**Printed Page: 1 of 2** 

**Subject Code: BAS102**

**0Roll No:**

| **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |  | **0** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**BTECH**

**(SEM I) THEORY EXAMINATION 2023-24**

**ENGINEERING CHEMISTRY**

**TIME: 3HRS M.MARKS: 70**

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt *all* questions in brief.**

| Q no. | Question | Marks |
| --- | --- | --- |
| a. | Explain molecular self-assembly method for preparing the nanomaterials. | 2 |
| b. | A solution shows a transmittance of 20%, when kept in a cell of 2.5 cm thickness. Calculate its concentration if the molar absorptivity coefficient is 12000dm3mol-1cm-1. | 2 |
| c. | Analyze the effect of polar solvent on π → π \* transition in acetone. | 2 |
| d. | Calculate the emf of the cell , if the standard emf of the cell is 1.54 V. Write cell reaction also.  *Zn*() ( ) *s Zn M Ag* ( ) () *M Ag s at C* 2 0 0.2 0.002 25 + + | 2 |
| e. | What is role of Gypsum in cement manufacturing? | 2 |
| f. | A sample of coal contains 60% Carbon, 33% Oxygen, 6.0% Hydrogen, 0.5% Sulphur, 0  0.2% Nitrogen and 0.3% Ash. Calculate its GCV. | 2 |
| g. | 9  What do you understand by Polymer Blends? | 322 |

P2\_~~2~~

**SECTION B**

**2. Attempt any *three* of the following:**

242.~~1~~

| a. | 4D55.Draw molecular orbital diagram of O2 and NO. Calculate their bond order and comment on their magnetic behaviors. | 7 |
| --- | --- | --- |
| b. | QP2 | 117.Illustrate the shielding and Deshielding effect involved in NMR spectroscopy.  In the P-NMR spectrum recorded at 293 K, an Organic compound (C3H7NO) exhibited signals at δ 7.8 (1H, singlet), δ 2.8 (3H, singlet) and δ 2.6 (3H, singlet). Find the structure of compound. | 7 |
| c. | 3:11Illustrate the various steps involved during manufacturing of Portland cement with the  help of a labelled diagram Give the chemical reactions involved during setting and hardening of cement. | 7 |
| d. | 8:5Compare merits and demerits of Zeolite and Ion Exchange method. | 7 |
| e. | 024 0Discuss the preparation of Grignard Reagent. Predict the final product obtained when  C2H5MgBr reacts with  (i) HCHO (ii) CH3CHO (iii) (CH3)2CO (iv) CO2 | 7 |

-03-~~2~~

**SECTION C**

**3. Attempt any *one* part of the following:**

| a. | 13Illustrate any five principles of Green Chemistry and the give green synthesis method for  preparation of Paracetamol. | 7 |
| --- | --- | --- |
| b. | |Classify Liquid crystals on the basis of temperature and give their applications in various  fields. | 7 |

**4. Attempt any *one* part of the following:**

| a. | Asymmetrically substituted compounds having even number of cumulative double bonds exhibit optical isomerism whereas compounds having odd number of cumulative double bonds exhibit geometrical isomerism. Explain giving proper reasons. | 7 |
| --- | --- | --- |
| b. | Write short notes on (any TWO)  (i) UV Shift (ii) Applications of IR spectroscopy (iii)Molecular vibration | 7 |

**5. Attempt any *one* part of the following:**

1 | Page

**QP24DP2\_290 | 13-03-2024 08:53:11 | 117.55.242.132**

**Printed Page: 2 of 2** 

**Subject Code: BAS102**

**0Roll No:**

| **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |  | **0** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**BTECH**

**(SEM I) THEORY EXAMINATION 2023-24**

**ENGINEERING CHEMISTRY**

**TIME: 3HRS M.MARKS: 70**

| a. | Illustrate the working, diagrammatic representation and cell reaction of Lead Acid storage battery during charging and discharging. | 7 |
| --- | --- | --- |
| b. | Briefly explain wet corrosion. How corrosion can be prevented by Metallic coating and using corrosion inhibitors? | 7 |

**6. Attempt any *one* part of the following:**

| a. | With the help of a neat diagram, explain the working of Bomb calorimeter. A sample of coal contain C=89%, H=8% and ash=3%.  The following data were obtained when the above coal was tested in bomb calorimeter: Weight of coal burnt= 0.85 g; Weight of water taken= 850 g; Water equivalent of bomb and calorimeter= 3500 g; Rise in temperature= 2.5˚C; Fuse wire correction = 10.0 cal ; Acid correction= 50.0 cal; Cooling correction= 0.03 ˚C. Assuming that the latent heat of condensation of steam as 580 cal/gm, Calculate gross and net calorific values of the coal. | 7 |
| --- | --- | --- |
| b. | Illustrate the principle of lime soda process.  2\_290  Analysis of raw water gives the following data: Ca2+ = 20 ppm, Mg2+ = 25 ppm, CO2 = 30 ppm, HCO3- = 150 ppm, K+ = 10 ppm. Analysis of treated water: CO3 2- = 45ppm, OH- = 68 ppm. Calculate the Lime (87% pure) and Soda (91% pure) required to soften 106 2  litre of sample water. | 7  .132 |

P

**7. Attempt any *one* part of the following:**

2~~4~~

| a. | D5.Classify conducting polymers and mention their important applications | 7 |
| --- | --- | --- |
| b. | QP24 117.5Write the preparation (structure of monomer and polymer), properties & applications of  the **any THREE** polymers:  (i) Buna –S (ii) Nylon 6,6 (iii) Polyester (iv) Kevlar (v) Bakelite | 7 |

| 13-03-2024 08:53:11 ~~|~~

2 | Page

**QP24DP2\_290 | 13-03-2024 08:53:11 | 117.55.242.132**

Printed Pages: 03 Sub Code: BAS- 102 Paper Id: Roll No.

