Registration No : | 2 | 2 | 0 | 1 | 2 | 1 | 4 | 0 | 6 | 5 |

Total Number of Pages : 02

B.Tech/
Integrated Dual Degree (B.Tech and M.Tech)
RCH2A002

2nd Semester Reg/Back Examination: 2022-23
Chemistry
BRANCH(S): AEIE, CIVIL, CST, CSEAI, CSEDS, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, EEE, ELECTRICAL, ECE, ETC, EIE, IT, MANUTECH, MECH, METTA, MINING, PLASTIC, AE, AUTO
Time: 3 Hour
Max Marks: 100
Q. Code: M553

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** (2 x 10)

a) State Lambert Beer's law.
b) Draw the phase diagram of water system.
c) What is producer gas?
d) Explain the term component. How many components are present in the following system ?

$$\text{Water} \rightleftharpoons \text{Water - vapour}$$

e) What is an Eutectic system?
f) What is synthetic petrol
g) What is cathodic protection?
h) What are chromophores?
i) What is power alcohol?
j) What is stress corrosion?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 × 8)

a) Discuss the postulates of quantum mechanics.
b) Discuss the effect of conjugation on chromophores.
c) Write a short note on refining of petroleum.
d) Explain triple point and eutectic point with examples.
e) Discuss main features of the phase diagram of water system, explaining especially why the slope of solid-liquid line is negative for water.
f) Write a short note on cathodic protection.
g) Classify the nano materials based on the size of particles and distinguish between 0D, 1D and 2D nano materials.

h) Give an account of gaseous fuels.
i) What is calorific value of a fuel? How it is determined by Dulong's formula.
j) Discuss how nanomaterials are synthesized via green synthetic routes.
k) Discuss the principles and application of vibrational spectroscopy.
l) How G.C.V. and N.C.V. of a fuel is calculated?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Discuss the Lambert Beer's law and its application in analyzing samples by UV-Visible spectroscopy.	(16)
Q4	What is phase rule? Discuss the phase diagram of Bi-Cd system.	(16)
Q5	What is corrosion? Discuss different types of corrosion and factors affecting corrosion.	(16)
Q6	Explain the synthesis of nanomaterial by top-down and bottom-up approaches. Discuss the application of nanomaterials in environmental fields and electronic devices.	(16)

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PAC1A101

1st Semester Regular Examination 2019-20
APPLIED CHEMISTRY
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUFAC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Time : 3 Hours

Max Marks : 100

Q.CODE : HB631

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1		**Answer the following questions :**	**(2 x 10)**
	a)	Define the term "Ultraviolet catastrophe"	**(2)**
	b)	The fundamental vibrational frequency of HCl is $8.667\times10^{13}s^{-1}$.Calculate the force constant	**(2)**
	c)	IR spectra are often characterized as molecular fingerprint. Justify	**(2)**
	d)	What is the significance of the negative slope of fusion curve of ice in water system?	**(2)**
	e)	What is EAN rule?	**(2)**
	f)	Bolt and nut made of different material. Mention the type of corrosion.	**(2)**
	g)	What is Wilkinson's catalyst? Write one uses of it.	**(2)**
	h)	Write one organometallic catalyst each for hydrogenation olefin and polymerization reaction.	**(2)**
	i)	What is condensed phase rule? Give an example of a system where condensed phase rule is applied.	**(2)**
	j)	Mention three factors taken in consideration while selecting coal for different use.	**(2)**

Part- II

Q2		**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(8 x 6)**
	a)	Show that the energy of a particle in one dimensional box is E= $\frac{n2h2}{8ma2}$	**(6)**
	b)	What are the general steps involved in the homogeneous catalysis using organometallic.	**(6)**
	c)	Internuclear distance of HCl molecule (rigid type) is 129pm.Calculate its rotational constant in cm^{-1} and find the wavelength of the transition between rotational energy levels J=2 to J-3.	**(6)**
	d)	Define the term phase, component and degrees of freedom with suitable examples.	**(6)**
	e)	Discuss the phase diagram of Bi-Cd system.	**(6)**
	f)	State three quantum numbers used to describe an orbital specify the permissible values of each quantum numbers	**(6)**
	g)	Describe how the calorific value of a solid fuel is determined by using a bomb calorimeter.	**(6)**
	h)	0A sample of coal has the following composition C=90%, H=4.5%, O=3%, S=0.5%, N=0.5% and ash =2.5%.Find the gross as well as net calorific value.	**(6)**
	i)	What is cathodic protection? Explain sacrificial anode method.	**(6)**
	j)	Discuss the factors affecting corrosion.	**(6)**
	k)	Describe knocking of petrol engine and octane number.	**(6)**
	l)	Explain the mechanism of differential aeration corrosion with reference to irin materials.	**(6)**

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16×2)**

Q3	**a)**	State and explain Beer-Lambert's law and its importance in spectroscopic methods of structure elucidation	**(10)**
	b)	Write the basic principles of UV-Visible spectroscopy.	**(6)**
Q4	**a)**	Derive the expression for the energy and frequency a diatomic molecules by assuming the molecule behaving as simple harmonic oscillator.	**(8)**

	b)	Write the theory of vibrational spectroscopy.	**(8)**
Q5	**a)**	Draw and explain the phase diagram of Sulphur system. Why all four phases of Sulphur system do not co-exist at equilibrium	**(8)**
	b)	What is electrochemical corrosion? Describe the mechanism of electrochemical corrosion by hydrogen evolution type and oxygen absorption.	**(8)**
Q6	**a)**	Discuss I brief the proximity analysis of coal	**(8)**
	b)	Describe the classification and applications of Organometallic compounds	**(8)**

Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech.**
PAC1A101

1st Semester Regular/Back Examination 2017-18
APPLIED CHEMISTRY
Branches: AEIE, AERO, AUTO, BIOMED, BIOTECH, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, FAT, IT, MECH, METTA, MINERAL, MINING, PE, PLASTIC, PT
Time: 3 Hours
Max Marks: 100
Q. CODE: B816

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.
(Mass: ^{1}H = 1.0078u; ^{2}H = 2.0141u; ^{17}F = 18.9984u; ^{35}Cl = 34.9689u; ^{37}Cl = 36.9659u; ^{79}Br = 79.81 u)

Q.1 **Answer the following questions:** **[2 x 10]**

a) Write the one-dimensional time-independent Schrödinger equation.
b) Find the value of Â f(x) when Â is d/dx and f(x) = $4x^2y$.
c) Define the any one postulate of quantum mechanics.
d) Write the selection rule for rotational spectrum and define the term used therein.
e) Calculate the energy (in ergs) per photon for radiations of □ = 400nm.
f) Which of the following molecules exhibit rotational spectrum:
CO, H_2, HBr, H_2O
g) Calculate the number of components, phases and degrees of freedom for a system:
$H_2 + O_2 \rightarrow H_2O$.
h) Define red and blue shifts in UV-Visible spectra.
i) Define CNG and its composition.
j) Write the chemical name and its formula of the compound produced generally on corrosion of iron in normal atmosphere.

