

NAME: _____ SECTION #: _____
Chemistry 111 EXAM 2-Fall 2013 10/25/2013/12:00PM/Odago

Fill in your A00 number and name correctly on the scantron. Attempt all the questions and fill in the bubbles with your answers.

Use the speed of light $c = 3.00 \times 10^8$ m/s, and Planck's constant $h = 6.63 \times 10^{-34}$ J·s where necessary. The periodic table, and the solubility table are attached.

- What is the percentage by mass of sulfur in copper(I) sulfide, Cu_2S ?
 - 20.1%
 - 28.4%
 - 38.4%
 - 46.7%
 - 59.4%
- When solutions of barium chloride and sodium sulfate are mixed, the spectator ions in the resulting reaction are
 - only Ba^{2+}
 - only SO_4^{2-}
 - only Na^+
 - only Cl^-
 - both Na^+ and Cl^-
- What is the net ionic equation for the neutralization of sulfuric acid with potassium hydroxide?
 - $\text{H}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l)$
 - $2\text{H}^+(aq) + 2\text{KOH}(aq) \rightarrow 2\text{H}_2\text{O}(l) + 2\text{K}^+(aq)$
 - $\text{H}_2\text{SO}_4(aq) + 2\text{KOH}(aq) \rightarrow 2\text{H}_2\text{O}(l) + \text{K}_2\text{SO}_4(aq)$
 - $\text{H}_2\text{SO}_4(aq) + 2\text{OH}^-(aq) \rightarrow 2\text{H}_2\text{O}(l) + \text{SO}_4^{2-}(aq)$
 - $\text{H}_2\text{S}(aq) + 2\text{KOH}(aq) \rightarrow 2\text{H}_2\text{O}(l) + \text{K}_2\text{S}(aq)$
- What is the balanced oxidation half-reaction for the following reaction?
 $\text{Cu}^{2+}(aq) + \text{Fe}(s) \rightarrow \text{Cu}(s) + \text{Fe}^{2+}(aq)$
 - $\text{Cu}^{2+}(aq) + 2e^- \rightarrow \text{Cu}(s)$
 - $\text{Fe}^{2+}(aq) + 2e^- \rightarrow \text{Fe}(s)$
 - $\text{Fe}(s) \rightarrow \text{Fe}^{2+}(aq) + 2e^-$
 - $\text{Cu}(s) + 2e^- \rightarrow \text{Cu}(s)$
 - $\text{Cu}(s) \rightarrow \text{Cu}^{2+}(aq) + 2e^-$
- What is the oxidation number of P in $\text{NH}_4\text{H}_2\text{PO}_4$?
 - 3
 - 0
 - +1
 - +3
 - +5

6. All of the following reactions are described as decomposition reactions except
- $\text{CH}_4(g) + \text{Cl}_2(g) \rightarrow \text{CH}_3\text{Cl}(g) + \text{HCl}(g)$
 - $2\text{H}_2\text{O}(g) \rightarrow 2\text{H}_2(g) + \text{O}_2(g)$
 - $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$
 - $\text{PCl}_5(g) \rightarrow \text{PCl}_3(g) + \text{Cl}_2(g)$
 - $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}(s) \rightarrow \text{BaCl}_2(s) + 2\text{H}_2\text{O}(g)$
7. In order to prepare a standard 1.00 M solution of oxalic acid from $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ (127.07 g/mol), 8.260 g of oxalic acid dihydrate should be dissolved in
- 65.0 cm³ of water
 - 65.0 g of water
 - 56.740 g of water
 - enough water to make 65.0 g of solution
 - enough water to make 65.0 mL of solution
8. The reaction of HCl with NaOH is represented by the equation
- $$\text{HCl}(aq) + \text{NaOH}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$$
- What volume of 0.252 M HCl is required to titrate 45.1 mL of 0.424 M NaOH?
- 45.1 mL
 - 26.8 mL
 - 4.82 mL
 - 75.9 mL
 - 3.97 mL
9. The relationship among the speed, wavelength, and frequency of electromagnetic radiation in vacuum is
- $\nu = \frac{c}{\lambda}$
 - $\nu = \frac{\lambda}{c}$
 - $c = \nu + \lambda$
 - $c = \frac{\lambda}{\nu}$
 - $\lambda = c\nu$
10. What is the wavelength of a photon having a frequency of 3.00×10^{15} Hz?
- ($c = 3.00 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J·s)
- 100 nm
 - 1.99×10^{-9} nm
 - 0.596 nm
 - 6.00×10^{-32} nm
 - 9.99×10^{-3} nm

