

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Chemistry

Core Course

CH 1141 : INORGANIC CHEMISTRY I

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. Explain Heisenberg's uncertainty principle.
2. State Hund's rule.
3. Write Schrodinger wave equation and explain the terms.
4. What is water gas?
5. Explain why ionization enthalpy decreases down in a group?
6. Which is the element used in xerography?
7. Give two examples for Lewis acids.
8. Second group elements are called as alkaline earth metals. Give reason?
9. What is acid rain?
10. Mention the names of any two biodegradable polymers.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Give de-Broglie equation and explain the terms.
12. What are the limitations of Bohr model of atoms?
13. Explain diagonal relationship with an example.
14. What are the isotopes of hydrogen? Mention one uses each.
15. Explain inert pair effect.
16. Compare the thermal stability of various oxides of nitrogen.
17. Explain the Lowery-Bronsted concept of acid and bases.
18. What is photochemical smog?
19. Explain why alkali metal solutions in liquid ammonia are coloured?
20. Write HSAB principle.
21. Explain the Indian Standard of drinking water.
22. What is entrophication? Write the reason for entrophication.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Describe the Davisson and Germer experiment. Verification of wave nature of electrons.
24. Discuss the anomalous behaviour of first element with other elements in a group.
25. Compare the solubility and stabilities of alkaline earth metal sulphates.

26. Give an account of cesium in photo voltaic cell and lithium battery.
27. Discuss Arrhenius and Zux-Flood concepts of acids and bases.
28. Explain levelling effect with an example.
29. Differentiate between BOD and COD.
30. Write short note on management of air pollution.
31. Discuss the duties and responsibilities of Pollution Control Board.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. What is meant by electronegativity? Discuss briefly any three electronegativity scales.
33. (a) Discuss the trend in the following aspects of p-block elements in a group and in a period
 - (i) Acidic and basic character of oxides
 - (ii) Oxidizing and reducing properties of elements

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- (b) Write short note on flame colouration. **5**
34. Write an essay on reactions of metal ions in non aqueous solvents with respect to liquid ammonia, liquid HF and liquid SO₂.
35. What are the various sources of water pollution? Discuss any three methods for the treatment of industrial waste water.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023
Career Related First Degree Programme under CBCSS
Group 2(a) — Bio Chemistry and Industrial Microbiology
Foundation Course I

IM 1121 : FUNDAMENTALS OF BIOCHEMISTRY

(2015 – 2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – I

Answer **all** questions. Answer in a word to a maximum of two sentences. Each question carries **1** mark.

1. Who is called father of modern Biochemistry?
2. What is the contribution of Arthur Kornberg in Biochemistry?
3. Draw the structure of L- Glucose.
4. Draw the structure of maltose.
5. Define saponification.
6. Mention another name of cephalin.
7. What is the single letter code for Tryptophan and Glutamine?

8. What are the codons for the serine and valine?
9. What is the best OS that can be used in Bioinformatics?
10. What is the definition for mean in statistics?

(10 × 1 = 10 Marks)

SECTION – II

Answer **any eight** questions. Answer not to exceed one paragraph. Each question carries **2** marks.

11. Brief Evolution and Natural Selection.
12. Explain about Einstein's Law of general relativity.
13. Brief about any two 6 carbon ketoses.
14. Draw the structure of Chondroitin sulphate.
15. Brief about the reduced products of carbohydrates.
16. Explain how D-Dimers are formed from plasminogen?
17. Structurally represent Oleic acid and Linoleic acid.
18. Brief about the emulsification properties of Fatty acids.
19. What do you mean by Zwitter ion?
20. What is the significance of ninhydrine reaction?
21. What is the benefit of using statistics in the biological analyses?
22. What do you mean by correlation analysis?

(8 × 2 = 16 Marks)

SECTION – III

Answer **any six** questions. Answers not to exceed **120** words. Each question carries **4** marks.

