

Part – III: Allied Subject: Second Semester: Paper – I

CHEMISTRY FOR BIOLOGIST-II

Under CBCS – Credit 4

Time: **3** HoursMax. Marks: **75**

Answer ALL Questions

(10 × 1 = 10)

1. What is the pH value of sodium chloride?
a) zero b) more than seven c) seven d) less than seven
2. CaO is an example of
a) Lux-Flood acid b) Usanovich base
c) Lux-Flood base d) Usanovich acid
3. As compared to ionic compounds, covalent bond has
a) high melting but low boiling point b) low melting and high boiling point
c) low melting and boiling point d) high melting and boiling point
4. AlCl_3 is covalent but AlF_3 is ionic, this fact can be explained on the basis of
a) Fajans' rule b) octet rule c) Born-Haber cycle d) lattice energy
5. An example of a fibrous protein is
a) mucin b) globin c) keratin d) casein
6. Deficiency of vitamin C causes
a) Rickets b) Scurvy c) Beriberi d) Pellagra
7. The potential of a pesticide for causing damage to plant is its:
a) lethal dose b) defoliation ability c) phyto toxicity d) chronicity

8. Which among the following accounts for approximately 80% of all pesticide use?
a) herbicide b) insecticide c) bactericide d) fungicide
9. Greenhouse gas is
a) Nitrogen b) Oxygen c) Hydrogen d) Carbon dioxide
10. Which of the following is indicator of water pollution
a) Biological oxygen demand b) pH c) salinity d) eutrophication

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. What are amphoteric substances?
12. What is covalent bond?
13. Write two examples for globular protein.
14. What is peptide linkage?
15. Define fungicide.
16. What do you mean by water pollution?
17. Write any two source of air pollution.

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) Give brief account on Lewis concept of acid and base.

[OR]

b) Illustrate Usanovich concept of acid and base with examples

19. a) Discuss hydrogen bonding and its types.

[OR]

b) Describe characteristic of ionic compounds.

20. a) Write a source, function and deficiency disease for vitamin C and vitamin E.

[OR]

b) Write short notes on the following.

- i) Zwitter ion ii) Isoelectric point.

21. a) Write a short note on safe handling of pesticides.

[OR]

b) Comment on the copper compounds as fungicides.

22. a) Describe Greenhouse effect. How does it affect the global climate?

[OR]

b) Explain Water treatment processes.

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. Write a note on the following acid and base concept

i) Arrhenius

ii) Bronsted – Lowry

24. Explain Born-Haber cycle.

25. Illustrate classification of protein with examples

26. Explain in detail above impact of pesticides on environment.

27. Discuss the various sources of water pollution.




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B.Sc. Physics Degree (Semester) Examinations, April 2021

Part – III: Allied Subject: Second Semester: Paper – I

CHEMISTRY FOR PHYSICIST – II

Under CBCS – Credit 4

 Time: **3 Hours**

 Max. Marks: **75**
SECTION – A
Answer ALL Questions
(10 × 1 = 10)

- Elements in the modern periodic table are arranged on the basis of their
 - Chemical symbols alphabetically
 - Atomic Mass
 - Boiling Point
 - Atomic Number
- Average distance between nucleus and outer shell is called
 - Atomic size
 - Nuclear size
 - Shielding effect
 - Covalent radius
- The glow of fireflies is due to the aerial oxidation of luciferin. It is an example of
 - Fluorescence
 - Phosphorescence
 - Bioluminescence
 - Chemiluminescence
- The emission of light from T_1 to S_0 is known as
 - Inter section crossing
 - Internal conversion
 - Fluorescence
 - Phosphorescence
- A crystal plane has intercepts of 3, 4 and 2 units with x, y and z axes respectively. the Miller Indices are
 - (4,2,6)
 - (3,4,6)
 - (4,3,3)
 - (4,3,6)
- The elements of symmetry are
 - Plane of symmetry
 - Axis of symmetry
 - Centre of symmetry
 - All of these

7. Which of the following electrolytes is not strong one?

- a) HCl b) NaCl c) H₂SO₄ d) CH₃COOH

8. The conductivity of an electrolyte is due to the

- a) Presence of ions in the electrolyte
b) Free movement of ions in the solution
c) Reunion of ions in the solution
d) Release of heat energy due to ionization

9. The name of the equation showing the relation between electrode potential (E), Standard electrode potential and concentration of ions in solution is

- a) Debye-Huckel-Onsager equation b) Kohlrausch's equation
c) Nernst equation d) Faraday's equation

10. Which one of the following is a primary cell?

- a) Lead-acid cell b) Daniell cell
c) Alkaline cell d) Leclanche cell

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. What is electron affinity? Is it exothermic or endothermic

12. State Grothus-Draper law and Stark Einstein law

13. Write law of constancy of interfacial angles and law of constancy of symmetry

14. Draw FCC and BCC. Calculate number of atoms are needed per unitcell for FCC and BCC crystal structure

15. A solution of salt (1.0 N) surrounding platinum electrodes 2.1cm apart and 4.2 cm² in area was found to offer a resistance of 50 Ω. Calculate the equivalent conductivity of the solution.

16. Define Salt bridge? Give its importance.

17. Write the difference between primary cell and secondary cell

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) What is ionization potential? Write the factors which affect ionization potential

[OR]

b) Define ionic radius? How does it vary in groups and periods?

19. a) Differentiate thermal reaction and photochemical reaction

[OR]

b) Briefly discuss the phenomenon of chemiluminescence with example

20. a) Write any five difference between crystalline solid and amorphous solid

[OR]

b) Derive Bragg's equation and mention its applications

21. a) State and explain Kohlrausch's law and give its any two application.

[OR]

b) What is an electrochemical series? Using the data given in the series explain why?

22. a) Give the Nernst equation showing effect of electrolyte concentration on the potential of an oxidation-reduction electrode.

[OR]

b) Describe construction and working principles of calomel electrode.

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. Account on determination of electronegativity by Pauling and Mulliken's method
24. Illustrate physicochemical phenomenon by Jablonski diagram with pictorial representation
25. What are Bravais lattices? Write its unit cell characteristics. Draw all the possible crystal structures
26. a) How are specific conductivity, equivalent conductivity and molal conductivity of an electrolyte related to each other? **(5)**
Give any five postulates of Arrhenius theory of ionization. Mention its limitations. **(5)**
27. a) Explain diagrammatically the working principle of hydrogen and oxygen fuel cell. **(5)**
b) Write a note on Weston – Cadmium cell **(5)**



Part – III: Core Subject: Second Semester: Paper – I

GENERAL CHEMISTRY - III

Under CBCS – Credit 4

Max. Marks: **75**

Answer ALL Questions

(10 × 1 = 10)

- Which of the following angle corresponds to sp^2 hybridization?
a) 90° b) 120° c) 180° d) 109°
- According to molecular orbital theory, which of the following will not exist?
a) H_2 b) He_2 c) N_2 d) O_2
- Which of the following agent is used in order to make benzene react with acetyl chloride to give acetophenone?
a) ultraviolet light b) Al_2O_3 c) Al d) $AlCl_3$
- Which of the following substituent is an ortho and para director and ring deactivating?
a) $-NH_2$ b) $-Cl$ c) $-OCH_3$ d) $-OH$
- Ethylene oxide undergoes acid-hydrolysis to form
a) ethylene glycol b) formic acid c) ethyl alcohol d) acetic acid
- Phenol is stronger acid than alcohol due to
a) +I effect b) resonance c) hyperconjugation d) +M effect
- The organic liquids which are steam volatile and immiscible with water can be separated by
a) distillation b) fractional distillation
c) steam distillation d) evaporation

8. The molality of a solution is defined as the number of moles of the solute present in
 a) one liter of the solvent b) one liter of the solution
 c) one kilogram of the solvent d) one kilogram of the solution
9. The addition of a non-volatile solute _____ the vapour pressure
 a) Enhances b) lowers c) diminishes d) equilibrium
10. Which of the following is a colligative property?
 a) K_p b) K_f c) ΔT_f d) degree of ionization

SECTION – B

Answer any FIVE Questions **(5 × 2 = 10)**

11. Examine CsCl lattice is less stable structure than NaCl.
12. How do alcohols behave towards oxidising agent?
13. Give a method of preparation of resorcinol.
14. Name the product formed when anthracene is treated with N-formyl methyl aniline.
15. State Henry's law. Give its two limitations.
16. Define ideal and non-ideal solutions.
17. What is van't Hoff factor?

