

3.11 Practice Problems

Chemical Formulas

1. For the following molecules; write the chemical formula, determine how many atoms are present in one molecule/formula unit, determine the molar mass, determine the number of moles in 1.00 gram, and the number of grams in exactly 5.00×10^{-2} moles.

- carbon dioxide
- iron (II) chloride
- dinitrogen pentoxide
- iron (III) sulfate

Exercise 1

Answers to Q1

Answer

Formula	Atoms per Molecule/Formula Unit	Molar Mass	Moles in 1.00 g	Grams in 5.00×10^{-2} moles
CO ₂	3	44.01	2.27×10^{-2}	2.20
FeCl ₂	3	126.75	7.89×10^{-3}	6.34
N ₂ O ₅	7	108.02	9.26×10^{-3}	5.40
Fe ₂ (SO ₄) ₃	17	399.88	2.50×10^{-3}	20.0

2. Name the following compounds, determine the molar mass, determine how many O atoms are present in one molecule/formula unit, determine the grams of oxygen in 1.00 mole of the compound, and determine how many moles of O atoms in 8.35 grams of the compound.

- K₂CO₃
- Ca(NO₃)₂
- Cu₂SO₄
- N₂O

Exercise 2

Answers to Q2

Answer

Name	Molar mass	Atoms O per Molecule/Formula Unit	Grams of O in 1.00 mole	Moles of O in 8.35 grams
potassium carbonate	138.205	3	48.0	1.81×10^{-1}
calcium nitrate	164.088	6	96.0	3.05×10^{-1}
copper(I) sulfate	223.25	4	64.0	1.50×10^{-1}
dinitrogen monoxide	44.013	1	16.0	1.90×10^{-1}

3. Give the chemical formula (including the charge!) for the following ions. Also, write out the chemical formula for the compound each anion would form with K⁺ and with Ca²⁺.

- sulfate
- sulfite

- c) nitrate
- d) chloride
- e) nitride
- f) acetate
- g) carbonate

Exercise 3

Answers to Q3

Answer

- a) SO_4^{2-} ; K_2SO_4 ; CaSO_4
- b) SO_3^{2-} ; K_2SO_3 ; CaSO_3
- c) NO_3^- ; KNO_3 ; $\text{Ca}(\text{NO}_3)_2$
- d) Cl^- ; KCl ; CaCl_2
- e) N^{3-} ; K_3N ; Ca_3N_2
- f) $\text{C}_2\text{H}_3\text{O}_2^-$; $\text{KC}_2\text{H}_3\text{O}_2$; $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
- g) CO_3^{2-} ; K_2CO_3 ; CaCO_3


Lewis Dot Structures


4. For the compounds i) SiS_2 , ii) PI_3 , iii) SCl_2 , and iv) CH_2PH a) draw the Lewis dot structure, b) determine the hybridization of the central atom(s), c) determine the EGA around the central atom(s), d) determine the MG around the central atom(s), e) determine the bond angles in the molecule, f) determine if the molecule is polar or non-polar


Exercise 4


Answers to Lewis dot questions

Answer

i) a)  b) sp c) line d) line e) 180° f) nonpolar

ii) a)  b) sp^3 c) tetrahedron d) trigonal pyramid e) $<109.5^\circ$ f) polar

iii) a)  b) sp^3 c) tetrahedron d) bent e) $<109.5^\circ$ f) polar

iv) a)  b) C sp^2 and N sp^2 c) C and N trigonal plane d) C trigonal plane; N bent e) $<120^\circ$ f) polar

Modified by [Tom Neils](#) (Grand Rapids Community College)

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