Q.2 **Answer all the questions :** **[2 x 10]**

a) With an example prove that Square operator is not a linear operator.
b) Define the salient features of the Schrödinger equation.
c) Calculate the uncertainty in velocity of a cricket ball with mass 100 gm, if uncertainty in position is 1cm.
d) Two energy levels in a rotational spectrum are separated by 400 nm. What is the energy difference between these levels? Express in Joules, ergs and eV.
e) How the net calorific value of a solid fuel is calculated?
f) Define EAN rule. Give two examples where this rule is not satisfied?
g) Calculate the weight of air required for complete combustion of 5 gm of CO.
h) Why galvanized utensils are generally not used for cooking?
i) Write the name and formula of a palladium catalyst used in alkene somerisation.
j) Write the structure of ferrocene.

Q.3 **a)** Which type of molecules exhibit infra-red spectra? Calculate the vibrational energy and force constant of $^{1}H^{17}F$ if its vibrational frequency is 3.0 x 10^{14} Hz. **[8]**

b) Discuss five different ligands where ETA(η) is used for organometallic compounds? **[7]**

Q.4 **a)** Discuss the phase diagram of a four phase one component system. **[9]**

b) Prove that the eigenvalues of a Hermitian operator are real. **[6]**

Q.5 **a)** A gas has the following composition by volume: H = 25%; CH_4 = 5%; CO = 25%, CO_2 = 5%; O_2 = 5% and N_2 = 35%. If 40% excess air is used for its complete combustion, find the weight and volume of air actually supplied for this process. **[10]**

b) Discuss the hydroformylation reactions which are catalysed by organometallic catalysts. **[5]**

Q.6 **a)** The force constant of $^{79}Br_2$ is 300 Nm^{-1}. Determine its vibrational energy (in Joules and eV), zero-point energy and vibrational frequency. **[10]**

b) Discuss the salient features of phase diagram of a Bi-Cd system. **[5]**

Q.7 **a)** The $^{1}H^{17}F$ (rigid type) has bond length 0.16nm. Determine its rotational constant in Joules, eV and cm^{-1}. **[9]**

b) A cell of 10 mm path length contains ferric chloride solution of 0.002M. An electromagnetic radiation of □= 400 nm is passed through it and the absorbance is 0.60. Determine its molar absorption coefficient and transmittance. **[6]**

Q.8 **a)** Define electrochemical corrosion. Discuss its mechanism under various corrosive environments. **[10]**

b) The rotational constant B for $^{1}H^{35}Cl$ is 12.00 cm^{-1}. Calculate B for $^{2}H^{35}Cl$ and $^{1}H^{37}Cl$. **[5]**

Q.9 **a)** What is cracking? Discuss the mechanism of thermal cracking. **[5]**

b) Define the basis of use of μ notation in organometallic compounds. Give two examples. **[5]**

c) Define Lambert-Beer law and write the equations used for this law. Discuss its limitations. **[5]**

Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech.**
BS1103

1st Semester Back Examination 2017-2018
CHEMISTRY- I
BRANCH: AERO, AUTO, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, FASHION, IT, MECH, METTA, MINING, MME, PE, PLASTIC
Time: 3 Hours
Max Marks: 70
Q.CODE: B821

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What do you mean by component? What is the maximum no of phases that can be in equilibrium at one point for one component system(T&P Constant)

b) What do you mean by zero order reaction? Give an example

c) Calculate the standard potential of the cell Pt(s)│H2(g)│H+(aq)‖ Ag+(aq)│Ag(s).
Given: E0Ag+/Ag = +0.8V

d) Aqueous solution of glucose has one phase. Whereas aqueous solution of carbon tetrachloride has two phase

e) Write down the Gibbs's Helmholtz equation and define term involved there in

f) Calculate the miller indices of crystal planes which cut through the crystal axes at (2a,-3b,-3c)

g) What do you mean by the planes of symmetry and Center of symmetry?

h) What is the value of ∂G for liquid water vaporizing at 337K and 1atm pressure?

i) What is the value of ∂G for liquid water vaporizing at 337K and 1atm pressure?

j) What is the coordination number of both the ions in CsCl structure?

Q2 Draw the phase Diagram of a one component system which contain more than one solid phase and Explain the following with help the Diagram. (i) Triple points (iii) Univariant system **(10)**

Q3 **a)** What do you mean by close packing in solids ?Give a comparative account of Hexagonal close packing(HCP) and Cubic close packing(BCC) in solids **(5)**

b) What is the standard EMF of the Electrochemical cell Made of Cd Electrode in a 1.0M Cd $(NO_3)2$ Solution and Cr electrode in 1.0M$Cr(NO_3)3$ solution E0 (Cd/Cd+2) =- 0.40v E0(Cr+3/cr)=-0.74v **(5)**

Q4 **a)** It was found that a cane sugar solution in water was hydrolyzed to the extent 25 percent in one hour .Calculate the time that will be taken for sugar to be hydrolyzed to the extents of 50%Assuming that reaction is of first order **(5)**

b) State Hess's Law of constant Heat of summation Calculate Heat of formation of Ethane. **(5)**
Given: Heat of combustion Ethane = -372.8Kj/mol
Heat of combustion of Carbon= -94.5Kj/mol
Heat of combustion of Hydrogen = -68.4KJ/mol

Q5 **a)** The heat of reaction for $N_2+H_2 \rightarrow 2NH_3$ at 270C is -91.94KJ What will be it value at 500C if molar heat capacities at constant pressure and 27 0C for N_2 and H_2 and NH_3 are 28.45.28.32 and 37.07J respectively **(5)**

b) What do you mean by Order and molecularity?Derive an expression **(5)**

Q6 **(a)** Prove that $Cp-Cv=[P+\{\partial U/\partial V\}_T][\partial V/\partial T]p$ **(7)**

(b) Discuss the characteristics of a good catalyst **(3)**

Q7 **(a)** What do you mean by Fuel cell. Write down the cell reaction of H2-O2 fuel cell **(5)**

(b) Draw the molecular orbital configuration ofN2and O2.Compare between them in reference to magnetic behavior and bond length. **(5)**

Q8 **a)** The standard electrode potentials of the electrodes, Ag+(aq)/Ag(s), and $Fe^{3+}(aq)/Fe^{2+}(aq)$, are 0.799 V and 0.771 V at 298 K, respectively. Write down the electrode reactions and designate the cell. Calculate he equilibrium constant for the cell reaction at 298 K, and calculate ∂G. ∂H **(5)**

b) For one mole of an ideal Gas T=f(P,V)show that ∂T is Perfects Differential **(5)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
BS1103