SECTION – C

Answer ALL Questions: **(5 × 5 = 25)**

18. a) Classify the bonds in the following as ionic, polar covalent or covalent
 i) HCl ii) NaCl iii) SnCl_4 iv) NH_3 v) NCl_3
- [OR]**
- b) State and explain Fajans' rules to explain covalent character in ionic compounds.

19. a) Illustrate the influence of hydroxyl and nitro group in benzene nucleus on further substitution.

[OR]

- b) Describe Haworth method for the synthesis of naphthalene.
20. a) Elaborate the chemical properties of ethyl mercaptan.

[OR]

- b) Discuss the mechanism of Reimer-Tiemann reaction.
21. a) Briefly explain the types of azeotropes.

[OR]

- b) Calculate the molarity of 0.212 g of Na_2CO_3 (molecular mass 106) is dissolved in 250 mL of the solution.
22. a) Describe the determination of molecular weight of a solute from relative lowering of vapour pressure.
- [OR]**
- b) Write a short note on 'Elevation in boiling point.'

SECTION – D

Answer any THREE Questions **(3 × 10 = 30)**

23. Write explanatory notes on **(2.5+2.5+2.5+2.5)**
- i) Molecular orbital theory of covalent bonding
- ii) Lattice energy
- iii) Shape of methane molecule
- iv) Hydrogen bond

24. How will you prepare the following compounds from benzene.

(2+2+2+2+2)

- i) Nitrobenzene ii) *o*, *p*-xylene iii) Acetophenone
iv) Benzene hexachloride v) Cyclohexane

25. Complete the following reactions

- i) Benzoic acid + BH_3 , THF & H_2O , HCl
ii) Toluene + CH_3Cl / AlCl_3 & aq.KOH / heat
iii) Benzaldehyde + $2[\text{H}]$ / LiAlH_4
iv) Benzyl chloride + aq.NaOH
v) How does ethanol react with: (a) PCl_5 (b) Na

26. How will you determine the variation of mutual miscibility of the following with temperature?

- a) Phenol – water b) Nicotine – water
c) Triethylamine – water

27. Write brief notes on (5+5)

- i) Beckmann's method for determination of depression of freezing point
ii) Berkeley Hartley method for determining osmotic pressure.



Part – III: Core Subject: Second Semester: Paper – II

GENERAL CHEMISTRY - IV

Under CBCS – Credit 4

Time: **3** HoursMax. Marks: **75**

Answer ALL Questions

(10 × 1 = 10)

- Isotopes of an element have _____ atomic number but _____ mass number.
 - same, same
 - different, same
 - same, different
 - different, different
- Who gave the theory of radioactive disintegration
 - Thomson and Einstein
 - Hahn and Strassmann
 - Soddy and Fajan
 - Rutherford and Soddy
- Diethyl ether on heating with conc. HI gives two moles of
 - ethanol
 - iodoform
 - ethyl iodide
 - methyl iodide
- The C–O–C bond angle in diethyl ether is approx.
 - 109.5°
 - 118°
 - 180°
 - none of these
- The decreasing order of Grignard reagent formation among following alkyl halides is
 - $\text{CH}_3\text{X} > \text{C}_2\text{H}_5\text{X} > \text{C}_3\text{H}_7\text{X}$
 - $\text{C}_2\text{H}_5\text{X} > \text{C}_3\text{H}_7\text{X} > \text{CH}_3\text{X}$
 - $\text{C}_3\text{H}_7\text{X} > \text{C}_2\text{H}_5\text{X} > \text{CH}_3\text{X}$
 - $\text{C}_2\text{H}_5\text{X} > \text{CH}_3\text{X} > \text{C}_3\text{H}_7\text{X}$
- Which one of the following organometallic compounds reacts with ethylene to give a polymer
 - RMgX
 - R_2Zn
 - R_2CuLi
 - R-Li
- The substance which initiate a photochemical reaction but itself does not undergo any chemical change is called
 - catalysis
 - sensitizer
 - quantum yield
 - fluorescent

8. "Absorbance of a sample is directly proportional to its path length". This statement is related with

- a) Lambert's law
- b) Beer's Law
- c) Stark- Einstein Law
- d) Beer-Lambert law

9. The unit of rate constant of a zero order reaction is

- a) Ms^{-1}
- b) s^{-1}
- c) $\text{M}^{-1}\text{s}^{-1}$
- d) M^{-1}

10. The activation energy for a chemical reaction is dependent on

- a) temperature
- b) nature of reacting species
- c) collision frequency
- d) concentration of reactants

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. What do you mean by binding energy and mass defect?

12. Differentiate between nuclear fission and nuclear fusion reaction

13. Write down the halogenation reactions of diethyl ether.

14. How will you prepare TEL? Give its two uses

15. State Grotthuss - Draper law and Stark-Einstein law of photochemistry

16. Define 'Order' of a reaction'

17. The rate constant for a second order reaction is $2.55 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$, if the initial concentration of the reactant is 0.02 mol dm^{-3} , Calculate its half-life.

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) Derive an equation for disintegration constant of a radioactive material

[OR]

b) Illustrate the working principle of nuclear reactor with the help of a labelled diagram

19. a) Write down the preparation and properties of Mustard gas

[OR]

b) Explain the mechanism of Williamson synthesis

20. a) Discuss the synthetic applications of Grignard reagent

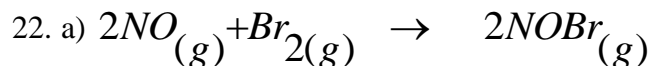
[OR]

b) Give any five synthetic utility of organolithium reagent

21. a) Compare and contrast thermal reaction and photochemical reaction

[OR]

b) Write a note on chemiluminescence and bioluminescence



i) Write the Rate Law Expression.

ii) Calculate the with order respect to NO and Br and overall order

iii) Calculate the rate constant (k)

iv) Calculate the rate(r)

v) Calculate the rate(r) if $[\text{NO}] = [\text{Br}] = 2 \times 10^{-5} \text{ mol dm}^{-3}$

Given:

1) $[\text{NO}]$ is $4 \times 10^{-3} \text{ mol dm}^{-3}$; $[\text{Br}]$ is $2 \times 10^{-3} \text{ mol dm}^{-3}$; and rate(r) is $5 \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$

2) $[\text{NO}]$ is $8 \times 10^{-3} \text{ mol dm}^{-3}$; $[\text{Br}]$ is $2 \times 10^{-3} \text{ mol dm}^{-3}$; and rate(r) is $10 \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$

3) $[\text{NO}]$ is $5 \times 10^{-3} \text{ mol dm}^{-3}$; $[\text{Br}]$ is $3 \times 10^{-3} \text{ mol dm}^{-3}$; and rate(r) is $4 \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$

4) $[\text{NO}]$ is $5 \times 10^{-3} \text{ mol dm}^{-3}$; $[\text{Br}]$ is $12 \times 10^{-3} \text{ mol dm}^{-3}$; and rate(r) is $16 \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$

[OR]

b) 5 mL of ethyl acetate was added to a conical flask containing 100 mL of 0.1 M HCl placed in a thermostat maintained at 30°C . 10 mL of the reaction mixture was withdrawn at different time intervals and after chilling, the solution was titrated against NaOH. The following data are obtained. Find out the rate constant (k), for the above reaction
Given:

Time(mins)	0	5	15	25	α
Volume of NaOH (ml)	9	12	13	14	30

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. Discuss the applications of radio active isotopes in agriculture, medicine and in carbon dating

