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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) H₂O (ii) CO₂
(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) (C₂H₅)₂ Zn (ii) (C₅H₅)₂ Fe
(iii) Ni(CO)₄ (iv) B(OCH₃)₃
- g) The expression for Hamiltonian operator (\hat{H}) used in Schrodinger equation is _____ .
- h) The IUPAC name of the compound, Rh Cl (PPh₃)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 $\text{V}(\text{CO})_6$ 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: $\text{H}_2 = 40\%$, $\text{N}_2 = 22\%$, $\text{CO} = 20\%$, $\text{CH}_4 = 10\%$, $\text{CO}_2 = 8\%$. 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 $\text{M}^{-1}.\text{cm}^{-1}$) 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 1600Nm^{-1} . (4)
Atomic masses are: C=12.00 amu and O = 16.00 amu)