1st Semester Back Examination 2019-20
CHEMISTRY - I
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Time : 3 Hours
Max Marks : 70
Q.CODE : HB774
Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Calculate the de-Broglie wavelength of helium atom at 27°C moving with velocity of $2.4 \times 10^2 mS^{-1}$.
b) What is the significance of ψ^2?
c) Why H_2^+ ion is more stable than H_2^- ion, though both of them have the same bond order?
d) The Standard EMF of the Daniel cell involving the cell reaction $Zn + Cu^{2+}$ (aq.) $\leftrightharpoons$ $Cu + Zn^{+2}$ (aq.) is 1.10V. Calculate the equilibrium constant
e) What are Miller indices?
f) What is value of ΔG at equilibrium? What is the relation between ΔH and ΔS at equilibrium.
g) Half-life period of a first order reaction is 40 min. Calculate the rate constant of the reaction at the same temperature.
h) For I mole of ideal gas T =f(P,V) , show that dT is an exact differential.
i) What is triple point of water?
j) State Heisenberg's uncertainty principle.

Q2 **a)** What do you mean by bonding and antibonding molecular orbital? Discuss the M.O diagram of CO molecule. Calculate its bond order & explain its magnetic character. **(5)**
b) Calculatethe uncertainty in velocity of a cricket ball (mass= 0.1kg) if the uncertainty in its position is of order of 100pm. Also comment on the result. **(5)**

Q3 **a)** What do you mean by pH of a solution? Describe the method of determination of pH of a quinhydrone electrode. Write the advantages of this method? **(5)**
b) What do you mean by order of a reaction? Derive the expression for the rate constant of a first order reaction. **(5)**

Q4 **a)** What is eutectic point? Draw and explain the phase diagrams of Bi-Cd system. **(5)**
b) What is Born-Haber cycle? Discuss the steps to calculate the lattice energy of Calcium chloride by using Born- Haber cycle. **(5)**

Q5 **a)** Write the construction, cell reaction, uses of lead-acid storage cell **(5)**
b) Discuss about Frenkel and Schotty defects. **(5)**

Q6 **a)** From the concept of enthalpy, internal energy and 1st law of thermodynamics shows that Show that $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$ **(5)**

b) The standard heat of formation of $CO_2(g)$ and $H_2O(l)$ are -393.5 KJ mole^{-1} and 285.8 KJ mole^{-1}, respectively and the standard heat of combustion of $C_3H_8(g)$ is -2220.2 KJ mole^{-1}. Find out the standard heat of formation of $C_3H_8(g)$. **(5)**

Q7 **a)** What do you mean by electrode potential? Derive Nernst equation for electrode potential. **(5)**

b) Derive Gibbs-Helmholtz equation. **(5)**

Q8 **a)** Explain band theories of metallic bond. **(5)**

b) Write notes on " Collision theory" **(5)**

Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech.**
15BS1103

1st Semester Back Examination 2017-2018
CHEMISTRY
BRANCH: AERO, AUTO, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, FAT, IT, MECH, METTAMIN, MME, PE
Time: 3 Hours
Max Marks: 100
Q.CODE: B820

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions: *multiple type or dash fill up type*** **(2 x 10)**

(a) Condensed phase Rule is……..
(b) The existence of solid substance in more than one crystalline form is called as……
(c) Electrode reaction of calomel electrode is …….
(d) Bond order of O_2^- is ……
(e) In exothermic reaction which has more energy? Product or reactant .
(f) E_a for for ward reaction is40kj mol^{-1} and reserve reaction is 60KJ^{-1} The reaction is
(g) A cubic has …….three fold axes of symmetry
(h) All the crystal except ……are anisotropic
(i) Two mole of ideal gas expand spontanesoluly in to vacuum. The work done is ….
(j) Give an example of Negative catalyst ……

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

(a) Two moles of perfect gas are expanded from a pressure of 20Nm^{-2} to 1Nm^{-2} at 300K What is the free energy.
(b) How the T∂S does Determines the spontaneous of reaction?
(c) What is the de-Broglie wavelength of an electron travelling at 1% of the speed of light?
(d) Write the decreasing order of stability for the following:
H_2, H_2^+,H_2^- and justify
(e) Calculate the activation energy of a chemical reaction which doubles the rate when the temperature is raised from 300K to 310K.
(f) While studying the decomposition of N_2O_5 it is observed that a plot of it partial pressure VS time is linear What kinetic parameter can be obtained from this observation.
(g) Give the unit of rate constant of a second order reaction with example
(h) What is difference between the triple point and critical point explain with example
(i) What are the Miller indices,if the plane intersects the crystal lattice at 2a, b,2c ?
(j) Explain why the order of a reaction cannot be predicted from overall stoichiometry

Q3 **(a)** With the help of the Phase rule, draw and describe the phase diagram of. Sulphur system **(10)**
(b) Iodine Molecule Dissociate in to atom after Absorbing radiation of 4500A^0.If one quantum of radiation is absorbed by each molecule .Calculate lattice energy of Iodine atom.(Bond energy of iodine=240KJ **(5)**

Q4 **(a)** Draw the molecular orbital configuration of O_2 O_2^- O_2^+. .Compare between them in reference to magnetic behavior and bond length. **(10)**

(b) The standard electrode potentials of the electrodes, Ag+(aq)/Ag(s), an Fe3+(aq)/Fe2+(aq), are 0.799 V and 0.771 V at 298 K, respectively. Write down the electrode reactions and designate the cell. Calculate the equilibrium constant for the cell reaction at 298 K **(5)**

Q5 **(a)** What do you mean by the Lattice energy ?How do you calculate the lattice of Nacl explain. **(5)**

(b) What do you mean by the Lattice energy ?How do you calculate the lattice of Nacl explain. **(5)**

(c) How is fuel cell different from battery? What are the advantages of fuel cells **(5)**

Q6 **(a)** It was found that a cane sugar solution in water was hydrolysed to the extent 25 percent in one hour .Calculate the time that will be taken for sugar to be hydrolyzed to the extents of 50%Assuming that reaction is of first order **(5)**

(b) Derive an expression for second order reaction when two reactant are Different **(5)**

(c) Calculate the uncertainty in velocity for a particle with mass 7x10-18 kg, if the uncertainty in position is 0.1 nm **(5)**

Q7 **(a)** (i) $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$ **(7)**

(ii) $\left(\frac{\partial V}{\partial S}\right)_P = \left(\frac{\partial T}{\partial P}\right)_S$

(b) A second order reaction, when two reactants are same, is 30% completed in 500 seconds. How long will it take to go to 90% completion **(4)**

(c) How is fuel cell different from battery? What are the advantages of fuel cells **(4)**

