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B. TECH.
(SEM I) THEORY EXAMINATION 2022-23
ENGINEERING CHEMISTRY

Time: 3 Hours ***Total Marks: 70***

समयः 03 घण्टे पूर्णांकः 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.

नोटः 1. सभी प्रश्नो का उत्तर दीजिए। किसी प्रश्न में, आवश्यक डेटा का उल्लेख न होने की स्थिति में उपयुक्त डेटा स्वतः मानकर प्रश्न को हल करें।

2. प्रश्नों का उत्तर देने हेतु सुविधानुसार हिन्दी भाषा, अंग्रेजी भाषा अथवा हिंदी एवं अंग्रेजी की मिश्रित भाषा का प्रयोग किया जा सकता है।

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

निम्न सभी प्रश्नों का संक्षेप में उत्तर दीजिए।

(a) On the basis of MO theory calculate the bond order of NO. Will NO be paramagnetic or diamagnetic?
MO सिद्धांत के आधार पर NO की आबंध कोटि की गणना कीजिए। NO अनुचुम्बकीय होगा या प्रतिचुम्बकीय?

(b) What are Chiral Drugs? Give examples of Chiral Drugs.
चिरल ड्रग्स क्या हैं? चिरल औषधियों के उदाहरण दीजिए।

(c) Give important applications of electrochemical series.
विद्युत रासायनिक श्रृंखला के महत्वपूर्ण अनुप्रयोग लिखिए।

(d) A water sample is found to contain 40.5 mg/L $Ca(HCO_3)_2$; 14.6 mg/L $Mg(HCO_3)_2$; 22.2 mg/L $CaCl_2$; 24 mg/L $MgSO_4$ and 18mg/L NaCl. Calculate the temporary and permanent hardness of the water sample.
एक पानी के नमूने में 40.5 mg/L $Ca(HCO_3)_2$; 14.6 mg/L $Mg(HCO_3)_2$; 22.2 mg/L $CaCl_2$; 24 mg/L $MgSO_4$ and 18mg/L NaCl पाया गया। पानी के नमूने की अस्थायी और स्थायी कठोरता की गणना करें।

(e) Discuss the preparation and uses of PTFE.
PTEE की निर्माण प्रक्रिया और उपयोगों पर चर्चा करें।

(f) How does Gross Calorific Value differ from Net Calorific Value?
सकल कैलोरी मान, शुद्ध कैलोरी मान से कैसे भिन्न होता है?

(g) What are Chromophores and Auxochromes? Give examples.
क्रोमोफोर और ऑक्सोक्रोम क्या हैं? उदाहरण दो।

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

निम्न में से किसी तीन प्रश्नों का उत्तर दीजिए।

(a) Describe different types of liquid crystals. Discuss the applications of Liquid crystals.
विभिन्न प्रकार के द्रव क्रिस्टलों का वर्णन कीजिए। लिक्विड क्रिस्टल के अनुप्रयोगों पर चर्चा करें।

(b) What is Atropisomerism? Give five examples of compounds showing optical isomerism in the absence of chiral carbons.
एट्रोपिसोमेरिज्म क्या है? काइरल कार्बन की अनुपस्थिति में प्रकाशिक समावयवता दर्शाने वाले यौगिकों के पाँच उदाहरण दीजिए।

(c) Explain the setting and hardening of cement with relevant chemical reactions involved during the process.
प्रक्रिया के दौरान शामिल प्रासंगिक रासायनिक प्रतिक्रियाओं के साथ सीमेंट की सेटिंग और कठोरता की व्याख्या करें।

(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 से बायोगैस के उत्पादन में शामिल चरणों की व्याख्या कीजिए। पर्यावरण पर बायोगैस और कोयले के उपयोग से होने वाले प्रभाव की तुलना कीजिए।

(e) What are organo metallic compounds? Discuss the preparation of Grignard Reagent.Predict the final product obtained when C_2H_5MgBr reacts with
(i) HCHO (ii) CH_3CHO (iii) $(CH_3)_2CO$?
ऑर्गनो धात्विक यौगिक क्या हैं? ग्रिग्नार्ड अभिकर्मक की निर्माण प्रक्रिया पर चर्चा करें। C_2H_5MgBr के साथ प्रतिक्रिया करने पर प्राप्त होने वाले अंतिम उत्पाद की भविष्यवाणी करें
(i) HCHO (ii) CH_3CHO (iii) $(CH_3)_2CO$?

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(a) Describe the structure and applications of Graphite and Fullerenes. Explain the reasons for electrical and lubricating properties of graphite.
ग्रेफाइट और फुलरीन की संरचना और अनुप्रयोगों का वर्णन कीजिए। ग्रेफाइट के वैद्युत एवं स्नेहक गुणों के कारणों की व्याख्या कीजिए।

(b) What are Carbon Nano Tubes? Discuss the applications of nanomaterials.
कार्बन नैनो ट्यूब क्या हैं? नैनो सामग्री के अनुप्रयोगों पर चर्चा करें।

4. Attempt any *one* part of the following: 7 x 1 = 7

निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(a) Why is TMS used as an internal standard in NMR spectroscopy? Two isomeric compounds A and B have molecular formula $C_{10}H_{14}$. 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 स्पेक्ट्रोस्कोपी में आंतरिक मानक के रूप में TMS का उपयोग क्यों किया जाता है? दो समावयवी यौगिक A तथा B का अणुसूत्र $C_{10}H_{14}$ है। इन आइसोमर्स के ^1H NMR स्पेक्ट्रा ने निम्नलिखित डेटा दिया:
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 हुए दो समावयवियों के लिए संरचनाओं का निर्धारण कीजिए।

(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 स्पेक्ट्रोस्कोपी के मूल सिद्धांत की व्याख्या करें। IR स्पेक्ट्रोस्कोपी में फ़िंगरप्रिंट क्षेत्र का क्या महत्व है?
(ii) UV स्पेक्ट्रोस्कोपी में, साइक्लोपेंटीन, टालूईन, ब्यूटेनोन और मेथेनेथियोल में मौजूद क्रोमोफोरिक समूहों की पहचान करें। ।

