SESSIONAL EXAMINATION 2023

B. Sc. 5th SEMESTER
SUBJECT: CHEMISTRY (DSE)
PAPER TITLE: ANALYTICAL METHODS IN CHEMISTRY
PAPER CODE: CHE-HE-5026

Total Marks: 30 Time: 1 hours

1Answer **any five** 5x1=5

a) For infrared radiation of 10μm, what is the wave number in cm^{-1}?
b) What is the ideal signal to noise ratio of a modern spectrophotometer?
c) Which of the following is true?
   i. $E_{el} >> E_{vib} >> E_{rot} >> E_{tr}$
   ii. $E_{tr} >> E_{vib} >> E_{rot} >> E_{el}$
d) What is Beer Lambert's Law?
e) What do you mean by interaction of radiation with matter?
f) Arrange the following electromagnetic radiations in increasing order of their energies:
   X-rays, UV rays, radiowaves, visible light

1. Answer **any five** 5x2=10

a) What do you mean by monochromator and detector in UV visible spectroscopy?
b) Which of the following molecules will show rotational spectra?
   HCl, NO, CO_2, H_2
c) What do you understand by allowed and forbidden transitions?
d) The lifetime of an excited electronic state is 10^{-8} s. calculate the width of the spectral line in Hz.
e) Can IR radiation induce electronic transition? Explain why.
f) Mention the properties of electromagnetic radiation.

4. Give the definition and theory of sampling. State one technique for each of gases, liquids and solids. 1+1+3=5

5. What do you mean by errors in chemical analysis? Discuss different kind of errors. 2+5=7

6. Write short notes on (any one) 3

a) Chromatographic separation

b) Isotopic dilution method

c) Thermogravimetric analysis.

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SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-3 (CBCS)

SUB: CHEMISTRY (Honours)

Paper title: Organic Chemistry

Paper code-CHE-HC-3026

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

Answer any three questions:

1. a) How can you convert Ethyl bromide to Ethyl cyanide and Propyl isocyanide? 2

b) Give the structure of benzyne intermediate and Write the equation when o-bromoanisole reacts with $NaNH_2/NH_3$ to form m-anisidine (m-methoxy aniline) 1+2=3

c) State the alkaline hydrolysis of tert-Butyl bromide and give one evidence for the reaction. 2+3=5

2. a) Give one example of nucleophilic substitution reaction which follows SN_2 mechanism. 1

b) Discuss three factors of nucleophilic substitution reaction. 3

c) What do you mean by Saytzeff and Hoffmann elimination reactions? State the preference of substitution versus elimination reaction. 2+2+2=6

3. a) How can you prepare all the four types halobenzene starting from benzene diazonium salt. 4

b) Compare the acidity of phenol and alcohol. 2

c) How can you distinguish 1°, 2° & 3° alcohols by Victor Meyer's Test. 3

d) What is Lucus reagent? 1

4. a) How can you prepare 1°, 2° & 3° alcohols starting from Grignard reagent? 3

b) Discuss the reactivity of 1°, 2° & 3° alcohols in term of elimination reactions. 3

c) Give the mechanism of any one: 4

i) Bouveault-Blanc reduction

ii) Pinacol-Pinacolone rearrangement.

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SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc SEMESTER-5 (CBCS)

SUB: CHEMISTRY (Honours)

Paper title: Organic Chemistry

Paper code-CHE-HC-5016

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

Answer any three questions:.

1. a) What do you mean by nucleoside, nucleotide and nucleic acid? 3

   b) Discuss about different bases present in RNA and DNA. 6

   c) Give the structure of ribose sugar present in DNA. 1

2. a) Write in brief the biological function of nucleic acids. 6

   b) Write the names of two essential and two non-essential amino acids. 4

3. a) How can you prepare α-amino acid from an aldehyde? 2

   b) What do you mean by acidic amino acid and basic amino acid? 2

   d) What is Zwitterion and isoelectric point? 4

   d) How do the amino acids form the Protein? 2

4.a) Discuss the classification of proteins based on molecular shape & function. 5

   b) Write three characteristics of enzyme, Discuss the enzyme action on the basis of Lock and Key model. 5

5. a) What are lipids? What do you mean by saponification value? 4

   b) What do you mean by metabolism ? Give examples of catabolism and anabolism. How ATP is an Universal currency of cellular energy? 6

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Sessional Examination 2023
North Gauhati College
Semester: I (FYUGP)
Subject: Chemistry I

Total marks: 30 Time: 1.5 hr

1. Answer the following questions (Any three) $1 \times 3 = 3$
   i. How many orientations are possible for *p* orbitals?
   ii. What is the designation of an orbital with $n = 4$ and $l = 2$?
   iii. What is the mathematical expression for Heisenberg's Uncertainty Principle?
   iv. Write down the possible values of quantum numbers n, l, m_l and m_s for an electron in *3d* orbital.
   v. What is the significance of Ψ^2 ?
2. Explain Pauli's exclusion principle. 2

   Or,

   Write down the electronic configuration of: a) Cu^{2+} b) Fe^{2+} $1 + 1 = 2$
3. What is screening or shielding effect? Using Slater's rules find out the effective nuclear charge felt by *3p* electron of chlorine atom. $2 + 3 = 5$

