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Engineering Chemistry
Final Exam

Menoufia University Faculty of Electronic Engineering Phy and Mat Eng Dept.	22 Jan 2020	Marks=90 marks (45 marks for part one) Time: 3 hr Prep. Year

Part 1: Dr. Khalid Mahmoud Hassan

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أجابه أسئلة الجزء الاول الخاص بالدكتور / خالد محمود حسن تبدأ من الجانب الأيسر لكراسة الإجابة
يتكون الجزء الاول من سؤالين (ورقة وجهان) حيث تبدأ إجابة كل سؤال في صفحة جديدة مع كتابة رقم السؤال واضحا اعلي الصفحة
يراعي أن تكون الإجابات منظمة ومرتبة حسب ترتيب أرقام الأسئلة وبخط واضح مستخدما القلم الجاف الأزرق أو الأسود
لن تصحح الإجابات المكتوبة باللغة العربية أو القلم الرصاص أو الأقلام الملونة

First question: Solve the following problems: (25 Marks)

1- Consider the following voltaic cell at 25 °C: $Ni_{(s)}/Ni^{2+}_{(aq)}//Ag^{+}_{(aq)}/Ag_{(s)}$. Write the half reactions that occur at each electrode, and the balanced redox reaction that occurs in the cell.

2- A voltaic cell contains a Cd electrode in a solution of $Cd^{2+}_{(aq)}$ as one half-cell and an inert Pt electrode in a solution containing $Fe^{3+}_{(aq)}$ and $Fe^{2+}_{(aq)}$ as the other half-cell.
   I. Which will be the cathode and which will be the anode?
   II. Write the half reactions that occur at each electrode, and the balanced redox reaction that occurs in the cell.
   III. Calculate K. ($E^{\circ}_{Cd^{+2}} = -0.40$ V , $E^{\circ}_{Fe^{+3}} = +0.77$ V)

3- A metal crystallizes in a BCC structure, if the edge length of unit cell is 353 pm, what is the radius of this atom?

4- Compare in a table between the following crystalline structures:
   I. Tetragonal and Orthorhombic
   II. Rhombohedral and Hexagonal

5- For the following reaction in acidic medium:

$$Ag_{(s)} + NO_3^-{}_{(aq)} \longrightarrow Ag^+_{(aq)} + NO_{(g)}$$

Calculate the equilibrium constant (make your two half reactions and total reaction equation) knowing that E^{o}_{red} for NO_3^- = + 0.964 V and E^{o}_{red} for Ag^+ = + 0.799 V.

Second question: Put (√) or (X) in front of the following sentences: (20 Marks)

مطلوب كتابة رقم السؤال و أمامه الإجابة فقط في كراسة الإجابة

1- Face centered cubic structure has a coordination number of 6.
2- We can predict the concentration where the cell stops by calculating the equilibrium constant.

3- The electrode that is the source of electrons is the negative electrode.
4- Cubic structure is the same as tetragonal structure, but differ in (c) axis length.
5- An acidic solution is characterized by a high value of $[H^+]$ with pH >7.
6- For spontaneous reaction, E°_{cell} will always be +ve value.
7- There is a difference between the primitive unit cell and the unit cell.
8- When the cell is empty, so E°_{cell} will be zero.
9- Strong acids and bases are virtually 100% ionized or dissociated in dilute aqueous solutions.
10- When the value of pKa increase, the solution becomes basic.
11- Bragg equation describes the reflection of X-ray by crystals.
12- Oxidation number is the negative charge only on an atom to give an ion (anion or cation), and equals to the number of electron transferred.
13- Crystalline solid is the solid which do not possess long-range order of atoms positions.
14- Water, owing to the fact that it possesses both acid and base properties, is termed amorphous.
15- Reducing agent takes electrons from other substance, oxidizes it and must be being reduced.
16- Ionization is the process at which E°_{cell} will be zero.
17- The main difference between crystal systems is the axial angles.
18- Unit cell could be primitive cell, but the opposite is wrong.
19- Buffer solution resists change in pH.
20- The extent to which the reaction proceeds towards products is measured by an equilibrium constant.

Good Luck

Ass. Prof. Khalid M. Hassan

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