| 233014 |
| --- |

B. TECH.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

(SEM I) THEORY EXAMINATION 2022-23

ENGINEERING CHEMISTRY

Time: 3 Hours Total Marks: 70 le;% 03 ?k.Vs iw.kkZad% 70

Note:

1. Attempt all Sections. If require any missing data; then choose suitably.

2. The question paper may be answered in Hindi Language, English Language or in the mixed language of Hindi and English, as per convenience.

uksV% 1- lHkh iz”uks dk mRrj nhft,A fdlh iz”u ea]s vko”;d MsVk dk mYy[s k u gksus dh fLFkfr esa mi;qDr MsVk Lor% ekudj iz”u dks gy djaAs

2- iz”uksa dk mRrj n sus gsr q lqfo/kku qlkj fgUnh Hkk’kk] vaxzsth Hkk’kk vFkok fganh ,oa vaxzsth dh fefJr Hkk’kk dk iz;ksx fd;k tk ldrk gSA

SECTION A

1. Attempt all questions in brief. 2 x 7 = 14 QP23DP2\_290

fuEu lHkh i z”uksa dk l a{k si esa mRrj nhft,A

| 20-03-2023 08:51:51 | 117.55.242.132

(a) On the basis of MO theory calculate the bond order of NO. Will NO be paramagnetic or diamagnetic?

MO िसȠांत के आधार पर NO की आबंध कोिट की गणना कीिजए। NO अनुचुɾकीय होगा या

Ůितचुɾकीय?

(b) What are Chiral Drugs? Give examples of Chiral Drugs.

िचरल डŌ ƺ Ɛा हœ? िचरल औषिधयोंके उदाहरण दीिजए।

(c) Give important applications of electrochemical series.

िवद् युत रासायिनक ŵृंखला के महȕपूणŊअनुŮयोग िलİखए।

(d) A water sample is found to contain 40.5 mg/L Ca(HCO3)2; 14.6 mg/L Mg(HCO3)2; 22.2 mg/L CaCl2; 24 mg/L MgSO4 and 18mg/L NaCl.

Calculate the temporary and permanent hardness of the water sample.

एक पानी के नमूनेमŐ40.5 mg/L Ca(HCO3)2; 14.6 mg/L Mg(HCO3)2; 22.2 mg/L

CaCl2; 24 mg/L MgSO4 and 18mg/L NaCl पाया गया । पानी के नमूनेकी अ̾थायी और

̾थायी कठोरता की गणना करŐ।

(e) Discuss the preparation and uses of PTFE.

PTEE की िनमाŊण ŮिŢया और उपयोगोंपर चचाŊकरŐ।

(f) How does Gross Calorific Value differ from Net Calorific Value?

सकल कै लोरी मान, शुȠ कै लोरी मान सेकै सेिभɄ होता है?

(g) What are Chromophores and Auxochromes? Give examples.

Ţोमोफोर और ऑƛोŢोम Ɛा हœ? उदाहरण दो।

SECTION B

2. Attempt any three of the following: 7 x 3 = 21 fuEu esa ls fdlh rhu i z”uk sa dk mRrj nhft,A

(a) Describe different types of liquid crystals. Discuss the applications of Liquid crystals.

िविभɄ Ůकार के ūव िŢːलोंका वणŊन कीिजए। िलİƓड िŢːल के अनुŮयोगोंपर चचाŊकरŐ।

**QP23DP2\_290 | 20-03-2023 08:51:51 | 117.55.242.132**

(b) What is Atropisomerism? Give five examples of compounds showing optical isomerism in the absence of chiral carbons.

एटŌोिपसोमेįरǚ Ɛा है? काइरल काबŊन की अनुपİ̾थित मŐŮकािशक समावयवता दशाŊनेवालेयौिगकों के पाँच उदाहरण दीिजए।

(c) Explain the setting and hardening of cement with relevant chemical reactions involved during the process.

ŮिŢया के दौरान शािमल Ůासंिगक रासायिनक ŮितिŢयाओंके साथ सीमŐट की सेिटंग और कठोरता

की ʩाƥा करŐ।

(d) Explain the stages involved in production of biogas from cattle dung. Compare the impact of use of biogas and coal on the environment.

गोबर सेबायोगैस के उȋादन मŐशािमल चरणोंकी ʩाƥा कीिजए। पयाŊवरण पर बायोगैस और कोयले के उपयोग से होने वाले Ůभाव की तुलना कीिजए।

(e) What are organo metallic compounds? Discuss the preparation of Grignard Reagent.Predict the final product obtained when C2H5MgBr reacts with

(i) HCHO (ii) CH3CHO (iii) (CH3)2CO?

ऑगŊनो धाİȕक यौिगक Ɛा हœ? िŤưाडŊअिभकमŊक की िनमाŊण ŮिŢया पर चचाŊकरŐ। C2H5MgBr के

साथ ŮितिŢया करनेपर Ůाɑ होनेवालेअंितम उȋाद की भिवˈवाणी करŐ

(i) HCHO (ii) CH3CHO (iii) (CH3)2CO?

SECTION C

QP23DP2\_290

| 20-03-2023 08:51:51 | 117.55.242.132

3. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) Describe the structure and applications of Graphite and Fullerenes. Explain the reasons for electrical and lubricating properties of graphite.

