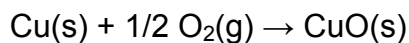


Practice Exam 3

1. Which of the following represents an increase in entropy?

- a. freezing of water
- b. boiling of water
- c. crystallization of salt from a supersaturated solution
- d. the reaction $2\text{NO}(\text{g}) \rightarrow \text{N}_2\text{O}_2(\text{g})$
- e. the reaction $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$

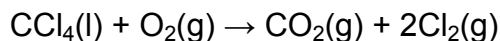
2. Calculate the standard entropy change for the following reaction,



given that $S^\circ[\text{Cu}(\text{s})] = 33.15 \text{ J/K}\cdot\text{mol}$, $S^\circ[\text{O}_2(\text{g})] = 205.14 \text{ J/K}\cdot\text{mol}$, and $S^\circ[\text{CuO}(\text{s})] = 42.63 \text{ J/K}\cdot\text{mol}$

- a. 195.66 J/K
- b. 93.09 J/K
- c. -45.28 J/K
- d. -93.09 J/K
- e. 195.66 J/K

3. Calculate the standard entropy change for the following reaction,



given that $S^\circ[\text{CCl}_4(\text{l})] = 216.40 \text{ J/K}\cdot\text{mol}$, $S^\circ[\text{CO}_2(\text{g})] = 213.74 \text{ J/K}\cdot\text{mol}$, $S^\circ[\text{O}_2(\text{g})] = 205.14 \text{ J/K}\cdot\text{mol}$, and $S^\circ[\text{Cl}_2(\text{g})] = 223.07 \text{ J/K}\cdot\text{mol}$.

- a. -25.78 J/K
- b. -15.27 J/K
- c. +1.93 J/K
- d. 238.34 J/K
- e. 317.42 J/K

4. In which of the following reactions do you expect to have the smallest entropy change?

- a. $2\text{HF}(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g}) + \text{F}_2(\text{g})$
- b. $2\text{Fe}(\text{s}) + 3/2 \text{O}_2(\text{g}) \rightarrow \text{Fe}_2\text{O}_3(\text{s})$
- c. $\text{CH}_4(\text{g}) + 2 \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
- d. $\text{Cu}(\text{s}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{CuO}(\text{s})$
- e. $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g})$

5. If ΔG is positive at all temperatures, then ΔS is _____ and ΔH is _____.

- a. positive, negative
- b. negative, positive
- c. small, zero
- d. large, zero
- e. large, small

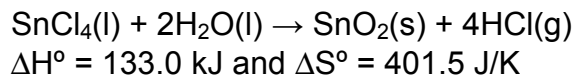
6. If ΔH and ΔS are both negative or positive, then ΔG has a _____ sign.

- a. positive
- b. negative
- c. variable
- d. large
- e. no

7. At what temperature would a given reaction become spontaneous if $\Delta H = +119 \text{ kJ}$ and $\Delta S = +263 \text{ J/K}$?

- a. 452 K
- b. 2210 K
- c. 382 K
- d. 2.21 K
- e. 363 K

8. Given the following information, calculate ΔG° for the reaction below at 25 °C:



- a. -252.6 kJ
- b. -13.4 kJ
- c. 13.4 kJ
- d. 122.9 kJ
- e. 252.6 kJ

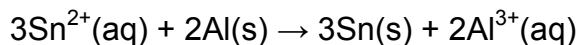
9. For the process at 25 °C $\text{I}_2(\text{g})$ to $\text{I}_2(\text{s})$, what are the signs of ΔG , ΔH , and ΔS ?

