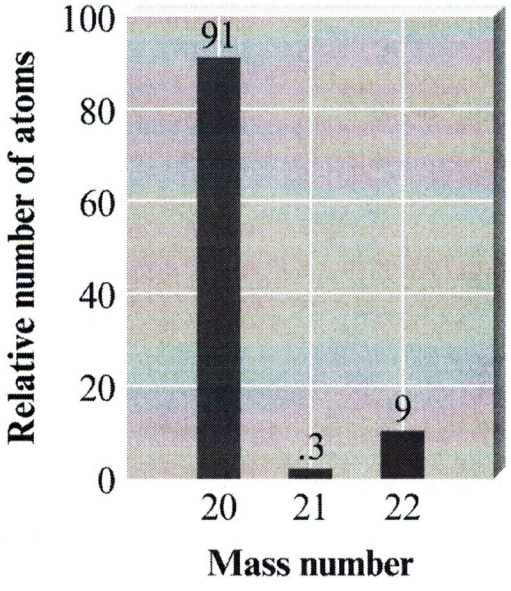
**Unit 1 Multiple Choice Practice** ANSWER KEY

**Multiple Choice: Use may use a periodic table. No calculators.**

Note: For all questions, assume that the temperature is 298 K, the pressure is 1.00 atmosphere, and solutions are aqueous unless otherwise specified.

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then fill in the corresponding circle on the answer sheet.




1. An element has 3 naturally occurring isotopes as shown in the mass spectrum above. Which of the following best represents the estimated atomic mass of this element based on the data provided? What is the identity of the element? - Most likely Neon

   (A) 20.00 amu - doesn't account for masses other than 20
   (B) 20.24 amu - isotopes mainly 20, but some (~10%) have higher mass
   (C) 21.00 amu - if 50% 20 and 50% 22
   (D) 21.54 amu - if more 22 than 20

2. The atomic mass of copper is 63.55 amu. Given that there are two naturally occurring isotopes of copper, $^{63}_{29}Cu$ and $^{65}_{29}Cu$, the natural abundance of the $^{65}_{29}Cu$ isotope must be approximately 63, 64, 65 63.55 is closer to 63 than to 65 ∴ must be more Cu-63 than Cu-65

   (A) 10% - too low
   (B) 25% - Most reasonable btwn A+B
   (C) 50% - Mass would be exactly 64
   (D) 70% - Mass would be closer to 65
   (E) 90% - Mass would be very close to 65

107.9 g of silver; 70.0 g of zinc; 21.0 g of magnesium

3. The masses of three samples of three metals is listed above. Which of the following correctly places the samples in order of decreasing number of atoms. Big → Small

(A) Silver, zinc, magnesium
(B) Silver, magnesium, zinc
(C) Zinc, silver, magnesium
(D) Magnesium, silver, zinc

1 mole = $6.02 \times 10^{23}$ atoms
∴ calc moles of each sample

$\frac{107.9\text{ g Ag}}{107.87\text{ g}} \approx 1\text{ mol Ag}$

$\frac{70\text{ g Zn}}{65\text{ g}} = \text{more than 1 mol Zn}$

$\frac{21\text{ g Mg}}{24\text{ g}} = \text{less than 1 mole Mg}$

4. A compound contains 1.10 mol of K, 0.55 mol of C, and 1.65 mol of O. What is the empirical formula of this compound? MOLE Ratio

(A) KCO
(B) $KC_2O$
(C) $K_2CO_3$
(D) $K_2CO_6$
(E) $K_4CO_6$

1.10 mol K / 0.55 = 2 mol K
0.55 mol C / 0.55 = 1 mol C
1.65 mol O / 0.55 = 3 mol O

$$2\ N_2H_4(g) + N_2O_4(g) \rightarrow 3\ N_2(g) + 4\ H_2O(g)$$

5. When 8.0 g of $N_2H_4$ (molar mass 32 g) and 92 g of $N_2O_4$ (molar mass 92 g) are mixed together and react according to the equation above, what is the maximum mass of $H_2O$ that can be produced?

(A) 9.0 g
(B) 18 g
(C) 36 g
(D) 72 g
(E) 144 g

$\frac{8\text{ g } N_2H_4}{32\text{ g}} \left| \frac{1\text{ mol } N_2H_4}{} \right| \frac{4\text{ mol } H_2O}{2\text{ mol } N_2H_4} \left| \frac{18\text{ g } H_2O}{1\text{ mol } H_2O} \right. = 9\text{ g } H_2O$

$\frac{92\text{ g } N_2O_4}{92\text{ g}} \left| \frac{1\text{ mol } N_2O_4}{} \right| \frac{4\text{ mol } H_2O}{1\text{ mol } N_2O_4} \left| \frac{18\text{ g } H_2O}{1\text{ mol } H_2O} \right. = 72\text{ g } H_2O$

$$2\ K_3PO_4(aq) + 3\ Fe(NO_3)_2(aq) \rightarrow \ldots Fe_3(PO_4)_2(s) + 6\ KNO_3(aq)$$

6. What is the coefficient for $KNO_3(aq)$ when the equation above is balanced with lowest whole-number integers?

(A) 1
(B) 2
(C) 4
(D) 6
(E) 12

7. A measured mass of an unreactive metal was dropped into a small graduated cylinder half filled with water. The following measurements were made.

| | |
|---|---|
| Mass of metal | 19.611 g |
| Volume of water before addition of metal | 12.4 mL |
| Volume of water after addition of metal | 14.9 mL |

What is the density of the metal?

(A) 7.8444 g/mL
(B) 7.844 g/mL
(C) 7.84 g/mL
(D) 7.8 g/mL
(E) 8 g/mL

density = mass / volume = 19.611 g / 2.5 mL

Don't Calculate
* Division Sig Figs = least # total Sig Figs

volume = 14.9 mL − 12.4 mL = 2.5 mL

* subtraction = least # decimal places Sig Figs

8. The empirical formula for a compound is $N_2O$. Which of the following could be a molecular formula for the compound?

← Multiple of the empirical formula

(A) $N_3O$
(B) $N_2O_3$
(C) $N_4O_3$
(D) $N_8O_4$

} Which of these reduces to an empirical formula of $N_2O$?

9. Potassium sulfide has a molar mass of 103 g/mol. How many moles of potassium sulfide are in a 51.5 g sample of potassium sulfide?

(A) 0.25 mol
(B) 0.50 mol
(C) 1.0 mol
(D) 2.0 mol
(E) $6.0 \times 10^{23}$ mol

$$\frac{51.5\ g\ K_2S \mid 1\ mol\ K_2S}{\mid 103\ g} = \frac{1}{2}$$

← charge of +1

10. A species with 11 protons and 10 electrons is

↑ atomic # is 11 = Na

(A) Ne
(B) $Na^+$
(C) $F^-$
(D) $Mg^{2+}$