Ťेफाइट और फु लरीन की संरचना और अनुŮयोगोंका वणŊन कीिजए। Ťेफाइट के वैद् युत एवं ˘ेहक गुणों के कारणोंकी ʩाƥा कीिजए।

(b) What are Carbon Nano Tubes? Discuss the applications of nanomaterials. काबŊन नैनो Ǩूब Ɛा हœ? नैनो सामŤी के अनुŮयोगोंपर चचाŊकरŐ।

4. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) Why is TMS used as an internal standard in NMR spectroscopy? Two isomeric compounds A and B have molecular formula C10H14. The 1H NMR spectra of these isomers gave the following data:

Isomer A: δ 1.30 (9H,s); δ 7.28 (5H, s)

Isomer B: δ 0.88 (6H, d); δ 1,86 (1H, m); δ 2.45 (2H, d); δ 7.12 (5H, s)

Giving reasons assign the structures for the two isomers.

NMR ˙ेƃŌोˋोपी मŐआंतįरक मानक के ŝप मŐTMS का उपयोग Ɛोंिकया जाता है? दो समावयवी यौिगक A तथा B का अणुसूũ C10H14 है। इन आइसोमसŊके 1H NMR ˙ेƃŌा नेिनɻिलİखत डेटा िदया: आइसोमर A: δ 1.30 (9H,s); δ 7.28 (5H, s)

आइसोमर B: δ 0.88 (6H, d); δ 1,86 (1H, m); δ 2.45 (2H, d); δ 7.12 (5H, s)

कारण बताते Šए दो समावयिवयों के िलए संरचनाओं का िनधाŊरण कीिजए।

(b) (i) Explain the basic principle of IR Spectroscopy. What is the significance of Fingerprint region in IR spectroscopy?

(ii) Identify the chromophoric groups present in cyclopentene, toluene,

butanone and methanethiol in UV spectroscopy.

(i) IR ˙ेƃŌोˋोपी के मूल िसȠांत की ʩाƥा करŐ। IR ˙ेƃŌोˋोपी मŐिफ़ं गरिŮंट Ɨेũ का Ɛा

महȕ है?

(ii) UV ˙ेƃŌोˋोपी मŐ, साइƑोपŐटीन, टालूईन, ɯूटेनोन और मेथेनेिथयोल मŐमौजूद Ţोमोफोįरक

समूहोंकी पहचान करŐ। ।

**QP23DP2\_290 | 20-03-2023 08:51:51 | 117.55.242.132**

5. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) Discuss the mechanism of electrochemical theory of corrosion by absorption of oxygen. What effect will increased oxygen supply have on such corrosion? How can corrosion be minimized by proper design?

ऑƛीजन के अवशोषण Ȫारा संƗारण के िवद् युत रासायिनक िसȠांत की िŢयािविध की चचाŊकीिजए। ऐसेजंग पर ऑƛीजन की आपूितŊमŐवृİȠ का Ɛा Ůभाव पड़ेगा? उिचत िडजाइन Ȫारा जंग को कै सेकम िकया जा सकता है?

(b) Discuss the differences between anodic and cathodic metallic coatings. Explain the processes of Galvanizing and Electroplating? What will happen if an iron ship travelling in the sea is attached through an insulated metallic wire to a small sheet of magnesium?

एनोिडक और कै थोिडक धाİȕक लेप के बीच अंतर पर चचाŊकरŐ। गैʢेनाइिजंग और इलेƃŌोɘेिटंग की ŮिŢयाओंकी ʩाƥा करŐ? Ɛा होगा, यिद समुū मŐयाũा कर रहेएक लोहेके जहाज को िवद् युतरोधी धातुके तार के माȯम सेमैưीिशयम की एक छोटी शीट सेजोड़ िदया जाए?

6. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) Explain the zeolite process of water softening. What are the advantages and limitations of this process? Calculate the amount of lime and soda required for the treatment of 10,000 litres of water whose analysis is as follows (in mg/L): QP23DP2\_290

Mg(HCO3)2=73; CaSO4=102; MgCl2=95; MgSO4=24; Ca(HCO3)2=121.5;

NaCl= 55.

| 20-03-2023 08:51:51 | 117.55.242.132

जल के मृदुकरण की िजओलाइट ŮिŢया को समझाइए। इस ŮिŢया के लाभ और सीमाएँƐा हœ? 10,000 लीटर पानी के उपचार के िलए आवʴक चूनेऔर सोडा की माũा की गणना करŐिजसका िवʶेषण इस Ůकार है (mg/L मŐ):

Mg(HCO3)2=73; CaSO4=102; MgCl2=95; MgSO4=24; Ca(HCO3)2=121.5; NaCl= 55.

(b) Explain the different parameters that are determined in the proximate analysis of coal. On burning 0.92g of a solid fuel in a bomb calorimeter, the temperature of 3300g of water increased by 2.42℃. Water equivalent of calorimeter and latent heat of steam are 385.0g and 587.0cal/g, respectively. If the fuel contains 0.7% hydrogen, calculate its GCV and NCV.

कोयलेके Ůोİƛमेट िवʶेषण मŐिनधाŊįरत िविभɄ मापदंड की ʩाƥा कीिजए। एक बम कै लोरीमीटर मŐ 0.92 Ťाम ठोस ईंधन जलानेपर 3300 Ťाम पानी का तापमान 2.42 ℃ बढ़ जाता है। कै लोरीमीटर का जल तुʞांक और भाप की गुɑ ऊˆा Ţमशः 385.0g और 587.0 cal/g के बराबर है। यिद ईंधन मŐ 0.7% हाइडŌोजन है, तो इसके GCV और NCV की गणना करŐ।

7. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) (i) Differentiate between Chain Growth and Step Growth polymerization. (ii)Outline the process of vulcanization of rubber. Describe the preparation, important properties and uses of Butyl rubber or Kevlar.

