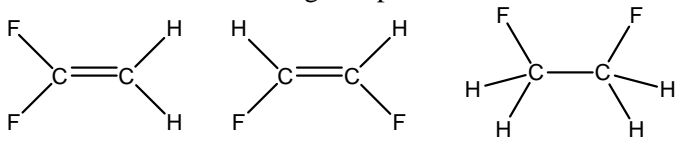


Fall 2005 - CHEM 210 - Final Exam

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. What is the mass percent of sodium acetate in a solution prepared by dissolving 25.0 g of sodium acetate in 150.0 g of water?
A) 0.167 % B) 83.3% C) 16.7 % D) 0.143 % E) 14.3 %
- _____ 2. How many electrons are in a calcium ion?
A) 22 B) 2 C) 18 D) 22 E) 20
- _____ 3. For which of the following compounds do *cis*- and *trans*- isomers exist?
- 
- (1) (2) (3)
- A) 3 only B) 1 and 2 C) 2 and 3 D) 2 only E) 1 only
- _____ 4. Which one of the following substances will exhibit dipole-dipole intermolecular forces?
A) H₂CO B) CO₂ C) Kr D) CCl₄ E) N₂
- _____ 5. How many neutrons are in an atom of the chromium-53 isotope?
A) 24 B) 52 C) 53 D) 29 E) 77
- _____ 6. A rectangular box has dimensions of 20.0 cm × 15.0 cm × 8.00 cm. Calculate the volume of the box in liters.
A) 2.40 × 10⁻³ L B) 2.40 L C) 4.30 × 10⁻³ L D) 2.40 × 10³ L E) 43.0 L
- _____ 7. What is the volume of a piece of aluminum with a mass of 36.8 g? (D_{Al} = 2.71 g/cm³)
A) 99.7 cm³ C) 13.6 cm³ E) none of these
B) 2.71 cm³ D) 0.0736 cm³
- _____ 8. How many protons and electrons are in a nitride ion?
A) 3 protons, 0 electrons. C) 10 protons, 10 electrons E) 10 protons, 7 electrons
B) 7 protons, 7 electrons D) 7 protons, 10 electrons

- ____ 9. What is the percent by mass of N in ammonium sulfite?
A) 24.1 % B) 12.1% C) 14.3 % D) 21.2% E) 33.5 %
- ____ 10. What is the shape of the BrCl_3 molecule?
A) square planar C) trigonal pyramidal E) tetrahedral
B) t-shaped D) see-saw
- ____ 11. Use VSEPR theory to predict the SHAPE of SeI_2
A) bent C) linear E) trigonal planar
B) tetrahedral D) perpendicular
- ____ 12. Which of the following represents the largest mass?
A) 1.5×10^{-8} Gg C) 3.0×10^9 pg E) 1.0 g
B) 540 cg D) 0.030 kg
- ____ 13. How many orbitals could have the designation 5g?
A) 5 B) 11 C) 1 D) 9 E) 8
- ____ 14. What is the electron configuration for the As^{5+} ion?
A) $[\text{Ar}]4s^24d^8$ C) $[\text{Ar}]4s^23d^8$ E) $[\text{Ar}]4s^23d^{10}4p^3$
B) $[\text{Ar}]3d^{10}$ D) $[\text{Xe}]$
- ____ 15. Which of the following transitions in a hydrogen atom would **emit** the highest energy photon?
A) $n = 2$ to $n = 1$ C) $n = 2$ to $n = 8$ E) $n = 3$ to $n = 2$
B) $n = 6$ to $n = 3$ D) $n = 1$ to $n = 2$
- ____ 16. Write the full set of 4 quantum numbers for the outermost electron in Krypton (Kr).
A) $n = 4$ $l = 6$ $m_l = 1$ $m_s = -\frac{1}{2}$
B) $n = 4$ $l = 2$ $m_l = -1$ $m_s = +\frac{1}{2}$
C) $n = 4$ $l = 1$ $m_l = 1$ $m_s = -\frac{1}{2}$
D) $n = 4$ $l = 2$ $m_l = 1$ $m_s = -\frac{1}{2}$
E) $n = 4$ $l = 1$ $m_l = -1$ $m_s = +\frac{1}{2}$

