

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme Under CBCSS

Chemistry

Core Course – II

CH 1341 : INORGANIC CHEMISTRY – II

(2017 – 2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all the questions. Each question carries 1 mark.

1. What is the bond order of F_2 molecule?
2. What are Pseudohalogens?
3. What are Fullerenes?
4. What are Nanostructures?
5. Does water have a zero or non-zero dipole moment? Why?
6. Name a naturally occurring radioactive element.
7. What is flint glass?
8. What are phosphazenes?

9. Give the name and formula of an orthosilicate.

10. What are isotopes?

(10 × 1 = 10 Marks)

SECTION – B

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

11. What is the state of hybridization of Be in BeCl_2 molecule and what is the shape of the molecule?

12. Name and formulate the compound known as inorganic benzene. Why is it called so?

13. What is meant by a radioactive tracer?

14. Explain the top-down approach of the preparation of nanomaterials.

15. Which has greater bond dissociation energy $-\text{O}_2$ or O_2^+ ? why?

16. What are the uses of xenon?

17. What are interstitial carbides?

18. What is the Basicity of H_3PO_3 ? Explain your answer.

19. What are the favourable conditions for the formation of an ionic compound?

20. How are polyphosphazenes prepared?

21. Write a short note on breeder reactors.

22. Discuss the free electron theory of metallic bonding.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Apply the VSEPR theory to predict the shape of ClF_3 .
24. Discuss the important properties and uses of boron nitride (BN).
25. What are quantum dots? Give an example and an application.
26. Explain the terms mass defect and binding energy.
27. Give the Born-Landé equation and explain the terms.
28. What are the Characteristics of the different types of sigma molecular orbitals?
29. How are the oxide nanoparticles prepared by sol-gel process?
30. What are interhalogen compounds? Give the formulae of two of them.
31. Write a short note on nuclear fission.

(6 × 4 = 24 Marks)

SECTION – D

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

32. (a) Calculate the bond order of NO molecule from its MO configuration and draw the MO diagram.
(b) State the postulates of VSEPR theory.
(c) What is meant by ion polarization? Discuss Fajans rules.
33. (a) Write a short note on dipole-dipole interactions.
(b) Describe the Radio carbon dating (C-14 dating).
(c) Illustrate the use of radioisotopes in radiotherapy.

34. (a) Explain the applications of nanomaterials in the field of catalysis.
(b) Write a note on three dimensional silicates.
(c) Discuss the properties and applications of Carbon nanotubes.
35. (a) What are borides? Give their general properties.
(b) Distinguish between bonding and antibonding molecular orbitals.
(c) Mention the uses of the different classes of silicones.

(2 × 15 = 30 Marks)

gcwcentrallibrary.in

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme Under CBCSS

Chemistry

Core Course II

CH 1341 : INORGANIC CHEMISTRY II

(2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all the questions. Each question carries 1 mark.

1. What is nanofabrication?
2. What are fullerenes?
3. What is an isotone?
4. Why nuclear fusion reactions are called thermonuclear reactions?
5. Define mass defect?
6. Which is the most acidic oxoacid of Chlorine?
7. Write a note on radioactive tracer?
8. What is meant by a polar covalent bond?
9. State the hybridization of C in CCl_4 ?
10. Name an oxofluoride of xenon that has a T shape.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. Give two applications of nanomaterials.
12. Explain the sol-gel process for the synthesis of nanoparticles.
13. Write a short note on breeder reactors.
14. What is nuclear fission? Give an example.
15. What are carboranes?
16. What are pseudohalogens? Give two examples.
17. The majority of known noble gas compounds are those of xenon. Why?
18. Mention the important uses of Helium.
19. What are phosphazenes.
20. Give the name and formula of an orthosilicate.
21. What is the dipole moment of CO_2 ?
22. Discuss the free electron theory of metals.
23. Why is PCl_5 a reactive molecule?
24. What is the state of hybridization of Be in BeCl_2 molecule and what is the shape of the molecule?
25. Discuss the important criteria regarding hybridization.
26. How can dipole moment studies help to differentiate between ortho, meta and para dichlorobenzenes?