23. Discuss about the features Watson and Crick's double stranded DNA.
24. Discuss about the major classes of science-theory and practical. Which one is superior?
25. Discuss in detail about the light rotating properties of glucose.
26. Explain the biological synthesis of TAG in our body.
27. Brief about the light absorption property of Amino acids based on their functional groups.
28. Briefly write about the different classification of amino acids.
29. How will you prepare a PPT for the seminar preparation? Give a detailed flow chart in the model seminar preparation.
30. What is the significance of Genbank? Explain in detail.
31. Explain in detail on the significance of understanding probability theory?

(6 × 4 = 24 Marks)

SECTION – IV

Answer **any two** questions. Each question carries **15** marks.

32. Discuss in detail about the Hypothesis, classifications of hypothesis and execution of hypothesis.
33. What are the major biological functions of Hyaluronic acid? Explain in detail with suitable diagrammes.
34. Discuss in detail about the applications of Bioinformatics in context of drug discovery in pharmaceutical industry.
35. In a research, how the selection of the appropriate statistical software is decided. Explain with suitable example.

(2 × 15 = 30 Marks)

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Name :

First Semester B.Sc. Degree Examination, March 2023
Career Related First Degree Programme under CBCSS
Group 2(a) – Bio Chemistry and Industrial Microbiology
Foundation Course
IM 1121 : BIO MOLECULES
(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – I

Answer **all** questions.

1. Clarify the work of Frederick Sanger.
2. Define reducing sugar.
3. How glycosidic bond is formed?
4. What is PUFA?
5. Mention the significance of acid number.
6. What are prostaglandins?
7. Name any two aromatic amino acids.
8. Define isoelectric pH.

9. Draw the structure of deoxyribose.

10. What is T_m value?

(10 × 1 = 10 Marks)

SECTION – II

Answer any **eight** questions.

11. What is Watson-Crick base pairing?

12. Define mutarotation of glucose.

13. What are mucopolysaccharides?

14. List out the biological role of glycoproteins.

15. Name any four unsaturated fatty acids.

16. What are sphingolipids and their function?

17. Specify the role of leukotrienes in the body.

18. Give the color reactions of amino acids.

19. Mention any two non-protein amino acids.

20. Give two examples of secondary structure of protein.

21. Outline the structure of phosphodiester bond.

22. What are hypo and hyper chromic effect?

(8 × 2 = 16 Marks)

SECTION – III

Answer any **six** questions.

23. Explain any two general reactions of carbohydrates.
24. Analyze the structural properties and functions of disaccharides.
25. Write note on essential fatty acids.
26. Classify the types of compound lipids.
27. Give the structure and functions of cholesterol.
28. List out the name of essential amino acids.
29. Outline the principle of salting-in and salting-out.
30. Explain the Cot curve and its significance.
31. Show the types of RNA and its functions.

(6 × 4 = 24 Marks)

SECTION – IV

Answer any **two** questions.

32. Write a detailed classification of carbohydrates.
33. Describe the tests to analyze the purity of oil and fats.
34. Discuss the different structures of proteins and forces stabilizing.
35. Elaborate the features of double helical structure of DNA.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023
Career Related First Degree Programme under CBCSS
Group 2(a) : Biochemistry and Industrial Microbiology
Vocational Course I

IM 1171 : FUNDAMENTALS OF MICROBIOLOGY
(2014–2021 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Very short answer type questions.

Answer **all** questions. Answer in **one** word to maximum of **two** sentences.
Each question carries **1** mark.

1. Who is known as the father of Microbiology?
2. What do you mean by resolution of a microscope?
3. Give two examples for acidic dyes?
4. Which is the counterstain used in Scheffer Fulton staining method?
5. Give an example for spore forming bacteria.
6. What is the full form of HEPA filter? Where is it used?
7. What are autotrophs?

8. The UV wavelength most effective in destroying bacteria.
9. Define disinfection.
10. The temperature and time used in HTST method of pasteurization.

(10 × 1 = 10 Marks)

SECTION – B

Short answer type questions.

Answer any **eight** questions. Answer not to exceed **one** paragraph. **Each** question carries **2** marks.