Q8 **(a)** Show that fcc lattice has more effective packing than sc lattice. **(5)**

b) State and explain Hess's law of constant heat summation. **(6)**

(c) What information's are conveyed by ψ and ψ2? **(4)**

Q9 **(a)** What is a catalyst? Write down the characteristics of catalysts **(5)**

(b) By the help of molecular orbital theory, show that the bond order of Nitrogen is three. **(5)**

(c) Explain the potentiometric method to determine the emf of a cell. **(5)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
15BS1103

1st Semester Back Examination 2019-20
CHEMISTRY
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Max Marks : 100
Time : 3 Hours
Q.CODE : HB773

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Calculate the kinetic energy of a moving electron which has a wavelength of 4.8pm.
b) What are the physical significance of ψ^2.
c) Why H_2^+ ion is more stable than H_2^- ion, though both of them have the same bond order?
d) What is the significance of the negative slope of fusion curve of ice in water system?
e) What is triple point of water?
f) What do you mean by the packing efficiency of a crystal?
g) If the rate of the reaction is equal to the rate constant, find the order of the reaction.
h) The Standard EMF of the Daniel cell involving the cell reaction Zn+ Cu^{2+} (aq.) ⇋ Cu+ Zn^{+2}(aq.) is 1.10V. Calculate the equilibrium constant
i) What is the difference between Pearlite and Ledburite?
j) What is the significance of Gibb's free energy.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) State and explain Heisenberg's uncertainty principle.
b) Compare the relative stability of O_2^- and N_2^+ and predict their magnetic behavior.
c) Discuss about Frenkel and Schotty defects.
d) Define the term phase, component and degrees of freedom with suitable examples.
e) Discuss the phase diagram of Bi-Cd system.
f) What do you mean by order of a reaction? Derive the expression for the rate constant of a first order reaction.
g) 5 moles of an ideal gas expanded reversibly at a temperature of 50°C and pressure of 760 mm of Hg to 25°C and 380 mm of Hg. Calculate the change in entropy. Given C_V = R.
h) If enthalpies of formation of CO2, H2O are -393.5 kJ $mole^{-1}$& -285.8 kJ $mole^{-1}$ respectively and the enthalpy of combustion of propane is 2220.2 $kJmole^{-1}$, calculate the enthalpy of formation of propane
i) $C_P - C_V = \left[V - \left(\frac{\partial H}{\partial P}\right)_T\right]\left(\frac{\partial P}{\partial T}\right)_V$
j) Calculate the maximum work that can be accomplished by the operation of the following cell at 25 ° C. Ni(s) / Ni^{2+} (0.01M) // Cu^{2+} (o.1M)/Cu(s).
Given that $E^0_{Ni^{2+}/Ni}$=-0.25V and $E^0_{Cu/Cu^{2+}}$= 0.34V.
k) What is quinhydrone electrode? How can the pH of an unknown solution be found out by using this electrode.
l) Write the construction, cell reaction and applications of Leclanche cell.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** What do you mean by bonding and antibonding molecular orbital? Discuss the M.O diagram of CO molecule. Calculate its bond order & explain its magnetic character. **(8)**

b) Write down the Schrodinger wave equation for the wave mechanical model of an atom. Name three quantum numbers of an electron which are yielded by this equation. What is Eigen values and Eigen functions? **(8)**

Q4 **a)** State and explain Hess`s law. The molar heat of combustion of $C_2H_2(g)$, C (graphite) and $H_2(g)$ are 310.62, 94.05 and 68.32 Kcal respectively, Calculate the heat of formation of $C_2H_2(g)$. **(8)**

b) What do you mean by pH of a solution? Describe the method of determination of pH of a solution by glass electrode. What are the disadvantages of this method? **(8)**

Q5 **a)** Derive the expression for the rate constant of a second order reaction when (i) both the reactants are same and (ii) both the reactants are different. **(8)**

b) Draw and explain the phase diagram of Sulphur system. Why all four phases of Sulphur system do not co-exist at equilibrium **(8)**

Q6 **a)** Discuss the method of determination of Lattice energy of Calcium Chloride by Born-Haber cycle. **(8)**

b) Derive Gibbs-Helmholtz equation. **(8)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

RCH1A002

1st Semester Regular/Back Examination 2019-20

CHEMISTRY

BRANCH : AEIE, AERO, AG, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Time : 3 Hours

Max Marks : 100

Q.CODE : HRB633

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1		**Answer the following questions :**	**(2 x 10)**
	a)	Identify the microwave active molecules(s).Give reasons CO, CH_3Cl,H_2O,CH_3-CH_3,Cl_4, CO_2, HCl , NH_3	**(2)**
	b)	Define the term "Ultraviolet catastrophe" using the energy density plot.	**(2)**
	c)	Λ_{max} for aniline shift from 230nm in neutral medium to 203nm in acidic medium. Explain	**(2)**
	d)	What is the significance of the negative slope of fusion curve of ice in water system?	**(2)**
	e)	Write two uses of Ag nano particles.	**(2)**
	f)	Why does part of nail inside the wood undergoes corrosion easily?	**(2)**
	g)	Write one organometallic catalyst each for hydrogenation olefin and polymerization reaction.	**(2)**
	h)	What is condensed phase rule? Give an example of a system where condensed phase rule is applied.	**(2)**
	i)	Mention three factors taken in consideration while selecting col for different use.	**(2)**
	j)	Why gasoline-containing TEL is used in internal combustion engine?	**(2)**

Part- II

Q2		**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(8 x 6)**
	a)	Show that the energy of a particle in one dimensional box is E= $\frac{n2h2}{8ma2}$	**(6)**
	b)	The frequency of oscillation of HF is 5×10^{12} Hz. Calculate the force constant and vibrational energy in Joule and cm-1.Calculate the zero point energy of the molecule.	**(6)**
	c)	Internuclear distance of HCl molecule (rigid type) is 129pm.Calculate its rotational constant in cm^{-1} and find the wavelength of the transition between rotational energy levels J=2 to J-3.	**(6)**
	d)	Define the term phase, component and degrees of freedom with suitable examples.	**(6)**
	e)	Discuss the phase diagram of Bi-Cd system.	**(6)**
	f)	State three quantum numbers used to describe an orbital specify the permissible values of each quantum numbers	**(6)**
	g)	Describe how the calorific value of a solid fuel is determined by using a bomb calorimeter.	**(6)**
	h)	0.72g of a fuel containing 80% carbon, when burnt in a bomb calorimeter , increased the temperature of water from 227.3 ^{o}C to 29.1 ^{o}C .If the calorimeter contains 250g of water and its water equivalent is 150grams, calculate the HCV of the fuel. Write the answer in LJ/kg.	**(6)**
	i)	What is cathodic protection? Explain sacrificial anode method.	**(6)**
	j)	Discuss the factors affecting corrosion.	**(6)**
	k)	Explain Sol-Gel synthesis for producing nanomaterials. Explain with help of a neat sketch.	**(6)**
	l)	Explain the mechanism of differential aeration corrosion with reference to irin materials.	**(6)**

