

$$\textcircled{3} 50.0 \text{ g Cu} \times \frac{1 \text{ mol Cu}}{63.5 \text{ g Cu}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol Cu}} = 4.74 \times 10^{23} \text{ atoms}$$

Repeat for other 3, Aluminium has lightest atoms, so more atoms in 1 mol,

Molar Calculations, Part II

A

1. Choose the false statement.

[A] 1 mol = 6.02×10^{23} amu

[B] 1 mol of carbon atoms weighs 12.0 g

[C] Fluorine is a diatomic gas

[D] 6.02×10^{23} atoms = 1 mol of atoms

[E] 6.02×10^{23} hydrogen atoms weigh 1.008 g

$\rightarrow 1 \text{ mol} = 6.02 \times 10^{23} \text{ things}$

B

2. One mole of oxygen atoms represents

[A] 32.0 g

[B] 6.02×10^{23} atoms

[C] 16 atoms

[D] 1.00 g

[E] none of these

C

3. Which represents the greatest number of atoms?

[A] 50.0 g Cu

[B] 50.0 g Al

[C] 50.0 g Zn

[D] 50.0 g Fe

[E] all the same

B

4. Which represents the greatest mass?

[A] 1.0 mol Fe

55.8 g/mol

[B] 1.0 mol Zn

65.4 g/mol

[C] 1.0 mol Cu

63.5 g/mol

~~[D] 1.0 mol Al~~

27.0 g/mol

[E] all the same

D

5. How many atoms of calcium are present in 80.0 g of calcium?

[A] 3.32×10^{-24}

[B] 2

[C] 6.02×10^{23}

[D] 1.20×10^{24}

[E] none of these

$80.0 \text{ g Ca} \times \frac{1 \text{ mol}}{40.1 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 1.20 \times 10^{24} \text{ atoms}$

A

6. Calculate the molar mass of a sample if a single molecule weighs 5.34×10^{-23} g.

[A] 32.2 g/mol

[B] 5.34×10^{-23} g/mol

[C] 12.0 g/mol

[D] 1.13×10^{46} g/mol

[E] none of these

$$1 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} \times \frac{5.34 \times 10^{-23} \text{ g}}{1 \text{ atom}} = 32.1468 \approx 32.2$$

7. A chemical mole

[A] is a large molecule

[B] contains 6.02×10^{23} particles

[C] is no longer useful to chemistry

[D] was a kind of material

[E] contains an undetermined number of ions

A

8. What is the mass of one atom of copper in grams?

[A] 1.06×10^{-22} g

[B] 58.9 g

[C] 63.5 g

[D] 52.0 g

[E] 65.4 g

9. Calculate the mass of 20.0 moles of He.

[A] 1.00

[B] 6.02×10^{23}

[C] 1.20×10^{25}

[D] 5.00

[E] 80.1

$$\textcircled{8} 1 \text{ atom} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atoms}} \times \frac{63.5 \text{ g/mol}}{1 \text{ mol}} = 1.05 \times 10^{-22} \text{ g}$$

$$\textcircled{9} 20.0 \text{ mol He} \times \frac{4.00 \text{ g}}{1 \text{ mol He}} = 80.0 \text{ g}$$

$$(10) 58.7g Ni \times \frac{1 \text{ mol}}{58.7g} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = \frac{6.02 \times 10^{23}}{1} \text{ atoms}$$

Molar Calculations, Part II

- C 10. How many atoms are there in 58.7 g of nickel?
 [A] 28 [B] 1 [C] 6.02×10^{23} [D] 1.204×10^{23} [E] none of these

- E 11. One mole of water weighs $H+H+O = 1+1+16 = 18 \text{ g/mol} = 18 \text{ grams per 1 mole}$
 [A] 18 mL [B] 3 g [C] 1 g [D] 10 g [E] 18 g

- E 12. A 20.0-g sample of Ca contains how many calcium atoms?
 [A] 6.02×10^{23} atoms [B] 40.1 atoms [C] 0.500 atoms
 [D] 20.0 atoms [E] 3.0×10^{23} atoms $20.0g \times \frac{1 \text{ mol}}{40.1g} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 3.00 \times 10^{23}$

- D 13. 0.314 mol of a diatomic molecule has a mass of 22.26 g. Identify the molecule.
 [A] I_2 [B] F_2 [C] Br_2 [D] Cl_2 [E] none of these
 molar mass = $\frac{22.26g}{0.314 \text{ mol}} = 70.9g/mol$ $Cl_2 = 35.5 + 35.5 = 71g/mol$

14. 18.7 kg of Zn represents how many grams?
 $18.7kg \times \frac{1000g}{1kg} = 18700g = 1.87 \times 10^4 g$

15. 18.7 kg of Zn represents how many milligrams?
 $18.7kg \times \frac{10^3g}{1kg} \times \frac{10^3mg}{1g} = 1.87 \times 10^7 mg$

16. 18.7 kg of Zn represents how many moles?
 $18.7kg \times \frac{1000g}{1kg} \times \frac{1 \text{ mol}}{65.4g} = 286 \text{ mol}$

17. What is the molar mass of nitroglycerin, $C_3H_5(NO_3)_3$?
 [A] 199 g/mol [B] 165 g/mol [C] 309 g/mol [E] none of these
 $(3 \times C) + (5 \times H) + (9 \times O) + (3 \times N)$
 $= 36 + 5 + 144 + 42 = 227$

- D 18. How many molecules of O_2 are there in 4.0 mol of O_2 ?
 [A] 2.4×10^{24} [B] 64 [C] 128 [D] 6.6×10^{-24} [E] 1.9×10^{25}

19. Calculate the mass of 9.13×10^{19} molecules of HCl.
 $9.13 \times 10^{19} \text{ molecules} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{36.5g}{1 \text{ mol}} = 5.54 \times 10^{-3} g$

- E 20. 6.00 g of water contains how many molecules of water?
 [A] 3.00 [B] 0.333 [C] 4.20×10^{23} [D] 3.61×10^{24} [E] 2.10×10^{23}

(18) $4.0 \text{ mol } O_2 \times \frac{6.02 \times 10^{23} \text{ molecules } O_2}{1 \text{ mol } O_2} = 2.41 \times 10^{24} \text{ molecules}$

(20) $6.00g H_2O \times \frac{1 \text{ mol}}{18.0g H_2O} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 2.01 \times 10^{23} \text{ molecules}$