11. Explain Koch's postulates
12. Joseph Lister
13. Pili
14. Aldehydes
15. What is meant by tyndallization?
16. Explain the structure of flagella.
17. Briefly explain anaerobic culture methods.
18. What is Pasteurization?
19. Explain the principle behind functioning of an autoclave.
20. What is the use of oil in oil immersion objective?
21. What is negative staining?
22. Explain Ziehl- Neelsen staining?

(8 × 2 = 16 Marks)

SECTION – C

Short essay type questions.

Answer any **six** questions. Answer not to exceed **120** words. Each question carries **4** marks.

23. What are the important characteristics of fungi?
24. Explain TEM and SEM.
25. What is an endospore? Explain its structure.
26. What are the differences between gram positive and gram negative cell wall?
27. Explain the different preservation techniques used for microbial cultures.
28. Explain in detail the contributions of Louis Pasteur.
29. Write an essay on different staining techniques.
30. Nutritional types of Bacteria.
31. Write an essay on replication of bacteriophages?

(6 × 4 = 24 Marks)

SECTION – D

Long essay type questions.

Answer any **two** questions. Each question carries **15** marks.

32. Write an essay on various microbiological media used for the cultivation of bacteria.
33. What is meant by a pure culture. Write an essay on pure culture techniques?
34. With the help of a diagram explain the ultrastructure of a bacterial cell?
35. Define sterilization. Write an essay on different sterilization techniques.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023
Career Related First Degree Programme Under CBCSS
Group 2(a) – Biochemistry and Industrial Microbiology
Vocational Course I
IM 1171 : FUNDAMENTALS OF MICROBIOLOGY
(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Answer in a word to a maximum of two sentences.
Each question carries 1 mark.

1. Psychrophiles
2. Thermal death time
3. Lithotrophs
4. N acetyl glucose amine is a component of _____
5. Purpose of tyndallisation
6. The component of endospore spore which makes it recalcitrant
7. Principle of lyophilisation

P.T.O.

8. Stain used for negative staining
9. Temperate phage
10. Cryptic plasmid

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Answer not to exceed **one** paragraph. **Each** question carries **2** marks.

11. Chemostat
12. Heterotrophs
13. Autoclave
14. Tyndallisation
15. Sterilization by irradiation
16. Enumeration of bacteria by serial dilution
17. Purification of bacteria by pour plate method
18. Cephalosporins and their Mode of action
19. Bacterial ribosomes
20. Measurement of bacterial growth.
21. Viroid
22. Betalactam antibiotic

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Answer not to exceed **120** words. Each question carries **4** marks.

23. Continuous culturing of microorganisms
24. Structure of gram negative bacterial cell wall
25. Illustrate and explain the structure of bacterial endospore
26. Positive and negative staining
27. Transformation in bacteria
28. Classification of bacteria based on nutrition
29. Classification of bacteria based on cell shape and plane of division with examples
30. Structure of bacteriophage
31. Explain different anaerobic culture methods

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** of the following. Each question carries **15** marks.

32. Classification of antibiotics based on the mode of action.
33. Explain principle and application of bright field, fluorescent and phase contrast microscopes.
34. Explain the various sterilization methods and its application.
35. Compare and contrast the lytic and lysogenic cycles of a bacteriophage

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme Under CBCSS

Chemistry

Complementary Course for Physics & Geology

CH 1131.1/CH 1131.2 : THEORETICAL CHEMISTRY

(2017-2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. The size of the atom is described by which quantum number?
2. State Aufbau rule.
3. Suggest the name of the principle which says that every additional electron enters the orbital with the lowest possible energy.
4. Give the shape of the dsp^2 hybrid orbital.
5. What is the dipole moment of CCl_4 ?
6. Give any two factors that determine ionic compounds' lattice energy.
7. If n/p ratio is high, the nucleus tends to stabilize it by which process?