5. Attempt any *one* part of the following: 7 x 1 = 7

निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(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?
ऑक्सीजन के अवशोषण द्वारा संक्षारण के विद्युत रासायनिक सिद्धांत की क्रियाविधि की चर्चा कीजिए। ऐसे जंग पर ऑक्सीजन की आपूर्ति में वृद्धि का क्या प्रभाव पड़ेगा? उचित डिजाइन द्वारा जंग को कैसे कम किया 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?
एनोडिक और कैथोडिक धात्विक लेप के बीच अंतर पर चर्चा करें। गैल्वेनाइजिंग और इलेक्ट्रोप्लेटिंग की प्रक्रियाओं की व्याख्या करें? क्या होगा, यदि समुद्र में यात्रा कर रहे एक लोहे के जहाज को विद्युतरोधी धातु के तार के माध्यम से मैग्नीशियम की एक छोटी शीट से जोड़ दिया जाए?

6. Attempt any *one* part of the following: 7 x 1 = 7

निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(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):
$Mg(HCO_3)_2$=73; $CaSO_4$=102; $MgCl_2$=95; $MgSO_4$=24; $Ca(HCO_3)_2$=121.5; NaCl= 55.
जल के मृदुकरण की जिओलाइट प्रक्रिया को समझाइए। इस प्रक्रिया के लाभ और सीमाएँ क्या हैं? 10,000 लीटर पानी के उपचार के लिए आवश्यक चूने और सोडा की मात्रा की गणना करें जिसका विश्लेषण इस प्रकार है (mg/L में):
$Mg(HCO_3)_2$=73; $CaSO_4$=102; $MgCl_2$=95; $MgSO_4$=24; $Ca(HCO_3)_2$=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°C. 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.
कोयले के प्रोक्सिमेट विश्लेषण में निर्धारित विभिन्न मापदंड की व्याख्या कीजिए। एक बम कैलोरीमीटर में 0.92 ग्राम ठोस ईंधन जलाने पर 3300 ग्राम पानी का तापमान 2.42 °C बढ़ जाता है। कैलोरीमीटर का जल तुल्यांक और भाप की गुप्त ऊष्मा क्रमशः 385.0g और 587.0 cal/g के बराबर है। यदि ईंधन में 0.7% हाइड्रोजन है, तो इसके GCV और NCV की गणना करें।

7. Attempt any *one* part of the following: 7 x 1 = 7

निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(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) शृंखला वृद्धि और चरण वृद्धि बहुलकन में अंतर स्पष्ट कीजिए।
(ii) रबड़ के वल्कनीकरण की प्रक्रिया की रूपरेखा प्रस्तुत कीजिए। ब्यूटाइल रबर या केवलर की तैयारी, महत्वपूर्ण गुणों और उपयोग का वर्णन करें।

(b) (i) Differentiate between Thermosetting and Thermoplastic polymers.
(ii)Giving examples write a brief note on conducting polymers.
(i) थर्मोसेटिंग और थर्मोप्लास्टिक पॉलिमर के बीच अंतर करें।
(ii) चालक बहुलकों पर उदाहरण देते हुए एक संक्षिप्त टिप्पणी लिखिए।

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B. TECH
(SEM- II) THEORY EXAMINATION 2022-23
ENGINEERING CHEMISTRY

Time: 3 Hours ***Total Marks: 70***

समयः 03 घण्टे पूर्णांकः 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.

नोटः 1. सभी प्रश्नो का उत्तर दीजिए। किसी प्रश्न में, आवश्यक डेटा का उल्लेख न होने की स्थिति में उपयुक्त डेटा स्वतः मानकर प्रश्न को हल करें।

2. प्रश्नों का उत्तर देने हेतु सुविधानुसार हिन्दी भाषा, अंग्रेजी भाषा अथवा हिंदी एवं अंग्रेजी की मिश्रित भाषा का प्रयोग किया जा सकता है।

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

निम्न सभी प्रश्नों का संक्षेप में उत्तर दीजिए।

(a) Draw the molecular energy level diagram for CO. Calculate its bond order and explain its magnetic behavior.
CO के लिए आणविक ऊर्जा स्तर आरेख बनाएं। इसके बांड आर्डर की गणना करें और इसके चुंबकीय व्यवहार की व्याख्या करें।

(b) Predict the number of signals and their splitting patterns in ^1H NMR of $CH_3CCl_2CH_3$ and $CH_3OCH_2CH_3$
$CH_3CCl_2CH_3$और $CH_3OCH_2CH_3$के ^1H NMR में संकेतों की संख्या और उनके विभाजन पैटर्न का आकलन करें।.

(c) Two Isomers ***X*** and ***Y*** having molecular formula C_3H_6O 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.
आणविक सूत्र C_3H_6O वाले दो आइसोमर्स **X** और **Y** क्रमशः 3550 cm^{-1} और 1717 cm^{-1} के करीब IR बैंड देते हैं। **X** और **Y** को उनके IR अवशोषण बैंड के अनुरूप संरचनात्मक सूत्र निर्दिष्ट करें।

(d) What is electrochemical series? What is the potential of a half cell consisting of zinc electrode in 0.01M $ZnSO_4$ solution at 25°C. $E^\circ = 0.763V$
इलेक्ट्रोकेमिकल श्रृंखला क्या है? 25°C पर 0.01M $ZnSO_4$ घोल में जिंक इलेक्ट्रोड से युक्त अर्ध सेल की विभव क्या होगा ? $E^\circ = 0.763V$

(e) Differentiate between Gross and Net calorific value.
ग्रॉस और नेट कैलोरी मान के बीच अंतर करें।

(f) Discuss the preparation and uses of Nylon- 6,6.
नायलॉन-6,6 की तैयारी और उपयोग कि विवेचना कीजिये ।

