

Name: \_\_\_\_\_

Hour: \_\_\_\_\_ Date: \_\_\_\_\_

## Chemistry: *Atoms, Mass, and the Mole*

Directions: Use appropriate conversion factors and unit cancellation to solve the following problems. In order to get full credit, you must show the set-up and include units in all quantities.

1. Find the number of atoms of phosphorus (P) in 3.44 moles of phosphorus.
2. What is the mass of 0.38 moles of cobalt (Co)?
3. How many moles of nickel (Ni) is  $3.88 \times 10^{25}$  atoms of nickel?
4. How many atoms is 3.75 moles of iron (Fe)?
5. Find the number of moles of sodium (Na) in 145 g of sodium.
6. How many moles is 0.55 g of magnesium (Mg)?
7. If you have  $7.22 \times 10^{23}$  atoms of chromium (Cr), how many moles of chromium do you have?
8. What mass of tungsten (W) is 35 moles of tungsten?
9. How many atoms is 5.2 moles of titanium (Ti)?

10. How many moles of iron (Fe) is  $5.98 \times 10^{24}$  atoms of iron?
11. What mass of molybdenum (Mo) is 6.68 moles of molybdenum?
12. How many moles is 586 g of rhenium (Re)?
13. How many atoms of palladium (Pd) is 400 g of palladium?
14. Find the mass of  $4.55 \times 10^{28}$  atoms of vanadium (V).
15. Find the mass of  $4.77 \times 10^{22}$  atoms of scandium (Sc).
16. Find the number of atoms in 36 g of germanium (Ge).
17. How many atoms are in 8500 g of selenium (Se)?
18. Find the mass of  $1.43 \times 10^{28}$  atoms of polonium (Po).

Answers:

- |                                   |                                   |                                    |
|-----------------------------------|-----------------------------------|------------------------------------|
| 1. $2.07 \times 10^{24}$ atoms P  | 7. 1.20 mol Cr                    | 13. $2.26 \times 10^{24}$ atoms Pd |
| 2. 22.4 g Co                      | 8. 6433 g W                       | 14. $3.85 \times 10^6$ g V         |
| 3. 64.4 mol Ni                    | 9. $3.13 \times 10^{24}$ atoms Ti | 15. 3.6 g Sc                       |
| 4. $2.26 \times 10^{24}$ atoms Fe | 10. 9.93 mol Fe                   | 16. $3.0 \times 10^{23}$ atoms Ge  |
| 5. 6.3 mol Na                     | 11. 641 g Mo                      | 17. $6.48 \times 10^{25}$ atoms Se |
| 6. 0.023 mol Mg                   | 12. 3.15 mol Re                   | 18. $4.96 \times 10^6$ g Po        |

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Directions: Use appropriate conversion factors and unit cancellation to solve the following problems. In order to get full credit, you must show the set-up and include units in all quantities.

1. Find the number of atoms of phosphorus (P) in 3.44 moles of phosphorus.

$$x \text{ atoms P} = 3.44 \text{ mol P} \left( \frac{6.02 \times 10^{23} \text{ atoms P}}{1 \text{ mol P}} \right) = 2.07 \times 10^{23} \text{ atoms P}$$

2. What is the mass of 0.38 moles of cobalt (Co)?

$$x \text{ g Co} = 0.38 \text{ mol Co} \left( \frac{58.9 \text{ g Co}}{1 \text{ mol Co}} \right) = 22.4 \text{ g Co}$$

3. How many moles of nickel (Ni) is  $3.88 \times 10^{25}$  atoms of nickel?

$$x \text{ mol Ni} = 3.88 \times 10^{25} \text{ atoms Ni} \left( \frac{1 \text{ mol Ni}}{6.02 \times 10^{23} \text{ atoms Ni}} \right) = 64.4 \text{ mol Ni}$$

4. How many atoms is 3.75 moles of iron (Fe)?

$$x \text{ atoms Fe} = 3.75 \text{ mol Fe} \left( \frac{6.02 \times 10^{23} \text{ atoms Fe}}{1 \text{ mol Fe}} \right) = 2.26 \times 10^{23} \text{ atoms Fe}$$

5. Find the number of moles of sodium (Na) in 145 g of sodium.

$$x \text{ mol Na} = 145 \text{ g Na} \left( \frac{1 \text{ mol Na}}{23 \text{ g Na}} \right) = 6.3 \text{ mol Na}$$

6. How many moles is 0.55 g of magnesium (Mg)?

$$x \text{ mol Mg} = 0.55 \text{ g Mg} \left( \frac{1 \text{ mol Mg}}{24.3 \text{ g Mg}} \right) = 0.023 \text{ mol Mg}$$

