

Total Pages : 20

B.Sc./5th Sem (G)/CHEM/22(CBCS)

2022

5th Semester Examination

CHEMISTRY (General)

Paper : DSE 1A/2A/3A-T

[CBCS]

Full Marks : 40

Time : Two Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

[Analytical Methods in Chemistry]

Group - A

1. Answer any *five* from the following questions :

2×5=10

- (a) Why sampling is needed for any analytical measurement?
- (b) What is Q test?
- (c) Write basic principle of pH metric titration.
- (d) What types of compounds are used as stationary and mobile phase in TLC?
- (e) Mention the possible reasons for the deviation of the Lambert-Beer's law?

P.T.O.

(2)

- (f) Define enantiomeric excess.
- (g) What are the sources of chemical interference in AAS?
- (h) What is retention factors (R_f) in chromatography?

Group - B

2. Answer any *four* from the following questions :

5×4=20

- (a) What is accuracy and precision? In any acid-base titration, expected volume of acid is 25.0 mL but you have got the two titre values 24.9 and 25.7 mL. Which value is more accurate and why?
3+2
- (b) How composition of a metal complex is determined by mole ratio method? 5
- (c) Write down the effect of isotopic substitution in IR spectroscopy. Which molecule has higher C = O stretching frequency between benzaldehyde and acetaldehyde? Explain. 2+3
- (d) Write the basic principle of conductometry. Draw the curve with explanation for the conductometric titration of oxalic acid by NaOH solution. 2+3
- (e) Write short note on working principle of GC and HPLC. 2.5+2.5

(3)

- (f) How solvation and chelation techniques are used to separate the compounds from a mixture?

2.5+2.5

Group - C

3. Answer any *one* from the following questions :

10×1=10

3. (a) What is thermogravimetry (TG)? Draw and explain the TGA thermogram of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Write the basic components of the atomic absorption spectrophotometer and write the function of any one component. (2+3)+(3+2)

- (b) Write down the Lambert-Beer's law? Calculate the value of absorbance of a 1×10^{-2} M solution if it transmits 50% of the incident radiation. Write the basic principle and mechanism of separation by partition chromatography. (2+3)+(2+3)

বঙ্গানুবাদ

বিভাগ - ক

1. যে কোনো পাঁচটি প্রশ্নের উত্তর দাও :

2×5=10

- (a) কোনো বিশ্লেষণাত্মক পরিমাপের জন্য Sampling প্রয়োজনীয় কেন?

- (b) Q পরীক্ষা কি?

- (c) pH মেট্রিক টাইট্রেশনের মূল নীতি লেখ।

P.T.O.

(6)

OR

[Polymer Chemistry]

Group - A

Answer any *five* questions from this group.

2×5=10

1. (a) Write down the differences between Addition polymerization and Codensation polymerization.
- (b) Define Poly Dispersity Index and write the value of it for natural polymer.
- (c) Write down the differences between HDPE and LDPE.
- (d) What is Plasticizers? Give examples.
- (e) Define degree of polymerization and the extent of reaction.
- (f) What is Zeigler Natta catalyst Mention its uses.
- (g) What is Suspension Polymerisation? Give example.
- (h) Write a short note about Neoprene.

Group - B

Answer any *four* questions from this group.

5×4=20

1. (a) Write down the factors on which the glass transition temperature is dependent.
- (b) Write a short note about polyester.

- (c) Write down the structure of novalac and polypyrrole. $2+2+1=5$
2. (a) What are the differences between nylon 6 and nylon 66?
- (b) Write a short note on Bakelite. $2+3=5$
3. (a) Write a short note about Teflon.
- (b) What is number average molecular weight and weight average molecular weight?
- (c) What do you mean about 'Mylar' and 'Plexiglass'? $2+2+1=5$
4. (a) Write down the differences between Homopolymers and heteropolymers.
- (b) Draw a plot about degree of polymerization against change of tensile strength of cellulose acetate and also explain it. $2+3=5$
5. (a) Write down the Mark-Houwink-Sakurada equation.
- (b) Define Graft copolymers? Give example.
- (c) Which polymer is used to making rechargeable battery? $2+2+1=5$
6. (a) Briefly describe the industrial methods of PVC.
- (b) What are the differences between rigid PVC and flexible PVC? $3+2=5$

P.T.O.

(8)

Group - C

Answer any *one* question from this group.