(8 × 2 = 16 Marks)

SECTION – C

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

27. What are quantum dots? Give an example and an application.
28. Write a note on nanocomposites.
29. A radioactive substance decays at such a rate that after 46 days, only 0.25 of its original amount is left. Calculate its disintegration constant and half life period.
30. What is a nuclear reactor? What are the general features of it?
31. What is hydroboration? Give an example.
32. Compare the properties of borazole with benzene.
33. State Fajan's rules.
34. Give the Born-Landé equation and explain the terms.
35. Give the differences between valence bond theory and molecular orbital theory.
36. How can the chlorine atoms of cyclic $(NPCl_2)_3$ be replaced by phenyl groups?
37. Explain the structure of XeF_2 molecule.
38. Discuss the important properties and uses of boron nitride (BN).

(6 × 4 = 24 Marks)

SECTION – D

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

39. (a) Explain the optical and catalytic properties of nanomaterials. 10
(b) Write a note on carbon nanotubes. 5
40. (a) Explain with examples, how radio isotopes are useful in (i) medical diagnosis (ii) radio therapy. 5+5
(b) Describe the Radio carbon dating (C-14 dating). 5

41. What are Silicones? How are they classified? Mention the application of each class.
42. (a) What are Zeolites? Mention one important application of the class.
(b) What are interstitial carbides. Discuss their general properties.
(c) Explain the process for glass manufacture.
43. What is Born-Haber cycle? Discuss with respect to NaCl.
44. Discuss the molecular orbital (MO) diagram of O_2 molecule. Compare the bond length, magnetic behavior and bond energy of O_2 , O_2^+ , O_2^{2+} , O_2^- and O_2^{2-} on the basis of MO theory.

(2 × 15 = 30 Marks)

gcwcentrallibrary.in

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023.

First Degree Programme under CBCSS

Chemistry

Core Course – II

CH 1341 – INORGANIC CHEMISTRY II

(2020 Admission onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions in a word or one or two sentence. Each question carries 1 mark.

1. Mention the hybridisation and geometry of SF_6 molecule _____
2. What is the magnetic property of B_2 molecule?
3. Which is more Ionic - $BeCl_2$ or $BaCl_2$? Give reason.
4. Name two dibasic oxyacids of phosphorous.
5. Draw the geometry of XeF_4 molecule.
6. Give any two examples for pseudohalogens.
7. How many α particles will be emitted in the change ${}_{92}^{238}U$ to ${}_{82}^{206}Pb$?
8. What are isotones?

9. Name a nanomaterial used in Li ion batteries.
10. What are nano sensors?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Which is paramagnetic- CO or NO? Why?
12. Define lattice energy. Why lattice energy of ionic solid is high?
13. Predict the geometry of IF_7 molecule on the basis of VSEPR theory.
14. The effect of H-bonding in NH_3 is less than that of H_2O . Why?
15. Give a suitable example of dipole-dipole interaction.
16. State and explain Fajan's rule.
17. What is tracer technique?
18. Explain artificial transmutation with an example.
19. Discuss neutron activation analysis.
20. What are quantum dots?
21. Write a method for the preparation of Au nanoparticles.
22. What is inorganic benzene. Why is it called so?
23. Draw the structure of P_4O_6 and P_4O_{10} .
24. How is diborane converted to boron nitride?
25. What are polyphosphazenes?
26. What is the peculiarity of pyrex glass?