7. If you have  $7.22 \times 10^{23}$  atoms of chromium (Cr), how many moles of chromium do you have?

$$x \text{ mol Cr} = 7.22 \times 10^{23} \text{ atoms Cr} \left( \frac{1 \text{ mol Cr}}{6.02 \times 10^{23} \text{ atoms Cr}} \right) = 1.20 \text{ mol Cr}$$

8. What mass of tungsten (W) is 35 moles of tungsten?

$$x \text{ g W} = 35 \text{ mol W} \left( \frac{183.84 \text{ g W}}{1 \text{ mol W}} \right) = 6434 \text{ g W}$$

9. How many atoms is 5.2 moles of titanium (Ti)?

$$x \text{ atoms Ti} = 5.2 \text{ mol Ti} \left( \frac{6.02 \times 10^{23} \text{ atoms Ti}}{1 \text{ mol Ti}} \right) = 3.13 \times 10^{24} \text{ atoms Ti}$$

10. How many moles of iron (Fe) is  $5.98 \times 10^{24}$  atoms of iron?

$$x \text{ mol Fe} = 5.98 \times 10^{24} \text{ atoms Fe} \left( \frac{1 \text{ mol Fe}}{6.02 \times 10^{23} \text{ atoms Fe}} \right) = 9.93 \text{ mol Fe}$$

11. What mass of molybdenum (Mo) is 6.68 moles of molybdenum?

$$x \text{ g Mo} = 6.68 \text{ mol Mo} \left( \frac{95.94 \text{ g Mo}}{1 \text{ mol Mo}} \right) = 641 \text{ g Mo}$$

12. How many moles is 586 g of rhenium (Re)?

$$x \text{ mol Re} = 586 \text{ g Re} \left( \frac{1 \text{ mol Re}}{186 \text{ g Re}} \right) = 3.15 \text{ mol Re}$$

13. How many atoms of palladium (Pd) is 400 g of palladium?

$$x \text{ atoms Pd} = 400 \text{ g Pd} \left( \frac{6.02 \times 10^{23} \text{ atoms Pd}}{106.4 \text{ g Pd}} \right) = 2.26 \times 10^{24} \text{ atoms Pd}$$

14. Find the mass of  $4.55 \times 10^{28}$  atoms of vanadium (V).

$$x \text{ g V} = 4.55 \times 10^{28} \text{ atoms V} \left( \frac{50.94 \text{ g V}}{6.02 \times 10^{23} \text{ atoms V}} \right) = 3.85 \times 10^6 \text{ g V}$$

15. Find the mass of  $4.77 \times 10^{22}$  atoms of scandium (Sc).

$$x \text{ g Sc} = 4.77 \times 10^{22} \text{ atoms Sc} \left( \frac{45 \text{ g Sc}}{6.02 \times 10^{23} \text{ atoms Sc}} \right) = 3.6 \text{ g Sc}$$

16. Find the number of atoms in 36 g of germanium (Ge).

$$x \text{ atoms Ge} = 36 \text{ g Ge} \left( \frac{6.02 \times 10^{23} \text{ atoms Ge}}{72.6 \text{ g Ge}} \right) = 3.0 \times 10^{23} \text{ atoms Ge}$$

17. How many atoms are in 8500 g of selenium (Se)?

$$x \text{ atoms Se} = 8500 \text{ g Se} \left( \frac{6.02 \times 10^{23} \text{ atoms Se}}{79 \text{ g Se}} \right) = 6.48 \times 10^{25} \text{ atoms Se}$$

18. Find the mass of  $1.43 \times 10^{28}$  atoms of polonium (Po).

$$x \text{ g Po} = 1.43 \times 10^{28} \text{ atoms Po} \left( \frac{209 \text{ g Po}}{6.02 \times 10^{23} \text{ atoms Po}} \right) = 4.96 \times 10^6 \text{ g Po}$$

Answers:

1.  $2.07 \times 10^{24}$  atoms P
2. 22.4 g Co
3. 64.4 mol Ni
4.  $2.26 \times 10^{24}$  atoms Fe
5. 6.3 mol Na
6. 0.023 mol Mg

7. 1.20 mol Cr
8. 6433 g W
9.  $3.13 \times 10^{24}$  atoms Ti
10. 9.93 mol Fe
11. 641 g Mo
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13.  $2.26 \times 10^{24}$  atoms Pd
14.  $3.85 \times 10^6$  g V
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18.  $4.96 \times 10^6$  g Po