24. Write a short note on acid and base catalyzed ring opening of epoxides with suitable mechanism.

25. Write the preparation, properties and synthetic applications of following reagents

i) Frankland reagent

ii) Gilman reagent

26. Illustrate the photophysical phenomenon with the help of Jablonski diagram

27. a) Derive an integral Expression for First order reaction **(5)**

b) Derive an Expression for Arrhenius rate equation **(5)**



**SECTION – A****Answer ALL Questions****(10 × 1 = 10)**

- The p-block elements are placed in groups _____ of the periodic table.
a) 2-10 b) 12-16 c) 13 to 18 d) 8-13
- CaC_2 is an example of _____ carbide.
a) Ionic b) Covalent c) Mixed d) Metallic
- N-N bond distance in hydrazine is
a) 1.65 Å b) 1.57 Å c) 1.47 Å d) 1.30 Å
- The angle between three oxygen atoms in ozone is
a) 110.5° b) 122.3° c) 105.5° d) 116.8°
- The outermost electronic configuration of bromine _____
a) $[\text{Kr}] 3d^{10} 4s^2 4p^5$ b) $[\text{Ar}] 4s^2 4p^5$
c) $[\text{Ar}] 3d^{10} 4s^2 4p^5$ d) $[\text{Ar}] 4d^{10} 5s^2 5p^5$
- The shape of IF_5 is _____
a) Square pyramidal b) Octahedral
c) Square planar d) Pentagonal bipyramidal
- Which one of the following does not show different oxidation states?
a) Iron b) Copper c) Zinc d) Manganese

8. Which of the following is INCORRECT regarding actinides?
- a) All actinides are paramagnetic in nature
 - b) All actinides are radioactive in nature
 - c) All these metals are not attacked by HCl
 - d) They react with boiling water to give a mixture of oxide and hydride
9. During the concentration of ores, the obtained impurities are called as
- a) Sludge b) Nuggets c) Gangue d) all the above
10. The reduction of carbon is also known as
- a) Smelting b) Roasting c) Calcination d) Leaching

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

- 11. Why oxygen has less ionization energy than nitrogen?
- 12. BI_3 is stronger Lewis acid than BF_3 . Give reason
- 13. How is sulphuric acid prepared?
- 14. What are pseudohalogens? Why is it so called?
- 15. Which transition element of the 3d series exhibit largest number of oxidation states and why?
- 16. Differentiate between mineral and ore.
- 17. What is meant by the term concentration of the ore?

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) Discuss the diagonal relationship between B and Si.

[OR]

- b) Write a note on allotropes of carbon.

19. a) List out the differences between nitrogen and the rest of the family members.

[OR]

- b) Give the preparation of following compounds

- i) ammonia ii) nitric acid iii) urea

20. a) Discuss the anomalous behaviour of fluorine.

[OR]

- b) Find out the hybridization and shape of XeOF_2 and XeO_3 .

21. a) Describe the catalytic property of d-block elements.

[OR]

- b) Compare briefly the chemistry of elements of d-block with those of f-block.

22. a) Discuss calcination and roasting with suitable examples.

[OR]

- b) Explain the extraction of titanium from its ore.

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

- 23. Discuss briefly the structure and classifications of silicates.
- 24. Describe the preparation, properties and structure of hydrogen peroxide.
- 25. Explain the separation of noble gases by Dewar's charcoal method.
- 26. What is lanthanoid contraction? Discuss its causes and consequences.
- 27. Write a note on i) Froth flotation process ii) Zone refining method



**B.Sc. Chemistry Degree (Semester) Examinations, April 2021**

Part – III: Core Subject: Fourth Semester: Paper – II

PHYSICAL CHEMISTRY - II

Under CBCS – Credit 4

Time: **3 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions****(10 × 1 = 10)**

- HCP and BCC are called close-packed structures. close packed structures have
 - Highest packing efficiency
 - Highest void fraction
 - Highest density
 - All of the mentioned
- Graphite is a common allotrope of carbon. Its crystal structure is
 - Cubic
 - Monoclinic
 - Orthorhombic
 - Hexagonal
- If arsenic is added as impurity to silicon, the type of semiconductor obtained is called _____
 - p-type
 - n-type
 - Intrinsic
 - None of the above
- The interplanar distance d_{hkl} for a cubic system is given by:
 - $a/(\sqrt{h^2+k^2+l^2})$
 - $b/(\sqrt{h^2+k^2+l^2})$
 - $c/(\sqrt{h^2+k^2+l^2})$
 - $abc/(\sqrt{h^2+k^2+l^2})$
- Thread like liquid crystal exhibit by _____
 - Smectic
 - Nematic
 - Cholesteric
 - Disc
- Pick out correct structure in the following adopted by ZnS
 - Sphalerite
 - Wurtzite
 - Fluorite
 - Rutile
- Equal volumes of all gases under the same conditions of temperature and pressure contain equal number of molecules". This is
 - Dalton's law
 - Charle's law
 - Boyle's law
 - Avogadro's law

8. The expression for most probable velocity is

- a) $(4RT/M)^{1/2}$ b) $(3RT/M)^{1/2}$ c) $(2RT/M)^{1/2}$ d) $(RT/M)^{1/2}$

9. Van der Waals equation for a real gas is

- a) $(P+n2a/V^2)(V-nb)=nRT$ b) $(P+n2b/V^2)(V-na)=nRT$
c) $(P-n2a/V^2)(V-nb)=nRT$ d) $(P-n2b/V^2)(V-na)=Nrt$

10. The interaction energy $\phi(r)$, for polar molecules with permanent dipole moments is given by the expression

- a) $+2C/r^6$ b) $+C/r^6$ c) $-C/r^6$ d) $-2C/r^6$

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. Define the following i) Allotropy ii) Polymorphism
12. Calculate the miller indices and weiss indices of a crystal plane which cut through the crystal axis at (1a, 3b, 0c)
13. What do you mean by a quasi crystal?
14. Write the equation of root mean square, most probable and average velocity.
15. Calculate the root mean square velocity of nitrogen at 27°C and 70 cm pressure. Density of Hg = 13.6 g cm⁻¹.
16. Which factor is mainly responsible for real gases to show deviation from ideal gases?
17. Calculate the Boyle temperature T_B for CO₂ gas, assuming it to be a Van der Waals gas.

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) How will you differentiate the seven crystal systems based on edge length and interfacial angle? Give examples.

[OR]

b) Explain the characteristics of crystalline solid and amorphous solid.

19. a) Discuss any one method that aid in the study of crystal structure

[OR]

b) Describe any two imperfections that occur in a crystal lattice.

20. a) Compare and contrast the structure of diamond and graphite

[OR]

b) Tabulate radius ratio rule with valid comments and examples.

21. a) Explain the mathematical terms involved in

- i) Boyle law ii) Charles law iii) Avogadro's law

[OR]

b) How will you calculate collision diameter and mean free path from viscosity measurement.

22. a) Derive an expression for the Boyle temperature on Van der Waals equation.

[OR]

b) Write a note on

- i) Dipole – Dipole interaction ii) Induced dipole interaction

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. Calculate the packing efficiency of the following unit cells:

i) SC ii) FCC iii) BCC.

24. Illustrate the band theory of solids in detail.

25. Describe the classification and structure of liquid crystal

26. Discuss postulates of kinetic molecular theory of gases and derive kinetic gas equation.

27. Elaborate the dielectric equation, Berthelot equation, Clausius equation and Redlich –Kwong equation state of real gases.