(8 × 2 = 16 Marks)

SECTION – C

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

27. Define dipole moment. Explain how is it helpful in predicting the geometry of molecules.
28. What is LCAO? Discuss this in the formation of HF molecule.
29. Compare VB theory with MO theory.
30. Calculate the binding energy per nucleon of ${}^9_4\text{Be}$ nucleus in both MeV and Joule. Given mass of proton = 1.008 amu, mass of neutron = 1.009 amu and mass of Be isotope is 9.012 amu.
31. How radioisotopes are useful in medical diagnosis and radiotherapy? Give examples.
32. Explain the structure of diborane.
33. Write a short note on refractory materials.
34. Write a short note on carboranes and boron nitrides.
35. Discuss the applications of different noble gases.
36. What are pseudohalogens?
37. What are the different types of carbon nanotubes?
38. Write a note on fullerenes.

(6 × 4 = 24 Marks)

SECTION – D

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

39. (a) What are the applications of radioisotopes?
(b) One microgram of Na-24 was injected into the blood of a patient. How long will it take for the radioactivity to fall to 10% of the initial value? The half-life of Na-24 is 14.8 hours.

40. (a) Sketch the MO diagram of O_2 molecule. 7
- (b) Arrange O_2 , O_2^+ , O_2^- and O_2^{2-} in the increasing order of their stability. 4
- (c) Comment on their magnetic behaviour. 4
41. Discuss different types of silicates with suitable examples.
42. Discuss the structures of different oxyacids of halogens.
43. Write a note on
- (a) Kuroll's salts 4
- (b) Silicones 7
- (c) Zeolites 4
44. Explain the following methods for the synthesis of nanoparticles with suitable examples.
- (a) Sol-gel 7
- (b) Combustion 4
- (c) Ball milling 4

(2 × 15 = 30 Marks)

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023.

Career Related First Degree Programme under CBCSS

Chemistry

Complementary Course for Biochemistry and Industrial Microbiology

CH 1331.7 : BIO-ORGANIC CHEMISTRY

(2019 Admission Onwards)

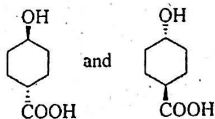
Time : 3 Hours

Max. Marks : 80

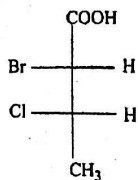
SECTION – A

Answer all questions. Each question carries 1 mark

- How many asymmetric carbon atoms are present in the α -D-glucopyranose molecule?
- What are the constituents of starch?
- Name two initiators used in free radical polymerization.
- What is the monomer of neoprene?
- What are nucleophiles? Give examples.
- Arrange the following in the increasing order of -I effect.
 - $-\text{NR}_2$
 - $-\text{F}$
 - $-\text{OR}$
- Identify the relationship between the given compounds.



8. Assign R-S notation to the following structure



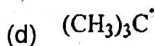
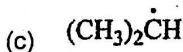
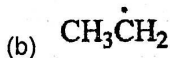
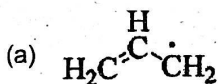
9. What is the Larmor frequency?
10. What type of solvents are generally employed in chromatography?

(10 × 1 = 10 Marks)

SECTION – B

Answer any eight questions. Each question carries 2 marks

11. What are oligosaccharides? Give examples.
12. Fructose has no aldehydic group but acts as a reducing agent. Explain.
13. What are anomers? Give example.
14. Distinguish between homopolymer and copolymer.
15. What is step-growth polymerization?
16. Classify the polymers based on the source of origin?
17. Arrange the following free radicals in the increasing order of stability.



18. Write a short note on the role of inductive effects on acid strengths.

19. Why are molecules like ethane-1,2-diol and 2-chloroethanol's gauche conformation favoured over anti-conformation?
20. What are diastereoisomers? Give examples.
21. Distinguish between meso and racemic forms of tartaric acid.
22. 'Infrared and Raman are complementary to each other'. Explain with suitable examples.
23. What is chemical shift?
24. Comment on the relative intensities of stokes and anti-stokes lines in Raman spectrum.
25. Define the term eluent.
26. What do you understand by the term 'R_f value'?