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16×2)**

Q3	**a)**	State and explain Beer-Lambert's law. The absorbance of a 2.5×10^{-4} M solution taken in a 1 cm is 1.17.Calculalte the molar extinction coefficient.	**(8)**
	b)	Write the basic principles of UV-Visible spectroscopy.	**(8)**
Q4	**a)**	Derive the expression for the energy and frequency a diatomic molecules by assuming the molecule behaving as simple harmonic oscillator.	**(8)**
	b)	What do fundamental and overtone vibrations mean? HCl shows intense absorption peak at 2900 cm-1 and weak one at 8600 cm-1.Calcualte the anharmonicity constant	**(8)**
Q5	**a)**	Draw and explain the phase diagram of Sulphur system. Why all four phases of Sulphur system do not co-exist at equilibrium	**(8)**
	b)	What is electrochemical corrosion? Describe the mechanism of electrochemical corrosion by hydrogen evolution type and oxygen absorption.	**(8)**
Q6	**a)**	Discuss I brief the proximity analysis of coal	**(8)**
	b)	Discuss the applications of nanotechnology in electronics.	**(8)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
PAC2A102

2nd Semester Regular / Back Examination 2017-18
APPLIED CHEMISTRY
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUFAC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE
Time : 3 Hours
Max Marks : 100
Q.CODE : C802
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 **Answer the following questions: *multiple type or dash fill up type :*** **(2 x 10)**

a) In anodic metal coating, the base metal is coated with _____ .

b) Which of the following molecules does not absorb microwave radiation?
(i) H_2O (ii) CO_2
(iii) CO (iv) All of the above

c) Which one of the followings is NOT an example of primary fuel?
(i) Coal (ii) Natural gas
(iii) Kerosene (iv) Wood

d) The unit of Gross Calorific value (GCV) in MKS system is _____

e) The shifting of UV-visible absorption peak towards shorter wavelength is known as:
(i) Bathochromic shift (ii) Hyperchromic shift
(iii) Hypsochromic shift (iv) Hypochromic shift

f) Which of the following is NOT an organometallic compound?
(i) $(C_2H_5)_2$ Zn (ii) $(C_5H_5)_2$ Fe
(iii) $Ni(CO)_4$ (iv) $B(OCH_3)_3$

g) The expression for Hamiltonian operator ($\hat{H}$) used in Schrodinger equation is _____.

h) The IUPAC name of the compound, Rh Cl $(PPh_3)_3$ is _____

i) In the phase diagram for sulfur system, the metastable triple point represents the equilibrium between _____, _____ and _____ .

j) The number of phases and components present in a system of saturated solution of sugar are _____ and _____.

Q2 **Answer the following questions: *Short answer type :*** **(2 x 10)**

a) What is the major composition of water gas and producer gas?

b) Complete combustion of 5 kg of carbon produces 37,750 kcal of heat. Calculate the HCV.

c) Ocean-going ships undergo differential aeration corrosion but ships sunk under the ocean water for many years does not. Explain.

d) Write any two differences between anodic metal coating and cathodic metal coating.

e) State Beer-Lambert's law and write the equation.

f) Calculate the wavenumber in cm^{-1} and m^{-1} for the radiation, whose wavelength is 200 nm.

g) What is EAN rule? Justify that $V(CO)_6$ does not obey EAN rule.

h) What is cracking process?

i) How does triple point differ from critical point in a phase diagram?

j) What types of information can be obtained from azimuthal quantum number and magnetic quantum number?

Part – B (Answer any four questions)

Q3 **a)** Discuss in detail the phase diagram of water system. **(8)**

b) The internuclear distance of HCl molecule (rigid type) is 129 pm. Calculate its rotational constant (in cm^{-1}) and find the wavelength of the transition between rotational energy levels, J=1 to J=2. (The atomic masses are: H = 1.008 amu and Cl = 35.5 amu) **(7)**

Q4 **a)** Derive the time-independent Schrodinger wave equation and write its applications. **(10)**

b) Write any five differences between dry corrosion and wet corrosion. **(5)**

Q5 **a)** Discuss the knocking process in petrol engine. Define octane number and how is it related to the chemical structure of the fuel? **(10)**

b) Calculate net calorific value for a coal sample containing 82% C, 8% H, 2% S, 3% N and remaining ash. (Latent heat of steam is 587 kcal/kg) **(5)**

Q6 **a)** What is hydroformylation reaction? Write the steps for hydroformylation of ethylene using octacarbonyldicobalt catalyst. **(7)**

b) A gaseous fuel has the following composition by volume: H_2= 40%, N_2 = 22 %, CO = 20%, CH_4 = 10 %, CO_2 = 8%. Calculate the weight and volume of air required for the combustion of $1m^3$ of the fuel. **(8)**

Q7 **a)** Discuss the various factors affecting the corrosion process. **(10)**

b) Write the basis of use of eta (η) notation in organ metallic compounds? Give two examples. **(5)**

Q8 **a)** What is power alcohol and Discuss its advantages and disadvantages. **(6)**

b) The percentage transmittance of 8×10^{-5} M solution of a compound X is 40, when measured at 510 nm in a cell of path length of 1 cm. Calculate the absorbance and the molar extinction coefficient (in $M^{-1}.cm^{-1}$) of this solution. **(5)**

c) Calculate the ground state energy (in eV) for a particle of mass 9.1×10^{-31} kg, which is confined in one-dimensional box of length 10 nm. **(4)**

Q9 **a)** Discuss briefly the applications of UV-Visible absorption spectroscopy. **(6)**

b) State Gibbs phase rule and write its limitations. **(5)**

C) Calculate the frequency of oscillation of CO, if its force constant is 1600 Nm^{-1}. Atomic masses are: C=12.00 amu and O = 16.00 amu) **(4)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 B.Tech

PAC2A102

2nd Semester Back Examination 2018-19

APPLIED CHEMISTRY

BRANCH : AEIE, AUTO, CHEM, CIVIL, CSE, ECE, EEE, ELECTRICAL, ETC, IEE, IT, MANUTECH, MECH, METTA, MINING, MME, PE, PLASTIC, TEXTILE

Time : 3 Hours

Max Marks : 100

Q.CODE : F522

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Short Answer Type Questions (Answer All-10) **(2 x 10)**

a) Justify the following organic compound attained the 18e configuration of their covalent model .Fe(η^5-C_5H_5) and Mo(η^5-C_6H_6)

b) What is the de-Broglie wavelength of an electron travelling at 1% of the speed of light?

c) During corrosion evolution of hydrogen occurs in……

d) The structure of Grignard's reagent is

e) Calculate the number of components and degree of freedom for N_2 (g) +O_2(g) $\leftrightarrow$ 2NO(g).

f) Calculate the uncertainty in velocity of a cricket ball (mass = 0.01 gm) if uncertainty in its position is of the order of 100 pm.

g) What is Pilling-Bed worth rule? What is its significance?

h) What do you mean by fuel? Discuss characteristics of good fuel.

i) Why calgon conditioning is better than the phosphate conditioning?

j) Suggest some chemicals reagent for removal of DO and CO_2 from water which is better and why?