**SECTION – A****Answer ALL Questions:****(10 × 1 = 10)**

- Which of the following monosaccharides is the majority found in the human body?
a) D-type b) L-type c) LD-types d) DL-types
- Which of the following glycosidic linkage found in maltose?
a) Glucose ($\alpha 1 - 2\beta$) Fructose b) Glucose ($\alpha 1 - 4$) Glucose
c) Galactose ($\beta 1 - 4$) Glucose d) Glucose ($\beta 1 - 4$) Glucose
- Sulpha drugs are used as
a) Antimalarial b) Analgesic c) Antibacterial d) Antipyretics
- Which one of the following method used for isolation of Terpenoids?
a) Steam distillation b) Solvent extraction
c) Enfleurage process d) All these
- Claisen reaction gives _____ migration which leads to the formation product
a) allylic b) vinylic c) geminal d) both a & b
- What would be intermediate formed in Curtius rearrangement
a) nitrene b) carbene c) carbocation d) carbanion

7. Gabriel-phthalimide method is used to synthesis_____

- a) Primary amine b) Secondary amine
- c) Tertiary amine d) All of these

8. Cocaine hydrolysed under controlled condition to give

- a) Benzylecgonine b) Ecgonine
- c) Tropinone d) None of these

9. Which one of the following excited state has long life

- a) S_1 b) S_2 c) T_1 d) T_2

10. Diels-Alder reaction is an example for

- a) Sigmatropic reaction b) Cycloaddition reaction
- c) Electrocyclic reaction d) cheletropic reaction

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. Differentiate anomers and epimers in carbohydrates

12. What is reducing and non reducing sugar? Give two example for each

13. How will you synthesis sulphanilamide?

14. How will you convert menthol into *p*-methane?

15. Give an example of molecular reaarngement involving carbanion intermediate.

16. What is Wolff rearrangement?

17. Write down the characteristic features of pericyclic reactions

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) What will happen when glucose oxidise with the following reagents:

- i) $\text{Br}_2/\text{H}_2\text{O}$ ii) HNO_3 iii) HIO_4
- iv) Zymase v) Excess of phenylhydrazine

[OR]

b) Draw the structure of following:

- i) Sucrose ii) Maltose iii) Cellobiose
- iv) Amylose v) Cellulose

19. a) Outline the synthesis of Zinziberene and Camphor

[OR]

b) Outline the synthesis of Piperine and nicotine

20. a) List out the various colour tests for detection of amino acid.

[OR]

b) Outline the synthesis and uses of sulphapyridine and sulphathiazole

21. a) Discuss the mechanism of Pinacol-pinacolone rearrangement

[OR]

b) What is Favorskii rearrangement? Discuss its mechanism with one example.

22. a) Illustrate Norrish type-I photolytic cleavage reaction

[OR]

b) Account on types of pericyclic reactions with suitable examples

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. Write a note on:

i) Kiliani-Fischer synthesis

ii) Ruff Degradation

24. Explain the structure and functions of cholesterol and testosterone

25. Discuss the preparations and applications of Martius yellow and methyl orange

26. Explain the mechanism of the following rearrangement

i) Wagner-Meerwin

ii) Fries

iii) Beckmann

27. Illustrate the following reactions with mechanism

i) Di-π methane rearrangement

ii) Paternò-Büchi reaction



**B.Sc. Chemistry Degree (Semester) Examinations, April 2021**

Part – III: Elective Subject: Sixth Semester: Paper – I

ANALYTICAL CHEMISTRY

Under CBCS – Credit 5

Time: **3 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions****(10 × 1 = 10)**

- What is full form of MSDS Sheet?
 - Material safety data sheet
 - Material service data sheet
 - Molecular safety data sheet
 - Manufacturer service data sheet
- How to treat an acidic compound spill on someone's hand in laboratory?
 - wash with cold saturated sodium bicarbonate solution
 - wash with cold 1 % boric acid solution
 - wash with 1 % acetic acid solution
 - wash with Dettol
- The standard deviation of population is denoted by
 - θ
 - μ
 - σ
 - Ω
- How many significant figures are there in 0.002000?
 - 1
 - 2
 - 3
 - 4
- Chromatography is a type of _____ technique
 - Biochemical
 - Biophysical
 - Chemical
 - Physical
- _____ is called as modified form of column chromatography
 - TLC
 - Gas chromatography
 - HPLC
 - Flash chromatography

7. The solvent that is enriched in solute is called as _____
 a) Emulsion b) Raffinate c) Slug d) Extract
8. According to Distribution Coefficient (K_D), the ratio of solute is _____
 a) Constant in both phases b) Constant in organic phase
 c) Partially constant in organic phase d) Partially constant in both phases
9. For the ideal reversible reaction, ΔE_p is
 a) 100 mV b) 59 mV c) 20 mV d) 150 mV
10. Which of the following studies cannot be done by TGA?
 a) Sublimation b) Combustion c) Kinetics d) Extraction

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. Write any two differences between classical and instrumental methods of analysis.
12. Define the following terms.
 i) Mean ii) Median
13. Calculate the absolute and the relative errors on ppt (parts per thousand) of two numerical value, i.e., 5.431 and 5.410.
14. Define the term ‘Chromatography’.
15. What is meant by Solvent extraction?
16. Write down the Randles-Sevcik equation.
17. List out the applications of polarimeter.

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) Discuss the important role of analytical chemistry.

[OR]

- b) Explain the stoichiometric and non-stoichiometric analytical procedures.

19. a) The errors in five consequent measurements are 0.019, 0.018, 0.017, 0.025 and 0.015. Calculate standard deviation.

[OR]

- b) Write a note on accuracy and precision.

20. a) Write down the steps involved in TLC chromatography.

[OR]

- b) Write down the steps involved in Ion exchange chromatography.

21. a) List out the important applications of solvent extraction method.

[OR]

- b) Mention the importance of Solid phase extraction

22. a) Explain in detail about the circular dichroism and its instrumentation.

[OR]

- b) List out the important differences between TGA and DTA

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. i) Write a note on quantitative and qualitative analysis.
 ii) Discuss the safety measures to prevent the accident in laboratories.
24. Discuss the various types of errors with suitable examples.
25. Write a short note on ‘Column Chromatography’ technique.
26. Explain the following terms
 a) Solvent phase Extraction
 b) Distribution and Extraction Co-efficient
 c) Diluents d) Solid phase extraction
27. Write a short note ‘Cyclic Voltammetry’ technique.



**B.Sc. Chemistry Degree (Semester) Examinations, April 2021**

Part – III: Elective Subject: Sixth Semester: Paper – II

ELEMENTS OF SPECTROSCOPY

Under CBCS – Credit 5

Time: **3 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions****(10 × 1 = 10)**

- The different types of energies associated with a molecule are
 - Electronic energy
 - Vibrational energy
 - Rotational energy
 - All of the mentioned
- A photon of wavenumber 100 cm⁻¹ has a wavelength of
 - 1 m
 - 1 mm
 - 1000 nm
 - 100 m
- Infrared spectroscopy provides valuable information about
 - Molecular weight
 - Melting point
 - Conjugation
 - Functional group
- Raman Effect supports
 - Corpuscular theory
 - Wave theory
 - Quantum theory
 - Electromagnetic theory
- Woodward's empirical rules were modified by Fieser in the year:
 - 1947
 - 1948
 - 1957
 - 1958
- An allowed UV transition will have ϵ_{max} value of
 - > 1000
 - 500 – 1000
 - 100 – 500
 - < 100
- δ value of TMS in NMR spectra is fixed at
 - 0
 - 1
 - 2
 - 3

8. Which of the following molecule shows ESR spectra?
 a) H_2O b) O_2 c) H_2O_2 d) CO_2
9. Which of the following formulae is consistent with a molecular ion of m/z 73 in a mass spectrometry experiment?
 a) $\text{C}_3\text{H}_8\text{N}_2$ b) $\text{C}_4\text{H}_{11}\text{N}$ c) $\text{C}_4\text{H}_{10}\text{O}$ d) $\text{C}_3\text{H}_5\text{NO}$
10. In ionization chamber vapors are bombarded with fast moving
 a) Protons b) Electrons c) Neutrons d) Antineutron

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. Which of the following molecules will show a pure rotational (microwave) spectrum and why ? H_2 , HCl , CH_3Cl , H_2O (liquid), NH_3 and NH_4Cl (s).
12. State the Born-oppenheimer approximation.
13. What do you mean by stokes and antistokes lines.
14. Define: a) chromophore b) auxochrome
15. What are the two types of relaxation processes in NMR.
16. Define zero field splitting.
17. Define nitrogen rule.

SECTION – C

Answer ALL Questions

(5 × 5 = 25)

18. a) Discuss the factors affecting the width of spectral lines

[OR]

- b) Write any four applications of molecular spectroscopy.