(8 × 2 = 16 Marks)

SECTION – C

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

27. Give the conversion of glucose to fructose.
28. What is mutarotation? Which type of carbohydrates exhibit mutarotation?
29. Distinguish between thermoplastic and thermosetting polymers.
30. What are silicones? What are their applications?
31. Compare the reactivity of aldehydes and ketones towards nucleophilic addition reactions.
32. Explain the significance of the hyperconjugation effect.
33. What is resolution? Discuss the chemical methods for resolving a racemic mixture.
34. What do you understand by chair and boat conformations? Why is the chair conformation of cyclohexane more stable than the boat conformation?
35. What are the factors affecting chemical shift?
36. Write a note on spin-spin coupling.
37. Give the principle involved in chromatography.
38. Briefly discuss thin layer chromatography.

(6 × 4 = 24 Marks)

SECTION – D

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

39. Discuss the structure and industrial applications of starch and cellulose.
40. Discuss the methods for the determination of the molar mass of polymers.
41. What are carbocations? Explain their structure, generation and stability.
42. (a) Explain optical isomerism. What are the conditions required for a molecule to be optically active? 7
- (b) Discuss the conformation of n-butane. 8
43. (a) A compound having molecular formula C_4H_9Br gave the following NMR data.
- (i) δ 1.5 (6H, doublet)
- (ii) δ 1.95 (1H, multiplet)
- (iii) δ 3.33 (2H, doublet)
- Suggest a suitable structure for the compound. Give reasons. 7
- (b) A compound having molecular formula $C_{10}H_{13}Cl$ gave the following NMR data.
- (i) δ 1.5 (6H, singlet)
- (ii) δ 3.07 (2H, singlet)
- (iii) δ 7.27 (5H, singlet)
- Suggest a suitable structure for the compound. Give reasons. 8
44. Describe the principle involved, instrumentation and applications of gas chromatography.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Home Science

CH 1331.5 : ORGANIC CHEMISTRY II

(2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark.

1. Name the alkaloid present in hemlock herb.
2. Draw the structure of nicotine.
3. What is the mobile phase in GLC?
4. Give an example for a thermoplastic.
5. What is the use of *methyl orange*?
6. Give the name of the phenomenon that the visibility of the path of the beam for the projector in a cinema hall.
7. What is delta formation?

P.T.O.

8. What is the role of activated charcoal in gas masks?
9. Among starch, gelatin, gum and As_2S_3 , which is the best protective colloid.
10. What is meant by *retention time*?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Explain the physiological functions of morphine.
12. What are the chief sources of *codeine* and *quinine*?
13. What is the role of an *emulsifier*?
14. Explain the term *zeta potential*.
15. Define the term *flocculation value*.
16. Give an example each for the following types of colloidal systems: (a) a solid dispersed in gas and (b) a gas dispersed in liquid.
17. How will you synthesize *phenolphthalein* from *phenol*?
18. Explain the uses of *citral*.
19. What does the term *micelle* mean?
20. Define *enthalpy of adsorption*.
21. What is meant by *emulsification*? Give an example.
22. Write down two applications of *polyethene*.
23. What is *terylene*? What is its use?
24. Give the monomer units of *Nylon 66*.

25. Distinguish between *chemisorption* and *physisorption*.
26. Illustrate with two examples the classification of chromatographic methods according to the types of phases used.

(8 × 2 = 16 Marks)

SECTION – C

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

27. Discuss the *Hoffmann exhaustive methylation* method.
28. Give the structures of *coniine*, *quinine* and *codeine*.
29. (a) Which among the following is more effective in coagulating the positively charged $\text{Fe}(\text{OH})_3$ sol – Cl^- or SO_4^{2-} ? Explain your answer.
(b) Explain the term surfactants with suitable examples.
30. Distinguish between *lyophilic colloids* and *lyophobic colloids*.
31. Explain the term *gold number*.
32. Give any one method each for the synthesis of *alizarin* and *fluorescein*.
33. Describe any two methods each for the synthesis of PMMA and PTFE.
34. Write a note on the *chromophore-auxochrome* theory.
35. Distinguish between natural and *synthetic* polymers with suitable examples.
36. What are the differences between *Buna-N* and *Buna-S*.
37. How is *TLC* carried out?
38. State and explain the *isoprene rule*.

