

**Sample Exam 1 – Chapters 1-3**  
**SHOW ALL WORK FOR FULL CREDIT!!!!**

1. Give the symbol for each of the following elements:
  - a. The semimetal in group IIIA. \_\_\_\_\_
  - b. The noble gas in period 6. \_\_\_\_\_
  - c. The halogen touching two semimetals. \_\_\_\_\_
  
2. A piece of turquoise is a blue-green solid; it has a density of  $0.0957 \text{ lb/in}^3$  and a mass of 2.5 g. Calculate the volume of the turquoise in mL.
  
  
  
  
  
  
  
  
  
  
3. Venus has a surface temperature of 730 K. What is this temperature in degrees Fahrenheit?
  
  
  
  
  
  
  
  
  
  
4. The following are examples of chemical changes *except*:
  - a. Solid iron forms rust when combined with water and oxygen.
  - b. Butane burns with air at  $1970^\circ\text{C}$ .
  - c. Sodium bicarbonate reacts with vinegar to form carbon dioxide gas.
  - d. Sodium chloride dissolves in water at room temperature.
  
  
  
  
  
  
  
  
  
  
5. What is the correct term for a gas turning into a solid? \_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
6. What is the physical state for elemental chlorine,  $\text{Cl}_2$ , at room temperature and normal pressure?
  - a. solid
  - b. liquid
  - c. gas
  
  
  
  
  
  
  
  
  
  
7. An oxygen molecule travels at 975 mph at room temperature. What is the de Broglie wavelength, in m, for an oxygen molecule if the mass of one oxygen molecule is  $5.31 \times 10^{-23} \text{ g}$ ?  
(1 mi = 1.6093 km)
  
  
  
  
  
  
  
  
  
  
8. Calculate the mass in grams of  $4.73 \times 10^{25}$  formula units of calcium phosphate,  $\text{Ca}_3(\text{PO}_4)_2$ .



16. Match the scientist to their discovery

Dalton

JJ Thomson

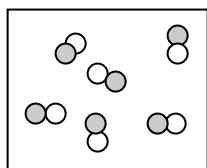
Rutherford

\_\_\_\_\_ a. Identified the atom as a sphere of mainly positive charge with negatively charged particles dispersed throughout.

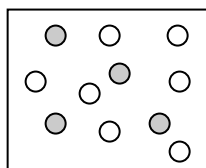
\_\_\_\_\_ b. An element is composed very tiny particles that are indivisible called atoms.

\_\_\_\_\_ c. The atom consists of a tiny, dense, positively charged nucleus where nearly all of the mass resides.

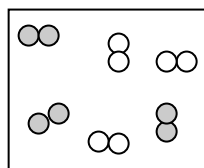
17. If white and grey spheres represent atoms of different elements, which represents a mixture of diatomic elements?



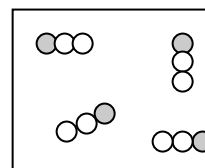
a



b



c



d

18. What is the symbol of the atom with the following short-hand electron configurations?

a.  $[\text{Kr}] 5s^2 4d^{10} 5p^2$  \_\_\_\_\_

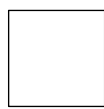
b.  $[\text{Ar}] 4s^1 3d^{10}$  \_\_\_\_\_

c.  $[\text{Xe}] 6s^1$  \_\_\_\_\_

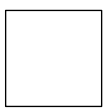
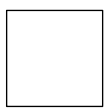
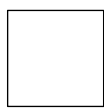
19. Correctly complete the orbital filling diagram for a neutral aluminum atom:



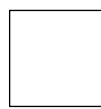
1s



2s



2p



3s



3p

20. Write the full electron configuration from the ground state for the following:

a. Se \_\_\_\_\_

b. V \_\_\_\_\_

c.  $\text{Ni}^{2+}$  \_\_\_\_\_

21. Which set of quantum numbers is **NOT** allowed?

c.  $n = 4, l = 2, m_l = 2, m_s = -\frac{1}{2}$

d.  $n = 2, l = 1, m_l = 0, m_s = -\frac{1}{2}$

e.  $n = 3, l = 2, m_l = -3, m_s = -\frac{1}{2}$

f.  $n = 5, l = 0, m_l = 0, m_s = +\frac{1}{2}$

22. When  $n=5$  and  $l = 3$ , what are the possible values for  $m_l$ ? \_\_\_\_\_
23. Which quantum number represents the shape of an atomic orbital?  
a.  $n$                                       b.  $l$                                       c.  $m_l$                                       d.  $m_s$
24. Which one of the following alkali metal ions has the largest atomic radius?  
a.  $Rb^+$                                       b.  $K^+$                                       c.  $Na^+$                                       d.  $Li^+$
25. Which of the following has the highest metallic character?  
a. Sr                                      b. Te                                      c. Mo                                      d. Rb
26. Which element has the lowest ionization energy?  
a. F                                      b. Cl                                      c. Br                                      d. I
27. Which ion is isoelectronic to a noble gas?  
a.  $Cr^{3+}$                                       b.  $Sc^{2+}$                                       c.  $Ga^{3+}$                                       d.  $Ti^{4+}$
28. Which atom has the higher ionization energy, N or O?  
a. N                                      b. O
29. Energy is \_\_\_\_\_ when an electron changes from  $n = 5$  to  $n = 2$  in the hydrogen atom.  
a. absorbed                                      b. emitted                                      c. negligible                                      d. destroyed
30. What is the molar mass of calcium phosphate,  $Ca_3(PO_4)_2$ ?  
a. 430.42 g/mol                                      b. 278.18 g/mol                                      c. 310.18 g/mol                                      d. 279.21g/mol
31. What value remains constant between different isotopes of the same element?  
a. protons                                      b. electrons                                      c. neutrons                                      d. mass number
32. What is the phase change associated with a substance changing from gas to liquid?  
a. sublimation                                      b. freezing                                      c. vaporization                                      d. condensation
33. How many carbon atoms are there in 10.0 g of propane,  $C_3H_8$ ?
34. What mass of oxygen gas occupies a 2.50 L container at STP?
35. How many potassium ions are there in 8.99 moles of potassium nitride,  $K_3N$ ?