

**B.Tech. Civil (Construction Management)/  
B.Tech. Civil (Water Resources Engineering)**

**Term-End Examination**

**December, 2016**

00650

**ET-105(B) : CHEMISTRY**

*Time : 3 hours*

*Maximum Marks : 70*

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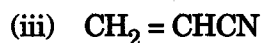
**Note :** *Question no. 1 is compulsory. Attempt any six questions from questions number 2 to 11. Use of calculator is permitted.*

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1. (a) Lanthanide and actinide series belong to 1
- (i) s-block elements
  - (ii) p-block elements
  - (iii) d-block elements
  - (iv) f-block elements
- (b) As atomic number increases 1
- (i) energy level of the orbitals decreases
  - (ii) energy level of the orbitals increases
  - (iii) energy level of the orbitals remains constant
  - (iv) energy level of the orbitals first increases then decreases

- (c) Select the element having lower ionization energy from each of the pairs given below : 3
- (i)  ${}_3\text{Li}$  and  ${}_9\text{F}$
  - (ii)  ${}_7\text{N}$  and  ${}_8\text{O}$
  - (iii)  ${}_9\text{F}$  and  ${}_{53}\text{I}$
- (d) Electrolysis of aqueous NaCl solution will produce 2
- (i)  $\text{H}_2(\text{g})$
  - (ii)  $\text{H}_2(\text{g})$  and  $\text{Cl}_2(\text{g})$
  - (iii)  $\text{H}_2(\text{g})$ ,  $\text{Cl}_2(\text{g})$  and  $\text{NaOH}$
  - (iv)  $\text{Na}(\text{s})$  and  $\text{Cl}_2(\text{g})$
- (e) Write the enol form of 1,3-Diketone. 2
- (f) Write one contribution each of the following scientists : 3
- (i) Becquerel
  - (ii) J. Chadwick
  - (iii) Aston
- (g) Name the process associated with each of the following : 3
- (i) Parkes' process
  - (ii) Ostwald process
  - (iii) Solvay process

(h) Give one important use for each of the following compounds : 3



(i) In +ve electromeric effect, if an electron is added to the following compound, then in which direction will  $\pi$  electron transfer take place —  $\text{C}_3$  to  $\text{C}_2$  or  $\text{C}_2$  to  $\text{C}_3$  ? Justify. 3



(j) Teflon, polystyrene and neoprene, all are 1

(i) Copolymers

(ii) Condensation polymers

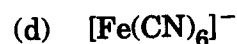
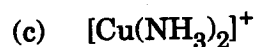
(iii) Homopolymers

(iv) Monomers

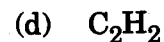
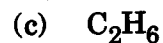
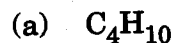
2. Calculate the density ratio for BCC to FCC unit cell of iron. ( $a_{\text{BCC}}$  is the lattice constant of BCC unit cell and  $a_{\text{FCC}}$  is the lattice constant of FCC unit cell) 8

3.  $K_2Cr_2O_7$  solution is added into an acidic solution of  $FeSO_4$ .
- Write the balance equation for the reaction.
  - Which one is the oxidising agent and which one is the reducing agent ?
  - What is the oxidation number of chromium before and after the reaction ?
  - What is the change in oxidation number of iron ?  $4+2+1+1=8$
4. (a) Which ore is called the fool's gold ?
- (b) How is pig iron obtained in a blast furnace ? Give the chemical reactions occurring in a blast furnace when hematite, limestone and coke are charged in the blast furnace and air or oxygen is blown from the bottom.  $2+6=8$
5. Answer the following :  $3+3+1+1=8$
- When is a ligand termed as a chelating ligand ? Give one example.
  - Which one —  $[Ni(en)_3]^{2+}$  or  $[Ni(NH_3)_6]^{2+}$  will be more stable and why ? ('en' stands for diethylene triamine)
  - Which one —  $[Ni(en)_3]^{2+}$  or  $[Ni(NH_3)_6]^{2+}$  is a monodentate ligand ?
  - Ligand is a Lewis \_\_\_\_\_ .

6. Name the following coordination compounds according to IUPAC nomenclature :  $2+2+2+2=8$



7. How will you convert  $\text{CH}_3\text{CH}_2\text{I}$  into any of the two compounds given below ? Also give the names of the reagents and conditions used and steps involved in each case.  $4+4=8$



8. Answer the following :  $6+2=8$

(a) How many isomers are possible for  $\text{C}_4\text{H}_{10}\text{O}$  ?

Draw all the structures.

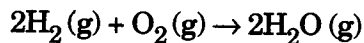
(b) A compound with molecular formula  $\text{C}_7\text{H}_{16}$  shows optical isomerism, the compound will be

(i) 2,3-Dimethyl pentane

(ii) 2,2-Dimethyl pentane

(iii) 2-Methyl hexane

9. A mixture with the mole ratio of  $H_2$  and  $O_2$  as 2 : 1 is used to prepare water by the following reaction :



The total pressure in the container is 0.8 atm at  $20^\circ C$  before the reaction. The temperature is raised to  $120^\circ C$  and allowed to attain equilibrium. Determine the final pressure at  $120^\circ C$  after the reaction, assuming 80% yield of water.

(Hint : Use Gay-Lussac law to determine the initial pressure at  $120^\circ C$ )

8

10. (a) What will be the nature of slope,  $(dP/dV)$ , for a plot between P and V when 1 mole of an ideal gas is expanded ?

- (i) Isothermally ( $PV = \text{const.}$ )  
(ii) Adiabatically ( $PV^\gamma = \text{const.}$ ), ( $\gamma > 1$ )

- (b) What will be the relation between T and V for an ideal gas under adiabatic condition ?

(Given :  $\Delta E = \bar{C}_V dT$ )

4+4=8

11. (a) Under what condition will the work be a state function ?
- (b) The standard heat of formation of  $\text{CH}_4(\text{g})$ ,  $\text{CO}_2(\text{g})$  and  $\text{H}_2\text{O}(\text{g})$  are  $-76.2$ ,  $-394.8$  and  $-241.6 \text{ kJ mol}^{-1}$  respectively. Calculate the amount of heat evolved by burning  $1 \text{ m}^3$  of  $\text{CH}_4$  measured under standard condition.  $2+6=8$
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