

CH 123
General Chemistry

Exam 4
August 6, 2002

Name: _____
(please print)

SSN: * * * - * * - _____
(last 4 digits)

Each question is worth 1 point.

Circle your answer clearly, otherwise no credit will be given.

Circle only one answer. If you circle two or more, you will receive no credit.

1. Which property of metals decreases as one moves down a group in the periodic chart?
 - a. atomic radius
 - b. ionic radius
 - c. ionization energy
 - d. atomic mass
 - e. atomic number

2. The formula for the hydroxopentaaquairon(III) ion is
 - a. $[\text{Fe}(\text{OH})(\text{H}_2\text{O})_5]^{3+}$
 - b. $[\text{Fe}(\text{OH})(\text{H}_2\text{O})_5]^{2+}$.
 - c. $[\text{Fe}(\text{OH})_5]^{3+}(\text{aq})$.
 - d. $[(\text{H}_2\text{O})_5\text{Fe}](\text{OH})_3$.
 - e. $[\text{Fe}^+{}_5 \text{H}_2\text{O}](\text{OH})_3$.

3. The hydronium ion concentration of a 0.00100 acetic acid solution is 1.34×10^{-4} M. The pH of the solution is
 - a. 3.00.
 - b. 3.40.
 - c. 3.87.
 - d. 4.00.
 - e. 4.13.

4. A strong acid and weak acid respectively are
 - a. HF and HCl.
 - b. H_2SO_4 and H_2SO_3 .
 - c. H_3PO_3 and H_3PO_4 .
 - d. HCl and HBr.
 - e. CH_3COOH and $\text{CH}_3\text{CH}_2\text{COOH}$.

5. Which of the elements indicated below would be classed as transition elements?

- a. $1s^2 2s^2 2p^5$
- b. $1s^2 2s^2 2p^6 3s^2 3p^6$
- c. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$
- d. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$
- e. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$

6. Calculate the standard Gibbs free energy change for the reaction:
 $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{Fe}^{3+} + 6\text{Cl}^-$
given the following electrode potentials:

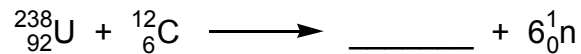
$\text{Fe}^{3+} + 3\text{e}^- \rightarrow \text{Fe}$	<u>E°, volts</u>
$\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$	-0.036
	1.358

- a. 765 kJ
 - b. -269 kJ
 - c. -404 kJ
 - d. -765 kJ
 - e. -807 kJ
7. A cell consists of a magnesium electrode immersed in a solution of magnesium chloride and a silver electrode immersed in a solution of silver nitrate. The two half cells are connected by means of a salt bridge. It is possible to increase the voltage of the cell by
- a. addition of sodium chloride to both half cells.
 - b. increasing the Mg^{2+} concentration and decreasing the Ag^+ concentration.
 - c. increasing the size of the Mg electrode and decreasing the size of the Ag electrode.
 - d. decreasing the size of the Mg electrode and increasing the size of the Ag electrode.
 - e. decreasing the Mg^{2+} concentration.

8. In a blast furnace, iron oxides are reduced by
- CaCO_3
 - CO
 - CO_2
 - CaSO_4
 - CS_2
9. Copper ores are enriched to increase the percentage of copper in the mixture by a process called
- roasting.
 - flotation.
 - pyrometallurgy.
 - hydrometallurgy.
 - ganguation.
10. Which of the following occur as native ores?
- Al
 - K
 - Au
- 1 only
 - 2 only
 - 3 only
 - 1 and 2 only
 - 1, 2, and 3
11. How many isomers are possible for the square planar complex, $[\text{Pt}(\text{NH}_3)_3\text{Br}]\text{Br}$?
- 1
 - 2
 - 3
 - 4
 - 6

12. In which compound is cobalt in the highest oxidation state?
- $K_4[Co(CN)_6]$
 - $Co_2(CO)_8$
 - $[Co(H_2O)_6]Cl_2$
 - $[Co(NH_3)_4Br_2]Cl$
 - $Na_2[CoCl_4]$
13. The total number of isomers possible for the octahedral complex $[Co(NH_3)_3Cl_3]$ is
- 1
 - 2
 - 3
 - 4
 - 5
14. How many optical isomers do the cis and trans isomers of $[Co(en)_2Cl_2]^+$ have?
- cis, 0 and trans, 2
 - cis, 2 and trans, 0
 - cis, 2 and trans, 2
 - cis, 0 and trans, 0
 - cis, 0 and trans, 1
15. The isotope ${}^{53}_{24}Cr$ is produced by the β decay of:
- ${}^{53}_{25}Mn$
 - ${}^{54}_{24}Cr$
 - ${}^{52}_{24}Cr$
 - ${}^{53}_{23}V$
 - ${}^{54}_{24}V$

16. The mass number of a nucleus which emits a positron will
- remain the same.
 - increase by one unit.
 - increase by two units.
 - decrease by one unit.
 - decrease by two units.
17. Complete the following nuclear reaction:



- ${}_{99}^{249}\text{Es}$
 - ${}_{98}^{239}\text{Cf}$
 - ${}_{92}^{244}\text{U}$
 - ${}_{98}^{244}\text{Cf}$
 - ${}_{104}^{250}\text{Rf}$
18. The half-life of iodine-131 is 8.0 days. If you have 25.0 grams of iodine-131, how much will remain after 40 days?
20. g
 - 5.0 g
 - 3.1 g
 - 0.78 g
 - 0.039 g
19. Of these chemists, which one did not play an active role in our current understanding of nuclear chemistry?
- Bohr
 - Meitner
 - Einstein
 - Boyle
 - Fermi

20. Artificial (synthetic) radioactive isotopes of many elements used in medical treatments

1. have short half-lives.
 2. are made in fusion reactions.
 3. emit γ radiation.
- a. 1 only
 - b. 2 only
 - c. 3 only
 - d. 1 and 2 only
 - e. 1 and 3 only