

**PURWANCHAL UNIVERSITY**  
**I SEMESTER FINAL EXAMINATION-2003**

**LEVEL** : B. E. (Civil)

**SUBJECT:** BEG104SH, Chemistry

**TIME:** 03:00 hrs

**Full Marks:** 80

**Pass marks:** 32

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Attempt any FIVE questions, choosing at least TWO questions from GROUP-A and ONE from GROUP-B and C.**

**GROUP-A**

**Q. [2] [a]** Explain the working of the galvanic cell by taking the example of Zn/CuSO<sub>4</sub> reaction. Also explain the function of a salt bridge. [10]

**Q. [1] [a]** What is buffer solution? Explain the action of buffer in addition of acid and base with examples. [2+6]

**[b]** What are electrolytic cell and galvanic cell? A galvanic cell consists of metallic zinc plate immersed in 0.1 M zinc nitrate solution and lead plate in 0.02M lead nitrate solution. Calculate the E.M.F of the cell at 25°C. Also write the cell notation. [2+6]

$E^0 \text{Zn}^{2+}/\text{Zn} = -0.76\text{V}$ ,  $E^0 \text{Pb}^{2+}/\text{Pb} = -0.13\text{V}$ .

**Q. [2] [a]** State Hess's law of constant heat transmission. Determine  $\Delta H$  of the reaction  $\text{C}_{(s)} + 2\text{H}_2(\text{g}) \rightarrow \text{CH}_4(\text{g})$  from the following data. [6+6]  
(i)  $\text{C}_{(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) \Delta H = -393.7\text{KJ}$ .  
(ii)  $\text{H}_2(\text{g}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l}) \Delta H = -285.7\text{KJ}$

(iii) CH.....

[b] Define internal energy and entropy of a reaction. [4]

**Q. [3]** Write short note on (any TWO): [2×8=16]

[a] Hybridization.

[b] Hund's rule

[c] Corrosion.

**Q. [4]** Derive de-Broglie equation. Calculate the de-broglie wave lengths associated with a ball of 200gm. Mass with a velocity of  $3 \times 10^6 \text{ ms}^{-1}$  and an electron moving with the same velocity. [10+6]

**GROUP-B**

**Q. [5]** Give the postulate of valence theory. How it explains the formation of octahedral and tetrahedral complexes. [10+6]

**Q. [6]** What are transition elements? Give the electronic configuration of 3-d series. Explain the characteristic properties of transition element with regard to :

[a] Colour.

[b] Magnetic properties.

[c] Complex formation.

[d] Oxidation State. [4+4+4+4]

**Q. [7]** Write short note (any TWO): [2×8=16]

[a] Silicones.

[b] Water Pollution.

[c] Valence bond theory.

**Q. [8]** What are SN<sup>1</sup> and SN<sup>2</sup> reactions? Explain the mechanism of SN<sup>1</sup> and SN<sup>2</sup> reaction. [8+8]

**Q. [9]** What are enantiomers and diastereomers? Explain the optical isomerism in tartaric acid. [8+8]

**Q. [10]** What are natural and synthetic rubbers? Give the preparation, properties and uses of Teflon, nylon 6,6, and polystyrene. [8=8]

**PURWANCHAL UNIVERSITY**  
**I SEMESTER FINAL EXAMINATION-2004**

**LEVEL** : B. E. (Civil)

**SUBJECT:** BEG104SH, Chemistry

**TIME:** 03:00 hrs

**Full Marks:** 80

**Pass marks:**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Attempt any FIVE questions, choosing at least TWO questions from GROUP-A and ONE from GROUP-B and C.**

**GROUP-A**

**Q. [1] [a]** Derive de-Broglie equation for a particle of mass **m** moving with a velocity **c**. [10]

**[b]** Calculate the wavelength of an a particle having mass  $6.6 \times 10^{-27}$  kg moving with a speed of  $10^8$  cm/sec ( $h = 6.6 \times 10^{-34}$  kgm<sup>2</sup>sec). [6]

**Q. [2] [a]** Explain the working of the galvanic cell by taking the example of Zn/CuSO<sub>4</sub> reaction. Also explain the function of a salt bridge. [10]

