

D 93387

(Pages : 2)

Name.....

Reg. No.....

**FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2020**

(CBCSS)

Chemistry

CHE 1C 02—ELEMENTARY INORGANIC CHEMISTRY

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. In cases where choices are provided, students can attend **all** questions in each section.
2. The minimum number of questions to be attended from the Section / Part shall remain the same.
3. There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.

Section A*Answer any **eight** questions.**Each question carries a weightage of 1.*

1. The electrical conductivity of liquid ammonia is increased when ammonium chloride is dissolved in it ; why ?
2. What is symbiosis ? Explain.
3. Classify the following into *closo/nido/arachno* structures :
a) B_5H_9 b) $(B_8H_8)^{2-}$ c) $C_2B_3H_5$ d) B_4H_{10}
4. Discuss the consequences of isomorphous substitution in silicates.
5. Explain, why $P_4N_4Cl_8$ is puckered while $P_4N_4F_8$ is planar ?
6. What are interstitial carbides ? Give examples.
7. What are Ellingham diagrams ? Account for the abrupt changes in these diagrams.
8. What is the significance of 'Q' values in nuclear reactions ?
9. How is uranyl sulphate prepared ? Give the equation.
10. Comment on the size-dependent properties of cadmium selenide.

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any six questions.

Each question carries a weightage of 2.

11. Explain Lux-Flood theory of acids and bases.
12. What are Frost diagrams? Discuss their applications.
13. How do substituted borazines are prepared? Give a brief account of the structure and bonding in borazine.
14. Give a brief account of the synthesis, structure and properties of $(\text{SN})_x$, S_2N_2 and S_4N_4 .
15. Discuss the principle involved in neutron activation analysis.
16. Write a note on trans-actinide elements.
17. How do graphenes differ from fullerenes?
18. Write briefly on diagnostic and therapeutic applications of nanomaterials.

(6 × 2 = 12 weightage)

Section C

Answer any two questions.

Each question carries a weightage of 5.

19. Give the important characteristics of ammonia as a solvent. Discuss briefly, the precipitation reaction that occur in ammonia.
20. How is 1, 2-dicarba-closo-dodecaborane(12) prepared? Write a note on its isomerism. Compare the acidity of the different types of hydrogen atoms present in carboranes.
21. a) Write an account on the synthesis, structure and uses of silicones.
b) Write briefly on the classification of carbides.
22. Write an account on heteropoly and isopoly anions of W and Mo.

(2 × 5 = 10 weightage)

D 13103

(Pages : 2)

Name.....

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**FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2021**

(CBCSS)

Chemistry

CHE 1C 02—ELEMENTARY INORGANIC CHEMISTRY

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend **all** questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*
4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A*Answer any **eight** questions.**Each question carries a weightage of 1.*

1. All Bronsted bases may not be Arrhenius bases. Substantiate this statement with suitable example.
2. Classify the following into *closo/nido/arachno* structures :

a) $[B_{12}H_{12}]^{2-}$.	b) CB_8H_{12} .
c) $C_2B_{10}H_{12}$.	d) B_4H_{10} .
3. How is polythiazyl prepared ? Comment on the metallic property of this compound.
4. Aluminium can reduce FeO to Fe below $1500^\circ C$; but aluminium will not reduce MgO to Mg below $1500^\circ C$. Give reasons.
5. What is the significance of nuclear reaction cross section ?
6. Distinguish between SEM and TEM.
7. 'Bases that are weak in water may appear stronger in more strongly proton donating solvent'. Substantiate this statement with an example.

Turn over

8. Arrange the different types of hydrogen atoms present in carboranes in the increasing order of acidity. Justify your answer.
9. Bring out the reasons for water repellent nature of silicones.
10. What information do we get from Latimer diagram ? Explain.

(8 × 1 = 8 weightage)

Section B

Answer any **six** questions.

Each question carries a weightage of 2.

11. Explain leveling effect of solvents with suitable examples.
12. How is tetrasulphur tetranitride prepared ? Give its structure. Comment on the thermochromism exhibited by this compound.
13. How is 1, 2-dicarbido-closo-dodecaborane(12) prepared ? What happens when it is heated ?
14. Write briefly on the heteropoly and isopoly anions of Mo.
15. Explain how energy is produced in the sun and stars.
16. Explain with suitable examples, the bottom up and top-down approaches for the synthesis of nanomaterials.
17. How XRD is useful in the characterization of nanomaterials ?
18. Compare the differences between 4f and 5f orbitals and the consequences of these on the properties of lanthanides and actinides.

(6 × 2 = 12 weightage)

Section C

Answer any **two** questions.

Each question carries a weightage of 5.

19. Discuss the theoretical basis of classifying acids and bases as 'hard' and 'soft'. Comment on the chemical consequences of this concept in the study of coordination compounds.
20. a) Discuss the importance of icosahedral frame work of boron atoms in boron chemistry.
b) Write a note on sandwich type metallocarboranes. (3 + 2 = 5 marks)
21. Write an account on the classification of silicates based on their structure giving examples. Discuss the consequences of isomorphous substitution in silicates.
22. Outline the theory and experimental setup involved in neutron activation analysis. Comment on the merits and demerits of this technique.

