

**B.Tech. AEROSPACE ENGINEERING
(BTAE)****Term-End Examination****June, 2017****00284****BAS-002 : APPLIED CHEMISTRY***Time : 3 hours**Maximum Marks : 70*

Note : Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. (a) Calculate the energy to shift an electron from the first Bohr's orbit to the fifth orbit in a hydrogen atom. Also, determine the wavelength of emitted radiations if the electron returns to the initial orbit. 5
- (b) What is the shape of p -orbitals ? Draw labelled diagrams. How many nodes are there in $3p$ -orbitals ? 5
2. (a) What is Ionisation Energy (IE) ? Discuss the factors on which IE depends. 5
- (b) What is lanthanide contraction ? How can the similarities in the chemical properties of the lanthanides be explained ? 5

3. (a) (i) "Of all the inert gases, only xenon forms compounds with fluorine."

Explain.

$2\frac{1}{2}$

- (ii) Explain why gold and silver are generally found in nature in the native state.

$2\frac{1}{2}$

- (b) Predict the geometry of the complexes formed by transition metal ions using the following hybrid orbitals with the help of valence bond theory :

5

(i) sp^3

(ii) d^2sp^3

4. (a) (i) For the formation of SO_3 according to the equation



outline the conditions favourable for the formation of SO_3 .

3

- (ii) Give the equation for the manufacture of urea.

2

- (b) (i) Explain why transition metal compounds are coloured.

2

- (ii) Write the electronic configuration of the following elements :

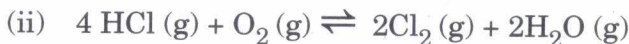
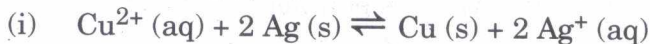
${}_6C$ and ${}_{15}P$.

3

5. (a) Write the structure of 4
- (i) 2, 2, 4-trimethylhexane
 - (ii) 2, 3-dimethylbutane
- (b) (i) What is petroleum ?
- (ii) Explain the term "petroleum refining". 6
6. (a) (i) What are the important features of Galvanic cell ? 3
- (ii) Give the representation of Zn-CuSO₄ cell. 2
- (b) Predict whether the following reaction would occur spontaneously at 298 K : 5
- $$\text{Co (s)} + \text{Fe}^{2+} (\text{aq}) \longrightarrow \text{Co}^{2+} (\text{aq}) + \text{Fe (s)}$$
- Given [Co²⁺] = 1 M, [Fe²⁺] = 1 M
- $$E^{\circ}_{\text{Co}^{2+}/\text{Co}} = -0.28 \text{ V}$$
- $$E^{\circ}_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$$
7. (a) (i) List any two factors which promote corrosion. 2
- (ii) What is meant by barrier protection for prevention of corrosion ? 3
- (b) What are fuel cells ? Explain N₂ – O₂ fuel cell with reactions occurring at cathode and anode. How is it difficult to construct fuel cells ? 5

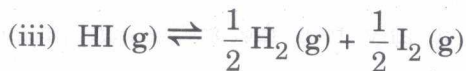
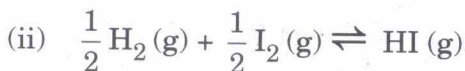
8. (a) Derive a relationship between K_p and K_c . 4

(b) Write K_c expressions for the following reactions : 3



(c) What is the relationship between concentration quotient (Q) and equilibrium constant (K) ? 3

9. (a) The value of equilibrium constant for the reaction $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ at 720 K is 48. What is the value of equilibrium constant for the following reactions ? 5



(b) What is the degree of dissociation ? Derive an expression for the degree of dissociation of weak monobasic acid having concentration of C moles/litre. 5