King Saud University College of science	Chemistry Dept.	430 Chem.
MED EXAM (30 marks)		**8-3-1444 H**
Student name:	**ID#:**	

Instructions: **Use the following constants where applicable.**

F = 96485 C/mol e, R = 8.314 J/mol K, T = 298°K . Elec. Chem. Series is provided

PART (I) True (√) or false (X) questions (10marks)

1- For the following reaction $2Au + 4Cl_2 \rightarrow 2AuCl_4$ Au is the oxidizing agent   (   )

2- In an electrochemical cell OXIDATION Occurs at the anode.   (   )

3- Sodium (Na) ca be obtained by the electrolysis of NaCl(aq).   (   )

4- For $Cu^{2+} + 2e \rightarrow Cu$ electrode we can increase the reduction potential by increasing $[Cu^{2+}]$ and the temperature.   (   )

5- The electron transfer between an electrode and electroactive species becomes thermodynamically favorable when the fermi-level of the electrode is higher than the LUMO of the reactant [O].   (   )

6- The cathodic reaction rate becomes faster when the applied potential is made more negative.   (   )

7- If ($\propto = 0.3$) oxation is favored which means the oxidation current increases more rapidly with η.   (   )

8- The Tafel Slope is an intensive parameter depends on the area of the electrode surface.   (   )

9- The exchange current (I_o) is an extensive parameter.   (   )

10- Helmholtz double layer hypothesizes rigid layer of opposite charges.   (   )

PART (II) multiple choice questions (10 marks)

1) The process in which chemical change occurs on passing electricity is termed

    A) electrolysis   B) hydrolysis   C) Osmolysis   D) Faradlysis

2) The units of **(RT/F)** & **(αηF/RT)** respectively are

    A) V ; Am^{-2} B) V ; unitless   C) unitless ; V   D) unitless ; unitless

3) The standard free energy change ΔG^0 in kJ/mol for
    $Mg/Mg^{2+}//zn^{2+}/zn$ (E^0= + 1.61 V) equals

    A) -622   B) -311   C) -150.5   D) +150.5

4) The potential of hydrogen electrode in contact with a solution whose pH=10 equals(in V)

    A) 0.0951pH   B) -0.951pH   C) 0.951pH   D) 0.0951pH

5) E^0_{cell} for [Sn (s) | Sn^{2+} (1M) ‖ Ag^+ (1M) | Ag (s)] equals

    A) +1.82   B) -0.65   C) +0.65   D) +0.94

6) Volt (V) =

  A) J A s   B) J A^{-1} s^{-1} C) J A^{-1} s   D) J A s^{-1}

7) For the electrode: Pt|Fe^{3+}(0.1M) , Fe^{2+}(0.2M) calculate (E) at 25°C   **(E^0 = 0.771 V)**

  A) +0.375   B) -0.753   C) +0.753   D) +0.380

8) In order to find the exchang current (I_0) & the symmetry factor ($\propto$) we have to

  A) plot η (X) against I (Y)   B) plot η (Y) against Log I (X)

  B) plot Log η (X) against Log I (Y)   D) plot η (X) against Log I (Y)

9) we may obtain the standard potential of a galvanic cell from the equation of

  A) Nernst   B) Arrhenius

  B) Van't Hof   D) None of of them

10) The strongest Reducing agent from the following (Cr , Hg , Mg, Cl^-) is

  A) Cr   B) Mg   C) Cl^- D) Hg

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PART (III) Answer the following questions

1- Calculate the molar conductivity for 0.1M KCl (κ = 0.012896 Ω^{-1} cm^{-1}) ? **2marks**

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2- Calculate the mean activity coefficient and the mean ionic activity for 0.001 M NaCl ?   **2marks**

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3- For η = 10 mV , i = 0.62 mA through 2 cm^2 Pt electrode in H$^+$|H$_2$ (H$^+$ + e → ½ H$_2$)
, What will be i for η = 100 mV ; α = 0.5.

$$i = i_0 (e^{(1-\alpha)\eta F/RT} - e^{-\alpha\eta F/RT}).$$ **3 marks**
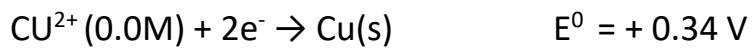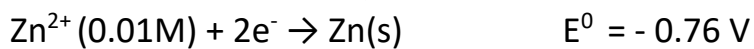
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4- An electrochemical galvanic cell based on the following two half reactions
Zn^{2+} (0.01M) + 2e$^-$ → Zn(s)   E^0 = - 0.76 V
CU^{2+} (0.0M) + 2e$^-$ → Cu(s)   E^0 = + 0.34 V
Calculate ΔG and the equilibrium constant K after identifying the anodic and cathodic
reaction and the cell overall reaction?   **3 marks**

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