19. a) Sketch the normal modes of vibrations of
 i) water
 ii) carbondioxide and determine which are IR active /inactive why?

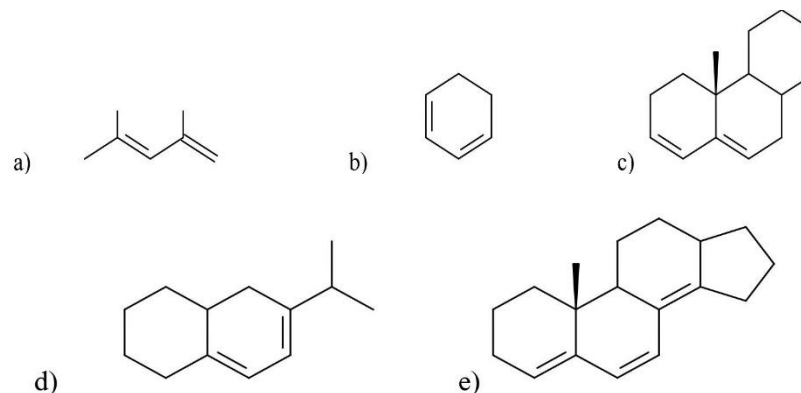
[OR]

- b) Write the differences between IR and raman spectroscopy.

20. a) Discuss in brief the various types of electronic transitions.

[OR]

- b) Calculate the wavelength of maximum UV absorption for the following molecules using Woodward-Fieser's Rules



21. a) Discuss in brief hyperfine splitting in ESR spectroscopy

[OR]

- b) Highlight the theory of Kramer's degeneracy in a nutshell.

22. Explain basic principles of mass spectrometry.

[OR]

- b) Write a note on McLafferty rearrangement.

SECTION – D

Answer any THREE Questions

(3 × 10 = 30)

23. Discuss in detail about the classification of rotational spectra.

24. Explain the theory of pure vibrational spectra of a diatomic molecule (SHO).

25. Explain in detail the various shifts in absorption maxima of UV spectroscopy.

26. Write a note on chemical shift and the factors affecting it.

27. Explain the following terms

i) Parent peak

ii) Base peak

iii) Molecular ion peak

iv) Fragmentation ion

v) Isotopic peak



**SECTION – A****Answer ALL Questions:****(10 × 1 = 10)**

- Deep cuts out of rusted objects may result in
 - haemorrhage
 - titanus
 - rashes
 - swelling
- Which salt is used to cure the disinfectant based poison
 - Gypsum
 - Caustic Potash
 - Epsom
 - both a & c
- All infectitious diseases are caused by _____
 - bacteria
 - fungi
 - algae
 - germs
- Filariasis is charaterised by the swelling of
 - neck
 - hands
 - legs
 - head
- The chief intracellular cation that forms the main base of the body is
 - Na⁺
 - K⁺
 - Ca²⁺
 - Cu²⁺
- Which among the following metal is associated with chlorophyll
 - Ca
 - I
 - Cu
 - Zn
- In Greek etymology, the word anaesthesia means
 - Lightness
 - Sleepless
 - Insensibility
 - Pain reliever

8. Which alcohol is used to avoid the formation of poisonous carbonyl chloride?
chloroform

- a) Methanol b) Ethanol c) Propanol d) Butanol

9. The more potent natural product present in neem

- a) Margosine b) Margosa c) Azadirachtin d) Lauric acid

10. Spinach is rich in

- a) Fe b) Na c) Cu d) K

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. What does a first aid kit consist of?
12. Give example of any two insect borne diseases.
13. Define pharmacology.
14. Name any two aluminium compounds that are used in daily life for a robust health.
15. Give any two points of significance of calcium in health maintenance.
16. What are general and local anaesthetics.
17. Write the medicinal use of green grass.

SECTION – C

Answer ALL Questions

(3 × 9 = 27)

18. a) Prescribe the antidotes for the following poison cases

- i) alkali ii) alkaloid iii) salicylate

[OR]

b) Discuss in detail any three water borne diseases

19. a) List out the compounds of Mercury that promote the health of human beings and write its uses

[OR]

b) Briefly discuss the structure and properties of cocaine and benzocaine

20. a) Give a gist on the following herbal plants:

- i) Tulsi ii) Hibiscus Rosa iii) Azadirachta indica

[OR]

b) Reveal the medicinal values of:

- i) Adathoda Vasia ii) Killaynelli iii) Thuduvalai

SECTION – D

Answer any TWO Questions

(2 × 14 = 28)

21. Define first aid. Quote its basic rules. Write the same for:

- i) fracture
ii) burns
iii) poisonous bites

22. Jot down the causing organism, symptoms, control, treatment and prevention of air borne diseases.

23. Elaborate the role of the following chemicals for a healthy human body

- a) iodine b) copper c) zinc

24. Tabulate the chemical structure, properties, advantages and disadvantages of anaesthetics.



**B.Sc. Chemistry Degree (Semester) Examinations, April 2021**

Part – IV: Skill Based Subject: Fourth Semester: Paper – I

BIOMOLECULES

Under CBCS – Credit 2

Time: **2 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions****(10 × 1 = 10)**

- This is an example of derived lipids
 - Terpenes
 - Steroids
 - Carotenoids
 - all of the above
- Which of these is not a lipid?
 - Fats
 - Oils
 - Proteins
 - Waxes
- Who coined the word enzyme?
 - Wilhelm Kuhne
 - Alfred Russel
 - Robert Koch
 - Rosalind Franklin
- The general mechanism is that an Enzyme acts by
 - Reducing the activation energy
 - Increasing activation energy
 - Decreasing pH value
 - Increasing the pH value
- Amino acids in proteins are linked through which bond?
 - Covalent non
 - Peptide bond
 - Glycosidic
 - Ionic bond
- Which of the following is the example of defense proteins?
 - Dehydrogenase
 - Myoglobin
 - Hemoglobin
 - Immunoglobulin

7. Which of the following are not the components of RNA?
 a) Thymine b) Adenine c) Guanine d) Cytosine
8. Group of adjacent nucleotids are joined by _____
 a) Phosphodiester bond b) Peptide bond
 c) Ionic bond d) Covalent bond
9. Retinol is the scientific name of which vitamin?
 a) Vitamin A b) Vitamin D c) Vitamin K d) Vitamin C
10. Which of the following is the most essential nutrient for a woman during her initial stages of pregnancy to prevent birth defects?
 a) Thiamin b) Folic acid c) Vitamin C d) Vitamin E

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. What are enzymes? Give two exmples.
12. What are saturated and unsaturated fats?
13. What is nucleic acids and its function?
14. What are the types of enzyme specificity?
15. What are antivitamins?
16. What is protein denaturation and how does it happen?
17. What is DNA repair and why is it important?

SECTION – C

Answer ALL Questions

(3 × 9 = 27)

18. a) Discuss the following terms
 i) saponification number ii) iodine number
- [OR]**
- b) What are lipids? Discuss different types of lipids with suitable examples.

19. a) Define the following terms:
 i) Coenzyme ii) isoenzyme iii) enzyme's active site
 iv) hydrolases v) ligases

[OR]

- b) Write short notes on the following
 i) Zwitter ion ii) Isoelectric point iii) Peptide linkage.
20. a) Briefly expalin the following terms:
 i) competitive inhibition ii) Non-competitive inhibition
 iii) Coenzyme

[OR]

- b) Wirte a sources, functions and deficiency and diseases for vitamin A, D, E and K.

