
1. Which type of bond involves the transfer of electrons from one atom to another?

- A. Hydrogen bond C. Metallic bond
B. Ionic bond D. Covalent bond
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2. Ethene (C_2H_4) and cyclohexane (C_6H_{12}) have the same

- A. molecular formula. C. structural formula.
B. empirical formula. D. molar mass.
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3. In which pair are both compounds correctly classified?

- A. N_2O_4 , ionic compound; $LiCl$, molecular compound
B. CH_4 , ionic compound; CuS , ionic compound
C. $C_6H_{12}O_6$, molecular compound; Fe_2O_3 , molecular compound
D. SF_6 , molecular compound; ScF_3 , ionic compound
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4. What is the formula of aluminum sulfate?

- A. $Al_2(SO_4)_3$ C. $Al_2(SO_3)_3$
B. $Al_3(SO_4)_2$ D. $Al_3S_3O_9$
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5. What is the chemical name of $Mn(CO_3)_2$?

- A. magnesium carbonate C. manganese(IV) carbonate
B. manganese(II) carbonate D. manganese carbonate
-

6. What is the name of S_2F_{10} ?

- A. sulfur fluoride C. sulfur(V) fluoride
B. diselenium decafluoride D. disulfur decafluoride
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7. Aspirin is acetylsalicylic acid ($C_9H_8O_4$). What is the molar mass of acetylsalicylic acid?

- A. 169.15 g/mol C. 180.16 g/mol
B. 191.26 g/mol D. 168.14 g/mol
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8. How many molecules are present in 25.0 g of CH_3OH ?
- A. 4.85×10^{26} molecules C. 7.77×10^{23} molecules
B. 4.70×10^{23} molecules D. 1.56×10^{25} molecules

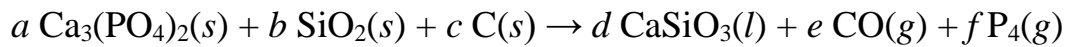
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9. What is the mass percent composition of mercury in methylmercury(II) chloride, HgCH_3Cl ?
- A. 68.64% C. 23.27%
B. 96.45% D. 79.89%

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10. What mass of oxygen is in 15.8 g of $\text{Al}(\text{NO}_2)_3$?
- A. 5.93 g C. 15.4 g
B. 9.19 g D. 6.98 g

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11. A compound decomposes into 165 g of carbon, 27.8 g of hydrogen, and 220.2 g of oxygen. What is the empirical formula of the compound?
- A. CH_2O C. CHO_2
B. CH_3O D. C_2HO

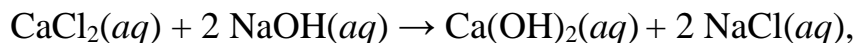
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12. A compound has the empirical formula CH and a molar mass of 78.11 g/mol. What is its molecular formula?
- A. C_6H_{12} C. C_5H_5
B. C_6H_6 D. C_7H_7
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13. What is the sum of the stoichiometric coefficients, $d + e + f$, when the chemical equation below is balanced with the lowest set of whole number coefficients?



- A. 12
B. 17
C. 9
D. 19

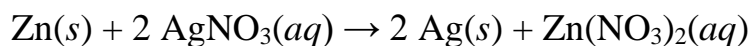
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14. Given the chemical equation



how many moles of NaCl are formed from the complete reaction of 2 moles of CaCl₂ with excess NaOH?

- A. 16
B. 2
C. 4
D. 1

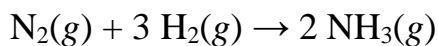
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15. A strip of zinc metal with a mass of 2.00 g is placed in an aqueous solution containing 2.50 g of silver nitrate, causing the following reaction to occur:



How much silver metal will form?

- A. 1.23 g
B. 1.59 g
C. 4.44 g
D. 6.32 g

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16. A reaction of 15 g of N₂ with excess H₂ produces 12 g of NH₃. What is the percent yield of the reaction?