(g) Give the structures of ***FOUR*** compounds used as initiators in Free Radical polymerization.
फ्री रेडिकल पोलीमराइजेशन में आरंभकर्ताओं के रूप में उपयोग किए जाने वाले चार यौगिकों की संरचनाएं दें।

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**
निम्न में से किन्हीं तीन प्रश्नों का उत्तर दीजिए।

(a) Discuss the classification of liquid crystals. Distinguish between nematic and smectic liquid crystals. Give their important applications.
लिक्विड क्रिस्टल के वर्गीकरण की विवेचना कीजिये। नेमैटिक और स्मेक्टिक लिक्विड क्रिस्टल के बीच अंतर बताएं। उनके महत्वपूर्ण अनुप्रयोग 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.
असममित रूप से प्रतिस्थापित यौगिक जिनमें सम संख्या में संचयी डबल बांड होते हैं, ऑप्टिकल आइसोमेरिज्म प्रदर्शित करते हैं जबकि विषम संख्या में संचयी डबल बांड वाले यौगिक ज्यामितीय आइसोमेरिज्म प्रदर्शित करते हैं। उचित कारण बताते हुए व्याख्या करें।

(c) Define Corrosion. How can corrosion be minimized by sacrificial anodic protection and impressed current cathodic protection methods?
संक्षारण को परिभाषित करें। sacrificial एनोडिक सुरक्षा और impressed विद्युत कैथोडिक सुरक्षा विधियों द्वारा संक्षारण को कैसे कम किया जा सकता है?

(d) Explain with the help of a neat labeled diagram the working of bomb calorimeter. A 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°C. 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 की कार्यप्रणाली को एक स्वच्छ नामांकित चित्र की सहायता से समझाइए। बम कैलोरीमीटर का उपयोग करके ऑक्सीजन की अधिकता में ठोस ईंधन का 0.85 ग्राम नमूना पूरी तरह से जल गया। कैलोरीमीटर में पानी के तापमान में 2.8°C की वृद्धि हुई। ईंधन के HCV की गणना करें, यदि कैलोरीमीटर में लिया गया पानी 2000 ग्राम है और पानी के तुल्य कैलोरीमीटर 2200 ग्राम है। ईंधन की LCV की भी गणना करें। (ईंधन में %हाइड्रोजन =2.5)

(e) Predict the final product obtained when $LiAlH_4$ reacts with:
$LiAlH_4$ के साथ क्रिया करने पर प्राप्त अंतिम उत्पाद का आकलन करें:
(i) CH_3CHO
(ii) CH_3CN
(iii) $CH_3COOC_2H_5$
(iv) $CH_3COC_2H_5$
(v) CH_3COOH
(vi) CH_3N_3
(vii) CH_3CHCH_2O (epoxide)

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**
निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(a) What are nanomaterials**?** How the physical and chemical properties of nanoparticles vary with their size? Write important applications of nanomaterials.
नैनोमटेरियल्स क्या हैं? नैनोकणों के भौतिक और रासायनिक गुण उनके आकार के साथ कैसे परिवर्तित होते हैं? नैनोमटेरियल के महत्वपूर्ण अनुप्रयोग लिखिए।

(b) Write a brief note on fullerenes, discussing their preparation, properties and applications.
फुलरीन पर, उसकी तैयारी, गुणों और अनुप्रयोगों पर चर्चा करते हुए, एक संक्षिप्त नोट लिखें।

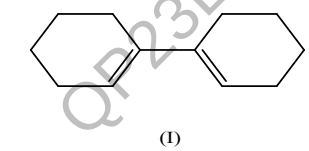
4. Attempt any *one* part of the following: 7 x 1 = 7
निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(a) What is shielding and deshielding in NMR spectroscopy? A compounds having molecular formula C_4H_9Br 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 स्पेक्ट्रोस्कोपी में शीलिंडग और डीशीलिंडग क्या है? आणविक सूत्र C_4H_9Br वाले एक यौगिक ने अपने ^1H NMR स्पेक्ट्रा में निम्नलिखित संकेत दिए:
δ 1.04 (6H, d)
δ 1.95 (1H, m)
δ 3.33 (2H, d)
कारण बताते हुए यौगिक के लिए संरचनाएँ निर्दिष्ट करें।

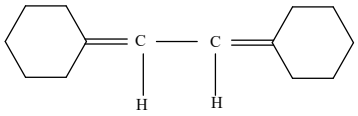
(b) How do Auxochromes increase the coloring power of Chromophores?
ऑक्सोक्रोम क्रोमोफोरस की रंगाई शक्ति को कैसे बढ़ाते हैं?

(i) A diene (molecular formula C_4H_6) shows an intense peak at λ_{max} 217 nm while another diene (molecular formula C_5H_8) shows an intense peak at λ_{max} 175 nm in their UV spectra. Giving proper explanation assign the structures to the two dienes.
एक diene (आणविक सूत्र C_4H_6) अपने UV स्पेक्ट्रा में λ_{max} 217 nm पर एक तीव्र शिखर दिखाता है जबकि दूसरा diene (आण्विक सूत्र C_5H_8) अपने UV स्पेक्ट्रा में λ_{max} 175 nm पर एक तीव्र शिखर दिखाता है। उचित स्पष्टीकरण देते हुए दोनों diene को संरचनाएँ निर्दिष्ट करें।

(ii) Why the λ_{max} for the diene (I) is observed at a lower nm than diene (II) ?
λ_{max} diene (I) *के लिए* diene (II) से कम nm पर क्यों देखा जाता है?



(I)



(II)

5. Attempt any *one* part of the following: 7 x 1 = 7
निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(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?
हाइड्रोजन के विकास के साथ लोहे के विद्युत रासायनिक क्षरण की क्रियाविधि पर चर्चा करें। यदि जिंक की छड़ को आधा पानी में डुबा दिया जाए, तो क्या होगा?

