

CHAPTER 0

IONS & IONIC CHARGES

0.1 Indicate if the following chemical species represent an atom, an anion or a cation: (a) Fe^{2+} (b) Cl^- (c) Ag

0.2 Identify the ionic state of the following elements. If needed, indicate the existence of multiple ionic states: (a) H (b) O (c) N (d) F (e) Mn

0.3 Identify the ionic state of the following elements. If needed, indicate the existence of multiple ionic states: (a) Li (b) V (c) Cl (d) S (e) Cr (f) Sr (g) Ni

COVALENT COMPOUNDS

0.4 Name or formulate the following covalent compounds: (a) NO (b) Dichlorine monofluoride (c) NO_2

0.5 Name or formulate the following covalent compounds: (a) Chlorine Monofluoride (b) N_2O (c) Nitrogen trifluoride

0.6 Name or formulate the following covalent compounds: (a) SO_3 (b) Disulfur dichloride (c) SO_2 (d) Disulfur tetrachloride

0.7 Name or formulate the following covalent compounds: (a) P_4S_3 (b) Sulfur Tetrafluoride (c) As_2O_5 (d) Sulfur trioxide

IONIC COMPOUNDS

0.8 Classify the following chemicals in two groups, justifying your classification: (a) NaCl (b) CO_2 (c) FeCl_3 (d) N_2O_3 (e) SO_3 (f) Ca_3N_2

0.9 Combine the following ions:

- | | |
|------------------------------------|--------------------------------------|
| (a) $\text{Na}^+ + \text{Cl}^-$ | (d) $\text{Mg}^{2+} + \text{Cl}^-$ |
| (b) $\text{Na}^+ + \text{Se}^{2-}$ | (e) $\text{Mg}^{2+} + \text{O}^{2-}$ |
| (c) $\text{Na}^+ + \text{P}^{3-}$ | (f) $\text{Mg}^{2+} + \text{N}^{3-}$ |

0.10 Name or formulate the following ionic (Type I) compounds: (a) Magnesium iodide (b) Ca_3P_2 (c) Lithium nitride (d) MgF

0.11 Name or formulate the following ionic (Type I) compounds: (a) Magnesium fluoride (b) CaS (c) Barium phosphide (d) Mg_3N_2

0.12 Name the following compounds:

- | | |
|-----------------------------|----------|
| (a) NaCl | (d) SrS |
| (b) Ca_3N_2 | (e) RbCl |
| (c) MgI_2 | (f) KF |

0.13 Combine the following ions:

- | | |
|--------------------------------------|--------------------------------------|
| (a) $\text{Cs}^+ + \text{F}^-$ | (c) $\text{Be}^{2+} + \text{C}^{4-}$ |
| (b) $\text{Sr}^{2+} + \text{O}^{2-}$ | (d) $\text{Li}^+ + \text{I}^-$ |

0.14 Classify the following chemicals in two groups. Justify your classification.

- | | | |
|--------------------|---------------------|---------------------------|
| (a) NaCl | (c) FeCl_3 | (e) Li_3N |
| (b) MnO_2 | (d) SrO | (f) NiO |

0.15 Formulate the following compounds:

- | | |
|------------------------|-------------------------|
| (a) Copper(I) oxide | (c) Nickel(III) oxide |
| (b) Copper(II) nitride | (d) Manganese(IV) oxide |

0.16 Name the following compounds:

- | | |
|-----------------------------|--------------------|
| (a) NiO | (c) VO |
| (b) Cr_2O_3 | (d) MnO_4 |

0.17 Formulate the following compounds:

- Iron(II) nitride
- Copper(I) sulfide
- Chromium(III) iodide
- Palladium(IV) phosphide
- Manganese(VI) oxide

0.18 Name the following compounds:

- | | |
|-----------------------------|------------------------------|
| (a) Ni_2O_3 | (d) Ni_3P_2 |
| (b) Fe_3N_2 | |
| (c) Cr_2O_3 | (e) Ru_2Se_3 |

0.19 Name the following compounds:

- | | |
|----------------------|-----------------------|
| (a) FeO | (e) MnF ₃ |
| (b) CrN | (f) Cu ₂ C |
| (c) ZnI ₂ | (g) Ag ₂ O |
| (d) CoS | |

0.20 Name or formulate the following ionic (Type II) compounds: (a) Fe₃P₂ (b) Copper(II) iodide (c) Fe₃N₂ (d) Iron(II) sulfide

0.21 Name or formulate the following ionic (Type II) compounds: (a) Fe₂S₃ (b) Gold(III) chloride (c) FeO (d) Vanadium(V) nitride