   Or,

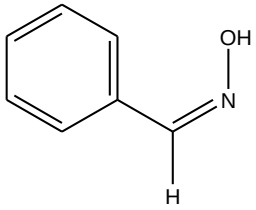
   Write down the postulates of Bohr's atomic model and discuss its failures. $2 + 3 = 5$
4. Answer the followings: $1 \times 5 = 5$
   i. Define Compressibility factor.
   ii. Write Vander Waal's equation for one mole of a real gas.
   iii. Mention the significance of Vander Waals constants a and b.
   iv. What are the causes of deviation from ideal behaviour?
   v. Define most probable velocity.
5. Answer the followings: (any three) $1 \times 3 = 3$
   i. What are cohesion and adhesion forces?
   ii. Why is the shape of a liquid drop spherical?
   iii. How does viscosity get affected on increasing pressure?
   iv. Define vapour pressure.
   v. Define coefficient of viscosity.

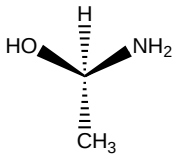
To what height will water rise in a capillary of diameter 0.50 mm at 25 °C if the surface tension of water is 71.97 dynes cm^{-1}? (Density of water 1 gcm^{-3}) 2

6. a) Draw the structure of ethane molecule from hybridisation of atomic orbital. 3

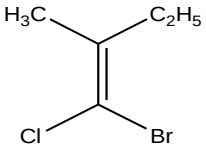
b) Select the Syn/Anti form, R/S and E/Z notation from the following structures. 2

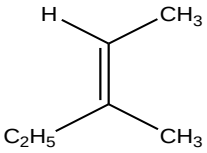
i) ii)





iii) iv)





c) Give two examples from each of nucleophile and electrophile. 2

d) Draw the resonance structure of any three of the following. 3

i) CO^{3-} ii) C_6H_6 iii) SO_4^{2-} iv) O_3

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SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-5 (CBCS)

SUB: CHEMISTRY (DSE)

Paper code: CHE-RE-5026

Paper Title: Analytical Methods in Chemistry

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

1. Answer the followings: (any three)
   a) Give the definition and theory of sampling. State one technique for each gases, liquids and solids. 1 + 1 + 3 = 5
   b) What do you mean by errors in chemical analysis? Discuss different kind of errors. 2 + 3 =5
   c) Discuss the basic principle of solvent extraction. Give the mechanism and techniques extraction. 5
   d) Write short notes on: (any two) 2.5 × 2 = 5
      i) Chromatographic separation
      ii) Isotopic dilution method
      iii) Thermogravimatric analysis
2. What are the typical range of radiofrequency, microwave, Infra-red, UV-Visible and X-ray radiation in terms of wavelength. 5
3. Discuss fundamental laws of spectroscopy. On which factors does the spectral intensity depend? 2 + 3 = 5

   Or,

   Explain Beer Lambert's Law. What are its limitations? 3 + 2 = 5
4. Describe briefly different components of a UV spectrometer. 5

   Or,

   Describe the sample preparation techniques in FT-IR spectroscopy. Write briefly about the detectors used in FT-IR spectroscopy. 3 + 2 = 5

SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-5 (CBCS)

SUB: CHEMISTRY (HC)

Paper-CHE-HC-5026

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

1. Answer the followings: (any ten) : 2 × 10 = 20

   (a) What is the significance of Ψ and $|\Psi|^2$?

   (b) What are normalized and orthogonal functions?

   (c) What are the conditions for a wave function to be acceptable?

   (d) Calculate the energy separation of electron between the levels of n=7 and n=6 in a box of length 1nm.

   (e) What is meant by spherical harmonics?

   (f) Draw energy level and wave function for the first four lowest state of 1-D harmonic oscillator.

   (g) Explain why s-orbital is spherically symmetric?

   (h) Calculate the average kinetic energy of the electron of ground state H-atom.

   (i) Write down the normalized VB wave functions and normalized MO wave functions for H_2 molecule.

   (j) What do you mean by Born-Oppenheimer approximation?

   (k) Why N_2 is Raman active but microwave and IR inactive?

   (l) Calculate the relative Boltzmann population of the v=1 and v=0 vibrational energy levels of a diatomic molecule, at 25 °C, if they are separated by 1000 cm^{-1}.

   (m) Which of the following molecule show vibrational spectra and why?

   H_2, O_2, H_2O, HCl

   (n) What is zero point energy? Is particle in a simple harmonic oscillator possesses zero pint energy?