(i) Şंखला वृİȠ और चरण वृİȠ बŠलकन मŐअंतर ˙ʼ कीिजए।

(ii) रबड़ के वʋनीकरण की ŮिŢया की ŝपरेखा Ůˑुत कीिजए। ɯूटाइल रबर या के वलर की तैयारी, महȕपूणŊगुणोंऔर उपयोग का वणŊन करŐ।

(b) (i) Differentiate between Thermosetting and Thermoplastic polymers. (ii)Giving examples write a brief note on conducting polymers.

(i) थमŖसेिटंग और थमŖɘाİːक पॉिलमर के बीच अंतर करŐ।

(ii) चालक बŠलकोंपर उदाहरण देतेŠए एक संिƗɑ िटɔणी िलİखए।

**QP23DP2\_290 | 20-03-2023 08:51:51 | 117.55.242.132**

**0Roll No:**

**Printed Page: 1 of 2**

**Subject Code: KAS102**

| **0** | **0** |  | **0 0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**BTECH**

**(SEM I) THEORY EXAMINATION 2021-22**

**CHEMISTRY**

***Time: 3 Hours Total Marks: 100* Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt *all* questions in brief. 2 x 10 = 20**

| Qno. | Question | Marks | CO |
| --- | --- | --- | --- |
| a. | Which species out of H2, H22+ and H22- are paramagnetic and why? | 2 | 1 |
| b. | Why Lithium exists as diatomic while beryllium remains as monoatomic? | 2 | 1 |
| c. | How will you distinguish between benzene and anthracene by UV spectroscopy? | 2 | 2 |
| d. | How many vibrational modes are there in a linear and non-linear molecule having n number of atoms? | 2 | 2 |
| e. | Why Iron Nail present on the door undergoes corrosion? | 2 | 3 |
| f. | What is salt bridge? Mention its function in an electrochemical cell. | 2 | 3 |
| g. | What is the difference between Gross calorific value and Net calorific value of a fuel? | 2 | 4 |
| h. | 290  Temporary hardness is removed by boiling. Write chemical reactions in support of your answer. | 2 | 2.4 |
| i. | 2\_What is Bio-degradable polymers? Discuss their importance. | 2 | 45 |
| j. | 2PDefine functionality. What is the minimum functionality required for a  compound to act as monomer? | 5.22 | 5 |

131

P~~2~~17~~.~~~~5~~

**SECTION B**

**2. Attempt any *three* of the following:**

| Qno. | Q1Question | Marks | CO |
| --- | --- | --- | --- |
| a. | 18 |Draw the Molecular Orbital diagram of NO. Calculate the bond order and predict the magnetic behaviors of NO, NO+, NO- . | 10 | 1 |
| b. | 09:01:Illustrate Finger print region in IR spectroscopy. Two Isomers I and II  of the molecular formula C3H6O give I.R. absorption band near 3550 cm-1 and 1717 cm-1 respectively. Assign structural formula to A and B consistent with their IR absorption bands. | 10 | 2 |
| c. | r-2022Define Phase, Component and Degree of freedom with examples. Also  outline the salient features of the phase diagram of water system highlighting the name of system (areas, curves and points), phase in equilibrium and degree of freedom in each case. | 10 | 3 |
| d. | -MaWhat are Resins? How hard water can be purified by Ion exchange resins? Compare its merits and demerits over lime –soda process. | 10 | 4 |
| e. | | 23Give preparation, properties and applications of following polymer:  (i) Buna-S (ii) Dacron (iii) Nylon 6 (iv) Neoprene | 10 | 5 |

**SECTION C**

**3. Attempt any *one* part of the following:**

| Qno. | Question | Marks | CO |
| --- | --- | --- | --- |
| a. | What are the Anisotropic crystals? How they are classified on the basis of temperature? Also mention their important applications. | 10 | 1 |
| b. | Discuss preparation, properties, structure and applications of an allotrope of carbon having truncated icosahedron geometry. | 10 | 1 |

1 | Page

**QP22P2\_290 | 23-Mar-2022 09:01:18 | 117.55.242.131**

**0Roll No:**

**Printed Page: 2 of 2**

**Subject Code: KAS102**

| **0** | **0** |  | **0 0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**BTECH**

**(SEM I) THEORY EXAMINATION 2021-22**

**CHEMISTRY**

**4. Attempt any *one* part of the following:**

| Qno. | Question | Marks | CO |
| --- | --- | --- | --- |
| a. | Discuss the quantum theory of Raman Spectroscopy. What technological advances have enabled the routine use of Raman Spectroscopy? How the Stokes, anti-Stokes and Rayleigh lines appear in the Raman Spectroscopy? | 10 | 2 |
| b. | Discuss electronic transitions involved in UV- visible spectroscopy. Illustrate, the effect of polar solvent on n - π\* transition in acetone. Also describe Absorption and Intensity shift in the UV spectroscopy with the help of examples. | 10 | 2 |

**5. Attempt any *one* part of the following:**

| Qno. | Question | Marks | CO |
| --- | --- | --- | --- |
| a. | What is battery? Differentiate between primary and secondary batteries. Explain the construction and working of secondary battery by taking an account of Lead Storage battery. | 10 | 3 |
| b. | 0Outline the mechanism involved in Electrochemical theory of corrosion.  How corrosion is prevented by anodic and cathodic inhibitors? | 10 | 3 |