SECTION – D

Answer any TWO Questions

(2 × 14 = 28)

21. Define mechanism of enzymatic action. Discuss in detail about lock and key mechanism and Induced fit model of enzyme action.
22. a) Discuss the classification of protein with examples **(7)**
 b) How do you prepare α-amino acid using following methods. **(7)**
 i) Gabriel phthalimide synthesis ii) Strecker synthesis
23. a) Compare Nucleoside and Nucleotide. **(6)**
 b) List the main differences between DNA and RNA? **(8)**
24. a) list out the various roles of fatty acids in human health. **(6)**
 b) Discuss functions and deficiency of water soluble vitamins. **(8)**



**B.Sc. Chemistry Degree (Semester) Examinations, April 2021**

Part – IV: Skill Based Subject: Sixth Semester: Paper – I

INDUSTRIAL AND CLINICAL CHEMISTRY

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

SECTION – A**Answer ALL Questions****(10 × 1 = 10)**

- Saccharin is _____ times sweeter than sugar
a) 180 b) 300 c) 450 d) 600
- What is India's contribution to the world's paper production?
a) 2 % b) 3 % c) 4 % d) 6 %
- Detergents are synthetic soaps like cleansing agents and are also known as _____
a) Artifacts b) Detritus c) Syndets d) Collagen
- Soaps are _____ based soapy detergents.
a) water b) kerosene c) oil d) acid
- Paraffin wax used for making candles is obtained from
a) Coal b) Petroleum c) Seaweeds d) Marsh gas
- Which one of the following is used as a permanent ink preservative?
a) sodium benzoate b) carbolic acid c) acetic acid d) ferrous salt
- In the manufacturing of safety matches, which of the following materials are used to coat the two sides of match boxes?
a) yellow phosphorus b) glycerine
c) red phosphorus d) gypsum

8. Disease transmission cycle can be stopped by_____

- a) Wet sanitation b) Water usage
- c) Sanitation system d) Night soil

9. Red Blood Cells are also known as_____

- a) Erythrocytes b) Platelets
- c) Leukocytes d) Granulocytes

10. On what basis blood group is classified?

- a) Antigen and antibody b) Rh factor
- c) hemoglobin content d) Oxygen content

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

- 11. How many sugar mills are there in Tamilnadu?
- 12. What is calendared paper?
- 13. Why detergents are not used for bathing?
- 14. How do safety matches work?
- 15. What is hygiene and sanitation?
- 16. What causes bile pigments in urine?
- 17. What is the principle of blood grouping?

SECTION – C

Answer ALL Questions

(3 × 9= 27)

18. a) Outline the synthesis of saccharin from toluene.

[OR]

b) Explain the following terms

- i) grading of sugar ii) bleaching of paper iii) antiseptics

19. a) Discuss the preparation and uses of wax candles and chalk crayons.

[OR]

b) Explain the cleansing action of soap with the help of a neat labelled diagram.

20. a) Elaborate the importance of personal and domestic hygiene.

[OR]

b) Describe composition of blood and hypertension.

SECTION – D

Answer any TWO Questions

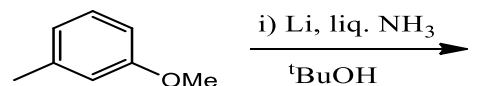
(2 × 14 = 28)

- 21. How will you prepare ethanol from molasses?
- 22. Identify what are the surfactant used in detergents.
- 23. Write notes on
 - i) White phenyl and mixed fruit jam preparation
 - ii) Types of hygiene.
- 24. How will you determine sugar in urine and glucose in serum by using suitable methods.



**SECTION – A****Answer ALL Questions****(75 × 1 = 75)**

- The most probable oxidation states for both Cr and Mo are
a) +2,+3,+4 b) +2,+3,+5 c) +2,+3,+6 d) +3,+4,+5
- Indicator used in redox titration is
a) Eriochrome black T b) Methyl orange
c) Phenolphthalein d) Methylene blue
- The decreasing order of the first ionization energy of the following elements is
a) Xe>Be>As>Al b) Xe>As>Al>Be
c) Xe>As>Be>Al d) Xe>Be>Al>As
- Which one of the following species is not isoelectronic with CO?
a) N₂ b) CN⁻ c) NO⁺ d) O₂⁺
- The ligand with only sigma (σ) bonding character is
a) CN⁻ b) CH₃⁻ c) CO d) NO
- The major product formed in the following reaction



- (a) (b) (c) (d)

7. The major product formed in the reaction of 1,3-butadiene with bromine is
 a) $\text{BrCH}_2\text{CH}(\text{Br})\text{CH}=\text{CH}_2$ b) $\text{CH}_2=\text{CH}-\text{CH}_2\text{CH}_2\text{Br}$
 c) $\text{CH}_2=\text{C}(\text{Br})-\text{C}(\text{Br})=\text{CH}_2$ d) $\text{BrCH}_2\text{CH}=\text{CHCH}_2\text{Br}$

8. Among the following, the compound that has the lowest degree of ionic character is

- a) NaCl b) MgCl_2 c) AlCl_3 d) CaCl_2

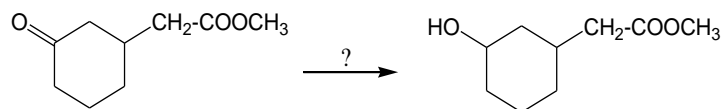
9. Acetic acid in liquid NH_3 behaves as

- a) weaker acid than that in water b) stronger acid than that in water
 c) base acid d) neutral acid

10. The nucleobase not found in DNA is

- a) Thymine b) Uracil c) Guanine d) Adenine

11. The reagent used in the transformation is



- a) LiAlH_4 b) NaBH_4 c) $\text{Zn}(\text{Hg})/\text{HCl}$ d) $\text{H}_2\text{NNH}_2, \text{OH}^-$

12. Allylic bromination is carried out by

- a) $\text{HBr}, \text{H}_2\text{O}_2$ b) HOBr c) Br_2, CS_2 d) NBS

13. The pK_a values of HOCl , HClO_2 and HClO_3 follow the order

- a) $\text{HClO}_2 > \text{HOCl} > \text{HClO}_3$ b) $\text{HClO} > \text{HClO}_2 > \text{HClO}_3$
 c) $\text{HOCl} > \text{HClO}_3 > \text{HClO}_2$ d) $\text{HClO}_3 > \text{HClO}_2 > \text{HOCl}$

14. Mulliken Barker's test is used for the detection of _____ group.

- a) $-\text{NH}_2$ b) $-\text{NO}_2$ c) $-\text{CHO}$ d) $-\text{COOR}$

15. If Δ_o and Δ_t denote respectively, the octahedral and the tetrahedral crystal field splitting for a given metal ion and ligand with the same bond distance, then the ratio Δ_o / Δ_t is

- a) 1.0 b) 0.5 c) 2.2 d) 0.44

16. For irreversible process, the entropy will be

- a) $\Delta S_{\text{universe}} > 0$ b) $\Delta S_{\text{universe}} < 0$ c) $\Delta S_{\text{universe}} = 0$ d) $\Delta S_{\text{universe}} \leq 0$

17. Two sets of quantum numbers with the same number of radial nodes are

- a) $n = 3; l = 2; m_l = 0$ and $n = 2; l = 1; m_l = 0$
 b) $n = 3; l = 0; m_l = 0$ and $n = 2; l = 0; m_l = 0$
 c) $n = 3; l = 1; m_l = 1$ and $n = 2; l = 1; m_l = 0$
 d) $n = 3; l = 1; m_l = -1$ and $n = 2; l = 1; m_l = 0$

18. The complex which does not obey 18-electron rule is (atomic number for $\text{Mn}=25$, $\text{Fe}=26$, $\text{Co}=27$, $\text{Ru}=44$)

- a) $[\text{Co}_2(\text{CO})_8]$ b) $[\text{Fe}(\text{CO})_4]^{2-}$
 c) $[\text{HMn}(\text{CO})_5]$ d) $[(n^5\text{-C}_5\text{H}_5) \text{RuCl}(\text{CO})(\text{PPh}_2)]$

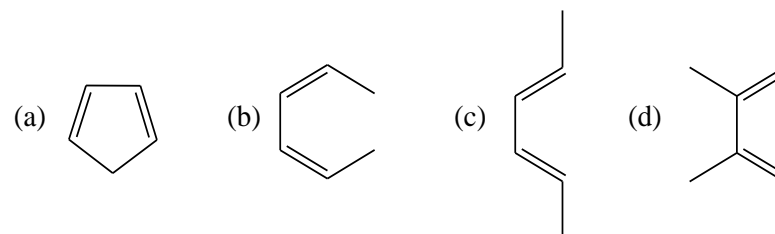
19. With respect to periodic properties, the correct statement is