2. Consider a particle in a cubic box. What is the degeneracy of the level that has an energy 3 times of the lowest level. 3

3. For a harmonic oscillation of effective mass of 1.33×10^{-25} kg the difference in adjacent energy level is 4.82 J. Calculate the force constant of the oscillator. 3

4. What is classical mechanics? What are the factors that lead to the failure of classical mechanics? 2 + 2 = 4

   Or,

   What do you mean by degrees of freedom? Calculate and explain diagrammatically the different normal modes of vibration of H_2O molecule. 1 + 3= 4

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SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-3 (CBCS)

SUB: CHEMISTRY (Regular/Generic)

Paper-CHE-RC/HG-3016

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

1. Answer the followings:

iv) How can you prepare benzene from acetylene? Give one electrophilic substitution reaction of benzene. 1 + 2 = 3

v) Complete the following reactions: 1 + 1 = 2

i) $C_2H_5OH + PCl_5 \rightarrow$ …… + $POCl_3$ + ……..

ii) $(CH_3)_3CBr + KOH_{(aq)} \rightarrow$ ……. + ……. + KBr

vi) Give the elimination reaction of alkyl halide. 1

vii) How can you convert 1°, 2° and 3° alcohols from Grignard reagent? 2 × 3=6

2. Answer the followings: (Any two) 1½ x2 =3

a) How can you convert alkyl halide into nitrile and isonitrile?

b) Give one example electrophilic substitution reaction of benzene.

c) What is the difference between phenol and benzyl alcohol?

3. Define efficiency of a heat engine. Can the efficiency of a heat engine be unity? 2

4. Derive Kirchhoff's equation for the effect of temperature on heat of a reaction. The enthalpy of reaction (ΔH) for the formation of ammonia according to the reaction $N_2 + 3H_2 \rightarrow 2NH_3$ at 27 °C was found to be -91.94 KJ. What will be the enthalpy of reaction (ΔH) at 50 °C. The molar heat capacity at constant pressure and at 27 °C for N2, H2 and NH3 are 28.45, 28.32 and 37.07 J respectively. 2 + 2 = 4

5. Sate 1st law of thermodynamics. What are its drawbacks? 1 + 1 = 2

6. What do you mean by pH ? Show that pH + pOH = 14 1 + 2 = 3

7. Calculate the pH of 0.001 M HCl solution. 2

8. What do you mean by ionic product of water? How it varies with temperature? 2

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SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-3 (CBCS)

SUB: CHEMISTRY (HC)

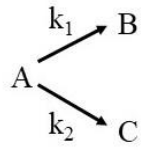
Paper-CHE-HC-3036

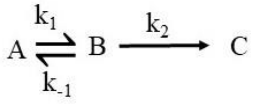
TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

Answer the followings:

1. For a 1st order reaction, $aA \rightarrow P$, show that $[A] = [A]_0 e^{-k_1 t}$ 2
2. How will you distinguish 0th order and 1st order reaction in terms of half-life period of a reaction. 2
3. A first order reaction complete its 75% in 32 minutes. What time it will take to complete its 50% of the reaction. 2
4. Define activation energy. Graphically show its variation with reaction for exothermic and endothermic reactions. 2
5. Seeing a stoichiometry, we cannot determine the order of a reaction. Explain. 2
6. Give examples of chain reaction and consecutive reactions. 2
7. Write rate law for the following complex reaction: 2

i. 

ii. 

8. How rate of a reaction changes with temperature and why? 2
9. Define and explain degree of freedom. How many degrees of freedom are there in a system, "water boiling to form steam"? 2 + 2 = 4
10. Discuss phase diagram of water system. 4
11. What is eutectic point? How is it different from the cryohydric point? 2 + 1 = 3
12. Determine the number of components, number of phases and the degrees of freedom in the following equilibria: 1.5 × 2 = 3

    i. $N_2O_4\ (g) \rightleftharpoons 2NO_2\ (g)$

    ii. $NH4Cl\ (s) \rightleftharpoons NH3\ (g) + HCl\ (g)$

SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-1(FYUGP)

SUB: Basic Analytical Chemistry

Paper-SEC0101003

TOTAL MARKS: 40 TIME: 2 Hours

The figures in the margin indicate full marks for the questions

Answer any two from 1-3

1. What is the theory of sampling? Give the statistical criteria of good sampling and required size. 2+3=5
2. What do you mean by Error? A student measures of a block and found the weight 10.506gm. The actual weight of the block is 10.65gm. Determine the percentage of error. 2+3=5
3. a) The masses of two objects are found to be 5.431 & 5.405gm. What is the absolute and relative difference of the two bodies? 2

   b) In the analysis of calcium following values were obtained: 15.52, 15.56, 15.8, 15.51, 15.52, 15.53, 15.54, 15.53, 15.52, and 15.56. State which values are acceptable and which can be rejected? 3

Answer any two from 4-6

4. a) Define pure water. Give difference methods of physical and chemical methods of purification of water. 2+4=6

   b) Give the disadvantages of using bleaching powder and advantages of calcium hypochlorite. 4
5. What do you mean by pH of a solution? What is DO & BDO? Give the principle of DO test. 2+3+5=10
6. a) What do you mean by nutritional value of food? Give the related foods of Vitamin A, B_6, B_{12}, C, E and Calcium. 2+3=5

   b) What do you mean by food preservatives? Name three food preservatives. 2+3=5

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SESSIONAL EXAMINATION-2023

NORTH GAUHATI COLLEGE

B SC SEMESTER-1 (CBCS)
SUB: CHEMISTRY (Regular/Generic)

Paper-CHE-RC/HG-1016

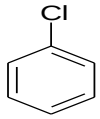
TOTAL MARKS: 30 TIME: 1 Hr

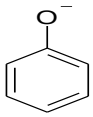
The figures in the margin indicate full marks for the questions

