

King Saud University	College of science	Chemistry Dept.	430 Chem.
MED EXAM (30 marks)			7-7-1444 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 (v) or false (X) questions (10marks)**

- 1- For the following reaction  $2\text{Au} + 4\text{Cl}_2 \rightarrow 2\text{AuCl}_4$   $\text{Cl}_2$  is the oxidizing agent ( )
- 2- In an electrochemical cell OXIDATION Occurs at the cathode ( )
- 3- Sodium (Na) can be obtained by the electrolysis of  $\text{NaCl}$ (fused). ( )
- 4- For  $\text{A}^{2+} + ne \rightarrow \text{A}$  electrode we can increase the reduction potential by decreasing  $[\text{A}^{2+}]$  from 0.12M to 0.06M. ( )
- 5- The electron transfer between an electrode and electroactive species becomes thermodynamically favorable when the fermi-level of the electrode is equal to the LUMO of the reactant [O]. ( )
- 6- The Anodic reaction rate becomes faster when the applied potential is made more negative. ( )
- 7- If ( $\alpha = 0.3$ ) oxidation is favored which means the oxidation current increases more rapidly with  $\eta$ . ( )
- 8- The value of Tafel Slope depends on the area of the electrode surface. ( )
- 9- The exchange current ( $i_0$ ) is an extensive parameter. ( )
- 10- Helmholtz double layer hypothesizes defused layer of opposite charges. ( )

**PART ( II ) multiple choice questions (10 marks)**

- 1)The cell in which electricity passes as a result of chemical change is termed  
A) electrolytic      B) hydrolytic      C) faradic      D) Voltaic
- 2)The units ( $\alpha\eta F/RT$ ) respectively are  
A)  $\text{Am}^{-2}$       B) V      C)  $\text{V}^{-1}$       D) unitless
- 3) If the standard free energy change  $\Delta G^0$  in kJ/mol for  $\text{Mg}/\text{Mg}^{2+}/\text{Zn}^{2+}/\text{Zn}$  equals to ( - 311 ), ( $E^0$  in V) equals  
A) -1.61      B) + 1.61      C) +3.205      D) -3.502
- 4) The potential of hydrogen electrode in contact with a solution whose  $[\text{H}^+] = 1 \times 10^{-10}\text{M}$  equals ( in V )  
A) 0.0951pH      B) -0.951pH      C) -0.951pH      D) 0.0951pH
- 5)  $E^0_{\text{cell}}$  for  $[\text{Sn}(s) | \text{Sn}^{2+}(1\text{M}) || \text{Ag}^+(1\text{M}) | \text{Ag}(s)]$  equals  
A) +1.82      B) -0.65      C) +0.65      D) +0.94
- 6)  $\text{J A}^{-1} \text{s}^{-1} =$   
A) V      B)  $\text{V}^{-1}$       C) V s      D)  $\text{V s}^{-1}$

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

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

8) In order to find the exchange current ( $i_0$ ) & the symmetry factor ( $\alpha$ ) we have to

- A) plot  $\eta$  (X) against I (Y)                      B) plot  $\eta$  (Y) against  $\text{Log I}$  (X)  
B) plot  $\text{Log } \eta$  (X) against  $\text{Log I}$  (Y)                      D) plot  $\eta$  (X) against  $\text{Log I}$  (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,  $\text{Cl}^-$  ) is

- A) Cr                                      B) Mg                                      C)  $\text{Cl}^-$                                       D) Hg

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**PART ( III ) Answer the following questions**

1- Calculate the molar conductivity for 0.1M KCl ( $\kappa = 0.012896 \Omega^{-1} \text{ cm}^{-1}$ ) ? **2marks**

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2- Calculate the mean activity coefficient for 0.001 M  $\text{MgCl}_2$ ?

**2marks**

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