**6. Attempt any *one* part of the following:**

2~~9~~

~~.1~~31

| Qno. | \_Question | Marks | 42CO |
| --- | --- | --- | --- |
| a. | QP22P2 | 117With the help of neat sketch, explain continuous cold Lime soda process  for softening of hard water. Also write the chemical reactions involved. Calculate the quantity of lime (74% pure) and soda (90%pure) for softening 50,000 liters of water containing the following salts: Mg(HCO3)2 =50mg/L, MgCl2 =6ppm,Ca(HCO3)2 =81 mg/L,CO2 =44 ppm, Na2SO4 =10oFr, HCl=73mg/L, Al2(SO4)3 =57 mg/L. | .55.210 | 4 |
| b. | 3-Mar-2022 09:01:18With the help of a neat diagram, explain the construction and working of  bomb calorimeter.  A sample of coal contain C=80%, H=15% and ash=5%. The following data were obtained when the above coal was tested in bomb calorimeter: Weight of coal burnt=0.98 g  Weight of water taken=1000 g  Water equivalent of bomb and calorimeter= 2500 g  Rise in temperature=2.5˚C  Fuse wire correction =8.0 cal  Acid correction= 50.0 cal  Cooling correction=0.02 ˚C  Calculate gross and net calorific values of the coal. | 10 | 4 |

| ~~2~~

**7. Attempt any *one* part of the following:**

| Qno. | Question | Marks | CO |
| --- | --- | --- | --- |
| a. | Write short notes on:  (i) Polymer Blends (ii) Preparation and applications of Grignard reagent | 10 | 5 |
| b. | What are conducting polymers? Classify conducting polymers and mention their important applications. | 10 | 5 |

2 | Page

**QP22P2\_290 | 23-Mar-2022 09:01:18 | 117.55.242.131**

Printed Pages: 03 Sub Code: BAS 202 Paper Id: Roll No.

| 238065 |
| --- |

B. TECH

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

(SEM- II) THEORY EXAMINATION 2022-23

ENGINEERING CHEMISTRY

Time: 3 Hours Total Marks: 70 le;% 03 ?k.Vs iw.kkZad% 70

Note:

1. Attempt all Sections. If require any missing data; then choose suitably.

2. The question paper may be answered in Hindi Language, English Language or in the mixed language of Hindi and English, as per convenience.

uksV% 1- lHkh iz”uks dk mRrj nhft,A fdlh iz”u ea]s vko”;d MsVk dk mYy[s k u gksus dh fLFkfr esa mi;qDr MsVk Lor% ekudj iz”u dks gy djaAs

2- iz”uksa dk mRrj n sus gsr q lqfo/kku qlkj fgUnh Hkk’kk] vaxzsth Hkk’kk vFkok fganh ,oa vaxzsth dh fefJr Hkk’kk dk iz;ksx fd;k tk ldrk gSA

SECTION A

1. Attempt all questions in brief. 2 x 7 = 14 fuEu lHkh i z”uksa dk l a{k si esa mRrj nhft,A

QP23EP2\_290

| 02-08-2023 08:50:47 | 117.55.242.132

(a) Draw the molecular energy level diagram for CO. Calculate its bond order and explain its magnetic behavior.

CO के िलए आणिवक ऊजाᭅ ᭭तर आरेख बनाए।ं इसके बाडं आडर क ᭅ ᳱ गणना करᱶ और इसके चुंबकᳱय ᳞वहार कᳱ ᳞ा᭎या करᱶ।

(b) Predict the number of signals and their splitting patterns in 1H NMR of CH3CCl2CH3 and CH3OCH2CH3

CH3CCl2CH3और CH3OCH2CH3के 1H NMR मᱶ संके तᲂ कᳱ सं᭎या और उनके िवभाजन पैटनᭅ का आकलन करᱶ।.

(c) Two Isomers X and Y having molecular formula C3H6O give IR band near 3550 cm-1 and 1717 cm-1 respectively. Assign structural formula to X and Y consistent with their IR absorption band.

आणिवक सूᮢ C3H6O वालेदो आइसोमसᭅX और Y ᮓमशः 3550 cm-1 और 1717 cm-1 के करीब IR बडᱹ दतेेह। ᱹ X और Y को उनके IR अवशोषण बᱹड के अनुᱨप संरचना᭜मक सूᮢ िन᳸द᳥ करᱶ।

(d) What is electrochemical series? What is the potential of a half cell consisting of zinc electrode in 0.01M ZnSO4 solution at 25℃. E⸰= 0.763V

इले᭍ᮝोके िमकल ᮰ृंखला ᭍या है? 25℃ पर 0.01M ZnSO4 घोल मᱶᳲजक इले᭍ᮝोड से युᲦ अधᭅ सेल कᳱ िवभव ᭍या होगा ? E⸰= 0.763V

(e) Differentiate between Gross and Net calorific value.

ᮕॉस और नेट कैलोरी मान के बीच अंतर करᱶ।

(f) Discuss the preparation and uses of Nylon- 6,6.

नायलॉन-6,6 कᳱ तैयारी और उपयोग ᳰक िववेचना कᳱिजये ।

(g) Give the structures of FOUR compounds used as initiators in Free Radical polymerization.

ᮨᳱ रेिडकल पोलीमराइजेशन मᱶ आरंभकताᭅᲐ के ᱨप मᱶ उपयोग ᳰकए जाने वाले चार यौिगकᲂ कᳱ संरचनाएं द।ᱶ

**QP23EP2\_290 | 02-08-2023 08:50:47 | 117.55.242.132**

SECTION B

2. Attempt any three of the following: 7 x 3 = 21 fuEu esa ls fdUgha rhu iz”uk sa dk mRrj nhft,A

(a) Discuss the classification of liquid crystals. Distinguish between nematic and smectic liquid crystals. Give their important applications.