[2 × 5 = 10 weightage]

D 32672

(Pages : 2)

Name.....

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**FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2022**

(CBCSS)

Chemistry

CHE 1C 02—ELEMENTARY INORGANIC CHEMISTRY

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

Section A

*Answer any **eight** questions.
Each question has 1 weightage.*

1. Carbon monoxide behaves as a Lewis base towards diborane ; but not towards BF_3 . Why ?
2. The acid-base strength is not an inherent property of a substance and it largely depends on the reference solvent ; justify this statement.
3. What is 'inorganic graphite' ? Why is it called so ?
4. Classify the following compounds into *closo*, *nido* and *arachino* structures :
 - a) B_5H_9 .
 - b) B_4H_{10} .
 - c) B_5H_{11} .
 - d) $\text{C}_2\text{B}_{10}\text{H}_{12}$.
5. Discuss the consequences of isomorphous substitution on silicates.
6. Comment on the metallic property of polythiazyl.
7. What are super heavy elements ? Give examples.
8. Account for the abrupt changes in the Ellingham diagrams.
9. What do you mean by radiation dosimetry ?
10. How do graphenes differ from fullerenes ?

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any **six** questions.

Each question carries 2 weightage.

11. What do you mean by differentiating and levelling solvents ? Explain with suitable examples.
12. Comment on the acidity of the different types of hydrogen atoms present in carboranes.
13. Describe the synthesis and structure of S_4N_4 . Comment on the thermochromism exhibited by this compound.
14. What are Latimer and Frost diagrams ? Mention their uses.
15. Discuss the liquid drop model of nucleus.
16. Describe the bottom-up and top-down approaches for the synthesis of nanomaterials giving examples.
17. Describe the principle involved and working of GM counter.
18. Discuss the applications of XRD in the study of nanomaterials.

(6 × 2 = 12 weightage)

Section C

Answer any **two** questions.

Each question carries 5 weightage.

19. What are the important characteristics of liquid ammonia as a solvent? Briefly discuss the precipitation reactions taking place in liquid ammonia.
20. Describe the methods of preparation of borazine and substituted borazines. Describe the structure and important reactions of borazine.
21. Give an account of the isopoly and heteropoly anions of W and Mo.
22. Discuss the synthesis, structure and reactivity of $(PNCl_2)_3$. What are the important uses of phosphazines ?

(2 × 5 = 10 weightage)

D 52779

(Pages : 2)

Name.....

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**FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2023**

(CBCSS)

Chemistry

CHE 1C 02—ELEMENTARY INORGANIC CHEMISTRY

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

Section A*Answer any eight questions.**Each question carries a weightage of 1.*

- Distinguish between Lewis concept and Lux-Flood concept of acids and bases.
- Arrange the following complex species in the increasing order of acid strength and substantiate your answer.
 $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{V}(\text{H}_2\text{O})_6]^{3+}$.
- Arrange the different types of hydrogen atoms present in carboranes in the increasing order of acidity. Give reasons for your answer.
- Using Wade's rule, classify the following compounds into *closo*, *nido*, *arachno* and *hypo* boranes :
 a) B_4H_{10} b) $\text{C}_2\text{B}_3\text{H}_5$ c) B_5H_{11} and d) $\text{C}_2\text{B}_3\text{H}_5\text{Fe}(\text{CO})_3$
- How does polythiazyl behave as 'one dimensional metal' ?
- How is triphosphonitrilic chloride converted into phospham ?
- What are super heavy elements ? How are they produced ?
- The ratio between atoms of two radioactive elements A and B at equilibrium was found to be $3.1 \times 10^9 : 1$. If half-life period of A is 2×10^{10} years, what is the half-life period of B ?
- Write a note on stellar energy.
- How do carbon nanotubes differ from fullerenes ?

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any **six** questions.

Each question carries a weightage of 2.

11. What is Symbiosis ? Explain with examples.
12. How is S_4N_4 prepared ? Discuss its structure and properties.
13. Give an account of the classification of silicates.
14. What are Latimer and Frost diagrams ? Discuss their applications.
15. Describe the working principle of a GM counter.
16. Discuss the bottom-up and top-down approaches for the synthesis of nanomaterials.
17. Discuss the principle and applications of XPS.
18. Give an account of the synthesis and structure of $(NPCl_2)_3$.

(6 × 2 = 12 weightage)

Section C

Answer any **two** questions.

Each question carries a weightage of 5.

19. Discuss the HSAB concept of acids and bases. Explain with suitable examples. How this concept predicts the co-ordination of ambidentate ligands.
20. How are B- and N- substituted borazines prepared ? Give an account of the structure and bonding in borazine. Compare its reactivity with that of benzene.
21. Give an account of the heteropoly and isopoly anions of W and Mo.
22. Elaborate the principle and instrumentation of neutron activation analysis. Mention its merits and demerits.

(2 × 5 = 10 weightage)