

CHAPTER 2 - ATOMS, IONS, AND MOLECULES

The Structure of the Atom

1. Which of the following statements about subatomic particles is false?

- A. Protons and electrons have charges of the same magnitude but opposite sign.
- B. Protons have about the same mass as neutrons, and electrons are much lighter than protons.
- C. Isotopes have the same number of protons but different numbers of neutrons.
- D. The number of electrons in a neutral atoms must equal the number of neutrons.
- E. The protons in the nucleus of an atom have a positive charge.

2. How many protons, neutrons, and electrons are there in Br-81 (${}_{35}^{81}\text{Br}$)?

- A. 46 neutrons, 35 protons, 46 electrons
- B. 35 protons, 46 neutrons, 35 electrons
- C. 35 protons, 81 neutrons, 46 electrons
- D. 44 protons, 35 neutrons, 44 electrons
- E. 81 protons, 46 neutrons, 81 electrons

3. What is the isotopic symbol in the form ${}^A_Z\text{X}$ for the nucleus with 53 protons and 74 neutrons?

- A. ${}_{127}^{53}\text{I}$
- B. ${}_{74}^{53}\text{W}$
- C. ${}_{53}^{127}\text{I}$
- D. ${}_{53}^{74}\text{I}$
- E. ${}_{74}^{53}\text{W}$

4. What is the mass number of an isotope of phosphorus that has 16 neutrons in its nucleus?

- A. 15
- B. 16
- C. 31
- D. 42
- E. 32

5. What element is defined by the following information?

$$p^+ = 11 \quad n^0 = 12 \quad e^- = 11$$

- A. sodium
- B. magnesium
- C. vanadium
- D. neon
- E. phosphorus

6. Choose the anion or cation that corresponds to the following: protons = 16, neutrons = 17, electrons = 18

- A. Cl
- B. Ar^{2+}
- C. S^{2-}
- D. Ar^+
- E. S^-

7. Predict the charge that an ion formed from nitrogen would have.

- A. 3+
- B. 3-
- C. 4+
- D. 4-
- E. none of the above

8. The species which has 12 protons and 10 electrons is

- A. Ne^{2+}
- B. Ti^{2+}
- C. Mg^{2+}
- D. Mg^{2-}
- E. Ne^{2-}

The Structure of the Periodic Table

9. Which of the following elements is a halogen?

- A. bromine
- B. potassium
- C. helium
- D. nickel
- E. magnesium

10. A covalent bond is best described as

- A. a bond between two polyatomic ions
- B. the transfer of electrons
- C. the sharing of electrons between atoms
- D. a bond between a metal and a polyatomic ion
- E. a bond between a metal and a nonmetal

11. Which of the following is a molecular compound?

- A. SrSO_3
- B. N_2O_4
- C. CuCl_2
- D. NaNO_3
- E. RbBr

12. Calcium is classified as a:

- A. alkali metal
 - B. alkaline earth metal
 - C. transition metal
 - D. halogen
 - E. noble gas
 - F. lanthanide
 - G. actinide
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Atomic Mass

13. Natural rubidium has an average molar mass of 85.4678 amu. It is composed of the isotopes ^{85}Rb (mass = 84.9117 amu), which accounts for 72.17% of all naturally occurring rubidium, and ^{87}Rb , which accounts for 27.83% of all naturally occurring rubidium.

Calculate the mass of ^{87}Rb .

- A. 81.55 amu
 - B. 83.21 amu
 - C. 86.91 amu
 - D. 88.69 amu
 - E. 93.41 amu
-

Nomenclature of Binary Ionic and Molecular Compounds

14. Which ONE of the following formulas is written correctly?

- A. Na_2P
 - B. Mg_2F
 - C. Al_2S_3
 - D. CaF
 - E. NaCl_2
-

15. What is the name of the compound Al_2S_3 ?

- A. aluminum(III) sulfide
 - B. dialuminum trisulfide
 - C. aluminum trisulfide
 - D. aluminum sulfide
 - E. none of the above
-

16. What is the formula of the compound sodium oxide?

- A. NaO
 - B. Na_2O
 - C. Na_3O
 - D. NaO_2
 - E. none of the above
-

17. What is the formula of chromium(III) sulfide?

- A. CrS
 - B. Cr_2S_3
 - C. CrS_3
 - D. Cr_3S_2
 - E. Cr_2S_2
-

18. What is the name of the compound FeO ?

- A. iron monoxide
 - B. iron(II) oxide
 - C. iron oxide
 - D. iron(I) oxide
 - E. iron(III) oxide
-

19. What is the name of the compound N_2O ?

- A. dinitrogen monoxide
 - B. nitrogen monoxide
 - C. nitrogen(II) oxide
 - D. oxygen dinitride
 - E. dinitrogen oxide
-

20. What is the formula of the compound sulfur tetrafluoride?

- A. SF_4
 - B. S_4F
 - C. S_4F_4
 - D. S_2F_2
 - E. SF_2
-

21. What is the name of the compound Hg_2S ?

- A. dimercury monosulfide
 - B. mercury(I) sulfide
 - C. mercury(II) sulfide
 - D. mercury monosulfide
 - E. mercury sulfide(II)
-

22. What is the name of the compound AlCl_3 ?

- A. aluminum trichloride
 - B. aluminum(III) chloride
 - C. aluminum chloride(III)
 - D. aluminum chloride
 - E. none of the above
-

Nomenclature of Compounds Containing Polyatomic Ions; Acid Nomenclature

23. Which ONE of the following formulas is written **incorrectly**?

- A. $\text{Mg}(\text{NO}_3)_2$
 - B. CaCO_3
 - C. NaClO_3
 - D. K_2PO_4
 - E. $\text{Al}_2(\text{SO}_4)_3$
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24. Which ONE of the following formulas is written **correctly**?