िलᳰᲤड ᳰᮓ᭭टल के वगᱮकरण कᳱ िववचे ना कᳱिजये। नमे ᳯैटक और ᭭मिे᭍टक िलᳰᲤड ᳰᮓ᭭टल के बीच अंतर बताएं। उनके मह᭜वपूणᭅ अनुᮧयोग बताइये।

(b) Asymmetrically substituted compounds having even number of cumulative double bonds exhibit optical isomerism whereas compounds having odd number of cumulative double bonds exhibit geometrical isomerism. Explain giving proper reasons.

असमिमत ᱨप से ᮧित᭭थािपत यौिगक िजनमᱶ सम सं᭎या मᱶ संचयी डबल बाडं होते ह, ᱹऑि᭡टकल आइसोमेᳯर᭔म ᮧदᳶशत करतेह जब ᱹ ᳰक िवषम सं᭎या मᱶसचं यी डबल बाडं वालेयौिगक ᭔यािमतीय आइसोमेᳯर᭔म ᮧदᳶशत करते ह। उिचत कारण बताते ᱹ ᱟए ᳞ा᭎या करᱶ।

(c) Define Corrosion. How can corrosion be minimized by sacrificial anodic protection and impressed current cathodic protection methods?

संᭃारण को पᳯरभािषत करᱶ। sacrificial एनोिडक सुरᭃा और impressed िव᳒तु कै थोिडक सुरᭃा िविधयᲂ ᳇ारा संᭃारण को कै से कम ᳰकया जा सकता है?

(d) Explain with the help of a neat labeled diagram the working of bomb calorimeter. A QP23EP2\_290

| 02-08-2023 08:50:47 | 117.55.242.132

0.85g sample of solid fuel was completely combusted in excess of oxygen using bomb calorimeter. The rise in temperature of water in calorimeter was 2.8℃. Calculate the HCV of the fuel, if water taken in calorimeter is 2000g and water equivalent of calorimeter is 2200 g. Also calculate the LCV of the fuel. (%Hydrogen in fuel =2.5)

बम कैलोरीमीटर कᳱ कायᭅᮧणाली को एक ᭭व᭒छ नामांᳰकत िचᮢ कᳱ सहायता से समझाइए। बम कै लोरीमीटर का उपयोग करके ऑ᭍सीजन कᳱ अिधकता मᱶ ठोस ᲊधन का 0.85 ᮕाम नमनू ा पूरी तरह से जल गया। कै लोरीमीटर मᱶ पानी के तापमान मᱶ2.8℃ कᳱ वृि᳍ ᱟई। ᲊधन के HCV कᳱ गणना करᱶ, यᳰद कै लोरीमीटर मᱶ िलया गया पानी 2000 ᮕाम हैऔर पानी के तु᭨य कै लोरीमीटर 2200 ᮕाम ह।ै ᲊधन कᳱ LCV कᳱ भी गणना करᱶ। (ᲊधन मᱶ %हाइᮟोजन =2.5)

(e) Predict the final product obtained when LiAlH4 reacts with:

LiAlH4 के साथ ᳰᮓया करने पर ᮧा᳙ अंितम उ᭜पाद का आकलन करᱶ:

(i) CH3CHO

(ii) CH3CN

(iii) CH3COOC2H5

(iv) CH3COC2H5

(v) CH3COOH

(vi) CH3N3

(vii) CH3CHCH2O (epoxide)

SECTION C

3. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) What are nanomaterials? How the physical and chemical properties of nanoparticles vary with their size? Write important applications of nanomaterials.

नैनोमटेᳯरय᭨स ᭍या ह? ᱹ नैनोकणᲂ केभौितक और रासायिनक गणु उनकेआकार केसाथ कैसेपᳯरवᳶतत होते ह? ᱹ नैनोमटेᳯरयल के मह᭜वपूणᭅ अनुᮧयोग िलिखए।

(b) Write a brief note on fullerenes, discussing their preparation, properties and applications.

फु लरीन पर, उसकᳱ तैयारी, गुणᲂ और अनुᮧयोगᲂ पर चचाᭅ करते ᱟए, एक संिᭃ᳙ नोट िलखᱶ।

**QP23EP2\_290 | 02-08-2023 08:50:47 | 117.55.242.132**

4. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) What is shielding and deshielding in NMR spectroscopy? A compounds having molecular formula C4H9Br gave the following signals in its 1H NMR spectra:

δ 1.04 (6H, d)

δ 1.95 (1H, m)

δ 3.33 (2H, d)

Giving reasons assign the structures for the compound.

एनएमआर ᭭पे᭍ᮝो᭭कोपी मᱶ शीᳲ᭨डग और डीशीᳲ᭨डग ᭍या है? आणिवक सूᮢ C4H9Br वालेएक यौिगक ने अपने 1H NMR ᭭पे᭍ᮝा मᱶ िन᳜िलिखत संके त ᳰदए:

δ 1.04 (6H, d)

δ 1.95 (1H, m)

δ 3.33 (2H, d)

कारण बताते ᱟए यौिगक के िलए संरचनाएँ िन᳸द᳥ करᱶ।

(b) How do Auxochromes increase the coloring power of Chromophores?

ऑ᭍सोᮓोम ᮓोमोफोरस कᳱ रंगाई शिᲦ को कै सेबढ़ाते ह? ᱹ

(i) A diene (molecular formula C4H6) shows an intense peak at λmax 217 nm while another diene (molecular formula C5H8) shows an intense peak at λmax 175 nm in their UV spectra. Giving proper explanation assign the structures to the two dienes.