- a) Electron affinity order is $\text{F} > \text{O} > \text{Cl}$
 b) First ionization energy is $\text{Al} > \text{Mg} > \text{K}$
 c) Atomic radius order is $\text{N} > \text{P} > \text{As}$
 d) Ionic radius order is $\text{K}^+ > \text{Ca}^{2+} > \text{Mg}^{2+}$

20. Carbonic anhydrase is an example of

- a) Hydrolysis enzyme b) Redox enzyme
 c) O_2 transport protein d) Heme protein

21. Which of the following diene is less reactive in Diels-Alder reaction?



22. According to equipartition energy, the molar heat capacity of Ne is

- a) R b) 1.5R c) 2R d) 1.66R

23. The crystal field splitting for CoCl_6^{4-} is 16000 cm^{-1} . The Δ for CoCl_4^{2-} would be _____ cm^{-1} .

- a) 8000 b) 711 c) 7111 d) 6423

24. The number of microstates for p^2 configuration is

- a) 45 b) 15 c) 25 d) 10

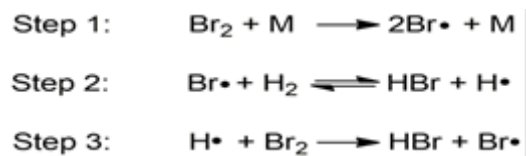
25. The activation energy for a reaction which doubles in rate when the temperature is raised from 18°C to 28°C ?

- a) 120 b) 1.2 c) 12 d) 0.12

26. (*S*)-isomer of $\text{ClCH}_2\text{C}(\text{CH}_3)(\text{Et})\text{CONH}_2$ is subjected to Hofmann rearrangement and the product is

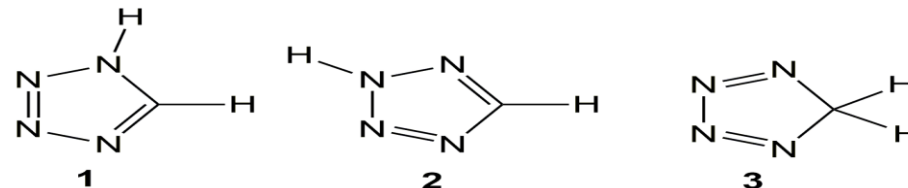
- a) *R*-isomer b) *S*-isomer c) Racemic mixture d) meso compound

27. For the radical chain reaction below, the correct classification for step 2 and step 3 is, respectively,



- a) Chain propagating, chain terminating
b) Chain branching, chain terminating
c) Chain propagating, chain propagating
d) Chain propagating, chain branching

28. The correct statement for the following structures is



- a) 1, 2 and 3 are resonance structures
- b) 1 and 2 are resonance structures, whereas 3 is an isomer of 1 and 2
- c) 1 and 3 are resonance structures, whereas 2 is an isomer of 1 and 3
- d) 1, 2 and 3 are constitutional isomers

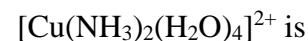
29. Treatment of formic acid with concentrated sulfuric acid gives

- a) $\text{CO} + \text{H}_2\text{O}$
- b) $\text{CO}_2 + \text{H}_2$
- c) $\text{HCHO} + \frac{1}{2} \text{O}_2$
- d) no product (no reaction)

30. The geometries of the species $[\text{Br}_3]^+$, $[\text{Br}_3]^-$ and $[\text{BrF}_3]$ are, respectively,

- a) Linear, trigonal bipyramidal and trigonal bipyramidal
- b) Linear, linear and trigonal planar
- c) Tetrahedral, trigonal bipyramidal and trigonal bipyramidal
- d) Tetrahedral, trigonal pyramidal and trigonal planar

31. The number of *d-d* transition(s) expected for the complex



- a) 1
- b) 2
- c) 3
- d) 4

32. A filter paper moistened with cadmium acetate solution turns yellow upon exposure to H_2S . The transition responsible for the yellow colour is

- a) *d-d*
- b) metal-to-ligand charge transfer
- c) ligand-to-metal charge transfer
- d) $\sigma-\sigma^*$

33. The most basic amino acid among the following is

- a) Tyrosine
- b) Methionine
- c) Arginine
- d) Glutamine

34. The crystal field stabilization energy (CFSE) in $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ is
 a) $0 \Delta_o$ b) $2.0 \Delta_o - 2P$ c) $0.4 \Delta_o - 2P$ d) $2.0 \Delta_o$
35. The correct order of entropy for various states of CO_2 is
 a) $\text{CO}_2(\text{s}) > \text{CO}_2(\text{l}) > \text{CO}_2(\text{g})$ b) $\text{CO}_2(\text{l}) > \text{CO}_2(\text{s}) > \text{CO}_2(\text{g})$
 c) $\text{CO}_2(\text{g}) > \text{CO}_2(\text{l}) > \text{CO}_2(\text{s})$ d) $\text{CO}_2(\text{g}) > \text{CO}_2(\text{s}) > \text{CO}_2(\text{l})$
36. The radial distribution functions for all orbitals is given by
 a) $n - l$ b) $n - l - 1$ c) $n - l - 2$ d) $n - l + 1$
37. Aluminium is thermodynamically stable because
 a) a thin layer of aluminium oxide is formed on its surface, protecting it from further attack
 b) it has a low hydration power
 c) its ionization energy is greater than that of copper
 d) it has a low standard reduction potential
38. An organic compound reduces Tollens reagent and Fehling's solution. It can be
 a) $\text{CH}_3\text{CH}_2\text{CHO}$ b) $\text{C}_6\text{H}_5\text{CHO}$
 c) $\text{CH}_3\text{COCH}_2\text{CH}_3$ d) $(\text{CH}_3)_3\text{CCOCH}_3$
39. The molar concentration of 20 g of NaOH present in 5 litre of solution is:
 a) 0.1 mol/L b) 0.2 mol/L c) 1.0 mol/L d) 2.0 mol/L
40. Of the following sets which one does not contain isoelectronic species?
 a) PO_4^{3-} , SO_4^{2-} , ClO_4^- b) CN^- , N_2 , C_2^{2-}
 c) SO_3^{2-} , CO_3^{2-} , NO_3^- d) BO_3^{3-} , CO_3^{2-} , NO_3^-

41. The correct order of first ionization potential is:
 a) $\text{F} > \text{He} > \text{Mg} > \text{N} > \text{O}$ b) $\text{He} > \text{F} > \text{N} > \text{O} > \text{Mg}$
 c) $\text{He} > \text{O} > \text{F} > \text{N} > \text{Mg}$ d) $\text{N} > \text{F} > \text{He} > \text{O} > \text{Mg}$
42. Which one of the following pairs of species have the same bond order?
 a) CN^- and NO^+ b) CN^- and CN^+
 c) O_2^- and CN^- d) NO^+ and CN^+
43. H_2O_2 acts as an oxidizing agent in _____ medium.
 a) Acidic b) Alkaline c) Acidic and alkaline d) Neutral
44. The pair of compounds which cannot exist together is
 a) NaHCO_3 & NaOH b) Na_2CO_3 & NaHCO_3
 c) Na_2CO_3 & NaOH d) NaHCO_3 & NaCl
45. The α and β -forms of D-glucopyranose are called
 a) Anomers b) Enantiomers c) Epimers d) Diastereomers
46. The pH of an aqueous solution of Al^{3+} is likely to be
 a) Neutral b) Acidic c) Slightly basic d) Highly basic
47. The pair of semi-metals in the following
 a) Al, Si b) Ge, As c) Sb, Te d) Ca, B
48. The C-2 epimers of D-glucose is
 a) D-mannose b) D-fructose c) D-galactose d) D-glucose
49. The NMR spectrum is observed in _____ region.
 a) UV b) X-ray c) IR d) Radiofrequency
50. If ψ is the Eigen function to the Hamiltonian operator with α as the Eigen value, then α must be
 a) Positive b) Negative c) An integer d) Real