**[b]** Calculate the emf of the cell;  $\text{Cu} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Cu}^{2+} + 2\text{Ag}(\text{s})$ . When  $[\text{Cu}^{2+}] = 0.130\text{M}$  and  $[\text{Ag}^+] = 1 \times 10^{-2}\text{M}$ . The value of  $E^\circ_{\text{Cu}^{2+}/\text{Cu}}$  and  $E^\circ_{\text{Ag}^+/\text{Ag}}$  are given to be 0.34V and 0.8V respectively. [6]

**Q. [3]** State and explain Hess's law of constant heat summation. What are their applications? [2+8+6]

**Q. [4] Write notes on (any TWO):** [2\*8=16]

**[a]** Buffer Solution

**[b]** Hydrogen Electrode

**[c]** Common ion Effect

**GROUP-B**

**Q. [5]** Differentiate between double salt and complex salt. Explain giving Werner's postulates, the bonding in coordinate compounds. [4+12]

**Q. [6]** What is hybridization? Explain the shape of  $\text{PCl}_5$  molecule on the basis of hybridization.  $\text{PCl}_5$  molecule is highly reactive, why? [4+8+4]

**Q. [7] Write notes on (any TWO):** [2x8=16]

**[a]** Water Pollution

**[b]** Silicones

**[c]** Applications of coordinate complexes

**GROUP-C**

**Q. [8]** Write down the preparation, properties and uses of Grignard reagent. [16]

**Q. [9] [a]** What is Stereoisomerism? Write three **criteria** for the compound to exhibit stereoisomerism. [2+6]

**[b]** Differentiate between optical and geometrical isomerism. [8]

**Q [10] Write notes on (any TWO):** [2x8=16]

**[a]** T.N.G.

**[b]** Polymerization

**[c]** Substitution Reaction

**PURWANCHAL UNIVERSITY**  
**I SEMESTER BACK-PAPER EXAMINATION-2005**

**LEVEL** : B. E. (Civil)

**SUBJECT:** BEG104SH, Chemistry

**TIME:** 03:00 hrs

**Full Marks:** 80

**Pass marks:**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Attempt any FIVE questions, choosing at least TWO questions from GROUP-A and ONE from GROUP-B and C.**

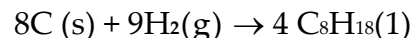
**GROUP-A**

**Q. [1] [a]** What is buffer solution? Explain the action of buffer in addition of acid and base with examples. [2+6]

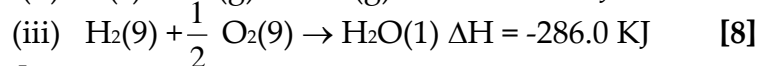
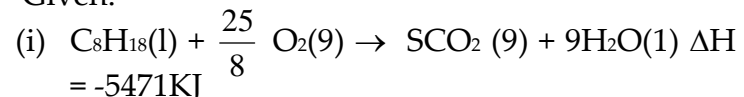
**[b]** Find the PH of 0.002 M acetic acid solution if it is 3.2% ionized at this dilution. [8]

**Q. [2] [a]** State and explain I law of Thermodynamics. [8]

**[b]** Calculate the enthalpy change for the following hypothetical reaction.



Given:



**Q. [3] [a]** What are quantum numbers? State their significances. Calculate the permitted values of n. and m for 2 P<sub>z</sub> orbital. [8]

**[b]** What do you mean by wave partial duality of matter & radiation? Calculate the de-broglie wave

length of a particle of mass 1 gm moving with a velocity 2000MS<sup>-1</sup> [2+4+2]

**Q. [4]** Write notes on (any TWO): [2 x 8 = 16]

[a] Calorific values of food & fuels.

[b] Corrosion and its prevention.

[c] Electrovalency and co-ordinate covalency.

