

[TP] When ionic compounds are dissolved in water, they dissociate into their component ions completely. Which of the following ionic compounds, when dissolved in water, will result in an aqueous solution that contains the greatest number of ions?

25% 1. 1 mol of sodium chloride
25% 2. 1 mol of ammonium carbonate
25% 3. 1 mol of potassium phosphate
25% 4. 1 mol of ammonium acetate

Lecture 4 CH101 A1 (MWF 9 am)

Wednesday, September 14, 2016

For today ...

- Review: Why $f_{100} \times 100$ lbs + $f_{150} \times 150$ lbs + $f_{200} \times 200$ lbs
- Chemist's dozen: The mole
- Begin ch3: Naming things

Next lecture: Molecular mass spectra; mass spectra of compounds with Br (or Cl); light; infrared (IR) spectra

Why $f_{100} \times 100$ lbs + $f_{150} \times 150$ lbs + $f_{200} \times 200$ lbs

75 students weigh 100 lbs

100 students weigh 150 lbs

50 students weigh 200 lbs

total mass = 75×100 lbs + 100×150 lbs + 50×200 lbs

average mass = total mass / (75 + 100 + 50)

= total mass / 225

= (75/225) × 100 lbs + (100/225) × 150 lbs + (50/225) × 200 lbs

= $f_{100} \times 100$ lbs + $f_{150} \times 150$ lbs + $f_{200} \times 200$ lbs

Chemist's dozen: mole → counting by weighing

Terms to distinguish

Relative atomic mass, A_r: ratio of mass of an isotope relative to mass of 1/12 of one ^{12}C atom

A_r of ^{13}C is 13.00335 (unitless)

Atomic mass unit, u: 1/12 mass of one ^{12}C atom

$1\ u = (1/12) \times (12\ g) / N_A = g / N_A = 1.66054 \times 10^{-24}\ g$

Atomic weight: average of relative atomic masses of an element

Atomic weight of C is 12.01 (unitless)

Molar mass, M: Mass in grams numerically equal to atomic weight; that is, the mass in grams of N_A "average atoms" of an element

Molar mass of C is 12.01 g

Mole: Count by weighing

The mass in g of 1 mol of any element is called its molar mass

Number of particles in 1 mol is $N_A = 6.022140857 \times 10^{23}$

Each of these amounts contains the same number of atoms

[TP] Which of the following contains the smallest number of atoms?

25% 1. 187 g of liquid mercury, Hg
25% 2. 1400 u of uranium, U
25% 3. 6×10^{24} atoms of sodium, Na
25% 4. 2 mol of hydrogen gas, H_2

[Quiz] Which of the following contains the largest number of atoms?

25% 1. 187 g of liquid mercury, Hg
25% 2. 1400 u of uranium, U
25% 3. 6×10^{24} atoms of sodium, Na
25% 4. 2 mol of hydrogen gas, H_2

Naming things

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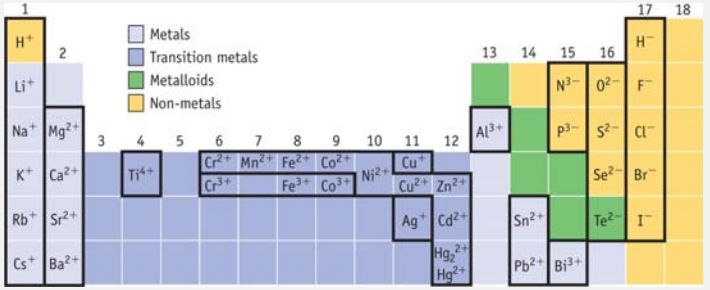
Common monoatomic ions and patterns

Figure 3.7 (p 57)



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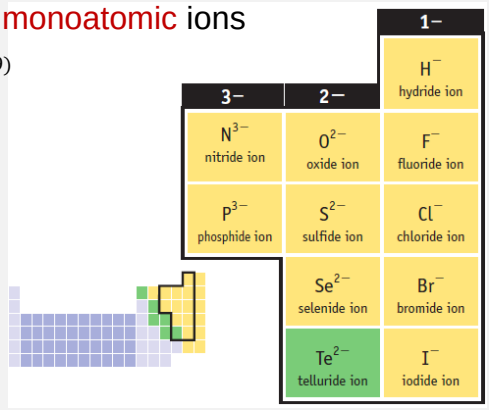
Common monoatomic ions

Figure 3.8 (p 59)



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Common polyatomic ions, Table 3.2 (p 59)

Formula	Name	Formula	Name
CATION: Positive Ion			
NH_4^+	ammonium ion		
ANIONS: Negative Ions			
Based on a Group 14 element		**Based on a Group 17 element**	
CN^-	cyanide ion	ClO^-	hypochlorite ion
CH_3COO^-	acetate ion	ClO_2^-	chlorite ion
CO_3^{2-}	carbonate ion	ClO_3^-	chlorate ion
HCO_3^-	hydrogencarbonate ion (or bicarbonate ion)	ClO_4^-	perchlorate ion
Based on a Group 15 element		**Based on a transition metal**	
NO_2^-	nitrite ion	CrO_4^{2-}	chromate ion
NO_3^-	nitrate ion	$Cr_2O_7^{2-}$	dichromate ion
PO_4^{3-}	phosphate ion	MnO_4^-	permanganate ion
HPO_4^{2-}	hydrogenphosphate ion		
$H_2PO_4^-$	dihydrogenphosphate ion		
Based on a Group 16 element			
OH^-	hydroxide ion		
SO_3^{2-}	sulfite ion		
SO_4^{2-}	sulfate ion		
HSO_4^-	hydrogensulfate ion (or bisulfate ion)		

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