10×1=10

1. (a) Write down the preparation of silicones rubber.
Give two characteristics of it and also mention its use.
(b) Write a short note about Ionic Polymerization.
(c) Define tacticity. (3+2+2)+2+1=10
2. (a) What is Buna-S? How is it prepared?
(b) Write down the relation between expansion of
Polymerisation and degree of Polymerisation.
(c) Write down the characteristics of emulsion
polymerisation.
(d) What is PEVA? (1+2)+4+2+1=10

বঙ্গানুবাদ

বিভাগ - ক

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও। 2×5=10

1. (a) যুত বহুলীভবন ও সংঘনিত বহুলীভবনের পার্থক্য লেখ।
(b) পলি ডিসপারসিটি সূচক কী? প্রাকৃতিক পলিমারের
ক্ষেত্রে-এর মান কত?
(c) HDPE ও LDPE-এর পার্থক্য লেখ।
(d) প্লাস্টিসাইজার (Plasticizers) বলতে কী বোঝ? উদাহরণ
দাও।

OR

[Instrumental Methods of Chemical Analysis]

Group - A

Answer any *five* from the following questions.

2×5=10

1. Explain why absorption and not emission spectroscopy is used to study the spectra of organic compounds.
2. When a UV light is passed through the given solution, the radiation is reduced to 50%, calculate the absorbance.
3. Explain why methanol is a good solvent for UV but not for IR spectroscopy.
4. Write down Three applications of UV-Vis spectroscopy.
5. Which of the following atoms do not exhibit nuclear magnetic resonance?

^{12}C , ^{16}O , ^{14}N , ^{15}N , ^2H , ^{19}F , ^{13}C and ^{31}P

6. How would you calculate the R_f value of two different polar molecules?
7. What do you mean by magnetically non-equivalent protons?
8. Why thin layer chromatography is superior to paper chromatography?

P.T.O.

Group - B

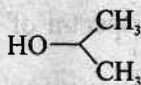
Answer any **four** from the following questions :

5×4=20

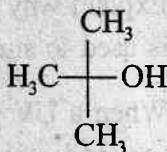
1. Explain how the following three alcohols (a, b and c) could be distinguished by their ^1H NMR spectra.



(a)



(b)



(c)

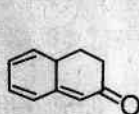
2. Distinguish between the following pairs of compounds with the help of infra-red technique.
- Ethanol and Dimethyl ether
 - Propanal and Propanone
3. How can the mass spectra be used to find the molecular formula of the organic compound?
4. Describe and derive the equation for Beer's-Lambert's law.
5. Write brief notes on the following :
- Magnetic anisotropy
 - Finger print region
6. In Gas chromatography, what is the stationary phase? What is the moving phase?

Group - C

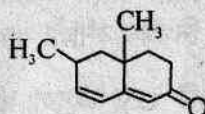
Answer any **one** from the following questions :

10×1=10

1. (a) Calculate the $\lambda_{\max}$ for the given organic compounds.



(A)



(B)

- (b) State the differences between Atomic absorption spectroscopy and Flame emission spectroscopy.
- (c) Describe the principle, instrumentation and applications of HPLC.
2. (a) Give the names of some important solvents which are used in NMR spectroscopy. What are important characteristics of the solvents used in this technique?
- (b) How many ^1H -NMR signals are formed for 1,1 dichloropropane.
- (c) Why TMS is used as a reference standard in NMR spectroscopy?
- (d) How will you distinguish between *cis* and *trans* isomers with the help of NMR spectroscopy?

3+2+2+3

P.T.O.

OR

**[Organometallics, Bioinorganic Chemistry,
Polynuclear hydrocarbons and UV,
IR Spectroscopy]**

Group - A

1. Answer any *five* questions : 2×5=10

- (a) How furan is synthesized?
- (b) What are Organometallic Compounds?
- (c) What is sodium nitroprusside used for?
- (d) What is the function of Ca^{2+} ions in blood clotting?
- (e) What are Heteronuclear aromatic compounds?
- (f) What is Beer Lamber law?
- (g) What do you mean by Synergic effects?
- (h) Why is thiophene more aromatic than pyrrole and furan?

Group - B

Answer any *four* questions : 5×4=20

- 2. The $V-C$ bond lengths in $V(\text{CO})_6^-$ and $V(\text{CO})_6$ are 193 pm and 200 pm respectively — Explain. How $\text{Fe}(\text{CO})_5$ is prepared?
- 3. How is potassium dichromate prepared from iron chromite ore?

P.T.O.

4. Pyridine is more basic than pyrrole — Explain. Using the nitration of pyrrole as an example, predict whether electrophilic aromatic substitution occurs predominantly at carbene-2 or carbon-3.
5. Write a note on Ferrocene.
6. Describe the preparation of potassium permanganate from manganous dioxide.
7. What is the role of Mg^{2+} ions in chlorophyll? What does the Na^+ and K^+ pump do?

Group - C

Answer any *one* question : $10 \times 1 = 10$

8. (a) What is the importance of Zeiss salt in organometallic chemistry? Discuss the structure and bonding in Zeiss salt.
(b) How is ethyl acetoacetate synthesized?
9. (a) What is the difference between aldol and Claisen condensation?
(b) What are the disadvantages of infrared spectroscopy?
(c) Differences between UV visible and IR spectroscopy. What is allowed and forbidden transitions?