

## Competitive Exams: Chemistry MCQs (Practice-Test 14 of 31)

1. Consider the following standard reduction potentials, half reaction  $E^{\circ}$ , V  
 $I_3^- (aq) + 2e^- \rightarrow 3I^- (aq)$  0.53  
 $Cr_3^+ (aq) + e^- \rightarrow Cr_2^+ (aq)$  -0.41
2. Calculate  $G^{\circ}$  (in kJ) for the following reaction at 25°C.
3.  $Cr_2^+ (aq) + I_3^- (aq) \rightarrow Cr_3^+ (aq) + I^- (aq)$
4. In which of the following reactions does the oxidation number of the sulfur atom NOT CHANGE?
  - a.  $3S^{2-} + 8H^+ + 2NO_3^-$  (nitrate ion)  $\rightarrow 2NO + 3S + 4H_2O$
  - b.  $2SO_2$  (sulfur dioxide) +  $O_2 \rightarrow 2SO_3$  (sulfur trioxide)
  - c.  $2H_2S + 3O_2 \rightarrow 2SO_2$  (sulfur dioxide) +  $2H_2O$
  - d.  $S_8 + 8O_2 \rightarrow 8SO_2$  (sulfur dioxide)
  - e.  $SO_2$  (sulfur dioxide) +  $H_2O \rightarrow H_2SO_3$  (sulfurous acid)
5. Which of the following reactions IS a reduction-oxidation reaction?
  - a.  $NH_3 (aq) + H_2O (l) \rightarrow NH_4^+ (aq) + OH^- (aq)$
  - b.  $Cu^{2+} (aq) + 4NH_3 (aq) \rightarrow Cu(NH_3)_4^{2+} (aq)$
  - c.  $AgF (s) \rightarrow Ag (aq) + F^- (aq)$
  - d.  $2Cu^+ (aq) \rightarrow Cu^{2+} (aq) + Cu (s)$
  - e.  $2NO_2$  (g, nitrogen dioxide)  $\rightarrow N_2O_4$  (g, dinitrogen tetroxide)
6. Which of the following statements explains why a definition of standard state conditions is needed in electrochemistry?
  - a. Cell potentials vary with concentration.
  - b. Cell potentials vary with temperature.
  - c. Cell potentials vary with partial pressures of gases.
  - d. Responses a and c are correct.
  - e. Responses a, b and c are all correct.

7. Consider the following reaction and standard cell potential,  $\text{Ni}^{2+}(\text{aq}) + 6\text{NH}_3(\text{aq}) \rightarrow \text{Ni}(\text{NH}_3)_6^{2+}(\text{aq})$ ,  $E^\circ = +0.25 \text{ V}$  Which of the following best describes what would happen in a solution that initially contains 1.0 M  $\text{Ni}^{2+}$ , 0.01 M  $\text{NH}_3$  and 6.0 M  $\text{Ni}(\text{NH}_3)_6^{2+}$  at 25°C (Assume that the number of moles of electrons transported in this reaction is equal to 2.)?
- The concentrations of both  $\text{Ni}^{2+}$  and  $\text{NH}_3$  would decrease and the concentration of  $\text{Ni}(\text{NH}_3)_6^{2+}$  would increase.
  - The concentrations of both  $\text{Ni}^{2+}$  and  $\text{NH}_3$  would increase and the concentration of  $\text{Ni}(\text{NH}_3)_6^{2+}$  would decrease.
  - The concentration of  $\text{Ni}(\text{NH}_3)_6^{2+}$  would decrease, the concentration of  $\text{NH}_3$  would increase and the concentration of  $\text{Ni}^{2+}$  would remain the same.
  - The concentrations of  $\text{Ni}^{2+}$ ,  $\text{NH}_3$  and  $\text{Ni}(\text{NH}_3)_6^{2+}$  would all remain the same.
  - It is impossible to tell.
8. Consider the following standard reduction potentials, half reaction  $E^\circ, \text{V}$   $\text{Ca}^{2+} + 2e^- \rightarrow \text{Ca} -2.76$   $\text{Pb}^{2+} + 2e^- \rightarrow \text{Pb} -0.13$   $\text{Cu}^{2+} + 2e^- \rightarrow \text{Cu} + 0.34$   $\text{Hg}_2^{2+} + 2e^- \rightarrow \text{Hg} + 0.80$   $\text{Pt}^{2+} + 2e^- \rightarrow \text{Pt} + 1.20$
9. Which of the following metals is the strongest REDUCING AGENT?
- Ca
  - Pb
  - Cu
  - Hg
  - Pt
10. Consider the following standard reduction potentials, half reaction  $E^\circ, \text{V}$   $\text{Fe}^{2+} + 2e^- \rightarrow \text{Fe} -0.4090$ ,  $\text{Ag}^+ + e^- \rightarrow \text{Ag} 0.7996$ ,  $\text{O}_2 + 2\text{H}_2\text{O} + 4e^- \rightarrow 4\text{OH}^- + 0.4010$
- N/A
  - N/A
  - N/A
  - N/A
11. Which of the following statements best describes what would happen if a block of silver metal were connected to a buried iron pipe via a wire (i.e.. as in a cathodic protection process).

- a. The silver metal would corrode, a current would be produced in the wire, and  $O_2$  would be reduced on the surface of the iron pipe.
  - b. The silver metal would corrode, a current would be produced in the wire, and  $Fe^{2+}$  would be reduced on the surface of the iron pipe.
  - c. The iron pipe would corrode, a current would be produced in the wire, and  $Ag^+$  would be reduced on the surface of the silver metal.
  - d. The iron pipe would corrode, no current would be produced in the wire, and  $O_2$  would be reduced on the surface of the iron pipe.
  - e. Neither the iron pipe nor the silver metal would be oxidized but  $O_2$  would be reduced.
12. Consider the following reduction-oxidation reaction,  $Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$ ,  $E_o = + 1.10 V$  When the components of the two half-reactions involved in this reaction are correctly separated, this reaction can be used to do electrical work and the change in internal energy of the system decreases. Which of the following statements best describes what will happen if  $Zn(s)$  is added to a solution containing  $Cu^{2+}(aq)$  at constant volume at  $25^\circ C$ ?
- a. The reaction will occur and the temperature of the solution will increase.
  - b. The reaction will occur and the temperature of the solution will decrease.
  - c. The reaction will occur and the temperature of the solution will remain the same.
  - d. The reaction will not occur and the temperature of the solution will remain the same.
  - e. The reaction will not occur but the temperature of the solution will increase.
13. Using the following standard reduction potentials, half reaction  $E_o, V$   $Cl_2 + 2e^- \rightarrow 2Cl^- + 1.36$   $Cr^{3+} + 3e^- \rightarrow Cr - 0.74$
14. calculate  $G_o$  (in kJ) for the reaction,  $3Cl_2 + 2Cr \rightarrow 6Cl^- + 2Cr^{3+}$  + Use the following information to answer the next four (4) questions.
- a. N/A
  - b. N/A
  - c. N/A
  - d. N/A