(b) Discuss the construction and chemistry of charging/discharging of Lead Acid battery.
लेड एसिड बैटरी की चार्जिंग/डिस्चार्जिंग की संरचना और रसायन पर चर्चा करें।

6. Attempt any *one* part of the following: 7 x 1 = 7
निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(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.

बॉयलर में स्केल कैसे बनते हैं? बॉयलरों में स्केल निर्माण के चार हानियों पर चर्चा करें। 10,000 लीटर पानी के नमूने की कठोरता को जिओलाइट सॉफ़्नर से गुजारकर दूर किया गया। जिओलाइट सॉफ़्नर को पुनर्निर्मित के लिए 200 ग्राम/लीटर *NaCl* युक्त 200 लीटर सोडियम क्लोराइड घोल की आवश्यकता होती है। पानी के नमूने की कठोरता की गणना करें।

(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.
कोयले के अंतिम विश्लेषण को संक्षेप में समझाइये। निम्नलिखित प्रतिशत संरचना वाले ईंधन के एक नमूने में *C*= 70%, *H* = 6%, *O* = 4%, *N* = 3%, *S* = 3%, राख = 6% और नमी = 8% है। 1 किलोग्राम ईंधन के पूर्ण दहन के लिए आवश्यक वायु की मात्रा की गणना करें।

7. Attempt any *one* part of the following: 7 x 1 = 7
निम्न में से किसी एक प्रश्न का उत्तर दीजिए।

(a) What are biodegradable polymers? Write a note on:
बायोडिग्रेडेबल पॉलिमर क्या हैं? निम्न पर एक टिप्पणी लिखें:
(i) Polynucleotides
(ii) Buna- S

(b) Differentiate between Thermoplastic and Thermosetting polymers. Discuss the preparation and uses of Phenol Formaldehyde resin.
थर्मोप्लास्टिक और थर्मोसेटिंग पॉलिमर के बीच अंतर बताइए। फिनोल फॉर्मलाडेहाइड रेसिन को तैयार करने की विधि और उपयोग की विवेचना कीजिये ।

Subject Code: KAS102T

PAPER ID-411332

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM I) THEORY EXAMINATION 2021-22
ENGINEERING CHEMISTRY

Time: 3 Hours **Max. Marks: 100**

Notes: *Attempt the questions as per the instructions given*
Assume missing data suitably

Section – A

Q.1	Attempt **all** the parts		**(2 x 10 =20)**
(a)	Arrange the following molecules or ions in increasing order of bond length. **O_2, O_2^+ & O_2^-**	CO1	2
(b)	What are nano materials? How they are different from bulk materials?	CO1	2
(c)	With the help of examples differentiate between Microwave active and microwave inactive compounds.	CO2	2
(d)	Explain why CO_2 is IR active and N_2 is IR inactive molecule.	CO2	2
(e)	Comment on the use of Al in place of Zn for cathodic protection of iron from rusting.	CO3	2
(f)	$\boldsymbol{Al^{3+}(1.2M) + Fe \rightarrow Al + Fe^{3+}(2.5M)}$**.** Calculate Ecell for the reaction if E°cell = -1.62 V.	CO3	2
(g)	Calculate the hardness of water sample containing impurity of **$Ca(HCO_3)_2$ = 81 mg/l.** Give your answer in °F also.	CO4	2
(h)	4.2 g of a sample of coal was Kjeldahalized and evolved ammonia gas was absorbed in 30 ml of 0.1N H_2SO_4. After absorption excess acid required 5 ml of 0.1N NaOH for neutralization. Calculate the % of nitrogen in coal sample.	CO4	2
(i)	Give the structure of vulcanized rubber.	CO5	2
(j)	Give two differences between addition and condensation polymers.	CO5	2

Section – B

Q.2	Attempt **any three** parts of the following		**(10 x 3 = 30)**
(a)	With the help of molecular orbital diagram, explain the formation of NO & N_2. Calculate their bond order and predict their magnetic behaviour.	CO1	10
(b)	Discuss the principle of Raman Spectroscopy. How Stokes and Antistokes lines appear in Raman spectroscopy. Also explain how it differs from microwave spectroscopy.	CO2	10
(c)	Define phase rule. Outline the salient features of the phase diagram of water system highlighting the curves, areas & points. Also explain the importance of triple point.	CO3	10
(d)	Write the different chemical reactions taking place in soda-lime process. A sample of water on analysis give following result: Analysis of Raw water: Ca^{2+} = 80 mg/l; Mg^{2+} = 24 mg/l, CO_2 = 33 mg/l, HCO_3^- = 132 mg/l, H^+ = 10 mg/l & NaCl = 4.3 ppm. Analysis of treated water: CO_3^{2-} = 12 mg/l and OH^- = 34 mg/l. Calculate the quantity of lime (74% pure) and soda (92% pure) needed for softening 50000 L of water.	CO4	10
(e)	Write down the preparation (structure of monomers and polymers) and uses of: (i) Nylon-6,6 (ii) Dacron (iii) BUNA-N (iv) Neoprene Rubber (v) Nylon-6	CO5	10

