

GW 01 Group Number: 15  
 Members (Please list full names):

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Show your work in the space provided below each question and the final answer in the boxes to the right.

1. For each of the following, give: (a) ground state electronic configuration (use core method); (b) the number of unpaired electrons in the valence shell; (c) the values of the 4 quantum numbers of an electron in the valence shell.

	a.	b.	c.
$\text{Co}^{3+}$	$\text{Co: [AR]} 4s^2 3d^7$ $\text{Co}^{3+}: [\text{AR}] 3d^6$	4	$n=3, l=2, m_l=2, m_s=+\frac{1}{2}$
Manganese in $\text{MnO}_2$	$[\text{AR}] 3d^5 4s^2$	5	$n=4, l=0, m_l=0, m_s=+\frac{1}{2}$
$\text{Ge}^{2+}$	$\text{Ge: [AR]} 4s^2 3d^{10} 4p^2$ $\text{Ge}^{2+}: [\text{AR}] 4s^2 3d^{10}$	0	$n=4, l=0, m_l=0, m_s=+\frac{1}{2}$

2. Give the number of protons, electrons and neutrons for each of the following:

	# Protons	# Electron	# Neutrons
$\text{As}^{3+}$ (mass # = 75)	33	30	42
$^{106}\text{Pd}$	46	46	60
$\text{Te}^{2-}$ (mass # = 128)	52	54	76

3.

A sample of copper has a mass of 38.66 g. Determine (a) the moles of copper in this sample; (b) atoms of copper there are in this sample.

(a)  $38.66 / 63.546 = 0.6084$

(b)  $38.66 \left( \frac{1}{63.546} \right) (6.02 \times 10^{23}) = 3.66 \times 10^{23}$

a.

$0.6084 \text{ mol}$

b.

$3.66 \times 10^{23}$

<p>4. Do the following conversions:</p> <p>(a) 46.24 g/mL to kg/m<sup>3</sup></p> <p>(b) A metal sphere has a volume of 47.2 ft<sup>3</sup>. How long is its diameter in cm?</p> <p>@ <math>46.24 \times 1000 = 46240</math></p> <p>⑥ <math>\left(6 \cdot \frac{47.2}{\pi}\right)^{1/3} = 4.48382 \text{ ft} \times 12 = 53.80584 \times 12 = 136.666</math></p>	<p>a.</p> <p>46240 kg/m<sup>3</sup></p>
<p>c.</p> <p>136.67 cm</p>	
<p>4. Br<sub>2</sub> has a density of 3.119 g/mL. How many Br atoms are there in 6.00 mL of Br<sub>2</sub>?</p> <p><math>3.119 \times 6 = 18.714 \text{ g/mL}</math></p> <p><math>18.714 \left(\frac{1}{159.808}\right) (6.02 \times 10^{23}) = 7.05 \times 10^{22}</math></p>	<p><math>7.05 \times 10^{22}</math></p>
<p>5. The three naturally occurring isotopes of argon, <sup>36</sup>Ar (0.34%), <sup>38</sup>Ar (0.063%), and <sup>40</sup>Ar (99.60%), have masses of 35.97, 37.96, and 39.96 amu, respectively. What is the average atomic mass unit of argon?</p> <p><math>35.97 + 37.96 + 39.96 / 3 = 37.96</math></p>	<p><sup>38</sup>Ar</p> <p>37.96 amu</p>
<p>6. (a) Determine the wavelength of an electron shift from n = 2 to n = 6. (b) Is light emitted or absorbed?</p> <p><math>2.18 \times 10^{-18} \left(\frac{1}{2^2} - \frac{1}{6^2}\right) = 4.84 \times 10^{-19}</math></p> <p><math>\frac{(6.626 \times 10^{-34} \times 3.00 \times 10^8)}{4.84 \times 10^{-19}} = 4.10702449 \times 10^{-7}</math></p>	<p>a.</p> <p>410 nm</p> <p>b.</p> <p>absorbed</p>