1. a) What do you mean by the inductive effect? How does the inductive effect increase the basicity of 2° amines? 2+1=3

b) Give the resonance structure of the following (any two) 3

i) HCO_2^- ii) iii)





c) Give the structure, shape and one method of generation of carbocation. 3

2. a) Draw the conformation of n-butane and give the energy profile diagram. 4

b) Draw R & S configuration of $CHBrCH_3(OH)$ 2

3. Discuss important postulates of Bohr's atomic theory. 5

4. State and explain Heisenberg's uncertainty principle. Write how this principle goes against Bohr's theory. 3+2=5

5. What is de Broglie wavelength? Calculate the de Broglie wavelength of electron moving with a velocity of 1.20×10^5 ms^{-1}. ($h= 6.626\times10^{-34}$ Js) 2+3=5

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NGC PRE-FINAL EXAMINATION 2023

CLASS: H. S. 2nd YEAR

SUB: CHEMISTRY

Full marks: 70 **Time: 3 hours**

The figures in the margin indicate full marks for the questions.

1. Answer the following questions. তলত দিয়াবোৰৰ উত্তৰ দিয়া। 1x8=8

   i) Which haloalkane undergoes SN^1 reaction?
   কোনটো এলকেনত SN^1 বিক্রিয়া ঘটে?

   ii) What is the main cause of higher boiling point of o-nitrophenol than p-nitrophenol? পেৰা নাইট্র'ফিনলতকৈ অর্থ নাইট্রফিনলৰ উটলাংক বেছি কিয়?

   iii) What is the reducing agent of Rosenmund reduction?
   ৰোজেনমাণ্ড বিজাৰণত কি বিজাৰক দ্রব্য ব্যৱহাৰ হয়?

   iv) Give an example of a solid solution in which the solute is a gas.
   গেছৰ কঠিন দ্রৱ এটাৰ উদাহৰণ দিয়া।

   v) Can E^o_{cell} or ΔG^o for a cell reaction over be equal to zero?
   এটা কোষ বিক্রিয়াৰ সমাপ্তিত E^o_{cell} নাইবা ΔG^o শূণ্য হব পাৰেনে?

   vi) What will be the effect of temperature on rate constant?
   হাৰ ধ্ৰৱকৰ ওপৰত উষ্ণতাৰ প্রভাৱ কি?

   vii) Name a transition element which does not exhibit variable oxidation states.
   চলমান যোজ্যতা নেদেখুৱা এটা সংক্রমণশীল মৌলৰ নাম লিখা।

   viii) Write down the electronic configuration of Pm^{3+}.
   Pm^{3+}ৰ ইলেক্ট্রনীয় বিন্যাস লিখা।

2. Answer the following questions. তলত দিয়াবোৰৰ উত্তৰ দিয়া। 2x10=20

   a) Although Zr belongs to 4d and Hf belongs to 5d transition series, it is quite difficult to separate them. Why? যদিও Zr 4d আৰু Hf, 5d সংক্রমনশীল শ্রেণীৰ অন্তর্ভুক্ত, ইহতক পৃঠক কৰিবলৈ অতি কঠিন।

b) Using IUPAC norms write the systematic names of the following:

তলত দিয়াবোৰৰ IUPAC নামাকৰণ দিয়া।

i) $[Ni(CO)_4]$ ii) $[Co(en)_3]^{3+}$

c) What are the different oxidation states exhibited by the lanthanoids?

লেণ্ঠেনাইডবোৰে কি কি ভিন্ন জাৰণ অৱস্থা দেখুৱায়?

c) Calculate the overall order of a reaction which has the rate expression

তলত দিয়া হাৰৰ প্ৰকাশ ৰাশিৰ পৰা বিক্ৰিয়াৰ পূৰ্ণ ক্ৰম গননা কৰা।

(i) $Rate = k [A]^{1/2} [B]^{1/2}$

(ii) $Rate = k [A]^{3/2} [B]^{-1}$

e) Can we store Copper Sulphate solution on a zinc pot? Explain with reason

আমি জিংকৰ পাত্ৰত কপাৰ ছালফেট দ্ৰৱ ৰাখিব পাৰোনে? ব্যাখ্যা কৰা।

f) Calculate the mass of urea (NH_2CONH_2) required in making 2.5 kg of 0.25 molal aqueous solution. 2.5 কিলোগ্ৰাম 0.25 মলেল জলীয় দ্ৰৱ প্ৰস্তুত কৰিবলৈ আৱশ্যক হোৱা ইউৰিয়াৰ ভৰ নিৰ্ণয় কৰা।

g) Write two methods of preparation of haloalkanes from alcohol.

এলকহলৰ পৰা হেল'এলকেন প্ৰস্তুত কৰা দুটা পদ্ধতিৰ নাম লিখা।

h) What is Reimer-Tiemann reaction? ৰেইমাৰ টেইমান বিক্ৰিয়া কি? বা Or,

How can you identify 1^o, 2^o, 3^o alcohol by Lucas reagent?

