

Multiple Choice: (4 points each. Put answers in left margin as capital letters.)

- Which of the following elements should have the lowest density?
A) argon B) chlorine C) magnesium D) sodium E) sulfur
2. A block has a temperature of 175 °C. What is its temperature in °F?
A) 65 B) 129 C) 283 D) 347 E) 448
- How many significant digits are in the answer to the problem $(2050 + 147.0) + 12$?
A) 1 B) 2 C) 3 D) 4 E) 5
- Which of the following is a chemical property?
A) density C) rusting E) weight
B) malleability D) solubility
- Which of the following indicates that light has been added to a reaction mixture when written above the reaction arrow?
A) Δ B) λ C) $h\nu$ D) light E) photon
- 1.95 kJ of heat is required to raise the temperature of 500 g of lead from 15° C to its final temperature. Taking the specific heat capacity of lead to be 130 J/(kg•°C), the final temperature is:
A) 22.5 °C C) 37.5 °C E) None of these
B) 30 °C D) 45 °C
- Which of the following particles would have the strongest repulsion to the Ca^{2+} ion?
A) Al^{3+} B) Br^- C) Na^+ D) O^{2-} E) S^{2-}
- The correct number of protons, neutrons, and electrons in P^+ (P-31) is:
A) 15p, 16n, 14e C) 16p, 16n, 15e E) 16p, 16n, 17e
B) 15p, 16n, 16e D) 16p, 15n, 16e
- Which of the following is a simple ion?
A) NO B) NO_3^- C) N_3^- D) N^{3-} E) N
- What is the charge on phosphorus in $\text{Cr}(\text{PO}_4)_2$?
A) +1 B) +2 C) +3 D) +4 E) +5

11. Which of the following elements can form cations of only one charge (+2)?
A) Cr B) Fe C) Sc D) Zn E) Zr
12. Identify the sulfite ion:
A) SO^{2-} B) SO_3^- C) SO_4^- D) SO_3^{2-} E) SO_4^{2-}

Discussion Questions:

1. Define: (4 points each)

kinetic energy – the energy of motion

mass number – the sum of the number of protons and neutrons in the atom

isotope – atoms of the same element with different numbers of neutrons

Fill-in-the-blanks (4 points each)

1. A proton weighs roughly 2000 (1836 exactly) times more than an electron.
2. Provide an English/metric conversion factor for **mass**: 454 g = 1 pound
3. BrCl_3 bromine trichloride, Cl_2O_7 dichlorine heptoxide
4. MgI_2 magnesium iodide, CoSO_4 cobalt(II) sulfate
5. CH_4 methane, HClO_2 chlorous acid
6. Consider the oxyacids of the halogens (e.g. HClO_2). How does fluorine differ from the other halogens? (Answer in one, short sentence.)
Fluorine is the halogen that does not form an oxyacid.
Type equation here.
7. In general, systems become less stable when energy is added to them.
8. Seven elements exist as homonuclear diatomic molecules. Name four, at least 3 of which coming from different groups.
 N_2 , O_2 , H_2 , F_2 , Cl_2 , Br_2 , I_2

Show your work problems (4 points each)

1. Gold can be hammered into extremely thin sheets called gold leaf. If a 200 mg piece of gold ($d = 19.32 \text{ g/cm}^3$) is hammered into a sheet measuring 2.4 x 1.0 ft, what is the average thickness of the sheet in meters?

$$\begin{aligned} \text{thickness (m)} &= \left(\frac{1 \text{ cm}^3}{19.32 \text{ g}}\right) \left(\frac{1 \text{ g}}{1000 \text{ mg}}\right) (200 \text{ mg}) \left(\frac{\text{in}}{2.54 \text{ cm}}\right)^2 \left(\frac{1 \text{ ft}}{12 \text{ in}}\right)^2 \left(\frac{1}{(2.4 \text{ ft})(1.0 \text{ ft})}\right) \left(\frac{1 \text{ m}}{100 \text{ cm}}\right)^2 \\ &= 4.6 \times 10^{-8} \text{ m} \end{aligned}$$

2. There are two naturally occurring isotopes of rubidium: ^{85}Rb with a mass of 84.9118 amu and ^{87}Rb has a mass of 86.9092 amu. Determine the abundance of each isotope if naturally occurring rubidium has an average atomic mass of 85.4678 amu.

$$85.4678 \text{ amu} = (84.9118 \text{ amu})x + (86.9092 \text{ amu})(1 - x)$$

$$85.4678 \text{ amu} = (84.9118 \text{ amu})x + 86.9092 \text{ amu} - (86.9092 \text{ amu})x$$

$$-1.4414 \text{ amu} = -(1.9974 \text{ amu})x$$

$$x = 0.7216$$

$$\% \text{ } ^{85}\text{Rb} = 72.16, \% \text{ } ^{87}\text{Rb} = 100\% - 72.16\% = 27.84\%$$