8. Give the units of radioactivity.
9. In cation analysis, third-group metals are precipitated in which chemical form?
10. What is the principle of paper chromatography.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. What is the Rydberg equation?
12. What is the physical significance of Schrodinger wave function?
13. How does the stability of the half-filled orbitals differ from that of fully-filled orbitals?
14. The bond angle in NH_3 is different from the bond angle of the tetrahedral bond angle. Why?
15. Distinguish between intermolecular and intramolecular hydrogen bonding.
16. What is the Born-Haber cycle?
17. How mass defect is related to binding energy?
18. What is radiocarbon dating?
19. What is Geiger Muller scintillation counter?
20. What are the advantages of oxidation-reduction titrations.
21. What is the difference between molarity and molality?
22. The K_{sp} of $PbBr_2$ is 4×10^{-6} at 300K. Find out the solubility of $PbBr_2$ at this temperature.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Write the postulates of Bohr model of atom.
24. Explain hydrogen spectrum.
25. What is meant by VSEPR theory? What are the limitations?
26. Explain the dsp^3 hybridization.
27. Explain how artificial transmutation takes place with suitable examples.
28. Explain the working of a scintillation counter.
29. Discuss Mullikan's approach to the electronegativity scale.
30. Briefly discuss the energetics of ionic bond formation.
31. What is common ion effect? What are its applications?

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Explain the various steps involved in deriving spectral frequency from the Bohr equation.
33. (a) What are quantum numbers? Discuss.
(b) Draw and explain the MO diagram for the O_2 molecule.
34. Write a note on
(a) Rock dating
(b) Neutron activation analysis
35. How will you analyze a compound qualitatively?

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Biochemistry / Home Science

CH 1131.5/CH 1131.6 – INORGANIC AND ANALYTICAL CHEMISTRY

(2017-2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Answer in one word to maximum two sentences. Each question carries **1** mark.

1. Paschen series of spectral lines occurs in _____ region of electromagnetic spectrum.
2. Define Hund's rule?
3. Suggest an indicator for HCl x NaOH titration.
4. Give one example for organometallic compound.
5. What is Rydberg equation?
6. Which metal is present in Haemoglobin?
7. Define Mass defect.

8. Write one example for organosilicone compound?
9. Write the electronic configuration of Ca.
10. What is the shape of 'S' Orbital?

(10 × 1 = 10 Marks)

SECTION – B

Short answer type. Answer **any eight** questions. Each question carries **2** marks.

11. What are organometallic complexes?
12. How Pauli's exclusion principle applied in electron filling.
13. What is artificial transmutation?
14. Explain the failures of Bohr's theory.
15. What is weight of NaOH is needed to make 1N, 1 litre solution.
16. Name any two series in hydrogen spectrum.
17. What are the different types of orbitals, explain?
18. Explain the application of Radio Carbon dating.
19. What you meant by 1M Solution?
20. Explain permanganometric titration.
21. Write Schrodinger equation and explain the terms.
22. How n/p ratio can be used to know the stability of nucleus?

(8 × 2 = 16 Marks)

SECTION – C

Short essay. Answer **any six** questions, Each carries **4** marks.

23. Give an account on metallo porphyrins.

24. Briefly explain the biological effects of radiation.
25. What are the different postulates in Bohr Theory?
26. Explain the principles of volumetric analysis.
27. Illustrate on different types of quantum numbers and their significance.
28. Give short account of Wilson's cloud chamber.
29. Distinguish between Haemoglobin and Myoglobin.
30. Illustrate on application of organometallic compound.
31. Explain the stability of half-filled and completely filled orbitals with examples.

(6 × 4 = 24 Marks)

SECTION – D

Essay, Answer any **two** question from the following. Each question carries **15** marks.

32. (a) Describe the artificial transmutation process with example.
(b) Explain neutron activation analysis.
33. (a) Illustrate Bohr's atomic theory and its limitations.
(b) Illustrate on the applications of radioactivity.
34. (a) What are the different theories on acid-base indicators?
(b) Write a brief account on the use of organometallic compounds in medicine.
35. Describe acid-base titration with examples.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

Career Related First Degree Programme under CBCSS

Group 2(a) : Biochemistry and Industrial Microbiology

Complementary Course – I

CH 1131.7 : BASIC THEORETICAL AND ANALYTICAL CHEMISTRY

(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark.