(6 × 4 = 24 Marks)

SECTION – D

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

39. (a) What are *terpenoids*? How are they classified?
(b) Explain the structure of *natural rubber* and what is meant by vulcanization.
(c) Write the structure of *menthol* and its uses.
40. (a) What are the applications of (i) paper chromatography and (ii) gas chromatography?
(b) What is R_f value? Explain its significance.
41. Write a note on the classification of *colloids*.
42. (a) Discuss the various factors that affect adsorption of gases on solid surfaces.
(b) Explain the *electrodialysis* method for purification of sols.
43. Write a note on *synthetic fibres* with examples.
44. (a) Discuss the *modern theory of colours*.
(b) Write a note on *electrophoresis* and *electroosmosis*.

(2 × 15 = 30 Marks)

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme Under CBCSS

Chemistry

Complementary Course for Home Science

CH 1331.5 : ORGANIC CHEMISTRY II

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. Explain the acidic nature of pyrrole.
2. Draw the structure of uracil.
3. What are the monomers of Buna-S?
4. Give two examples of natural polymers.
5. What is the physiological action of quinine?
6. What are drugs?
7. Write any two uses of PTFE.
8. What are the major uses of menthol?

9. How will you prepare phenolphthalein?
10. What are chromophores?

(10 × 1 = 10 Marks)

SECTION – B

Short answer type

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

11. Give one method of preparation of thiophene.
12. Give one general method of isolation of geraniol.
13. What are the purine bases present in nucleic acids?
14. Draw the structure of camphor.
15. How will you establish the presence of methoxyl group in alkaloids?
16. Give one method of preparation of paracetamol.
17. What are Chemotherapeutic agents? Give one example
18. What is PMMA? Mention its uses.
19. What are addition polymers? Give the preparation of polystyrene.
20. How will you prepare methyl orange? Mention its uses.
21. What are auxochromes? Give two examples.
22. Give the structure of pyridine-N-oxide How it can be prepared?
23. Explain isoprene rule with an example.
24. What are complementary colours?
25. Explain Paal-Knorr pyrrole synthesis.
26. What are alkaloids? Give its general methods of isolation.

(8 × 2 = 16 Marks)

SECTION – C

Short essay

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

27. Discuss the modern theory of colour and constitution.
28. Give the method of preparation and uses of alizarin.
29. Write short note on polymers used in medicine and surgery.
30. Explain the method of preparation and uses of PVC and PVA.
31. Discuss the classification of drugs based on application.
32. How will you synthesis aspirin? Mention its uses.
33. Write the structure and physiological actions of nicotine.
34. What is Hoffmann exhaustive methylation? Explain with an example.
35. What are terpenes? Give its classification.
36. Discuss the chemical properties and uses of citral.
37. Compare the aromatic character of pyrrole, furan and thiophene.
38. How will you synthesis pyridine?

(6 × 4 = 24 Marks)

SECTION – D

Long essay

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

39. Discuss the relative positions of electrophilic and nucleophilic substitution reactions of pyrrole and pyridine.
40. Give the method of preparation, properties and applications of the following
(a) Thiokol (b) Buna-N (c) Neoprene

41. Discuss briefly
- (a) Antimalarial drugs
 - (b) Antipyretics
 - (c) Sulpha drugs
42. How will you identify the following in the structural elucidation of alkaloids?
- (a) Primary, secondary and tertiary amino groups
 - (b) Hydroxy and ester groups
43. Write an essay on synthesis and uses of any three synthetic fibres.
44. Discuss the classification of dyes based on structure and application.
(2 × 15 = 30 Marks)
-