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) **(6 x 8)**

a) Discuss various types of electronic transition.

b) Discuss characteristics of eutectic mixture.

c) What do you mean by operator? Discuss the commutative operator.

d) What do you mean by Caustic embrittlement ? How do you prevent caustic embrittlement?

e) Discuss the Ziegler –Natta catalyst.

f) What do you mean by Eigen value and Eigen value function ? Prove that for operator d^2/dx^2 for Ø(x) =sin2x is an eigene value problem and finds it Eigen value.

g) A coal has following composition by weight C = 90%; O =3.0%; S = 0.5% ; N = 0.5% and Ash is 2.5%. NCV value of coal was found to be 8490.5 kcal/kg . Calculate the percentage of hydrogen and HCV of coal.

h) Discuss preparation and use of producer gas and water gas.

i) State any TWO laws of quantum mechanics.

j) How can you prepare power alcohol?

k) Calculate moment of inertia and rotational constant of HF molecule having bond distance 92pm. (atomic mass H = 1.0078u and F = 18.9984u.

l) Discuss the one method for measurement of COD.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Give a comparative account of κ, η *and* μ notations in organometallic compounds depending upon their modes of bonding of ligands. **(16)**

Q4 What do you mean by vapour pressure? Explain the vapour pressure curves in water and sulphur system with phase diagrams. **(16)**

Q5 What do you mean by corrosion? Discuss various types of corrosion with one example each along with their prevention method. **(16)**

Q6 What do you mean fuel? Discuss different type of methods carrying out for reformation of petrol. **(16)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
BS1103

2nd Semester Back Examination 2017-18
CHEMISTRY - I
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Time : 3 Hours
Max Marks : 70
Q.CODE : C801
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions:** **(2 x 10)**

a) What is pseudo first order reaction? Give one example.
b) Write the differences between molecularity and order of a reaction.
c) The fusion curve in the phase diagram for water system has negative slope. Explain.
d) Determine the number of phases and components in the following system: $CaCO_{3\,(s)} \rightarrow CaO_{\,(s)} + CO_{2\,(g)}$
e) Compute the standard EMF of the cell containing Zn^{2+}/Zn and Cu^{2+}/Cu electrodes. $E^{o}_{Zn2+/Zn}$ = -0.76V and $E^{o}_{Cu2+/Cu}$ = +0.34V
f) What is Frenkel defect?
g) Define heat of combustion.
h) Define crystal lattice. How many atoms/particles present per unit cell of a BCC lattice.
i) Distinguish between open system and close system
j) Calculate the pH of the solution with $[OH^-] = 1 \times 10^{-10}$ M.

Q2 **a)** Derive the expression for Gibbs-Helmholtz equation. **(5)**
b) What is homogeneous catalysis? Discuss the mechanism of homogeneous catalysis with a suitable example. **(5)**

Q3 **a)** State the Hess' law of constant heat summation and describe its application. **(5)**
b) For a cell, EMF is 0.0455 V at 298 K. Calculate ΔG, ΔH and ΔS for the cell reaction in the cell. Temperature coefficient, $(\partial E/\partial T)_p = 3.38 \times 10^{-4}$ V/K **(5)**

Q4 **a)** Draw the molecular orbital diagram for O_2^+ molecule. Write down the electronic configuration, bond order and magnetic behavior of it. **(5)**
b) An element *A* (atomic mass 100g/mol) of BCC structure has an edge length of 400 pm. Calculate the density of *A* and the number of unit cells present in 15 g of *A*. **(5)**

Q5 **a)** Describe the methods for determining the order of chemical reactions. **(6)**
b) Calculate the free energy change, when 4 moles of an ideal gas expands from a pressure of 10 atm to 1 atm at 25°C. **(4)**

Q6 **a)** If $dH = TdS + VdP$, prove that $[\partial T/\partial P]_s = [\partial V/\partial S]_p$ **(5)**

b) Derive the integrated rate equation of a first order reaction and show that half-life period for this reaction is independent of the initial concentration of the reactant. **(5)**

Q7 **a)** Write the seven crystal systems along with lattice parameters and example. **(5)**

b) Calculate the de Broglie wavelength for **(5)**

A cricket ball of mass 100 g moving with velocity of 2000 m/s

An electron of mass 9.1×10^{-31} kg moving with velocity of 1.2×10^{5} m/s.

Comment on the result.

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Dry cell

b) Quinhydrone electrode

c) Ionic solids

d) Born-Haber cycle

Registration No : | | | | | | | | | | |

Total Number of Pages : 02

B.Tech
BS1103

2nd Semester Back Examination 2018-19
CHEMISTRY - I
BRANCH : CHEM, CIVIL, CSE, ECE,
EEE, EIE, ELECTRICAL, IT, MANUTECH, MECH
Time : 3 Hours
Max Marks : 70
Q.CODE : F070

Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What do you mean by component? What is the maximum no of phases that can be in equilibrium at one point for one component system(T&P Constant?

b) Write down the Gibbs's Helmholtz equation and define term involved there in

c) Write down electrode reaction of quinhydrone electrode

d) Enthalpy/mole is extensive or intensive property. Justify your answer.

e) What do you mean by the planes of symmetry and Center of symmetry?

f) Construct a galvanic cell for the reaction
$Zn_{(S)} + HCl_{(aq)} \leftrightarrow ZnCl_{2_{(aq)}} + H_{2_{(g)}}$

g) Calculate Free energy change when 5 mole of oxygen at 300K and 5bar pressure expand isothermally to 1 bar pressure.

h) What do you mean by the Zero –order reaction? Give an example.

i) What do you mean by enzyme catalyst? Give an example of enzyme catalytic reaction.

j) What do you mean by Eutectic temperature and Critical temperature?