1. State Aufbau principle.
2. Write Schrodinger wave equation.
3. What is hydrogen bonding? Give one example.
4. Define the term dipole moment.
5. What is the unit of radioactivity?
6. Mention any two medicinal applications of radioisotopes.
7. What is the condition that a molecule will show microwave spectra?
8. Give two examples for primary standards.
9. What is the cause of Minamata disease?
10. Mention the different environmental segments.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Derive de Broglie's equation.
12. Explain why the bond angle in water is less than that in ammonia.
13. What are metallic bonds? Give one example.
14. What are atomic orbitals? Depict the shape of p_z atomic orbital.
15. How does n/p ratio affect the nuclear stability?
16. Explain nuclear fission reaction with an example.
17. How will you distinguish between the two isomeric compounds $\text{CH}_3\text{CH}_2\text{CHO}$ and CH_3COCH_3 by IR spectroscopy?
18. Which type of transitions are permitted in microwave spectroscopy?
19. What is acid rain? Mention its adverse effects.
20. How will you choose the indicators in acid base titrations? Explain with example.
21. Differentiate molarity and normality of a solution.
22. What is photochemical smog?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. What is meant by soil pollution? Mention its causes.
24. Explain the principle of complexometric titrations.
25. What is induced radioactivity? Give examples.

26. Discuss the causes and consequences of ozone depletion.
27. Describe the process carbon dating? Mention its applications.
28. Which is more volatile, o-nitro phenol or p-nitro phenol? Why?
29. Discuss Pauli's exclusion principle and Hund's rule.
30. What are molecular orbitals? Depict the molecular orbital energy diagram of H_2 molecule.
31. What are greenhouse gases? What is their impact on the environment?
(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Discuss the Bohr theory, highlighting its merits and demerits.
33. What are the different postulates of hybridization? Predict the hybridization and geometries of BF_3 and PCl_5 .
34. Discuss the applications of common ion effect and solubility product in qualitative analysis with examples.
35. (a) Write short note on transuranic elements. (7)
- (b) Discuss the applications of IR spectroscopy in distinguishing (8)
- (i) Hydrogen bonded OH and free OH
- (ii) Intermolecular and intra molecular Hydrogen bonding.
(2 × 15 = 30 Marks)
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Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Home Science

CH 1131.5 : INORGANIC AND ANALYTICAL CHEMISTRY

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark.

1. Define the term normality of a solution.
2. What are organometallic compounds?
3. Mention any two redox indicators.
4. Give the electronic configuration of copper (atomic number = 29).
5. What is Geiger Muller counter used for?
6. Draw the structure of $d_{x^2-y^2}$ orbital.
7. What do you mean by radioactivity?

P.T.O.

8. Explain the term average life of a radioactive substance.
9. State Aufbau principle?
10. Mention any two examples for organo arsenic compounds.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. How many orbitals are possible for an energy level $n = 4$?
12. 150 ml of 0.25 N NaOH solution required 120 ml of HCl solution. What is the normality of HCl solution?
13. State and explain Pauli's exclusion principle.
14. Write Rydberg equation and explain the terms.
15. What are indicators? Mention the indicator used in permanganometric titrations?
16. How does an atom change after alpha decay?
17. What is mass defect in nuclear chemistry?
18. How will you prepare 2N aqueous $\text{H}_2\text{C}_2\text{O}_4$ solution?
19. Mention any two units of radioactivity.
20. Explain the functions of myoglobin.
21. What are metallo porphyrins?
22. Give any two examples for organo mercury compounds used in medicine.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Explain the concepts of orbit and orbitals.
24. Calculate the energy of electron in the ground state of hydrogen atom.
25. Explain the principle and application of radiocarbon dating.
26. What are the biological effects of radiation?
27. Differentiate primary and secondary standard solutions with one example each.
28. Discuss the basic principles of volumetric analysis.
29. Explain the mechanism of oxygen and carbon dioxide transport in human body.
30. Discuss the structural differences between haemoglobin and myoglobin.
31. Explain the applications of radioactivity in agriculture.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. What are quantum numbers? Discuss its types and significances.
33. Write short notes on
 - (a) Dichrometric titrations 7
 - (b) Selection of indicators in acid-base titrations 8
34. Explain the following
 - (a) Artificial transmutation 5
 - (b) n/p ratio and nuclear stability 5
 - (c) Binding energy 5
35. What are organo mercury compounds? Discuss the biological, medicinal and environmental aspects of organo arsenic and silicon compounds.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Zoology

CH 1131.4 : THEORETICAL CHEMISTRY

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION - A

Answer all questions. Each question carries 1 mark.