PAPER ID-411332

Subject Code: **KAS102T**

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM I) THEORY EXAMINATION 2021-22
ENGINEERING CHEMISTRY

	Section – C		
Q.3	Attempt **any one** part of the following		**(10x 1 = 10)**
(a)	Illustrate the concept of liquid crystals. Classify them on the basis of temperature and mention their important applications.	CO1	10
(b)	Give the structure, preparation, properties & applications of an allotrope of carbon having truncated icosahedron's structure.	CO1	10
Q.4	Attempt **any one** part of the following		**(10x 1 = 10)**
(a)	Explain the different types of electronic transitions involved in UV-Vis. Spectroscopy. Also explain the different types of absorption and intensity shifts taking place in UV-VIS spectroscopy.	CO2	10
(b)	Explain the different types of molecular vibrations taking place in IR Spectroscopy. Differentiate between Functional group region and finger print region.	CO2	10
Q.5	Attempt **any one** part of the following		**(10x 1 = 10)**
a)	Define the term batteries. Explain the construction of Lead acid battery. Write all the chemical reactions taking place during charging and discharging of lead acid battery.	CO3	10
(b)	Define the term corrosion. Describe the mechanism of electrochemical corrosion with the help of hydrogen evolution and oxygen absorption reactions. How it can be prevented using sacrificial anodic protection?	CO3	10
Q.6	Attempt **any one** part of the following		**(10x 1 = 10)**
(a)	Write the chemical name and molecular formula of zeolite. Give different chemical reactions taking place in zeolite process. A zeolite softner was regenerated by passing 50 ltrs of NaCl solution having strength of 14.625 g/l of NaCl. Calculate the hardness of water if 10000 ltrs of hard water was softened by using this zeolite.	CO4	10
(b)	Explain the construction and working principle of Bomb calorimeter. A sample of coal contains 80% C, 15% H, and 5% Ash. The following data were obtained when the above coal sample was tested in bomb calorimeter: Weight of coal burnt = 0.98 g Weight of water taken = 1000 g Water equivalent of bomb calorimeter = 2500 g Obseved rise in temperature = 2.5 °C Fuse wire correction = 8 cal Acid correction = 50 cal Cooling correction = 0.02 °C Calculate gross and net calorific value of coal if the latent heat of condensation of water is 580 cal/g.	CO4	10
Q.7	Attempt **any one** part of the following		**(10x1 = 10)**
(a)	What are polymer composites? Discuss the classification and applications of polymer composites.	CO5	10
(b)	What are Organometallic compounds? How Grignard reagents are prepared? Write any five synthetic applications of Grignard reagents.	CO5	10

PAPER ID-421050

Subject Code: KAS202T

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM II) THEORY EXAMINATION 2021-22
ENGINEERING CHEMISTRY

Time: 3 Hours ***Total Marks: 100***

Notes:

- *Attempt all Sections and Assume any missing data.*
- *Appropriate marks are allotted to each question, answer accordingly.*

SECTION-A	Attempt **All** of the following Questions in brief	Marks**(10X2=20)**		
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. N_2^{2-},N_2^-& N_2		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 $dm^3mol^{-1}cm^{-1}$.		2	4
Q1(d)	What are Raman active molecules?		2	1
Q1(e)	Why KCl−NaCl – H_2O should be regarded as a 3 components system, Whereas KCl−NaCl−H_2O should be regarded as 4 components system?		3	4
Q1(f)	Calculate the EMF of the cell reaction: Zn / Zn^{2+} [0.1M] || Cu^{2+}[0.2M] / Cu Standard reduction potential of Zn^{2+} and Cu^{2+} are -0.76V and 0.34V respectively.		3	2
Q1(g)	0.4 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 $BaCl_2$ solution and a precipitate of $BaSO_4$ 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)	A sample of hard water has hardness 500 ppm. express the hardness in ^oCl and ^oCl		4	5
Q1(i)	Write monomers of Buna-S and Nylon 66?		5	2
Q1(j)	Write structure of Ferrocene and Dibenzene chromium.		5	2

SECTION-B	Attempt **ANY THREE** of the following Questions	Marks**(3X10=30)**		**BL**
Q2(a)	(i) Explain the applications of Graphite and comment upon the electrical and lubrication property of Graphite?		1	2
Q2(b)	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: $Ca(HCO_3)_2$ = 40.5; $Mg(HCO_3)_2$ =36.5 ppm; $MgSO_4$= 30 ppm; $CaCl_2$= 27.75 ppm.		4	4

PAPER ID-421050

Roll No: | | | | | | | | | | | | | |

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)**		**BL**
Q3(a)	With the help of molecular orbital diagram, explain the paramagnetic character of O_2 and diamagnetic character N_2.		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)**		**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

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**		**BL**
Q5(a)	What is secondary storage battery? Write charging and discharging reaction of Lead acid battery with application of lead acid battery.		3	2
Q5(b)	With 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

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**		**BL**
Q6(a)	Explain the process of determination of calorific value using Bomb calorimeter method.		4	4
Q6(b)	What 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

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**		**BL**
Q7(a)	Write 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

PAPER ID-310852

Subject Code: KAS102T

Roll No: | | | | | | | | | | | | | |

B TECH
(SEM-I) THEORY EXAMINATION 2020-21
ENGINEERING 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

Q no.	Question	Marks	CO
a.	Explain impurity defects.	2	1
b.	Why Teflon is highly chemically resistant?	2	5
c.	What is selection rule?	2	2
d.	On the basis of IR spectra, distinguish between intermolecular and intramolecular hydrogen bonding.	2	2
e.	Calculate Phase, Component and Degree of freedom in the given system; $C_{(s)} + \frac{1}{2} O_2 \underset{\leftarrow}{\rightarrow} CO(g)$ $C_{(s)} + O_2 \underset{\leftarrow}{\rightarrow} CO_2(g)$	2	3
f.	Why calgon is better than other internal process for water treatment?	2	4
g.	Give the preparations of Grignard reagent.	2	5
h.	Why O_2 is paramagnetic and N_2 is diamagnetic?	2	1
i.	How can sulfur be estimated by ultimate method?	2	5
j.	How much rust ($Fe_2O_3.3H_2O$) can be produced by 3g of iron?	2	3

