus
6. Producer gas is a mixture of
(a) CO and N₂ (b) CO₂ and H₂ (c) CO and H₂ (d) CO₂ and N₂
7. The solubility of iodine in water increases in the presence of
(a) Alcohol (b) Chloroform (c) Sodium hydroxide (d) Potassium iodide
8. Bromine is liberated when an aqueous solution of potassium bromide is treated with
(a) Cl₂ (b) I₂ (c) Dilute H₂SO₄ (d) SO₂

Subjective type

UNIT I

1. What is Hydrogen Bonding?
2. What are the Conditions for Hydrogen Bonding?
3. Discuss the effects of Hydrogen Bonding on Elements.
4. Discuss the types of Hydrogen Bonding with example.
5. Discuss the properties of Hydrogen Bonding.
6. What is Metallic Bonding?
7. Describe the Electron Sea Model of Metallic Bonding.
8. What are Van der Waals Forces? Discuss the types of Van der Waals Forces.
9. What are the characteristics of Van der Waals Forces?
10. Discuss the factors Affecting Van der Waals Forces.
11. Are Hydrogen Bonds a Type of Van der Waals Force?

UNIT II

1. Why the elements of group I are called alkali metals?
2. Why are they so reactive?
3. Discuss the important traits of alkali metals.
4. Why and how Li differs from the alkali metals?
5. What is meant by diagonal relationship? In what respects Li resembles to Mg?
6. Give a brief accounts for oxides and hydroxides of alkaline earth metals.
7. What is back bonding?
8. Discuss the nature of bonding in B₂H₆.
9. Why BBr₃ is better Lewis acid than BF₃?

UNIT III

1. Why does Boron Nitride differ from that of Graphite?
2. What are carboranes? How are they classified?
3. Explain why BCl₃ is monomeric and AlCl₃ is dimeric.
4. What is catenation property?
5. Why CO₂ is gas and SiO₂ is highly stable solid?
6. What are the uses of Silicon Carbide in industry?
7. Discuss the structure of silicon carbide.
8. Discuss the structure of Graphite and Diamond.

UNIT IV

1. Why N shows anomalous behaviour with comparison to other group members?

2. Explain: PF_5 is known but NF_5 is not.
3. Give a detailed description of HNO_2 and HNO_3 .
4. Explain the structures of oxoacids of P.
5. Explain: Why S is solid where O_2 is gas.
6. Give the structures of SO_2 and SO_3 with detailed explanation.
7. Explain: SF_6 is known but SCl_6 is not.
8. Why Iodine exhibits some metallic character.
9. Account for the following order of the acid strength: $\text{HOCl} > \text{HOBr} > \text{HOI}$
10. Why does fluorine differs from the rest of the family members?
11. Explain the acidity of oxoacids of P.

PROJECTS (To be given to group of students)