1. What is Balmer series of lines?
2. Which orbital does not have directional characteristic?
3. The spectra of He^+ , Li^{2+} and Be^{2+} are similar to that of hydrogen atom. Why?
4. How does the strength of intermolecular forces affect the boiling point of a liquid?
5. What is the H-N-H bond angles in the ammonium ion?
6. Calculate the bond order of H_2 molecule.
7. What is meant by standard solution?
8. Define molarity of a solution.

9. Which is the pollutant introduced to water when synthetic detergents are used?
10. What is meant by DO?

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. State and explain Pauli's exclusion principle.
12. Write Schrodinger wave equation and explain the terms.
13. What are the reasons for the stability of configurations with completely filled and half-filled orbitals?
14. List two main conditions for forming hydrogen bonds.
15. How can you predict the ionic character of a bond?
16. Give any two limitations of Bohr atom model.
17. Explain the term Eutrophication.
18. What is meant by BOD of water? How is it different from COD?
19. What is meant by greenhouse effect?
20. How to prepare 0.5 M, 250 ml NaOH solution. (Mol wt. of NaOH = 40).
21. State and explain Beer-Lambert law.
22. Methyl orange is not a suitable indicator in the titration of a weak acid against a strong base?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. What are quantum numbers? Discuss briefly the significance of each quantum number.
24. Calculate the wavelength of the radiation emitted when the electron in the hydrogen atom excited to the 5th energy level returns to the 2nd energy level. (Rydberg constant = $1.097 \times 10^7 \text{ m}^{-1}$).
25. Discuss the important postulates of the VSEPR theory.
26. Explain Born-Haber cycle for the formation of NaCl.
27. What are the consequences of ozone layer depletion?
28. Discuss the causes and consequence of ozone layer depletion.
29. Explain the colourimetric estimation of iron.
30. Discuss briefly the principle of iodometric titrations with suitable example.
31. Compare the bond orders and stabilities of O_2 , O_2^{2+} , O_2^{2-} .

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. What is meant by orbital hybridization? Explain the molecular geometries associated with Sp^3d^2 and Sp^3d^3 hybridizations with illustrative examples.
33. (a) Discuss the important postulates of Bohr's atomic theory. **7.5**
(b) How is hydrogen spectrum explained on the basis of Bohr's theory? **7.5**

34. (a) Discuss the various factors responsible for water pollution. 7.5
- (b) Explain the different methods for the treatment of industrial waste water. 7.5
35. (a) What are complexometric titrations? Explain with special reference to EDTA titrations. 7.5
- (b) Explain the theory of acid-base indicators with examples. 7.5
- (2 × 15 = 30 Marks)**
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Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Botany

CH 1131.3 : ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer all questions. Each question carries 1 mark.

1. What is lattice energy?
2. Give the electronic configuration of copper (atomic number = 29).
3. The quantum numbers $n = 3$ and $l = 2$ corresponds to which orbital?
4. What is LCAO?
5. Draw the structure of molecules with dsp^2 hybridization.
6. Give two examples for green house gases.
7. What is acid rain?
8. State Beer-Lambert law.

9. Define the term normality of a solution.
10. Mention the indicator used in iodometric titrations.

(10 × 1 = 10 Marks)

PART – B

Answer **any eight** questions. Each question carries **2** marks.