- A. CaClO_3
 - B. AlSO_4
 - C. $\text{Mg}_3(\text{PO}_4)_2$
 - D. BaNO_3
 - E. $\text{K}(\text{C}_2\text{H}_3\text{O}_2)_2$
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25. What is the name of the compound MgCO_3 ?

- A. magnesium(II) carbonate
 - B. magnesium acetate
 - C. manganese carbonic acid
 - D. magnesium carbon trioxide
 - E. magnesium carbonate
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26. What is the name of the compound NaClO_2 ?

- A. sodium chlorate
 - B. sodium chlorite
 - C. sodium hypochlorite
 - D. sodium perchlorate
 - E. He-Who-Must-Not-Be-Named
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27. What is the acid name of the compound HClO_3 ?

- A. hydrochloric acid
 - B. chloric acid
 - C. chlorous acid
 - D. hypochlorous acid
 - E. hydrogen chlorate
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28. Name the following substance: HClO_2 .

- A. hydrochloric acid
 - B. perchloric acid
 - C. chloric acid
 - D. chlorous acid
 - E. hypochlorous acid
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29. What is the name of the compound FePO_4 ?

- A. iron phosphorus tetroxide
 - B. iron phosphate
 - C. iron(II) phosphate
 - D. iron(III) phosphate
 - E. iron(III) phosphide
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30. What is the formula for the compound chromium(II) carbonate?

- A. CrCO_3
 - B. $\text{Cr}_2(\text{CO}_3)_3$
 - C. $\text{Cr}_3(\text{CO}_3)_2$
 - D. Cr_2CO_3
 - E. $\text{Cr}(\text{CO}_3)_2$
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31. What is the formula for the compound potassium hypochlorite?

- A. KClO_4
 - B. KClO_3
 - C. KClO_2
 - D. KClO
 - E. KCl
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32. Name the compound SO_3 .

- A. sulfur trioxide
 - B. sulfate ion
 - C. sulfite ion
 - D. sulfur oxide
 - E. monosulfur trioxide
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33. Name the compound SO_3^{2-} .

- A. sulfur trioxide
 - B. sulfate ion
 - C. sulfite ion
 - D. sulfur oxide
 - E. trisulfur monoxide
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34. Name the compound Na_2SO_3 .

- A. disodium sulfur trioxide
 - B. sodium sulfur oxide
 - C. sodium sulfate
 - D. sodium sulfite
 - E. sodium sulfide
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35. What is the formula for the compound barium nitrate?

- A. BaNO_3
 - B. BaNO_{32}
 - C. $\text{Ba}(\text{NO}_3)_2$
 - D. $\text{Ba}(\text{NO}_3)_3$
 - E. $\text{Ba}_2(\text{NO}_3)_2$
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36. What is the formula for the compound sodium phosphate?

- A. Na_3PO_4
 - B. Na_2PO_3
 - C. Na_3PO_3
 - D. Na_2PO_2
 - E. NaPO_4^{2-}
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37. What is the formula for the compound sodium phosphite?

- A. Na_3PO_4
 - B. Na_2PO_3
 - C. Na_3PO_3
 - D. Na_2PO_2
 - E. NaPO_4^{2-}
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38. What is the formula for potassium dichromate?

- A. $\text{K}_2\text{Cr}_2\text{O}_7$
 - B. K_2CrO_4
 - C. $\text{K}(\text{CrO}_4)_2$
 - D. $\text{K}_2(\text{CrO}_4)_2$
 - E. $\text{K}_2\text{Cr}_2\text{O}_8$
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39. What is the formula for the compound ammonium hydrogen phosphate?

- A. $(\text{NH}_4)_2\text{HPO}_4$
 - B. $\text{NH}_4\text{H}_2\text{PO}_4$
 - C. $(\text{NH}_4)_3\text{PO}_4$
 - D. NH_4PO_4
 - E. $(\text{NH}_4)_2\text{H}_2\text{PO}_4$
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40. What is the formula for nitrous acid?

- A. HNO_4
 - B. HNO_3
 - C. HNO_2
 - D. HNO
 - E. H_3N
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41. What is the formula for bromic acid?

- A. HBrO_4
 - B. HBrO_3
 - C. HBrO_2
 - D. HBrO
 - E. HBr
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42. What is the formula for hydrobromic acid?

- A. HBrO_4
 - B. HBrO_3
 - C. HBrO_2
 - D. HBrO
 - E. HBr
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