51. Which of the following test is used for the detection of carbohydrate?

- a) Libermann b) Molisch c) Mulliken Barker d) Biuret

52. The Gibbs-Duhem equation is

(a) $\sum_i \mu_i dn_i = 0$ (b) $\sum_i \mu_i dn_i \neq 0$ (c) $\sum_i n_i d\mu_i = 0$ (d) $\sum_i n_i d\mu_i \neq 0$

53. Which of the following is **NOT** the derivative for aldehyde and ketones?

- a) Phenyl hydrazone b) Semicarbazone c) Picrates d) Oximes

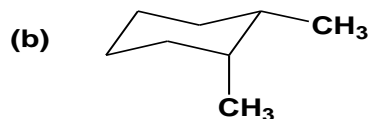
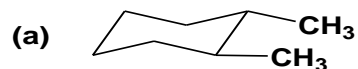
54. The ground state term for Ti^{2+} is

- a) 3F_2 b) 3F_4 c) 3F_3 d) 2F_2

55. The cage-type structure adopted by boron hydride, $[\text{B}_5\text{H}_{11}]$, is

- a) Closo b) Nido c) Hypo d) Arachno

56. Among the dimethylcyclohexanes, which one can be obtained in enantiopure form?



57. The decay modes of ^{14}C and ^{14}O are

- a) β -decay
b) Positron emission
c) β -decay and positron emission, respectively
d) Positron emission and β -decay, respectively

58. In which of the following C-H bond has the highest *s*-character?
a) Acetylene b) Ethylene c) Methane d) CH radical
59. Which of the following reaction is an example of photochemical reduction?
a) Benzophenone into benzpinacol b) Ketone into oxetane
c) Norbornene into its dimer d) All of the above
60. Which of the following heterocyclic compound is **NOT** aromatic?
a) Pyridine b) Pyrrole c) Furan d) Piperidine
61. The ionic strength of 0.1 M aqueous solution of $\text{Fe}_2(\text{SO}_4)_3$ is
a) 0.1 M b) 0.65 M c) 1.3 M d) 1.5
62. Among lithium, nitrogen, carbon and oxygen, which element has the highest first ionization potential?
a) Lithium b) Nitrogen c) Carbon d) Oxygen
63. The alkali metals are low melting. Which of the following alkali metal is expected to melt if the room temperature rises to 30°C ?
a) Na b) K c) Rb d) Cs
64. Which of the metal carbonate is most stable thermally?
a) MgCO_3 b) CaCO_3 c) SrCO_3 d) BaCO_3
65. By adding gypsum to cement
a) Setting time of cement becomes less b) Setting time of cement increases
c) Colour of cement becomes light d) Shining surface is obtained
66. Lithium shows _____ colour in a flame test.
a) Crimson red b) Golden yellow c) Violet d) Blue
67. For electronic transitions in organic molecules, the expected energy ordering of the transition is

- a) π to $\pi^* < n$ to $\sigma^* < \sigma$ to $\sigma^* < n$ to π^*
- b) π to $\pi^* < n$ to $\pi^* < n$ to $\sigma^* < \sigma$ to σ^*
- c) n to $\pi^* < \pi$ to $\pi^* < n$ to $\sigma^* < \sigma$ to σ^*
- d) n to $\sigma^* < \sigma$ to $\sigma^* < n$ to $\pi^* < \pi$ to π^*

68. Which of the following molecules does NOT show a pure rotational spectrum?

- a) HCl b) *trans*-CH₂Cl₂ c) *cis*-CH₂Cl₂ d) CHCl₃

69. A crystal system characterized by $a \neq b \neq c$ and $\alpha = \gamma = \beta = 90^\circ$ is

- a) Triclinic b) Monoclinic c) Rhombic d) Orthorhombic

70. Which one of the following is NOT a primary standard substance to be used in titrimetric analysis?

- a) Ferrous ammonium sulfate b) Potassium dichromate
- c) Oxalic acid d) Potassium permanganate

71. The average value of C-C bond order in graphite is

- a) 1 b) 3/2 c) 3/4 d) 4/3

72. Which of the following is Benedict's reagent?

- a) Copper sulfate pentahydrate, sodium citrate and sodium nitrite
- b) Copper sulfate pentahydrate, sodium nitrite and sodium carbonate
- c) Copper sulfate pentahydrate, sodium citrate and sodium carbonate
- d) Copper sulfate pentahydrate, sodium bicarbonate and sodium carbonate

73. The apple-green colour is given by _____

- a) Calcium b) Strontium c) Barium d) Radium

74. When aniline is heated with glycerol in the presence of sulphuric acid and nitrobenzene to give quinoline. This reaction is called _____ synthesis.

- a) Fischer b) Skraup c) Corey-house d) Friedlander

75. Raman effect is

- a) Elastic scattering of light b) Inelastic scattering of light
- c) Emission of light d) Absorption of light



**B.Sc. Chemistry Degree (Semester) Examinations, April 2021**

Part – IV: Skill Based Subject: Sixth Semester: Paper – III

NANO CHEMISTRY AND GREEN CHEMISTRY

Under CBCS – Credit 2

Time: **2 Hours**Max. Marks: **75****SECTION – A****Answer ALL Questions****(10 × 1 = 10)**

- Richard Feynman is often credited with predicting the potential of nanotechnology. What was the title of his famous speech given on December 29, 1959?
 - There is a tiny room at the bottom
 - Things get nanoscopic at the bottom
 - Bottom? What bottom?
 - There is plenty of room at the bottom
- Which of the process of materials was not described as Nanotechnology?
 - Separation
 - Creation
 - Processing
 - Consolidation
- Nano particles target the rare _____ causing cells and remove them from blood.
 - Tumour
 - Fever
 - Infection
 - Cold
- Nanomaterials are the materials with at least one dimension measuring less than _____.
 - 1 nm
 - 10 nm
 - 100 nm
 - 1000 nm
- The principles of green chemistry include eliminating _____ treatments.
 - Harmful
 - Costly
 - Hard
 - Easy

6. After use of chemicals, we must_____ them properly.

- a) Use b) Reuse c) Dispose d) Store

7. Green Chemsitry imporves_____of chemical manufactures.

- a) Competitiveness b) Easiness of production
c) Serivices d) Chemicals

8. The green solvent maximises the atom_____

- a) Molecular weight b) Electronic configuration
c) Velocity d) Efficiency

9. Which of the following are among the 12 Principles of Green Chemistry?

- a) Design commercially viable products b) Use only newsolvents
c) Use catalysts, not stoichiometric reagents d) Re-use waste

10. Green chemists reduce risk by?

- a) Reducing the hazard inherent in a chemical product or process
b) Minimizing the use of all chemicals
c) Inventing technologies that will clean up toxicsites
d) Developing recycled products

SECTION – B

Answer any FIVE Questions

(5 × 2 = 10)

11. What are nanomaterials? Give two examples
12. Write any two organic and inorganic nanomaterials.
13. Write any four application of carbon nanotube.
14. What is Green chemistry?
15. Write any three objective of environment protecation Act.
16. How can you improve the atom economy of a reaction?
17. “Green chemistry is sustainable chemistry”- explain the statement.

SECTION – C

Answer ALL Questions

(3 × 9 = 27)

18. a) Discuss the classification of nanomaterials in detail.

[OR]

b) Explain the principle of SEM.

19. a) Explain UV-Vis studies on nanoparticles.

[OR]

b) Explain the importance of Green chemistry education at the undergraduate level.

20. a) Define following terms:

- i) Green catalysis ii) Green solvent iii) Atom economy

[OR]

b) i) Why do we need Green chemistry?

SECTION – D

Answer any TWO Questions

(2 × 14 = 28)

21. Explain in detail surface, electronic, thermal and mechanical properties of nanostructured materials.
22. Write short note on i) Top-down ii) Bottom-up approach
23. Explain with neat diagram of TEM setup and its use in analysis nanostrures.
24. Write tweleve principles of Green chemistry with explanation.