Q2 a) Two second order reaction have identical pre exponential factor and activation energy differ by 20.01 kj/mol .Calculate ratio of their rate constant at (a) 0 $^{\circ}$C and (b) 1000 $^{\circ}$C **(5)**

b) What do you mean by Order and molecularity?Derive an expression for second order reaction when two reactant are Different? **(5)**

Q3 a) Prove that Cp-Cv=[P+{∂U/∂V}$_T$][∂V/∂T]p **(5)**

b) What do you mean by close packing in solids ?Give a comparative account of Hexagonal close packing(HCP) and Cubic close packing(BCC) in solids **(5)**

Q4 a) What is a fuel cell? Write the construction and cell reaction of Hydrogen-oxygen fuel cell **(5)**

b) What do you mean by the catalytic poisoning? **(5)**
Discuss the various type of catalytic poisoning. with example

Q5 a) Derive an expression for 2nd order reaction when two reactants are same. and different. **(5)**

b) Justify the paramagnetic behavior of O_2 and O_2- With help of Molecular orbital Diagram. With help of Molecular orbital Diagram : **(5)**

Q6 With the help of the Phase rule, draw and describe the phase diagram of. Sulphur system and BI-Cd System **(10)**

Q7 How can you find the PH Of solution with help of the Quinhydrone Electrode . Discuss it merit and demerits? **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Collision theory of reaction Rate

b) Standard Hydrogen electrode.

c) Theory of Heterogeneous catalyst

Registration No : | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech.**
15BS1103

2nd Semester Back Examination 2017-18
CHEMISTRY
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Time: 3 Hours
Max Marks : 100
Q.CODE : C800

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 **Answer the following questions: *multiple type or dash fill up type:*** **(2 x 10)**

a) The coordination number in a hexagonal close-packed (hcp) crystal structure is _____.
(i) 8, (ii) 6,
(iii) 4, (iv) 12

b) In the phase diagram of sulfur system, the transition curve represents the equilibrium between ____ and _____.

c) A process is said to be spontaneous, if it satisfies the condition_____
(i) $\Delta G > 0$, (ii) $\Delta G < 0$,
(iii) $\Delta G = 0$ (iv) can not be predicted

d) Evaporation of water is an example of _____ reaction. (exothermic/endothermic)

e) Quinhydrone electrode is an example of _____
(i) Redox electrode, (ii) Gas electrode,
(iii) Metal-metal ion electrode (iv) Metal-insoluble salt electrode

f) The bond order for O_2 and O_2^- (peroxide ion) are ____ and _____ respectively.

g) In case of Schottky defects, density of solid _____
(i) Remains unchanged, (ii) Increases, (iii) Decreases

h) The unit of rate constant for 2nd order reaction is _____

i) The hydrogenation of ethylene in presence of Nickel catalyst is an example of _____ catalysis. (homogeneous/ heterogeneous)

j) Which of the following relationship(s) is (are) correct?
(i) $-\Delta G = -nFE_{cell}$ (ii) $-\Delta G = nFE_{cell}$
(iii) $\Delta G = nFE_{cell}$ (iv) Both (i) & (ii)

Q2 **Answer the following questions: *Short answer type:*** **(2 x 10)**

a) What is activation energy? How is it related to rate of a reaction?

b) Write the rate equation for the following reaction:
m A + n B → products

c) Define unit cell. How many atoms/particles present per unit cell of FCC lattice?

d) Write down the Gibbs Helmholtz equation and define the terms involved.

e) Explain zero order reaction with one example.

f) Write the electrode notation and electrode reaction for calomel electrode.

g) How many phases and components are present in water-kerosene oil system?

h) Calculate the pH of the solution with $[OH^-] = 10^{-8}$ M.

i) Determine the wavelength associated with a cricket ball of mass 400 g moving with velocity 1.5×10^5 m/s.

j) What do you mean by state function? Give two examples.

Part – B (Answer any four questions)

Q3 **a)** What is spontaneity of a reaction? Describe the criteria for spontaneity and equilibrium of chemical reactions. **(10)**

b) Differentiate between Frenkel defects and Schottky defects in solids. **(5)**

Q4 **a)** State the law of mass action. Discuss the factors affecting the rate of a reaction. **(10)**

b) For a cell, EMF is 1.018 V at 293 K. Calculate ΔG, ΔH and ΔS for the cell reaction in the cell. Temperature coefficient $(\partial E/\partial T)_p = -4 \times 10^{-5}$ V/K **(5)**

Q5 **a)** Derive the integrated rate equation for a second order reaction, when **(10)**
(i) 2A → Products (ii) A+ B → Products.
Show that half-life period for this reaction varies inversely with the initial concentration of the reactant.

b) Write the half cell reactions and calculate the EMF of the following cell at 25 ^oC using Nernst equation. **(5)**

$Zn_{(s)}| Zn^{2+}$ (1M) || I^- (0.1M)| $CuI_{(s)}$ | $Cu_{(s)}$

The Standard electrode potentials are E^o (Zn^{2+}/Zn) = - 0.76V and E^o $(CuI/Cu/I^-)$ = - 0.17V

Q6 **a)** Derive all the four Maxwell's thermodynamic relations. **(10)**

b) Derive concept of entropy from second law of thermodynamics. **(5)**

Q7 **a)** Draw the molecular orbital diagram for O_2 molecule. Write down the electronic configuration, bond order and magnetic behavior of it. **(10)**

b) Discuss the construction and cell reaction of a storage cell. **(5)**

Q8 **a)** Explain the phase diagram for sulfur system with a neat diagram. **(10)**

b) A compound with FCC crystal structure has a density of 2.163 g/cm^3 and molecular weight is 58.5 g/mol. Calculate the edge length of its unit cell. **(5)**

Q9 **a)** Write short notes on any two : **(5 x 2)**
(i) Standard hydrogen electrode
(ii) L.C.A.O.
(iii) Collision theory

b) Calculate the change in entropy in (J/K) when an ideal gas expands from a volume of 3 L to 30 L at 27 ^oC. (R= 8.314 J/K-mol) **(5)**

Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
15BS1103

2nd Semester Back Examination 2018-19
CHEMISTRY
BRANCH : AEIE, CIVIL, CSE, ECE, EEE, ELECTRICAL, ETC, IEE, IT, MECH, MINERAL, MINING, MME, TEXTILE
Max Marks : 100
Time : 3 Hours
Q.CODE : F524

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer all -10)** **(2 x 10)**

a) Write down the Gibbs's Helmholtz equation and define term involved therein.
b) What do you mean by degrees of freedom? What is value above and below critical points.
c) Enthalpy/mole is extensive or intensive property. Justify your answer.
d) Give the number of components of the system:
$Fe_{(S)} + H_2O_{(g)} \leftrightarrow FeO_{(S)} + H_{2(g)}$
e) What is the relationship between free energy and equilibrium constant of a reaction.
f) What do you mean by the zero –order reaction? Give an example of it.
g) Aqueous solution of glucose has one phase. Whereas aqueous solution of carbon tetrachloride has two phase. Explain.
h) Distinguish between electrolytic cell and battery.
i) What do you mean by the planes of symmetry and center of symmetry?
j) Write down electrode reaction of quinhydrone electrode.

