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**CHEMISTRY PAPER-I : CHE-241**  
**Physical Chemistry & Inorganic Chemistry - II**  
**(24135)**

P. Pages : 2

Time : Two Hours

Max. Marks : 40

**Instructions to Candidates :**

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicates full marks.
6. Draw a neat diagram wherever necessary.
7. Use of non-programmable calculators and logarithmic tables is allowed.

**1. a) Multiple choice questions.**

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- i) Gibb's free energy is a function of -----  
 a) Temperature and pressure  
 b) Temperature and volume  
 c) Temperature and concentration  
 d) Volume and concentration
- ii) One calorie is equal to -----  
 a) 4.183 joules  
 b) 3.0 joules  
 c) 5.0 joules  
 d) 2.183 joules
- iii) Lanthanides and actinides are called as -----  
 a) Transition elements  
 b) Inert elements  
 c) Inner transition elements  
 d) Normal elements
- iv) Oxygen molecule is -----  
 a) Paramagnetic  
 b) Monomagnetic  
 c) Diamagnetic  
 d) Ferromagnetic

**b) Attempt any two of the following.**

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- i) Define fugacity and activity.
- ii) Define Galvanic cell and electrolytic cell. With examples.
- iii) Define atomic orbital and molecular orbital.
- iv) What is misch metal? Where it is used?

2. Attempt **any two** of the following. 8
- Describe Poggendorf compensation method for measurement of e.m.f. of a cell.
  - Derive Gibb's – Helmholtz equation.
  - State the rules for Linear combination of atomic orbitals.
3. a) Answer **any one** of the following. 4
- 6 grams of hydrogen gas at 373 K is compressed from 25 atm to 400 atm. calculate change in Gibb's – free energy.  
( $R = 1.987 \text{ cal mole}^{-1} \text{ K}^{-1}$ )
  - What is the cell reaction in the following cell.  

$$^{-}\text{Cd}_{(g)} | \text{Cd}^{+2}_{(aq)}(\text{C}_1) || \text{Ag}^{+}_{(aq)}(\text{G}) | \text{Ag}^{+}$$
- b) Answer **any one** of the following. 4
- Give important Features of MOT.
  - Distinguish between Bonding Molecular Orbitals (BMO's) and Antibonding molecular orbitals (ABMO's)
4. Answer **any two**. 8
- Explain gas electrode with suitable example with reference to construction and expression for E.M.F of electrode.
  - Draw MO energy level diagram of nitrogen molecule and calculate bond order and stabilisation energy.
  - What is monazite sand? Give flow sheet diagram for extraction of Lanthanides.
5. a) Answer **any one**. 6
- Explain Ion exchange chromatography method for separation of the lanthanide element.
  - Derive Clausius – Clapeyron equation for vapour pressure of liquids and give it's applications.
- b) What are the limitations of hydrogen gas electrode. 2

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