**Group-B**

**Q. [5] [a]** What are co-ordination compounds? Write the main applications of co-ordination compound. [2+6]

[b] Write the basic postulates of VBT. Explain the geometry and magnetic properties of [CoF<sub>6</sub>]<sup>3-</sup> ion on the basis of VBT. [4+4]

**Q. [6] [a]** What are transition elements? Discuss their characteristics with reference to (i) Electronic configuration (ii) Oxidation states. [2+3+3]

**[b]** What do you mean by Para magnetism and diamagnetism? Why the Para magnetism in transition elements first increases gets to maximum near the middles of the series and then decreases. [3+3+2]

**Q. [7]** Write notes on (any TWO): [2 x 8 = 16]

**[a]** Double salt and complex salt

**[b]** Soil pollution

**[c]** Organo silicon polymer.

**GROUP-C**

**Q. [8] [a]** What are carbonium ion & carbanion? Give structure, stability and reactivity of carbanions carbonium ion.

[b] Explain the Mechanism of SN<sup>1</sup> and SN<sup>2</sup> reaction with suitable examples. [4]

Q. [9] [a] What are stereoisomers? Differentiate enantiomers and Diastereomers with suitable examples.

[b] What are Grignard reagents? How would you prepare different classes of alcohols, carboxylic acids and alkenes?

Q [10] **Write notes on (any TWQ).** [2×8]

[a] Racemic Modification

[b] Explosives

[c] Rearrangement reaction

**PURWANCHAL UNIVERSITY**  
**I SEMESTER FINAL EXAMINATION-2007**

**LEVEL :** B. E. (Civil)

**SUBJECT:** BEG104SH, Chemistry

**TIME:** 03:00 hrs

**Full Marks:** 80

**Pass marks:**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Attempt any FIVE questions, choosing at least TWO questions from GROUP-A and ONE from GROUP-B and C.**

**GROUP-A**

**Q. [1] [a]** What are quantum numbers? State the significance of the four quantum numbers. [8]

**[b]** What do you understand by the dual character of matter? Derive de-Broglie equation. A particle having wavelength  $6.6 \times 10^4$  cm is moving with the velocity of  $10^6 \text{ sec}^{-1}$ . Find the mass of the particle ( $h = 6.62 \times 10^{-27} \text{ erg sec}$ ) [2+3+3]

**Q. [2] [a]** What type of bond is formed in calcium oxide molecule? Explain the formation of bond and the characteristics of it. [8]

**[b]** Explain  $sp$ ,  $sp^2$ ,  $sp^3$  hybridisation with the help of organic molecules. Indicate the shape of the molecule in each case. [8]

**Q. [3] [a]** Derive Ostwald's dilution law and point out its limitations. Calculate the pH of 0.1 M solution of acetic acid ( $K_a$  for acetic acid  $= 1.8 \times 10^{-5}$ )

**[b]** What is electrochemical series? What information can be derived from it? [5+3]

**Q. [4] [a]** Define internal energy and enthalpy. Show that the change in enthalpy at constant pressure for a reaction involving gases is given by the expression  $\Delta H = \Delta E + \Delta nRT$ ? [2+2+4]

**[b]** Define molar heat capacity at constant volume ( $C_v$ ) and at constant pressure ( $C_p$ ). Derive Kirchhoff's equation. [2+6]

**GROUP-B**

**Q. [5] [a]** Describe Werner's Theory of coordination compounds, name the following compounds per IUPAC rules

[i]  $[\text{Zn}(\text{OH})_4]^{2-}$  [ii]  $[\text{Fe}(\text{CN})_6]$

[iii]  $\text{K}_2[\text{Pt} \cdot \text{Cl}_6]$  [iv]  $[\text{Cu}(\text{NH}_3)_4]^{2-}$  [4+4]

**[b]**  $[\text{Ni}(\text{CN})_4]^{2-}$  ion has a square planar geometry and  $\text{Ni}(\text{CO})_4$  has tetrahedral geometry. Explain this on the basis of valence bond theory and discuss their magnetic behavior. [3+3+2]

**Q. [6]** Describe the general characteristics of transition elements with special reference to the following. [16]

**[a]** Variable oxidation states

**[b]** Formation of color compounds

**[c]** Complex formation

**[d]** Magnetic behavior

**[e]** Good catalysts

**Q. [7] Write notes on (any TWO):** [8+8=16]

**[a]** Double salt and complex salt

**[b]** Chemistry of silicon

**[c]** Air pollution and its remedies

**GROUP-C**

Q. [8] What do you understand by the terms  $\text{SN}^1$  and  $\text{SN}^2$  reactions? Explain the types of substitution .... elimination reactions with suitable examples.