SECTION B

2. Attempt any *three* of the following: 3 x 10 = 30

Q no.	Question	Marks	CO
a.	With the help of Molecular orbital theory how Metallic bonding in metals can be explained?	10	1
b.	Write the criteria for a molecule to show Raman, IR, Rotational and UV Spectra. Give the possible electronic transitions (UV spectra) in- $CH_3CH_2CH_3$, $CH_3CH=CH_2$, $CH_3CH=O$ and CH_3-$CH=CH-CH=CH-CH_3$. How many fundamental Vibrational degrees of freedom are expected. for the following molecules: CO_2, H_2O and C_2H?	10	2
c.	The percentage composition of coal sample is: C = 70 %, H_2 = 10 %, $O_2$1%,S= 5%,ash = 0.5 %and N = 0.3 %. i.Calculate the quantity of air needed for complete combustion of 1kg of coal, if 60% excess of air is supplied. ii. Calculate the gross and net calorific value of the coal using dulong's formula.	10	4
d.	Give significance of Nernst equation. Consider a cell reaction: Zn / Zn^{2+} [0.1M] || Cu^{2+}[0.2M] / Cu Standard reduction potential of Zn^{2+} and Cu^{2+} are -0.76V and 0.34V respectively. Write half-cell reactions, complete cell reaction and calculate EMF of the cell.	10	3
e.	Distinguish between addition and condensation polymerization. Give monomers and one use each of PMMA, Polyethylene, Bakelite, PVC, nylon6,6.,Buna S.	10	5

SECTION C

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

Q no.	Question	Marks	CO
a.	i. Explain types of Non stoichiometric defects with examples. ii. Calculate bond order, magnetic behavior and order of stability of NO, NO^-, NO^+	10	1
b.	Write a note on liquid crystal describing classifications and applications of liquid crystals.	10	1

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

Q no.	Question	Marks	CO
a.	The e.m.f. of the cell cd | $cdcl_2$, 2.5 H_2O (Saturated) || $AgCl_{(s)}$ | Ag involving following reaction $Cd(s)+2AgCl_{(s)}aq \leftrightarrow cdcl_2$ $2.5H_2O(Saturated)+2Ag_{(s)}$ is 0.6753V and 0.6915V at 25^0C and O^0C. Calculate Δ H, ΔG and ΔS at 25^0C.	10	3
b.	Draw the Phase diagram of water and explain triple point and metastable state.	10	3

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

Q no.	Question	Marks	CO
a.	Write Notes on chromophores and Auxochrome. Explain Transitions in UV spectra.	10	2
b.	Explain the Microwave (Rotational) spectra of diatomic molecule and write their applications.	10	2

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

Q no.	Question	Marks	CO
a.	Draw diagram of Bomb calorimeter. Explain proximate analysis of coal.	10	4
b.	Explain Ion exchange process of water softening. Zeolite softener was 90% exhausted, when 10,000 hard water was passed through it. The softener required 200 L of NaCL solution of strengths 50 gm/L. Calculates the hardners of water.	10	4

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

Q no.	Question	Marks	CO
a.	Explain with equations preparations of acid, ketone, alcohol, alkanes and Organometallic compound from Grignard reagent.	10	5
b.	What are composite materials? Give the classifications of composite materials?	10	5

Sub Code:KAS102

Paper Id: 199102 Roll No:

B. TECH.
(SEM-I) THEORY EXAMINATION 2019-20
CHEMISTRY

Time: 3 Hours ***Total Marks: 100***

Note: 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.	Compare and arrange the following in the increasing order of stability: N_2, N_2^+, N_2^- , N_2^{2-}	2	1
b.	Define schottky defect. Give example.	2	1
c.	What is Stokes and anti-stokes lines in Raman spectrum?	2	2
d.	'IR spectra are often characterized as finger print region'. Comment on it.	2	2
e.	Explain why does part of a nail inside the wood undergoes corrosioneasily?	2	3
f.	Predict the number of phases in saturated NaCl system.	2	3
g.	A water sample contains 10ppm of $CaCl_2$,3.2 mg/litre of NaCl, 21.1 °Fr of Al_2O_3. Calculate total hardness of water.	2	4
h.	A sample of coal has following composition by mass C =70 %, O = 8 %, H = 10%, N = 3 %, S = 2%, Ash = 7 %. Calculate H.C.V. and L.C.V of the fuel.	2	4
i.	Simple molecules do not polymerize. Justify.	2	5
j.	Illustrate various applications of polymer composites.	2	5

SECTION B

2. Attempt any *three* of the following: 3 x 10 = 30

Qno.	Question	Marks	CO
a.	With the help of molecular orbital diagram, explain the formation of NO and O_2molecule. Calculate their bond order and predict their magnetic behavior.	10	1
b.	State and derive the Lambert-Beer's law. The percentage transmittance of an aqueous solution of unknown compound is 20% at 25° C and 300 nm for a 2 x 10^{-5} M solution in a 4 cm cell. Calculate the absorbance and the molar extinction coefficient.	10	2
c.	Using phase rule outline the salient features of the phase diagram of water system highlighting the name of system (areas, curves and points), phase inequilibrium and degree of freedom in each case.	10	3
d.	Discuss the principle 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, thermometer, stirrer & calorimeter= 2500g Rise in temperature= 2.5°C Fuse wire correction= 8 Cal Acid correction= 50 Cal Cooling Correction= 0.02°C Calculate gross and net calorific values of the coal, (if the latent heat of vaporization is 580 cal/g)	10	4
e.	Write down the preparation, properties and applications of – i) Buna-N ii) Nylon 6,6 iii) Terylene (iv) Neoprene (v) Kevlar	10	5

Paper Id: 199102 Roll No: | | | | | | | | | | | | | |

SECTION C

3. Attempt any *one* part of the following: 1 x 10 = 10

Qno.	Question	Marks	CO
a.	Discuss the preparation, properties and applications of an allotrope of carbon having truncated icosahedron geometry.	10	1
b.	Illustrate the concept of liquid crystals. Classify them on the basis of temperature and mention their important applications.	10	1

4. Attempt any *one* part of the following: 1 x 10 = 10

Qno.	Question	Marks	CO
a.	State the selection rule for Raman spectroscopy. What technological advances have enabled the routine use of Raman Spectroscopy? Which of the following spectroscopy (IR or Raman) would you use to measure the vibrational frequency of the following bond? (ii) the stretching frequency of ^{14}N, ^{15}N (ii) the C=O structure in ethyne (CH≡CH)	10	2
b.	Write short notes on (**any TWO**) (i) UV Shift (ii) Applications of IR spectroscopy (iii)Molecular vibration	10	2