	ΔG	ΔH	ΔS
a.	+	-	-
b.	-	-	-
c.	-	+	+
d.	-	-	+
e.	+	+	+

10. All of the following have $\Delta G^\circ_f = 0$ **EXCEPT**

- a. $\text{O}_2(\text{g})$
- b. $\text{Br}_2(\text{g})$
- c. $\text{H}_2(\text{g})$
- d. $\text{Ca}(\text{s})$
- e. $\text{Hg}(\text{l})$

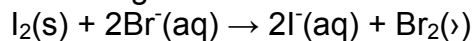
11. Consider an electrochemical cell where the following reaction takes place:



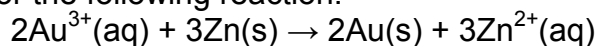
Which of the following is the correct cell notation for this cell?

- a. $\text{Al} \mid \text{Al}^{3+} \parallel \text{Sn}^{2+} \mid \text{Sn}$
- b. $\text{Al}^{3+} \mid \text{Al} \parallel \text{Sn} \mid \text{Sn}^{2+}$
- c. $\text{Sn} \mid \text{Sn}^{2+} \parallel \text{Al}^{3+} \mid \text{Al}$
- d. $\text{Sn} \mid \text{Al}^{3+} \parallel \text{Al} \mid \text{Sn}^{2+}$
- e. $\text{Al} \mid \text{Sn}^{2+} \parallel \text{Sn} \mid \text{Al}^{3+}$

12. Calculate ΔG for the following reaction:



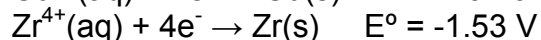
- a. +105 kJ
 - b. -105 kJ
 - c. +312 kJ
 - d. +52 kJ
 - e. -312 kJ
13. Calculate ΔG for the following reaction:



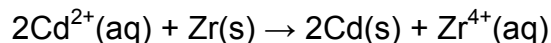
- a. +1310 kJ
 - b. +655 kJ
 - c. -437 kJ
 - d. -1310 kJ
 - e. -655 kJ
14. Using data from the reduction potential table and the reaction
- $$2\text{Ag}(\text{s}) + \text{Pt}^{2+}(\text{aq}) \rightarrow \text{Pt}(\text{s}) + 2\text{Ag}^+(\text{aq}) \quad E^\circ = 0.38 \text{ V}$$
- calculate the standard reduction potential of the half-reaction
- $$\text{Pt}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Pt}(\text{s})$$

- a. -1.18 V
 - b. -0.40 V
 - c. 0.40 V
 - d. 1.18 V
 - e. 2.00 V
15. Using data from the reduction potential table, predict which of the following is the best reducing agent.
- a. Ag^+
 - b. Al
 - c. F^-
 - d. Sn^{2+}
 - e. F_2

16. Given the following two half-reactions

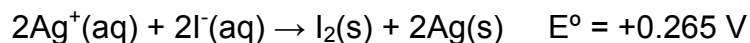


determine E° and the spontaneity of the following reaction:



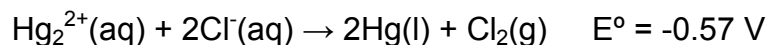
- a. +1.13 V and not spontaneous
- b. +1.13 V and spontaneous
- c. -1.13 V and not spontaneous
- d. -1.13 V and spontaneous
- e. -1.93 V and not spontaneous

17. What is the equilibrium constant for the following reaction at 298 K?



- a. 2.99×10^4
- b. 9.04×10^8
- c. 7.73×10^3
- d. 87.9
- e. 1.60×10^7

18. What is the equilibrium constant for the following reaction at 37°C?



- a. 5.1×10^{-20}
- b. 1.7×10^{-43}
- c. 2.1×10^{28}
- d. 2.9×10^{-19}
- e. 2.0×10^{19}

19. How many coulombs of charge are required to deposit 1.00 g Ag from a solution of $\text{Ag}^+(\text{aq})$?
- a. 9.27×10^{-3}
 - b. 1.00
 - c. 894
 - d. 1230
 - e. 1790
20. How much platinum would be produced by passing a 2.0 ampere current through a solution of Pt^{2+} for 30. minutes?
- a. 15 g
 - b. 7.3 g
 - c. 3.6 g
 - d. 1.8 g
 - e. 0.91 g