লিউকাস বিকাৰকৰ দ্বাৰা 1^o, 2^o, 3^o এলকহল কেনেকৈ চিনাক্ত কৰিবা?

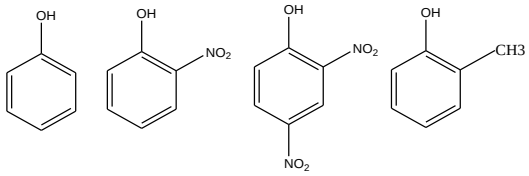
i) Explain why carbonyl compounds undergo nucleophilic addition reaction.

কাৰ্বনিল যৌগই কিয় নিউক্লিওফিলিক যোগাত্মক বিক্ৰিয়া সম্পন্ন কৰে ব্যাখ্যা কৰা।

j) Arrange the following as directed তলত দিয়াবোৰ নিৰ্দেশ অনুসৰিসজোৱা

a) CH_3NH_2, $(CH_3)_3N$, $(CH_3)_2NH$, NH_3 (Increasing order of basicity ক্ষাৰকীয়ৰ ঊৰ্ধক্ৰমত)

b) Arrange in increasing order of acidity অম্লতাৰ ঊৰ্ধক্ৰমত সজোৱা



3. Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent. Explain why? Cr^{2+} বিজাৰক প্ৰকৃতিৰ আনহাতে আনহাতে একেই d কক্ষীয় বিন্যাসৰ (d^4) Mn^{3+} জাৰক প্ৰকৃতিৰ হয় কিয় ব্যাখ্যা কৰা। 3

4. Why Transition metals and their compounds exhibit a paramagnetic behaviour? 3
সংক্ৰমণশীল মৌল আৰু সিহতৰ যৌগবোৰে পেৰাচুম্বকীয় ধৰ্ম কিয় দেখুৱায়?

Or, বা

In 3d series (Sc to Zn), the enthalpy of atomisation of Zn is low. Explain why?
3d শ্ৰেণীত (Sc to Zn), জিংকৰ পৰমাণুকৰণ এন্থেল্পি কম। ব্যাখ্যা কৰা।

5. Describe the preparation of potassium permanganate. How does the acidified permanganate solution react with i) Fe^{2+} and ii) oxalic acid ? 1+2=3
পটাছিয়াম পাৰ্মাংগেনেটৰ প্ৰস্তুত প্ৰণালী বৰ্ণনা কৰা। আম্লিক পটাছিয়াম পাৰ্মংগেনেটে Fe^{2+} আৰু অ'ক্সেলিক এছিডৰ সৈতে কেনেদৰে বিক্ৰিয়া কৰে?

6. State Henry's law and mention some important applications. 1+2=3
হেন্ৰিৰ নীতি বৰ্ণনা কৰা আৰু কিছুমান দৰকাৰী প্ৰয়োগ উল্লেখ কৰা।

Or, বা

Vapour pressure of $CHCl_3$ & CH_2Cl_2 at 298K are 200mm and 400 mm Hg respectively. Calculate the vapour pressure of the solution prepared by mixing 25.5g of $CHCl_3$ and 40g of CH_2Cl_2 at 298K.
298Kত $CHCl_3$ আৰু CH_2Cl_2 বাষ্পীয় চাপ ক্ৰমে 200mm আৰু 400mm. 25.5g $CHCl_3$ আৰু 40g CH_2Cl_2 ৰ 298K ত প্ৰস্তুত কৰা দ্ৰৱৰ বাষ্পীয় চাপ নিৰ্ণয় কৰা।

7. A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$. 3

এটা প্ৰথম ক্ৰমৰ বিক্ৰিয়াৰ 30% পূৰ্ণ হবলৈ সময় লাগে 40 মিনিট। $t_{1/2}$ গণনা কৰা।

Or, বা

For a first order reaction show that time required for 99% completion is twice the time required for the completion of 90% of reaction.

এটা প্ৰথম ক্ৰমৰ বিক্ৰিয়াৰ বাবে দেখুৱা যে 99% পূৰ্ণ কৰিবলৈ লগা সময় 90% পূৰ্ণ কৰিবলৈ লগা সময়ৰ দুগুণ হয়।

8. Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration. 3

এটা বিদ্যুতবিশ্লেষ্য দ্ৰৱৰ পৰিবাহিতা আৰু মলাৰ পৰিবাহিতাৰ সংজ্ঞা দিয়া। গাঢ়তাৰ সৈতে সিহতৰ পৰিবৰ্তন আলোচনা কৰা।

Or, বা

Depict the Galvanic cell in which the reaction takes place as follow. Further, show individual reaction at each electrode. তলত দিয়া বিক্ৰিয়াটোৰ বাবে গেলভেনিক কোষটো অংকন কৰা। আকৌ প্ৰত্যেক ইলেক্ট্ৰডত ঘটা বিক্ৰিয়া দেখুৱা।

Zn (s) + 2Ag + (aq) → Zn 2+ (aq) + 2Ag (s)

9. Complete the following reactions. তলত দিয়া বিক্ৰিয়াবোৰ পূৰ্ণ কৰা। 3

a) $(CH_3)_3CBr + KOH_{(aquous)} \longrightarrow$

b) $C_2H_5OH + SOCl_2 \longrightarrow$

c) $CH_3NH_2 + CH_3Cl \longrightarrow$

10. Explain why phenol is more acidic than alcohol. 3

ফিন'ল এলকহলতকৈ বেছি আম্লিক কিয় ব্যাখ্যা কৰা।

11. How will you establish the presence of carbonyl group and OH groups in glucose? 3

Or, What is Zwitter ion? Write the names of two essential ond two non-essential amino acids.