5. Attempt any *one* part of the following: 1 x 10 = 10

Qno.	Question	Marks	CO
a.	Describe electrochemical theory of corrosion. How corrosion can be prevented by sacrificial anodic protection and impressed current cathodic protection. https://www.aktuonline.com	10	3
b.	What is Nernst equation? The emf of a cell measured by means of a hydrogen electrode against a saturated calomel electrode at 298K is 0.4188 V. If the pressure of the H_2 (g) was maintained at 1atm, calculate the pH of the unknown solution, given potential of reference calomel electrode is 0.2415 V.	10	3

6. Attempt any *one* part of the following: 1 x 10 = 10

Qno.	Question	Marks	CO
a.	Calculate the amount of lime and soda required for 125000 L of H_2O with following analysis using 10 ppm of $NaAlO_2$ as coagulant. **Analysis of raw water:** Ca^{2+} = 95 ppm, Mg^{2+} =36 ppm, CO_2 =66 ppm, HCO_3^- = 244 ppm, H^+ = 2 ppm, **Analysis of treated water:** CO_3^{2-} =45 ppm, OH^-= 34 ppm.	10	4
b.	i. Outline demineralization process of water softening. Compare the merits and demerits of zeolite process with demineralization process. ii. Write the reaction involved in Calgon treatment of water.	10	4

7. Attempt any *one* part of the following: 1 x 10 = 10

Qno.	Question	Marks	CO
a.	What are conducting polymers? Discuss the classification and applications of conducting polymers.	10	5
b.	What are Grignard reagents? Write at least five applications of Grignard reagent.	10	5

Printed Pages: 02 **Sub Code: KAS102**

Paper Id: 199101 **Roll No.** | | | | | | | | | | |

B TECH
(SEM I) THEORY EXAMINATION 2018-19
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

a). Which of the following molecules will show rotational spectrum: H_2, HCl, CH_4, CH_3Cl, CH_2Cl_2, H_2O and SF_6?

b). What is meant by the term polarizability in Raman spectra?

c). Explain why the value of GCV is greater than NCV.

d). Why does magnesium bicarbonate require double amount of lime for softening?

e) . Write the monomer of a) Neoprene b) Terylene.

f). Why adry ether solvent important for the preparation of Grignard reagent?

g) Comment on the use of aluminum in place of Zinc for Cathodic protection of iron from rusting.

h) Calculate the cell potential at 298 k for the reaction:
$Al^{3+} + Fe \rightarrow Al + Fe^{3+}$ E^0 cell= –1.62.
The concentration of $Al^{3}+$ and Fe^{3+} are 1.2 and 2.5 M.

i) Write any two applications of Nanotechnology.

j). Arrange the following molecules /ions in order of their increasing bond length: N_2, N_2^-, N_2^{2-}.

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

a) Discuss the structure, preparation, properties and applications of fullerenes?

b) Derive Nernst Equation. The voltage of the cell $Pb/PbSO_4/Na_2SO_4/Hg$ is 0.9647 V at 25°C the temperature is 1.74×10^{-4} VK^{-1}. Calculate the values of ΔG, ΔS and ΔH.

c) What is finger print region and functional group region in IR spectroscopy? Two isomers A and B of the molecular formula C_3H_6O gives IR absorption at 1650 cm^{-1} and 1710 cm^{-1} respectively. Assign structural formula to A and B isomers?

d) What is hardness of water? What do you mean by term permutit? Describe Zeolite or Permutit process for softening of hard water.

e) What are organometallic compounds? Explain various methods of preparation of Grignard reagent and also write reactions of Grignard reagent with HCHO, R_2NH, CO_2, CH_3CH_2OH and ester.

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

(a) What are liquid crystals? Distinguish between Nematic & Smectic liquid crystal and write the applications of liquid crystal?

(b) Explain BMO and ABMO and differentiate between them. Draw molecular orbital diagram of NO^+. Calculate its bond order and predict its magnetic properties.

4. Attempt any one part of the following: 10 x 1 = 10

(a) State the selection rule for Raman spectroscopy. What technological advances have enabled the routine use of Raman spectroscopy? Which of the following spectroscopy (IR or Raman) would you use to measure the vibrational frequency of the following bonds:

i)The stretching frequency of ^{14}N-^{15}N

ii)The $C \equiv C$ Str in Ethyne, $(CH \equiv CH)$

iii)The C=O Str in acetone, CH_3COCH_3

iv)The Re-Re str in compound, $(CO)_5Re\text{-}Re(CO)_5$

(b) What is Beer-Lambert law in UV-Visible absorption spectroscopy? A compound having concentration 10^{-3}g/l resulted absorbance value 0.20 at λ max 510 nm using 1.0 cm cell. Calculate its absorptivity and molar absorptivity values. Molecular weight of compound is 400. Can ultra-violet spectral data be useful to distinguish the following compounds? Give reasons.

(i) Ethyl benzene and styrene.

(ii) $CH_2=CH\text{-}CH_2\text{-}CH=CH_2$ and $CH_2=CH\text{-}CH=CH\text{-}CH_3$.

5. Attempt any one part of the following: 10 x 1 = 10

(a) Define and explain the terms involved in phase rule. Draw a neat labeled phase diagram of water system and c areas and calculate degree of freedom of areas and curves in it. What is the significance of the triple point and metastable curve in the system?

(b) Describe the mechanism of electrochemical or wet corrosion with help of reactions? Explain the cathodic protection method of prevention of corrosion.

6. Attempt any one part of the following: 10 x 1 = 10

(a) Explain reverse osmosis with its advantages. A water sample on analysis gives the following data: Ca^{2+} =20 ppm, Mg^{2+}=25 ppm, CO_2 = 30 ppm, HCO_3^- =150 ppm, K^+ = 10 ppm. Calculate the lime (87% pure) and soda (91% pure) required to soften 10^6 liter of sample water.