11. What are orbitals? Draw the structure of $d_{x^2-y^2}$ orbital.
12. State and explain Pauli's exclusion principle.
13. List any two limitations of Bohr theory of atoms.
14. Give one example each for polar covalent bond and non polar covalent bond.
15. Explain intramolecular hydrogen bonding with an example.
16. Compare the bond orders in NO and NO^+ .
17. Calculate the mass of NaOH required for the preparation of 150 ml 2.5 M aqueous solution.
18. Write the chemical reactions involved in the permanganometric estimation of oxalic acid.
19. What are primary standards? Give two examples.
20. What is reverse osmosis?
21. Define BOD. What is its significance.
22. Explain the term eutrophication.

(8 × 2 = 16 Marks)

PART – C

Answer **any six** questions. Each question carries **4** marks.

23. Write Schrodinger wave equation and explain the significance of ψ and ψ^2 .
24. Discuss any four postulates of Bohr atom model.
25. Explain the principle of redox indicators.
26. How will you estimate phosphate colorimetrically?
27. Write short note on electrodialysis and its application in water treatment.
28. Explain the causes and consequences of ozone depletion.
29. Compare the bond angles in water and ammonia based on VSEPR theory.
30. Discuss the classification of air pollutants.
31. Explain the Born-Haber cycle for the formation of NaCl with a neat diagram.

(6 × 4 = 24 Marks)

PART – D

Answer **any two** questions. Each question carries **15** marks.

32. Discuss the origin of hydrogen spectrum.
33. Write short notes on
 - (a) Acid-base titrations. 7
 - (b) Complexometric titrations. 8
34. (a) Define hybridization. Discuss the hybridization and structures of PCl_5 and BF_3 . 8
(b) Write short note on hydrogen bonding and its consequences. 7
35. Discuss the various sources of water pollution? What are the control measures for minimizing water pollution?

(2 × 15 = 30 Marks)

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, March 2023

Career Related First Degree Programme under CBCSS

Group 2(a) : Biochemistry and Industrial Microbiology

Complementary Course – I

CH 1131.7 : BASIC THEORETICAL AND ANALYTICAL CHEMISTRY

(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark.

1. State Aufbau principle.
2. Write Schrodinger wave equation.
3. What is hydrogen bonding? Give one example.
4. Define the term dipole moment.
5. What is the unit of radioactivity?
6. Mention any two medicinal applications of radioisotopes.
7. What is the condition that a molecule will show microwave spectra?
8. Give two examples for primary standards.
9. What is the cause of Minamata disease?
10. Mention the different environmental segments.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Derive de Broglie's equation.
12. Explain why the bond angle in water is less than that in ammonia.
13. What are metallic bonds? Give one example.
14. What are atomic orbitals? Depict the shape of p_z atomic orbital.
15. How does n/p ratio affect the nuclear stability?
16. Explain nuclear fission reaction with an example.
17. How will you distinguish between the two isomeric compounds $\text{CH}_3\text{CH}_2\text{CHO}$ and CH_3COCH_3 by IR spectroscopy?
18. Which type of transitions are permitted in microwave spectroscopy?
19. What is acid rain? Mention its adverse effects.
20. How will you choose the indicators in acid base titrations? Explain with example.
21. Differentiate molarity and normality of a solution.
22. What is photochemical smog?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. What is meant by soil pollution? Mention its causes.
24. Explain the principle of complexometric titrations.
25. What is induced radioactivity? Give examples.

26. Discuss the causes and consequences of ozone depletion.
27. Describe the process carbon dating? Mention its applications.
28. Which is more volatile, o-nitro phenol or p-nitro phenol? Why?
29. Discuss Pauli's exclusion principle and Hund's rule.
30. What are molecular orbitals? Depict the molecular orbital energy diagram of H_2 molecule.
31. What are greenhouse gases? What is their impact on the environment?
(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Discuss the Bohr theory, highlighting its merits and demerits.
33. What are the different postulates of hybridization? Predict the hybridization and geometries of BF_3 and PCl_5 .
34. Discuss the applications of common ion effect and solubility product in qualitative analysis with examples.
35. (a) Write short note on transuranic elements. (7)
- (b) Discuss the applications of IR spectroscopy in distinguishing (8)
- (i) Hydrogen bonded OH and free OH
- (ii) Intermolecular and intra molecular Hydrogen bonding.
(2 × 15 = 30 Marks)
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