FACULTY OF ENGINEERING SCIENCES
FIRST SEMESTER INTERIM ASSESSMENT, 2013/2014
LEVEL 100: BACHELOR OF SCIENCE IN ENGINEERING
FAENG 107: CHEMISTRY

Answer All Questions — Time Allowed: 1Hr

1. Which pair of quantum numbers determines the energy of an electron in an orbital?
   (a) n & m (b) n & s (c) n & ℓ (d) ℓ & m

2. Which of the following sets of orbitals is arranged in order of increasing energy?
   (a) 4s < 3d < 4p < 5s < 4d
   (b) 4s < 3d < 4p < 4d < 5s
   (c) 3d < 4s < 4p < 4d < 5s
   (d) 3d < 4s < 4p < 5s < 4d

3. Which of the following electron configurations for carbon satisfies Hund's rule?
   (a) $1s^2\ 2s^2\ 2p_x^1\ 2p_y^0\ 2p_z^0$
   (b) $1s^2\ 2s^2\ 2p_x^1\ 2p_y^1\ 2p_z^0$
   (c) $1s^2\ 2s^2\ 2p_x^1\ 2p_y^1\ 2p_z^1$
   (d) $1s^2\ 2s^2\ 2p_x^2\ 2p_y^0\ 2p_z^0$

4. Which of the following is a legitimate set of n, ℓ, m, s quantum numbers?
   (a) 4, -2, -1, ½
   (b) 4, 2, 3, ½
   (c) 4, 3, 0, 1
   (d) 4, 0, 0, -½

5. Which of the following compounds will dissolve in water to give a solution with pH of about 5?
   (a) NH_3 (b) NaCℓ (c) $NH_4Cℓ$ (d) KOH

6. What is the pH of a solution if $[OH^-] = 4.0 \times 10^{-11}$ M
   (a) 10.4 (b) 3.6 (c) 11.4 (d) 4.6

7. The pH of an acid is 2.39. What is the K_a of the acid?
   (a) 1.1×10^{-5} (b) 1.4×10^{-6} (c) 1.8×10^{-4} (d) 1.8×10^{-5}

8. What is the solubility of $Cu(OH)_2$ in g/L. K_{sp} for $Cu(OH)_2 = 2.2 \times 10^{-20}$.
   (a) 1.1×10^{-5} g/L (b) 1.4×10^{-6} g/L (c) 1.8×10^{-4} g/L (d) 1.8×10^{-5} g/L

7.

9. A 466-g sample of water is heated from 8.50 °C to 74.60 °C. Calculate heat absorbed by the water. Specific heat of water is 4.184 J/g
(a) 129 kJ (b) 104 kJ (c) 112 kJ (d) 109 kJ

10. A buffer solution is 0.24 M NH_3 and 0.20 M $NH_4C\ell$. What is the pH of
(a) 1.52 (b) 9.34 (c) 8.51 (d) 5.50

11. What is the enthalpy change associated with the formation of 5.67 mol of the following reaction? $H_2(g) + C\ell_2(g) \rightarrow 2\,HC\ell(g)$ $\Delta H = -184.$
(a) -523 kJ (b) 328 kJ (c) 235 kJ (d) -445 kJ

12. Calculate the heat capacity of brake fluid if the sample must absorb 911 its temperature to rise from 15 °C to 100 °C.
(a) 1.55 J/°C (b) 1.43 J/°C (c) 5.11 J/°C (d) 5.64 J/°C

13. Calculate the molar solubility of Ag_2SO_4 in 1.00 M Na_2SO_4 aqueous soln $K_{sp} = 1.4 \times 10^{-5}$ for the sparingly soluble ionic compound/Ag_2SO_4
(a) 1.9×10^{-3} mol/L (b) 1.5×10^{-4} mol/L (c) 1.1×10^{-2} mol/L (d) 1.7

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