एक diene (आणिवक सूᮢ C4H6) अपने UV ᭭पे᭍ᮝा मᱶλmax 217 nm पर एक तीᮯ िशखर ᳰदखाता हैजबᳰक दसू रा diene (आि᭛वक सूᮢ C5H8) अपने UV ᭭पे᭍ᮝा मᱶλmax 175 nm पर एक

Q~~P~~23EP2\_290

| 02-08-2023 08:50:47 | 117.55.242.132

तीᮯ िशखर ᳰदखाता ह।ै उिचत ᭭प᳥ीकरण दतेेᱟए दोनᲂ diene को संरचनाएँ िन᳸द᳥ करᱶ।

(ii) Why the λ max for the diene (I) is observed at a lower nm than diene (II) ?

λmax diene (I) के िलए diene (II) से कम nm पर ᭍यᲂ दखे ा जाता ह? ै

(I)

C C

H H

(II)

5. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) Discuss the mechanism of electrochemical corrosion of iron with evolution of hydrogen. What will happen if a zinc rod is vertically half submerged under water? हाइᮟोजन केिवकास केसाथ लोहेकेिव᳒ुत रासायिनक ᭃरण कᳱ ᳰᮓयािविध पर चचाᭅ करᱶ। यᳰद ᳲजक कᳱ छड़ को आधा पानी मᱶ डुबा ᳰदया जाए, तो ᭍या होगा?

(b) Discuss the construction and chemistry of charging/discharging of Lead Acid battery. लेड एिसड बैटरी कᳱ चाᳺजग/िड᭭चाᳺजग कᳱ संरचना और रसायन पर चचाᭅ करᱶ।

6. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) How are scales formed in boilers? Discuss four disadvantages of scale formation in boilers. The hardness of 10,000 litres of water sample was removed by passing it through a zeolite softener. The zeolite softener then required 200 litres of sodium chloride solution containing 200 g/L of NaCl for regeneration. Calculate the hardness of water sample.

**QP23EP2\_290 | 02-08-2023 08:50:47 | 117.55.242.132**

बॉयलर मᱶ᭭के ल कै से बनते ह? ᱹ बॉयलरᲂ मᱶ᭭केल िनमाᭅण के चार हािनयᲂ पर चचा कर ᭅ ᱶ। 10,000 लीटर पानी के नमूने कᳱ कठोरता को िजओलाइट सॉᮆनर सेगुजारकर दरू ᳰकया गया। िजओलाइट सॉᮆनर को पुनᳶनᳶमत के िलए 200 ᮕाम/लीटर NaCl युᲦ 200 लीटर सोिडयम ᭍लोराइड घोल कᳱ आव᭫यकता होती ह।ै पानी केनमूनेकᳱ कठोरता कᳱ गणना करᱶ।

(b) Explain briefly the ultimate analysis of coal. A sample of fuel having following percentage composition C= 70%, H = 6%, O = 4%, N = 3%, S = 3%, ash = 6% and moisture = 8%. Calculate the quantity of air required for complete combustion of 1 Kg of fuel.

कोयलेकेअंितम िव᳣ेषण को संᭃेप मᱶ समझाइये। िन᳜िलिखत ᮧितशत संरचना वाले ᲊधन के एक नमूने मᱶC= 70%, H = 6%, O = 4%, N = 3%, S = 3%, राख = 6% और नमी = 8% ह।ै 1 ᳰकलोᮕाम ᲊधन के पूणᭅ दहन के िलए आव᭫यक वायु कᳱ माᮢा कᳱ गणना करᱶ।

7. Attempt any one part of the following: 7 x 1 = 7 fuEu esa ls fdlh ,d i z”u dk mRrj nhft,A

(a) What are biodegradable polymers? Write a note on:

बायोिडᮕेडेबल पॉिलमर ᭍या ह? ᱹ िन᳜ पर एक ᳯट᭡पणी िलखᱶ:

(i) Polynucleotides

(ii) Buna- S

(b) Differentiate between Thermoplastic and Thermosetting polymers. Discuss the preparation and uses of Phenol Formaldehyde resin.

थमᲃ᭡लाि᭭टक और थमᲃसेᳳटग पॉिलमर केबीच अंतर बताइए। ᳰफनोल फॉमलᭅ ाडहेाइड रेिसन को तैयार करने QP23EP2\_290

| 02-08-2023 08:50:47 | 117.55.242.132

कᳱ िविध और उपयोग कᳱ िववचे ना कᳱिजये ।

**QP23EP2\_290 | 02-08-2023 08:50:47 | 117.55.242.132**

**0Roll No:**

**Printed Page: 1 of 2**

**Subject Code: KAS202T**

| **0** | **0** |  | **0 0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**BTECH**

**(SEM II) THEORY EXAMINATION 2021-22**

**ENGINEERING CHEMISTRY**

***Time: 3 Hours***

**Notes:**

∙ *Attempt all Sections and Assume any missing data*.