11. A photon of blue light has a _____ frequency and a _____ wavelength than a photon of red light.
- lower, longer
 - higher, longer
 - lower, lower
 - higher, shorter
 - lower, shorter
12. What is the wavelength of a photon that has an energy of 4.28×10^{-18} J?
($c = 3.00 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J • s)
- 1.28×10^0 nm
 - 6.46×10^{15} nm
 - 46.4 nm
 - 4.28×10^{-9} nm
 - 1.00×10^9 nm
13. Which type of electromagnetic radiation has the lowest frequency?
- ultraviolet
 - infrared
 - microwaves
 - radio waves
 - visible
14. When a hydrogen electron makes a transition from $n = 3$ to $n = 1$, which of the following statements is(are) true?
- Energy is emitted.
 - Energy is absorbed.
 - The electron loses energy.
 - The electron gains energy.
 - The electron cannot make this transition.
- I, IV
 - I, III
 - II, III
 - II, IV
 - V
15. Which quantum number distinguishes the different shapes of the orbitals?
- n
 - l
 - m_s
 - m_l
 - any of these

16. Which of the following sets of quantum numbers (n, l, m_l, m_s) refers to a 3d orbital?

- a) 2 1 0 $+\frac{1}{2}$
- b) 3 2 2 $+\frac{1}{2}$
- c) 4 2 -2 $+\frac{1}{2}$
- d) 4 3 2 $+\frac{1}{2}$
- e) 5 4 3 $+\frac{1}{2}$






17. Which of the following combinations of quantum numbers is permissible?

- a) $n = 3, l = 3, m_l = 1, m_s = -\frac{1}{2}$
- b) $n = 4, l = 3, m_l = 4, m_s = -\frac{1}{2}$
- c) $n = 3, l = 2, m_l = 1, m_s = +\frac{1}{2}$
- d) $n = 1, l = 2, m_l = 0, m_s = -\frac{1}{2}$
- e) $n = 2, l = 1, m_l = -1, m_s = 0$

18. An orbital with the quantum numbers $n = 5, l = 2, m_l = 2$ may be found in which subshell?

- a) 5s
- b) 5p
- c) 5d
- d) 5f
- e) 5g

19. Which of the following is a representation of a 2p orbital?

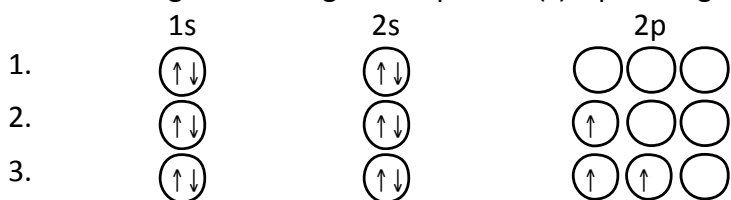
- a) 
- b) 
- c) 
- d) 
- e) 

20. Which of the following have 10 electrons in the d orbitals?

- a) Mn
- b) Fe
- c) Cu
- d) Zn
- e) Both Cu and Zn

21. The total number of electrons in p orbitals in a ground-state nickel atom is
- 6
 - 12
 - 18
 - 24
 - 30
22. An element that has the same valence-shell configuration as tin is
- antimony
 - tellurium
 - indium
 - selenium
 - germanium
23. How many unpaired electrons does Fe have in its d orbitals in its ground state electron configuration.
- 1 electron
 - 2 electrons
 - 3 electrons
 - 4 electrons
 - none of these
24. What is the ground-state electron configuration of Cr?
- $[\text{Ar}]3d^44s^2$
 - $[\text{Ar}]3d^54s^1$
 - $[\text{Ar}]3d^8$
 - $[\text{Ar}]3d^24s^2$
 - $[\text{Ar}]3d^44s^1$
25. The maximum number of electrons that can be accommodated in an f subshell is
- 1
 - 2
 - 14
 - 6
 - 10
26. All of the following species are isoelectronic except
- N^{3-}
 - F^-
 - Ne
 - O^-
 - Mg^{2+}

27. Which of the following orbital diagrams represent(s) a paramagnetic atom?



- a) 1 only
- b) 2 only
- c) 3 only
- d) 1 and 2 only
- e) 2 and 3 only

28. The ground-state electron configuration of a Cr^{2+} ion is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4$. Therefore, Cr^{2+} is

- a) diamagnetic
- b) paramagnetic with one unpaired electron
- c) paramagnetic with five unpaired electrons
- d) paramagnetic with four unpaired electrons
- e) paramagnetic with three unpaired electrons

29. A section of the periodic table with all identification features removed is shown below.

V	W	X
	Y	Z

Which element has the smallest atomic radius?

- a) V
 - b) W
 - c) X
 - d) Y
 - e) Z
30. What is the maximum number of electrons that can occupy one p orbital?
- a) 1
 - b) 2
 - c) 6
 - d) 10
 - e) 14

END