গ্লুকজত থকা কাৰ্বনিল মূলক আৰু হাইড্ৰক্সিল মূলক কেনেদৰে প্ৰতিপন্ন কৰিবা?

বা, জুইটাৰ আয়ন কি? দুটা অত্যাৱশ্যকীয় আৰু দুটা অনাৱশ্যকীয় এমিন' এছিডৰ নাম লিখা।

12. (a) Define colligative properties. The boiling point of benzene is 353.23K. When 1.80 g of non-volatile solute was dissolved in 90g of benzene, the boiling point is

raised to 354.11K. Calculate the molar mass of the solute. 1+2 = 3

সংখ্যাগত ধর্মৰ সংজ্ঞা দিয়া। বেঞ্জিনৰ উটলাংক 353.23K. যেতিয়া 1.80 গ্ৰাম অনুদ্বায়ী দ্ৰাব্য এটা 90 গ্ৰাম বেঞ্জিনত দ্ৰৱীভূত কৰা হয়, তেতিয়া উটলাংক 354.11K লৈ বৃদ্ধি হয়। দ্ৰাব্যটোৰ আণৱিক ভৰ গণনা কৰা।

(b) 200 cm^3 of an aqueous solution of a protein contains 1.26g of the protein. The osmotic pressure of such a solution at 300K is found to be 2.57×10^3 bar. Calculate the molar mass of the protein. 2

200 cm^3 প্ৰটিনৰ জলীয় দ্ৰৱ এটাত 1.26 গ্ৰাম প্ৰটিন থাকে। 300K উষ্ণতাত এই দ্ৰৱৰ ৰষাকৰ্ষী চাপ 2.57×10^3 বাৰ। প্ৰটিনটোৰ মলাৰ ভৰ গণনা কৰা।

13. List various types of isomerism possible for coordination compounds, giving an example of each. 5

Or

Explain the bonding in coordination compounds in terms of Werner's postulates. সমন্বয়ী যৌগবোৰত থকা বিভিন্ন সমযোগীবোৰ উদাহৰণৰ সৈতে দেখুৱা।

বা, ৱার্ণাৰৰ স্বীকার্য্যৰ পৰা সমন্বয়ী যৌগবোৰত থকা বান্ধনীবোৰ ব্যাখ্যা কৰা।

14. What do you mean by diazonium salt? Give its preparation. How can you prepare Chlorobenzene, iodobenzene and phenol from benzene diazonium salt? 5

Or,

Compound A on reaction with conc. H_2SO_4 gives an alkene B which on treatment with HBr gives C . Treatment of C with KCN gives D and hydrolysis of D gives 2 methyl Propanoic acid. Identify A, B, C and D.

ডাইএজ'নিয়াম লৱণ মানে কি বুজা? ইয়াৰ প্ৰস্তুত প্ৰণালী দিয়া। বেঞ্জিন ডাইএজ'নিয়াম লৱনৰ পৰা ক্লৰ'বেঞ্জিন, আইড'বেঞ্জিন আৰু ফিন'ল কেনেদৰে প্ৰস্তুত কৰিবা।

বা, এটা যৌগ A গাঢ় ছালফিউৰিক এছিডৰ সৈতে বিক্ৰিয়া কৰিলে এটা এলকিন B পোৱা যায়। Bয়ে HBrৰ সৈতে বিক্ৰিয়া কৰি C উৎপন্ন কৰে। Cয়ে KCNৰ সৈতে D উৎপন্ন কৰে। Dৰ জলবিশ্লেষণ কৰিলে 2 মিথাইল প্ৰপান'য়িক এছিড পোৱা যায়। A, B, C, D চিনাক্ত কৰা।

Sessional Exam 2024

North Gauhati College

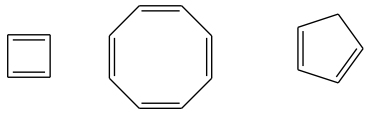
Semester : III (FYUGP)

Subject : Chemistry III

Total marks: 30 **Time: 1.5 hr**

The figures in the margin indicate full marks for the questions

1. Answer ***any two*** questions: 1×2=2
   i) Give an example of a soft base.
   ii) What are superacids ?
   iii) Define proton affinity.
   iv) What is HSAB principal?
2. Out of NH_3 and NF_3 which is more basic and why? 2
3. Answer ***any two*** of the following questions: 3×2=6
   i) Explain levelling and differentiating effect of solvents with examples.
   ii) What is galvanic cell? Explain with a suitable example.
   iii) Arrange the following in order of increasing pKa values and also give reasons:
   $HClO_2$, $HClO_3$, HClO, $HClO_4$
4. State the Huckel's rule of aromaticity . What do you mean by anti-aromatic and non-aromatic? Select the aromatic, non-aromatic and anti-aromatic compounds from the following. 1+2+3=6



5. Give the machanism of substituted nucleophilic aromatic reaction(S_NAr). Give one preparation of each of alkyl and aryl halide. 4

   Or

   How can you distinguish 1º, 2º and 3º alcohol? Which one is more acidic out of alcohol and phenol?