Q. [9] What is meant by stereoisomerism? How many stereoisomerism are known? Explain each with examples. [2+2+6]

Q. [10] Write notes on (any TWO): [8+8=1]

[a] Chemistry of TNT and nitrocellulose

[b] Teflon & Terylene

[c] Preparation and uses of Grignard reagents

**PURWANCHAL UNIVERSITY**  
**I SEMESTER CHANCE EXAMINATION-2009**

**LEVEL : B. E. (Civil)**

**SUBJECT: BEG104SH, Chemistry**

**TIME: 03:00 hrs**

**Full Marks: 80**

**Pass marks:**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Attempt any FIVE questions, choosing at least TWO questions from GROUP-A and ONE from GROUP-B and C.**

**GROUP-A**

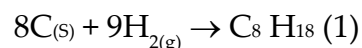
**Q. [1] [a]** What are quantum numbers? State the significance of the four quantum numbers. [8]

**Q. [1] [a]** What do you understand by wave particle duality of matter and radiation? Derive de-Broglie's equation. Calculate the de-Broglie's wavelength associated with a ball of 200gm mass moving with a velocity of  $3 \times 10^6 \text{ ms}^{-1}$ . [2+3+3]

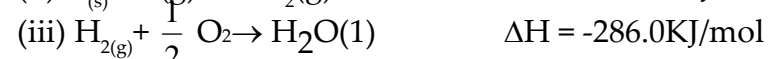
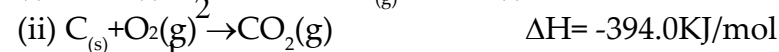
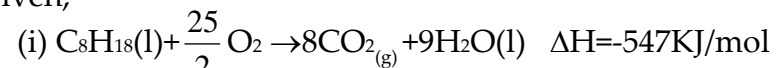
**[b]** What are quantum numbers? What is the significance of quantum numbers? Calculate the permitted values of  $n$ ,  $l$ ,  $m$  and  $s$  for  $3d^1$  electron. [2+3+3]

**Q. 2 [a]** What is enthalpy? Derive the relationship between  $\Delta H$  and  $\Delta E$ . In what condition  $\Delta H = \Delta E$ ? [2+4+2]

**[b]** Derive the Kirchhoff's equation. Calculate the enthalpy change for following hypothetical reaction. [4+4]

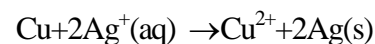


Given,



**Q. [a]** what is buffer solution? explain the action of buffer in addition of acid and base with examples. [2+6]

**[b]** What are electrolytic cell and galvanic cell? Calculate the emf of the cell



When  $[Cu^{2+}] = 0.130 \text{ M}$  and  $[Ag^+] = 1.10^2 \text{ M}$ . The value of  $E^\circ$

$Cu^{2+}/Cu$  and  $E^\circ Ag^+/Ag$  are given to be 0.34V and 0.8V respectively.

**Q. [4] Write short notes on any TWO:** **2x8=16**

[a] Hybridization

[b] Electrochemical series.

[c] Co-ordinate covalency and metallic bonding.

**GROUP-B**

**Q. [5]** Write down the main postulates of valence bond theory of complexes. How does VBT explain the formation of octahedral and tetrahedral complexes? Give one example of each. [6+10]

**Q. [6]** What is meant by transition elements? Why zinc and cadmium are not considered as transition metals? Give the characteristic of 3d transition with reference to: (a) Variable valency, (b) Formation of coloured compounds. [4+4+4+4]

**Q. [7] Write short notes on any TWO:** **2x8=16**

[a] Werner's theory and sidwick model of complex

[b] Water pollution and their remedies

[c] Chemistry of silicones.

**Q. [8] [a]** Explain the unimolecular nucleophilic substitution and bimolecular nucleophilic substitution. [4+4]



**Q. [b]** State and illustrate Markownikoff's rule and Kharasch's rule taking the example of addition of HBr to propene. **[4+4]**

**Q. [9]** What do you mean by geometrical isomerism? What are the necessary conditions for a compound to show geometrical isomerism? Explain the optical isomerism in tartaric acid.

**[3+3+10]**

**[10] Write Short notes any TWO:** **[2×8=16]**

**[a] Explosives**

**[b] Preparation and uses of Grignard reagent**

**[c] Preparation, properties and uses of Nylon, Polyethene**