

Write the following information in the first page of Answer Script before starting answer

ODD SEMESTER EXAMINATION: 2020-21

Exam ID Number _____

Course _____ Semester _____

Paper Code _____ Paper Title _____

Type of Exam: _____ (Regular/Back/Improvement)

Important Instruction for students:

1. Student should write objective and descriptive answer on plain white paper.
2. Give page number in each page starting from 1st page.
3. After completion of examination, Scan all pages, convert into a single PDF, rename the file with Class Roll No. **(2019MBA15)** and upload to the Google classroom as attachment.
4. Exam timing from 10am – 1pm (for morning shift).
5. Question Paper will be uploaded before 10 mins from the schedule time.
6. Additional 20 mins time will be given for scanning and uploading the single PDF file.
7. Student will be marked as ABSENT if failed to upload the PDF answer script due to any reason.

B.Sc. CHEMISTRY
THIRD SEMESTER
INORGANIC CHEMISTRY-II
BSC-301

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs.

Full Marks : 70

[PART-A : Objective]

Time : 20 min.

Marks : 20

Choose the correct answer from the following:

1X20=20

- For a reaction to be non spontaneous, the Free Energy Change must be:
 - Negative
 - Positive
 - Equal to entropy value
 - None of the above
- Roasting is:
 - Oxidation
 - Reduction
 - Precipitation
 - Thermit process
- The process in which the metal is obtained by simply heating the sulphide ore is called:
 - Roasting
 - Smelting
 - Pyrometallurgy
 - Calcination
- Pyrometallurgy refers to:
 - Hydrolysis of a metal ore
 - Heating metal oxide with coke
 - Ionisation of water
 - None of the above
- In Thermit Process, the metal used for reducing the oxide of another metal is:
 - Cr
 - Mn
 - Al
 - Fe
- In the reaction $\text{HCl} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{Cl}^-$; the conjugate base of HCl is:
 - Cl^-
 - H_2O
 - H_3O^+
 - HCl
- Protonic acid strengthas on moving from right to left in the periodic table.
 - Increases
 - Decreases
 - Increase then decreases
 - None of the above
- In $\text{Ni}(\text{CO})_4$, the metal Ni-atom is:
 - Lewis acid
 - Lewis base
 - Amphoteric
 - Conjugate base
- Chloride ion Cl^- is a:
 - Hard base
 - Soft base
 - Borderline base
 - Soft acid
- The structure of XeF_2 is:
 - Tetrahedral
 - Square planar
 - Linear
 - Square pyramid
- In 1868, a new emission line matching no known element, was found in the spectrum of the solar corona. The element is named as:
 - Xenon
 - Argon
 - Neon
 - Helium

12. The inert gas used to mix with oxygen for deep sea diving is:
a. Helium
b. Nitrogen
c. Argon
d. Neon
13. The Radioactive inert gas is:
a. Xenon
b. Krypton
c. Argon
d. Radon
14. Which of the following is false in case of BF_3 ?
a. It is solid at room temperature
b. It is Lewis acid
c. It has planar geometry
d. It forms adduct with NH_3
15. The borax bead test is used to detect the presence of:
a. Na^+
b. Mg^{2+}
c. Al^{3+}
d. Fe^{3+}
16. From B_2H_6 ; all the following can be prepared except:
a. B_2O_3
b. H_3BO_3
c. $\text{B}_2(\text{CH}_3)_6$
d. NaBH_4
17. Which one is not a borane?
a. B_5H_9
b. B_5H_{10}
c. B_5H_{11}
d. B_6H_{10}
18. Molecule(s) possessing three-centre-two electron bonds and three-centre-four-electron bonds would include:
a. B_2H_6 alone
b. B_2H_6 and SiF_4
c. B_2H_6 and XeF_4
d. Both (b) and (c)
19. The use of Boron carbide is:
a. As an abrasive
b. In nuclear reactor to absorb neutrons
c. Both (a) and (b)
d. None of the above
20. The product formed when Silicon reacts with hot solution of NaOH is:
a. $\text{Si}(\text{OH})_4$
b. $\text{Si}(\text{OH})_2$
c. SiO_2
d. Na_4SiO_4

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(PART-B : Descriptive)

Time : 2 hrs. 40 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a) How impure metal is purified by Zone refining process? 5
b) How impure metals are obtained in pure form by Parting Process with the help of sulphuric acid? 5
2. a) Discuss Electrolytic Kroll Process taking suitable example. 2
b) How zirconium is purified by van Arkel-de-Boer Process? 3
c) Write notes on extraction of metal by Hall Herolt Process. 2
d) Explain with the help of Ellingham's Diagram, how can you fix criterion for reduction of a metal oxide by hydrogen? 3
3. a) Discuss the Isolation and discovery of the Inert gases. 5×2=10
b) Draw the structure of XeO₄, XeOF₂, XeO₃F₂, XeOF₄ and XeO₆⁴⁻.
4. Explain the theory of Hard and Soft Acids and Bases. Explain its application in chemistry. 10
5. Explain in detail the Lewis theory of acid and base. What are its applications? 10
6. a) What is called interhalogen compounds? Explain the different types of interhalogen compounds with examples. 5×2=10
b) Discuss the preparation, structure and chemical properties of Inorganic benzene.
7. a) What happened when ethane and diborane reacts with oxygen? 5×2=10
Write the balanced equation for these two reactions. Look up heat of formation for the reactants and products of these reactions and calculate the heat of reactions.
b) (i) Draw structures for the four possible isomers of *closo*-Et₂C₂B₅H₅.
(ii) What structure do you predict for anions, B₂H₇⁻ and B₃H₈⁻ ?
8. a) Compare the relative reactivity of silanes and alkanes toward nucleophilic attack, hydrolysis, and halogenations. 5×2=10
b) Draw structures of [SiO₄]⁴⁻, [Si₂O₇]⁶⁻, [SiO₃²⁻]_n, [Si₄O₁₁⁶⁻]_n, [Si₄O₁₀⁴⁻]_n and [SiO₂]_n. Enclose the repeating units in brackets and show that these empirical formulas are correct.

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