Chemistry 30A | I Exam | Laney College
Dr Schaleger | Spring 2014

Name_____

1. (6). The dimensions of a block of pure iron (d = 7.86 g/cm^3) are 11.0 cm x 7.3 cm x 243.9 cm.

a. What is the volume of the block?

$V = (11.0 \times 7.3 \times 243.9)\ cm^3 = 1.96 \times 10^4\ cm^3$

b. What is the mass of the block?

$d = \frac{m}{V}$; $m = dV = (7.86)(g/cm^3)(11.0 \times 7.3 \times 243.9)\ cm^3$

2. (6). How many protons 28, electrons 28 and neutrons 30 are present in an atom of the mass 58 isotope of nickel (Ni)?

3. (3). Express the following number in scientific notation: 0.0061740.

6.1740×10^{-3}

4. (3). How many significant figures appear in the number, 0.0061740?

5

5. (5). Write the e-configuration of Mn, using $1s^2$ etc notation.

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

6. (6). For each of the following atoms, state the **number** of valence electrons and write the **electron-dot formula** for the atom:

N 5 :N·

Si 4 ·Si·

7. (3). One of the following is not an ionic compound. Circle it. AlF_3 Na_2SO_4 (H_2SO_4) CaO

8. (3). How many valence electrons are present in the carbonate ion, CO_3^{2-}?

$4 + 3 \times 6 + 2 = 24$

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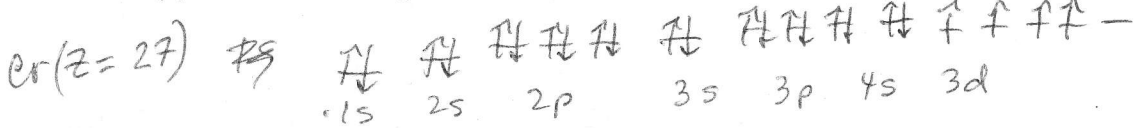
9. (6). What is the most likely formula of the sulfide of Li? The oxide of Al?

Li_2S Al_2O_3

10. (4). Write the e-configuration of the Cr^{+3} ion using arrow notation.

Cr(Z=27) 

24 e's

11. (3). The Al^{3+} ion has the same e-configuration as which noble gas?

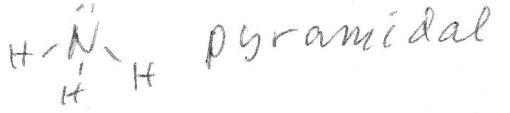
Ne

12. (3). Given that 1 in = 2.54 cm, what is the number of feet in one meter? (In other words, calculate *feet/meter*).

$$1\text{ in} \times \frac{1\text{ ft}}{12\text{ in}} \times \frac{1\text{ in}}{2.54\text{ cm}} \times \frac{100\text{ cm}}{\text{m}} = 3.28\ \text{ft/m}$$

13. (6). Using VSEPR theory, predict the geometric shapes of each of the following molecules (start by drawing the Lewis octet structure):

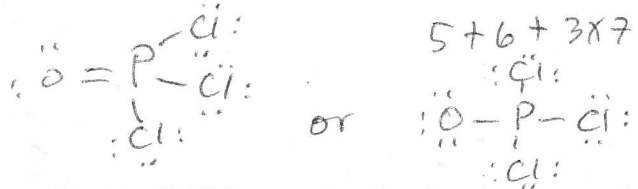
a. NH_3

 pyramidal

b. CO_2

 linear

14. (8). Draw the Lewis structure - showing all valence electrons – of phosphorus oxychloride, $POCl_3$. (P is the central atom). Start by determining the number of valence electrons.



15. (9). Hydrogen chloride (HCl) is a gas that dissolves in water to give H^+ ions (more correctly, H_3O^+ ions) and Cl^- ions, generating considerable heat in the process. Is this a chemical change ✓ or a physical change_____? Is the resulting solution homogeneous ✓ or heterogeneous_____? Is the resulting solution acidic ✓, basic_____ or neutral_____?

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16. (5). Given that (9/5)C + 32 = F, what is the temperature in degrees F when it is 10.0 degrees Celsius? What is this temperature in Kelvins (K)?

$\left(\frac{9}{5}\right)(10) + 32 = 50\ ^{\circ}C$ $\quad 50 + 273 = 323\ K$

17. (5). Calculate the specific heat of copper if it takes 23 cal to heat a 5.0 g sample from 25 ^{0}C to 75 ^{0}C. (Caution: significant figures!).

$$S(Cu) = \frac{23}{50 \times 5.0}\ \frac{cal}{deg\text{-}g} = \frac{0.46}{5} = 0.092\ cal/g\text{-}deg.$$

18. (3) Group 1A metals easily gain an electron. True____ or false✓.

19. (3) In the NaCl crystal lattice, each sodium ion has how many nearest-neighbor choride ions 6 ?

20. (4) The 'old' name for MnO_2 was manganese dioxide. An incorrectly written 'new' name is manganese(II) oxide. Give the correct 'new' name.

manganese (IV) oxide

21. (3). Given that the electronegativities of H, C and O are 2.1, 2.5, and 3.0, which molecular bond is more polar, C-H _____or O-H ✓?

22. (3). The maximum number of covalent bonds that nitrogen can form is 4. However phosphorus, which is also in Group 5A, can form 5 covalent bonds. What does phosphorus have that are not available to nitrogen? empty 3d orbitals