Answer the followings:

6. What do you mean by 1×3=3
   (a) Partial molar volume
   (b) Chemical potential
   (c) Fugacity
7. Explai physical significance of chemical potential. 2
8. Derive Gibbs Duhem equation. 3
9. Derive the followings: 2
   (a) $dG= -SdT + VdP + \sum_i \mu_i dn_i$
   (b) $dH= TdS + VdP + \sum_i \mu_i dn_i$

Sessional Exam 2024

North Gauhati College

B.Sc. Semester : V (CBCS)

Subject : Chemistry (Honours)

Paper Title: Novel Inorganic Solids

Paper Code : CHE-HE-5046

Total marks: 30 **Time: 1hr**

The figures in the margin indicate full marks for the questions

1. Answer ***any four*** of the following questions: 1×4=4

   i) What are super alloys?

   ii) Give an example of black inorganic pigment.

   iii) What is the amount (%) of carbon in steel?

   iv) What are one dimensional metals?

   v) State an application of nanocomposites.

2. Write notes on the following (**any two**): 2×2= 4

   i) Fullerides

   ii) White pigment

   iii) Carbon nanotube

   iv) Molecular magnets

3. What are refractories? How are they different from ceramics? 3

4. What do you mean by DNA nanotechnology? Discuss its biological importance. 2+2=4

5. Discuss the method of preparation of gold nanoparticles. 5

6. Discuss various methods used in the synthesis of inorganic solids. 10

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Sessional Exam 2024

North Gauhati College

Semester : I (FYUGP)

Subject : Chemistry I

Total marks: 30 **Time: 1.5 hr**

The figures in the margin indicate full marks for the questions

1. Answer ***any two*** of the following: 1×2=2

a) Write down the Schrödinger wave equation for hydrogen atom.

b) Write down the energy expression of an electron in the 3rd shell of a H-atom.

c) Draw the shapes of different *p* - orbitals.

2. Answer ***any two*** of the following: 2×2=4

a) State and explain Heisenberg's uncertainty principle.

b) Write two differences between atomic orbitals and molecular orbitals.

c) Draw the radial probability distribution curves for 2s and 2p electrons.

d) What is the significance of Ψ *and* Ψ^2 *?*

3. Answer ***any one*** of the following: 4×1=4

a) Discuss the physical significance of different quantum numbers.

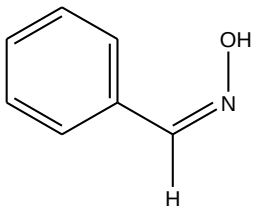
b) Explain photoelectric effect.

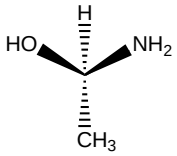
c) Find the frequency and wave number of the 2nd line in the Balmer series.

2. a) Draw the structure of ethane molecule from hybridisation of atomic orbital. 3

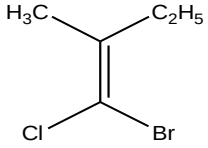
b) Select the Syn/Anti form, R/S and E/Z notation from the following structures. 2

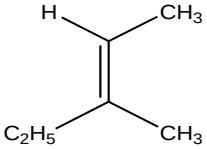
i) ii)





iii) iv)





c) Give two examples from each of nucleophile and electrophile. 2

d) Draw the resonance structure of any three of the following. 3

i) CO^{3-} ii) $C_6H_5O^-$ iii) SO_3^{2-} iv) $CH_2=CH-CH_2^-$

3. What is Boyle's temperature (T_B)? Derive an expression for T_B. 1+3=4

4. What are the significance of Van Der Waal's constants 'a' and 'b'? Calculate the pressure exerted by one mole of CO_2 gas in a 1.32 dm^3 vessel at 48 ^oC considering it to be a real gas. a= 3.59 $atmdm^6mol^{-2}$, b= 0.0427 dm^3mol^{-1}. 2+2=4

Or,

Deduce the relation between Critical constants (T_c, P_c and V_c) and Van Der Waal's constants 'a' and 'b'. 4 5.