- ____ 17. What is the correct formula for a binary compound that contains magnesium and bromine?
A) MgBr B) Mg₂Br C) MgBr₂ D) Mg₂Br₂ E) Mg₂Br₃
- ____ 18. How many oxygen atoms are there in 1.50 mol of oxygen gas at standard state?
A) 1.81×10^{24} atoms C) 2.89×10^{25} atoms E) 5.78×10^{25} atoms
B) 2.82×10^{22} atoms D) 9.03×10^{23} atoms
- ____ 19. Sodium oxalate has the chemical formula, Na₂C₂O₄. Based on this information, the formula for iron(III) oxalate is _____.
A) Fe₂(C₂O₄)₃ B) FeC₂O₄ C) Fe₃(C₂O₄)₂ D) Fe(C₂O₄)₂ E) Fe(C₂O₄)₂
- ____ 20. Which of the following particles has the SMALLEST radius?
A) K⁺ B) Se²⁻ C) Ca D) Ca²⁺ E) K
- ____ 21. A 50.0 L cylinder of He has a pressure of 151 atm at 298 K. What mass of He is inside the cylinder? ($R = 0.08206 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K}$)
A) 992 g B) 24.9 g C) 1.24×10^3 g D) 309 g E) 1.30×10^{-2} g
- ____ 22. An atom has the following ionization energies (all in kJ/mol):
1st: 800 2nd: 2 426 3rd: 3 659 4th: 25 020 5th: 32 820
What is the most likely charge for an ion of this element?
A) +5 B) +2 C) +1 D) +3 E) +4
- ____ 23. The lid is tightly sealed on a rigid (constant volume) flask containing O₂ at 15°C and 0.723 atm. If the flask is heated to 55°C, what is the pressure in the flask?
A) 0.465 atm B) 0.723 atm C) 0.230 atm D) 0.635 atm E) 0.823 atm
- ____ 24. What is the oxidation state of Cl in chloric acid, HClO₃ ?
A) +1 B) +3 C) +5 D) -1 E) 0
- ____ 25. What is mass (in mg) of 1.45×10^{21} atoms of iron?
A) 8.09×10^{25} mg C) 4.88×10^{49} mg E) 7.44 mg
B) 0.241 mg D) 134 mg

- _____ 26. What is the result of the following expression expressed to the appropriate number of significant digits?
$$\frac{(6.8 + 8.3)}{289.4}$$
- A) 0.0522 B) 0.05 C) 0.052 D) 0.05218 E) 0.52
- _____ 27. What is the ground state electron configuration for a seaborgium (element 106) atom?
- A) $[\text{Rn}]7s^26d^4$ C) $[\text{Rn}]7s^25f^{14}6d^4$ E) $[\text{Rn}]7s^25f^{14}6d^3$
B) $[\text{Rn}]7s^26f^{14}5d^4$ D) $[\text{Rn}]7s^27f^{14}7d^4$
- _____ 28. The radius of a helium atom is 31 pm. What is the radius in meters?
- A) 3.1×10^{-14} m C) 3.1×10^{-8} m E) 3.1×10^{-12} m
B) 3.1×10^{-11} m D) 3.1×10^{-9} m
- _____ 29. A green laser pointer emits 532 nm light. What is the frequency of this radiation?
- A) 1.77×10^{-6} s⁻¹ C) 1.77×10^{-15} s⁻¹ E) 5.64×10^5 s⁻¹
B) 5.64×10^{14} s⁻¹ D) 1.59×10^2 s⁻¹
- _____ 30. What is the correct name for CoBr_2 ?
- A) cobalt dibromide C) cobalt (I) bromide E) cobalt(II) dibromate
B) monocobalt dibromate D) cobalt(II) bromide

**Fall 2005 - CHEM 210 - Final Exam
Answer Section**

MULTIPLE CHOICE

1. ANS: E
2. ANS: C
3. ANS: D
4. ANS: A
5. ANS: D
6. ANS: B
7. ANS: C
8. ANS: D
9. ANS: A
10. ANS: B
11. ANS: A
12. ANS: D
13. ANS: D
14. ANS: B
15. ANS: A
16. ANS: C
17. ANS: C
18. ANS: A
19. ANS: A
20. ANS: D
21. ANS: C
22. ANS: D
23. ANS: E
24. ANS: C
25. ANS: D
26. ANS: A
27. ANS: C
28. ANS: B
29. ANS: B
30. ANS: D