0.22 Name or formulate the following ionic (Type II) compounds: (a) FeI₂ (b) Lead(IV) sulfide (c) FeBr₂

0.23 Name or formulate the following ionic (Type II) compounds: (a) Manganese(IV) oxide (b) FeCl₂ (c) Copper(I) oxide

ACIDS AND HYDROXIDES

0.24 Name or formulate the following acids or bases: (a) HCl (b) Hydrofluoric Acid (c) Mg(OH)₂

0.25 Name or formulate the following acids or bases: (a) Sulfuric Acid (b) H₂CO₃ (c) Lithium hydroxide

0.26 From the following chemicals identify acids and bases: (a) KOH (b) LiOH (c) CH₃OH

0.27 From the following chemicals identify acids and bases: (a) H₂SO₃ (b) NH₃ (c) Ca(OH)₂

0.28 From the following chemicals identify hydracids and oxoacids: (a) HF (b) H₂SO₃ (c) H₂S

0.29 From the following chemicals identify hydracids and oxoacids: (a) H₃BO₃ (b) HCl (c) HI

0.30 Working in pairs, memorize the following oxoacids:

- (a) H₂SO₄ Sulfuric acid
(b) H₂CO₃ Carbonic acid

(c) HMnO₄ Permanganic acid

(d) HNO₃ Nitric acid

(e) H₃PO₄ Carbonic acid

(f) H₂Cr₂O₇ Dichromic acid

0.31 Identify the redox number of the central atom of the following oxoacids: (a) H₂CrO₄ (b) H₂Cr₂O₇ (c) HMnO₄

0.32 Identify the redox number of the central atom of the following oxoacids: (a) H₂MnO₄ (b) HReO₃ (c) H₂SiO₃

0.33 Identify the most oxidized acid:

- (a) H₃AsO₄ or H₃AsO₃ (b) H₂XeO₄ or H₄XeO₆

0.34 Identify the most reduced acid:

- (a) H₂RuO₄ or HRuO₄ (b) HTcO₄ or H₂TcO₄

0.35 Identify the most oxidant acid:

- (a) H₂S₂O₆ or H₂SO₄ (b) H₂SeO₄ or H₂SeO₃

NAMING OF COMPLEX SALTS AND COMMON CHEMICALS

0.36 Name or formulate the following oxoanions:

- (a) ClO₄⁻ (b) PO₄³⁻ (c) SO₄²⁻ (d) CO₃²⁻ (e) NO₃⁻
(f) CrO₄²⁻ (g) BO₃³⁻

0.37 Name or formulate the following (Type I) oxosalts: (a) Mg(NO₃)₂ (b) Sodium permanganate (c) KMnO₄ (d) Calcium carbonate (e) Li₃PO₄

0.38 Name or formulate the following (Type I) oxosalts: (a) Lithium sulfate (b) Na₂CrO₄ (c) Lithium sulfite (d) Cs₂Cr₂O₇ (e) Calcium sulfate

0.39 Name or formulate the following compounds:

- (a) Na₂SO₄ (b) KNO₃ (c) CaCO₃ (d) Ca(NO₂)₂
(e) SrSO₃

0.40 Combine the following ions:

- | | |
|---|--|
| (a) Na ⁺ + PO ₄ ³⁻ | (d) Ca ²⁺ + CO ₃ ²⁻ |
| (b) Li ⁺ + MnO ₄ ⁻ | (e) Cs ⁺ + Cr ₂ O ₇ ²⁻ |
| (c) Mg ²⁺ + NO ₃ ⁻ | (f) K ⁺ + BO ₃ ³⁻ |

0.41 Combine the following polyatomic ions:

- (a) $\text{Na}^+ + \text{NO}_3^-$ (d) $\text{Ca}^{2+} + \text{CO}_3^{2-}$
 (b) $\text{Na}^+ + \text{CO}_3^{2-}$
 (c) $\text{Na}^+ + \text{PO}_4^{3-}$ (e) $\text{Ca}^{2+} + \text{PO}_4^{3-}$

0.42 Name or formulate the following (Type II) oxosalts: (a) $\text{Cr}_2(\text{SO}_4)_3$ (b) zinc(II) carbonate (c) $\text{Fe}(\text{MnO}_4)_3$

0.43 Name or formulate the following (Type II) oxosalts: (a) cobalt(III) carbonate (b) $\text{Fe}(\text{ClO}_4)_3$ (c) zinc(II) carbonate

0.44 Name or formulate the following hydrosalts: (a) NaHCO_3 (b) Calcium Hydrogencarbonate (c) $\text{Al}(\text{HSO}_4)_3$

0.45 Name or formulate the following hydrosalts: (a) Sodium dihydrogenphosphate (b) LiH_2PO_4 (c) Silver monohydrogenphosphate

0.46 Name or formulate the following hydrates: (a) $\text{Al}_2(\text{SO}_4)_3 \cdot 3 \text{H}_2\text{O}$ (b) Silver phosphate dihydrate (c) $\text{KMnO}_4 \cdot 4 \text{H}_2\text{O}$ (d) Lithium sulfate tetrahydrate

0.47 Name or formulate the following compounds: (a) MgSO_4 (b) $\text{Ni}(\text{SO}_4)_3$ (c) Cobalt(II) nitrate (d) Cobalt(II) sulfate dihydrate (e) KHCO_3

0.48 Name or formulate the following compounds: (a) $\text{Ca}(\text{NO}_3)_2$ (b) $\text{Ca}(\text{HCO}_3)_2$ (c) Nickel(II) sulfate (d) Nickel(II) sulfate tetrahydrate (e) NaH_2PO_4

0.49 Name or formulate the following compounds: (a) MnSO_4 (b) CuNO_3 (c) $\text{Cr}_2(\text{CO}_3)_3$ (d) $\text{V}(\text{NO}_2)_2$ (e) FeSO_3

0.50 Name or formulate the following pairs or ions: (a) carbonate and monohydrogencarbonate (b) sulfate and monohydrogensulfate (c) chromate and monohydrogenchromate (d) phosphate and dihydrogenphosphate (e) phosphate and monohydrogenphosphate (f) borate and dihydrogenphosphate