Why real gases deviate from ideal gas behaviour? 2

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SESSIONAL EXAMINATION 2024

B. Sc. 5th SEMESTER
SUBJECT: CHEMISTRY (DSE)
PAPER TITLE: ANALYTICAL METHODS IN CHEMISTRY
PAPER CODE: CHE-HE-5026

Total Marks: 30 Time: 1 hours

The figures in the margin indicate full marks for the questions

1Answer **any five** 5x1=5

a) For radiation of 10nm, what is the wave number in cm^{-1}?
b) What is the ideal signal to noise ratio of a modern spectrophotometer?
c) Which of the following is true?
iii. $E_{el} >> E_{vib} >> E_{rot} >> E_{tr}$
iv. $E_{tr} >> E_{vib} >> E_{rot} >> E_{el}$
d) What is Beer Lambert's Law?
e) What do you mean by interaction of radiation with matter?
f) Arrange the following electromagnetic radiations in increasing order of their energies:
X-rays, UV rays, Infrared, visible light

2. Answer **any five** 5x2=10

a) What do you mean by monochromator and detector in UV visible spectroscopy?
b) Which of the following molecules will show rotational spectra?
HCl, NO, CO_2, H_2
c) What do you understand by allowed and forbidden transitions?
d) The lifetime of an excited electronic state is 10^{-8} s. calculate the width of the spectral line in Hz.
e) Can IR radiation induce electronic transition? Explain why.
f) Mention the properties of electromagnetic radiation.

4. Give the definition and theory of sampling. State one technique for each of gases, liquids and solids. 1+1+3=5

5. What do you mean by errors in chemical analysis? Discuss different kind of errors. 2+5=7

6. Write short notes on (any one) 3

a) Chromatographic separation

b) Isotopic dilution method

c) Thermogravimetric analysis.

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SESSIONAL EXAMINATION-2024

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-5 (CBCS)

SUB: CHEMISTRY (DSE)

Paper code: CHE-RE-5026

Paper Title: Analytical Methods in Chemistry

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

5. Answer the followings: (any three)
   k) Give the definition and theory of sampling. State one technique for each gases, liquids and solids. 1 + 1 + 3 = 5
   l) What do you mean by errors in chemical analysis? State the difference between accuracy and precision. 2 + 3 =5
   m) Discuss the basic principle of solvent extraction. Give the mechanism and techniques extraction. 5
   n) Write short notes on: (any two) 2.5 × 2 = 5
      viii) Chromatographic separation
      ix) Isotopic dilution method
      x) Thermogravimatric analysis
6. What are the typical range of radiofrequency, microwave, Infra-red, UV-Visible and X-ray radiation in terms of wavelength. 5
7. Discuss fundamental laws of spectroscopy. On which factors does the spectral intensity depend? 2 + 3 = 5

   Or,

   Explain Beer Lambert's Law. What are its limitations? 3 + 2 = 5
8. Describe briefly different components of a UV spectrometer. 5

   Or,

   Describe the sample preparation techniques in FT-IR spectroscopy. Write briefly about the detectors used in FT-IR spectroscopy. 3 + 2 = 5

SESSIONAL EXAMINATION-2024

B. Sc SEMESTER-5 (CBCS)

SUB: CHEMISTRY (Honours)

Paper title: Organic Chemistry

Paper code-CHE-HC-5016

TOTAL MARKS: 30 TIME: 1 Hr

The figures in the margin indicate full marks for the questions

Answer any three questions:.

1. a) Write in brief the biological function of nucleic acids. 6

   b) Write the names of two essential and two non-essential amino acids. 4

2. a) What do you mean by nucleoside, nucleotide and nucleic acid? 3

   b) Discuss about different bases present in RNA and DNA. 6

   c) Give the structure of ribose sugar present in DNA. 1

3. a) How can you prepare α-amino acid from an aldehyde? 2

   b) What do you mean by acidic amino acid and basic amino acid? 2

   d) What is Zwitterion and isoelectric point? 4

   d) How do the amino acids form the Protein? 2

4. a) What are lipids? What do you mean by saponification value? 4

   b) What do you mean by metabolism ? Give examples of catabolism and anabolism. How ATP is an Universal currency of cellular energy? 6

5. a) Discuss the classification of proteins based on molecular shape & function. 5

b) Write three characteristics of enzyme, Discuss the factors affecting the enzyme action. 5

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SESSIONAL EXAMINATION-2024

NORTH GAUHATI COLLEGE

B. Sc. SEMESTER-1(FYUGP)

SUB: Basic Analytical Chemistry

Paper-SEC0101003

TOTAL MARKS: 20 **TIME: 1 Hours**

The figures in the margin indicate full marks for the questions

Answer any two from 1-3

1. What is the theory of sampling? Give the statistical criteria of good sampling and required size. 2+3=5

2. What do you mean by Error? A student measures of a block and found the weight 10.506gm. The actual weight of the block is 10.65gm. Determine the percentage of error. 2+3=5

3. a) The masses of two objects are found to be 5.431 & 5.405gm. What is the absolute and relative difference of the two bodies? 2

b) In the analysis of calcium following values were obtained: 15.52, 15.56, 15.8, 15.51, 15.52, 15.53, 15.54, 15.53, 15.52, and 15.56. State which values are acceptable and which can be rejected? 3

Answer any one from 4-6

4. a) Define pure water. Give difference methods of physical and chemical methods of purification of water. 2+4=6

b) Give the disadvantages of using bleaching powder and advantages of calcium hypochlorite. 4

5. What do you mean by pH of a solution? What is DO & BDO? Give the principle of DO test. 2+3+5=10

6. a) What do you mean by nutritional value of food? Give the related foods of Vitamin A, B_6, B_{12}, C, E and Calcium. 2+3=5

b) What do you mean by food preservatives? Name three food preservatives. 2+3=5

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