Part- II

Q2 **(Answer Any Eight out of Twelve)** **(6 x 8)**

a) What do you mean by Order and molecularity of a reaction? Derive an expression for second order reaction when two reactants are different.
b) What is the standard EMF of the Electrochemical cell made of Cd Electrode in a 1.0M Cd $(NO_3)_2$ solution and Cr electrode in 1.0M $Cr(NO_3)_3$ solution E^0 (Cd/Cd^{+2}) =- 0.40V $E^0(Cr^{+3}/Cr)$= -0.74V?
c) What do you mean by the catalytic poisoning? Discuss the various type of catalytic poisoning with example.
d) What do you mean by the reaction rate? Discuss the effect of temperature on reaction rate(Derive the Arrhenius equation).
e) Prove that Cp-Cv=[P+{$\partial U/\partial V\}_T$][$\partial V/\partial T$]p
f) A first order reaction takes 40.5 minutes for 25% decomposition of the reactant. Calculate the rate constant of the reaction.
g) State and explain Hess's law of constant heat summation.
h) Write the construction, cell representation and cell reaction of standard hydrogen electrode.
i) Prove that E = $-\partial H/nF + T\{(\partial E)/\partial T\}_P$
j) Write down the condition for overlapping of atomic orbitals.
k) Write the reactions of charging discharging in lead-storage battery.
l) Define term phase, component and degrees of freedom with at least one example of each state.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Write down the condition for overlapping of atomic orbital. Justify the paramagnetic behavior of NO, O_2 and O^{2-} with help of molecular orbital diagram. **(16)**

Q4 Make a Sketches representing schematically(Name each curve)each of following :

a) A temperature and pressure diagram for one component system involving more than one triple point **(8)**

b) A temperature –composition phase diagram for a binary system having eutectic point. **(8)**

Q5 What do you mean by order and molecularity in a chemical reaction? Derive an expression for second order reaction when two reactants are different? **(16)**

Q6 **a)** What do you mean by the lattice energy? How can you explain lattice energy with help of Born-Haber cycle. **(8)**

b) The pH of solution in cell **(8)**
$Pt/H_2(g)$ /HCl(g)/Agcl(s)/Ag is 0.65 calculate the EMF of cell E^0 Cl^-/Ag,Ag = 0.2224V

Registration No : | | | | | | | | | | |

Total Number of Pages : 02

B.Tech

RCH2A002

2nd Semester Regular / Back Examination 2018-19

CHEMISTRY

BRANCH : AEIE, AERO, AG, AUTO, BIOMED, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, IT, MANUTECH, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PLASTIC, PT

Max Marks : 100

Time : 3 Hours

Q.CODE : F525

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Differentiate between Eutectic temperature and Critical temperature.

b) What do you mean by calorific value of fuel?

c) Why fusion curve of ice has negative slope where as transition curve has positive slope?

d) Define calorific value of fuel .

e) What do you mean by auxochrome and chromophores?

f) Define cetane number.

g) What do you mean by 0D Nano material and 1D nano material?

h) Define CNG.

i) Give an example of cathodic coating and anodic coating.

j) What is effect of conjugation on chromophores?

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) State and explain Beer – Lambert's law. Explain various type of electronic transition occurs in UV Spectroscopy with example

b) Write the approximate compositions and calorific value of water gas and producer gas.

c) Write three important applications of nanomaterials in environmental field.

d) Write down short notes on selection rule

e) Write down mechanism of electrochemical corrosion.

f) Describe in detail on synthesis of power alcohol.

g) Draw the phase diagram of Pb-Tin system and elaborate its salient features.

h) Describe the fractional distillation of petroleum.

i) Write short notes on proximate analysis of coal.

j) Write down top down approach for synthesis of nanomaterials.

k) The vibrational spectrum of HCl gas exhibits an absorption band centered 2,885cm^{-1}.Calculate the force constant of the bond of HCl molecule. (mass: H = 1.0078u, Cl = 35.4993u)

l) A coal sample has following composition by weight C = 90% ; O = 3.0% ; S = 0.5%; N = 0.5% and ash = 2.5% . Net calorific value of coal was found to be 8490.5 kcal/kg .Calculate percentage of hydrogen and HCV and GCV of the coal sample.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Derive Schrödinger equation? Write its application to particle in one dimensional box .Also prove that this a Eigen value problem	**(16)**
Q4	What do you mean by the eutectic point? Discuss eutectic point with help of suitable diagram? Discuss its applications.	**(16)**
Q5	What do you mean by cracking? Discuss the mechanism of thermal cracking and catalytic cracking.	**(16)**
Q6	What are factors affecting corrosion? How can it be prevented?	**(16)**

Registration No :

Total Number of Pages : 02

B.Tech
RCH2A002

2nd Semester Regular / Back Examination: 2021-22
CHEMISTRY
BRANCH(S): AEIE, AUTO, BIOTECH, CIVIL, CSE, CSEAI, CSEAIME, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PLASTIC, PT

Time : 3 Hour

Max Marks : 100

Q.Code : J764

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions :** **(2 × 10)**

a) Write down the Schrodinger's wave equation in three dimensions.
b) Why carrot is orange in colour? Explain on the basis of conjugation.
c) Transition curve of rhombic sulphur has positive slope. Explain.
d) What is an isomorphous system? Give one example.
e) What are the secondary fuels of petroleum?
f) What is kerosene gas?
g) What is the chemical formula of rust?
h) Define eutectic point. Give one example.
i) Give one example each from one, two and three component systems.
j) What is calorific value of fuel? What are the two types?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Discuss the significance of Ψ and Ψ^2.
b) What is reduced phase rule? Describe the phase diagram of Lead-Tin system.
c) Write down short note on band or molecular spectra.
d) What are octane number and cetane number?
e) Describe the Pilling-Bedworth Rule.
f) Calculate the gross and net calorific value of a coal sample having the following composition carbon = 86%, hydrogen= 8%, sulphur=1%, nitrogen=2%, ash=3%.
g) Explain chromophore and auxochrome with suitable examples.
h) Write down the postulates of quantum mechanics.
i) Describe the transitions taking place in UV-Visible spectroscopy.
j) Explain phase diagram of the water system.
k) What is cracking? Differentiate between thermal and catalytic cracking.
l) What are the different fractions of petroleum? Mention their industrial uses.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Derive an expression for the normalized wave function for a particle in one dimensional box.	**(16)**
Q4	State Gibb's phase rule and explain the phase diagram of sulphur system with the help of phase diagram.	**(16)**
Q5	What are fossil fuels? Describe briefly the ultimate analysis of coal.	**(16)**
Q6	Write down short notes on waterline corrosion and galvanic corrosion. Discuss the various factors influencing the rate of corrosion.	**(16)**