∙ *Appropriate marks are allotted to each question, answer accordingly.*

***Total Marks: 100***

| **SECTION-A** | | Attempt **All** of the following Questions in brief | Marks**(10X2=20) CO** |  | **BL** |
| --- | --- | --- | --- | --- | --- |
| Q1(a) | Explain why helium is monatomic and hydrogen is diatomic? | | | 1 | 2 |
| Q1(b) | Arrange the following molecules or ions in increasing order of bond stability. N22-,N2-& N2 | | | 1 | 3 |
| Q1(c) | A solution shows a transmittance of 20%, when kept in a cell of 2.5 cm thickness. Calculate its concentration if the molar absorption coefficient is 12000 dm3mol-1cm-1. | | | 2 | 4 |
| Q1(d) | What are Raman active molecules? | | | 2 | 1 |
| Q1(e) | Why KCl ̶ NaCl – H2O should be regarded as a 3 components system, Whereas 290  KCl ̶ NaCl ̶ H2O should be regarded as 4 components system? | | | 3 | 4  3 |
| Q1(f) | P2\_Calculate the EMF of the cell reaction: Zn / Zn 2+ [0.1M] || Cu 2+[0.2M] / Cu  Standard reduction potential of Zn2+ and Cu2+ are -0.76V and 0.34V respectively. | | | 3  .24 | 2.12 |
| Q1(g) | QP22E  5 | 117.550.4 gm of a coal sample was used in bomb calorimeter for the determination of  calorific value .The ash formed in the bomb calorimeter was extracted with acid and the acid extracted was heated with BaCl2 solution and a precipitate of BaSO4 was formed .The precipitate was filtered dried and weighted. The weighted of precipitate was to 0.04 gm Calculate the percentage of sulphur in the sample? | | | 4 | 4 |
| Q1(h) | 03:1A sample of hard water has hardness 500 ppm. express the hardness in ofr and oCl | | | 4 | 5 |
| Q1(i) | 9:Write monomers of Buna-S and Nylon 66? | | | 5 | 2 |
| Q1(j) | 0Write structure of Ferrocene and Dibenzene chromium. | | | 5 | 2 |

2

2

| **SECTION-B** | | 2Attempt **ANY THREE** of the following Questions | Marks**(3X10=30)** | **CO** | **BL** |
| --- | --- | --- | --- | --- | --- |
| Q2(a) | 07-20(i) Explain the applications of Graphite and comment upon the electrical and lubrication property of Graphite? | | | 1 | 2 |
| Q2(b) | | 29-Define the principle of Raman spectroscopy. Explain the term chromophore and auxochrome in UV Spectroscopy? | | | 2 | 1 |
| Q2(c) | Explain the mechanism of electrochemical theory of corrosion with the help of hydrogen evolution and oxygen absoption reactions. Describe cathodic protection in detail. | | | 3 | 3 |
| Q2(d) | (i) Write the process of lime soda softening.  (ii) Calculate the amount of lime and soda required for the treatment of 20000 lts. of water whose analysis is as follows:  Ca(HCO3)2 = 40.5; Mg(HCO3)2 =36.5 ppm; MgSO4= 30 ppm; CaCl2= 27.75 ppm. | | | 4 | 4 |

**QP22EP2\_290 | 29-07-2022 09:03:15 | 117.55.242.132**

**0Roll No:**

**Printed Page: 2 of 2**

**Subject Code: KAS202T**

| **0** | **0** |  | **0 0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**BTECH**

**(SEM II) THEORY EXAMINATION 2021-22**

**ENGINEERING CHEMISTRY**

| Q2(e) | What are organometallic compounds? How Grignard reagents are prepared? Write any five applications of Grignard reagents. | 5 | 2 |
| --- | --- | --- | --- |

| **SECTION-C** | | Attempt **ANY ONE** following Question | Marks **(1X10=10) CO** |  | **BL** |
| --- | --- | --- | --- | --- | --- |
| Q3(a) | With the help of molecular orbital diagram, explain the paramagnetic character of O2 and diamagnetic character N2. | | | 1 | 3 |
| Q3(b) | What is Fullerene? Indicating the method of preparations, properties and their application? | | | 1 | 2 |

| **SECTION-C** | | Attempt **ANY ONE** following Question | Marks **(1X10=10) CO** |  | **BL** |
| --- | --- | --- | --- | --- | --- |
| Q4(a) | What is rotational spectroscopy? Explain the instrument of microwave spectroscopy and what are the conditions for microwave active molecules? | | | 2 | 1 |
| Q4(b) | Define infrared spectroscopy. Describe the various molecular vibrations in the technique and write the application of infrared spectroscopy. | | | 2 | 2 |

~~0~~

3~~2~~

| **SECTION-C** | | 29Attempt **ANY ONE** following Question | Marks **(1X10=10) CO** |  | 1**BL** |
| --- | --- | --- | --- | --- | --- |
| Q5(a) | EP2\_What is secondary storage battery? Write charging and discharging reaction of  Lead acid battery with application of lead acid battery. | | | 3  .24 | 2.2 |
| Q5(b) | 22.55With the help of phase diagram of a water system. Calculate the degree of freedom of triple point and define term involved in Phase rule? | | | 3 | 3 |

~~P~~

~~7~~

| **SECTION-C** | | QAttempt **ANY ONE** following Question | 11Marks **(1X10=10) CO** |  | **BL** |
| --- | --- | --- | --- | --- | --- |
|  | 5 | Q6(a) Explain the process of determination of calorific value using Bomb calorimeter  method. | | | 4 | 4 |
| Q6(b) | 022 09:03:1What is calorific value? Explain the construction and working of bomb  calorimeter?  A coal has the following composition by weight C=92% ,O=2.0% ,S=0.5% ,N=0.5% and ash =2.5% Net calorific value of the coal was found to be 9,430 kcal/Kg ,Calculate the percentage of hydrogen and gross calorific value of coal? | | | 4 | 3 |

-~~2~~

| **SECTION-C** | | 7Attempt **ANY ONE** following Question | Marks **(1X10=10) CO** |  | **BL** |
| --- | --- | --- | --- | --- | --- |
| Q7(a) | | 29-0Write down synthesis and application of following polymers **i)**-BUNA-S **ii)**-Neoprene **iii)**- Nylon 66 **iv)**– Dacron | | | 5 | 2 |
| Q7(b) | What are conducting polymers? Write the classification and application of conducting polymers. | | | 5 | 1 |

**QP22EP2\_290 | 29-07-2022 09:03:15 | 117.55.242.132**