(b) Describe proximate analysis of fuels. A coal sample has the following composition by weight: C=90%, O=3%, S=0.5%, N=0.5% and Ash=2.5%. Net calorific value of the coal was found to be 8,490.5 kcal/kg. Calculate the percentage of hydrogen and Gross calorific value.

7. Attempt any one part of the following: 10 x 1 = 10

(a) Write a note on (i) Polymer blends (ii) Polymer composites

(b) Differentiate between elastomers and fibers? Give the preparation, properties and uses of Buna-S, Buna-N and Neoprene.

Printed Pages:02 **Sub Code: KAS 202**

Paper Id: 199241 **Roll No.** | | | | | | | | | | |

B. TECH.

(SEM II) THEORY EXAMINATION 2018-19

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 x10 = 20

a. Why graphite is used as lubricant? **[CO 1]**

b. Give the approaches used for the preparation of Nanomaterials. **[CO 1]**

c. What is the selection rule for the molecule to show rotational spectrum? **[CO 2]**

d. Explain, which one will exhibit higher value **of** λ_{max} in UV/Visible spectra of CH_3COCH_3 and $CH_2=CHCOCH_3$. **[CO 2]**

e. Why does part of a nail inside the wood undergoes corrosion easily? **[CO 3]**

f. Calculate the cell potential of the given cell at 25°C. (R = 8.31JL^{-1} mol^{-1}, F= 96500C mol^{-1}).

$Ni(s)|Ni^{+2}(0.01\ M)||Cu^{+2}(0.1M)|Cu(s)$

Given $E^o_{Cu+2/Cu} = +0.34$ V; $E^o_{Ni+2/Ni} = -0.25$ V **[CO 3]**

g. Show with the help of reactions, how scale formation can be prevented by Calgon conditioning? **[CO 4]**

h. Calculate GCV of the coal sample having C=80%, H= 9%, O= 4%, N=1.5%, S=2.5% and ash=3%. **[CO 4]**

i. What are Bio-degradable polymers? Discuss their application. **[CO 5]**

j. What do you understand by the Polymer Blends? **[CO 5]**

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Outline the salient features of Molecular Orbital theory on the basis of LCAO principle.Draw the MO energy level diagram for the CO molecule. Calculate its bond order and predict its magnetic behavior. **[CO 1]**

b. Discuss the quantum theory of Raman spectroscopy and how the Stokes and anti Stokes lines appear in the Raman Spectroscopy? How does it differ from IR spectroscopy? **[CO 2]**

c. Discuss rusting of iron by Hydrogen evolution and Oxygen absorption mechanism. Briefly explain sacrificial cathodic protection and impressed current cathodic protection. **[CO 3]**

d. With the help of a neat diagram, explain the working of bomb calorimeter. A sample of coal contain C=91%, H=5.5%, N= 2.5% and ash=2%. The following data were obtained when the above coal was tested in bomb calorimeter:

Weight of coal burnt= 1.029 g

Weight of water taken= 570 g

Water equivalent of bomb and calorimeter= 2200 g

Rise in temperature= 3.3˚C

Fuse wire correction = 3.8 cal

Acid correction= 62.6 cal

Cotton thread correction= 1.6 cal

Cooling correction= 0.047 ˚C

Assuming that the latent heat of condensation of steam is 587cal/gm, calculate gross and net calorific values of the coal. **[CO 4]**

e. What are conducting polymers? Classify conducting polymers and mention their important applications. **[CO 5]**

SECTION C

3. Attempt any *one* part of the following: 5 x 2 = 10

(a) What do you understand by Mesomorphic state and illustrate it with the help of vapour pressure -temperature curve? Discuss its classification on basis of temperature and give their important applications. **[CO 1]**

(b) Differentiate stoichiometric and non-stoichiometric defects? Explain different stoichiometric defects with examples. **[CO 1]**

4. Attempt any one part of the following: 5 x 2 = 10

(a) What type of electronic transitions is involved in UV- visible spectroscopy? Explain the Absorption and Intensity shift in the UV spectroscopy and support with examples. Illustrate, the effect of polar and non polar solvent on π - π^* transition in acetone? **[CO 2]**

(b) Among H_2, HCl, CO_2, H_2O molecules identify which will be IR active and why? Explain different mode of vibrations observed in CO_2 molecule. Out of the following pairs which one is expected to absorb at higher frequency for stretching vibrations? Also state reason.

i) HCHO, CH_3CHO;
ii) C ≡ C, C= C:
iii) O- H, C-C. **[CO 2]**

5. Attempt any one part of the following: 5 x 2 = 10

(a) What are Secondary batteries? Discuss the various reactions involve during the charging and discharging of lead storage battery. **[CO 3]**

(b) 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**.** Why quadruple point does not exist in one component system? **[CO 3]**

6. Attempt any *one* part of the following: 5 x 2 = 10

(a) Calculate the quantities of lime (74%) and soda (92%) required for cold softening of 125,000 L of water with the following analysis, using 10 ppm of $NaAlO_2$ as coagulant.
Analysis of raw water: **Ca^{2+}= 160ppm**, **Mg^{2+}= 48ppm**, **CO_2= 66ppm**, **HCO_3^- = 264ppm, H^+ =20ppm, NaCl = 4.7 ppm.** **[CO 4]**
Analysis of treated water: **CO_3^{2-} =45 ppm and OH^- =68 ppm**.

(b) What are ion exchangers? With the help of neat sketch, discuss ion-exchange process for water softening. Compare its merit over zeolite process. **[CO 4]**

7. Attempt any *one* part of the following: 5 x 2 = 10

(a) Give preparation, properties and applications of following polymer: **[CO 5]**
(i) Neoprene (ii) Terylene (iii) Nylon 6,6.

(b) Write short notes: **[CO 5]**
(i) Applications of Grignard Reagent
(ii) Composites.