- A. 66%
B. 32%
C. 5.5%
D. 83%
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17. How many grams of $(\text{NH}_4)_2\text{SO}_4$ are needed to prepare 200.0 mL of a 1.27 M solution?

- A. 49.3 g
B. 0.324 g
C. 304 g
D. 33.6 g

18. What volume of 2.00 M HCl must be used to prepare 500.0 mL of 0.350 M HCl?

- A. 28.6 mL
B. 35.0 mL
C. 14.0 mL
D. 87.5 mL

19. Which of these compounds is the **most** soluble in water?

- A. KOH
B. $\text{Co}(\text{OH})_2$
C. AgOH
D. $\text{Fe}(\text{OH})_2$

20. Give the **net ionic equation** for the reaction (if any) that occurs when aqueous solutions of H_2SO_4 and KOH are mixed.

- A. $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
B. $\text{H}_2^{2+}(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2(\text{OH})_2(\text{aq})$
C. $2 \text{K}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{s})$
D. No reaction

21. The titration of a 50.00 mL sample of a HNO_3 solution of unknown concentration requires 67.25 mL of a 0.1245 M $\text{Ba}(\text{OH})_2$ solution to reach the equivalence point. What is the concentration of the unknown HNO_3 solution?

- A. 0.8372 M
B. 0.1681 M
C. 0.3349 M
D. 0.4628 M

22. What is the oxidation number of phosphorus in P_2Br_4 ?

- A. +2
B. +4
C. -2
D. -4
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23. Which one of the following is a redox reaction?

- A. $\text{H}_2\text{SO}_4(aq) + \text{Ca}(\text{OH})_2(aq) \rightarrow \text{CaSO}_4(s) + 2\text{H}_2\text{O}(l)$
- B. $\text{Pb}(\text{NO}_3)_2(aq) + \text{Na}_2\text{SO}_4(aq) \rightarrow 2 \text{NaNO}_3(aq) + \text{PbSO}_4(s)$
- C. $2 \text{H}_2(g) + \text{O}_2(g) \rightarrow 2 \text{H}_2\text{O}(l)$
- D. $\text{HBr}(aq) + \text{NaOH}(aq) \rightarrow \text{NaBr}(aq) + \text{H}_2\text{O}(l)$

24. Convert 1,180 mmHg to kPa (1 atm = 101.325 kPa).

- A. 1.57 kPa
- B. 1.57×10^2 kPa
- C. 1.18 kPa
- D. 0.118 kPa

25. A red and a blue balloon are each filled with 2.0 L of H_2 gas at 15 °C. The red balloon is submersed 30 m below the ocean's surface in 15 °C water. The blue balloon is submersed in liquid nitrogen at -195.8 °C. The volume of both balloons decreases. Which statement describes the reasons for the decrease in volume?

- A. The red balloon demonstrates the inverse relationship between volume and pressure; the blue balloon demonstrates the direct relationship between volume and temperature.
- B. The red balloon demonstrates the inverse relationship between volume and pressure; the blue balloon demonstrates the direct relationship between volume and moles of a gas.
- C. The red balloon demonstrates the direct relationship between volume and pressure according; the blue balloon demonstrates the inverse relationship between volume and temperature.
- D. The red balloon demonstrates the inverse relationship between volume and moles of a gas; the blue balloon demonstrates the direct relationship between volume and temperature.

26. Which of the following statements is *true* about ideal gases?

- A. Ideal gases do not exhibit intermolecular attractions between individual gas atoms or molecules in a gaseous mixture.
 - B. Ideal gas molecules are broken into individual atoms after colliding with one another in a gaseous mixture.
 - C. Ideal gases combine to form larger molecules after colliding with one another in a gaseous mixture.
 - D. All gases behave as ideal gases.
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27. What mass of $\text{CO}_2(g)$ exerts a pressure of 455 mmHg at $25\text{ }^\circ\text{C}$ in a 5.00 L vessel?

- A. 8.87 g
B. 0.0583 g
C. 1.08 g
D. 5.39 g

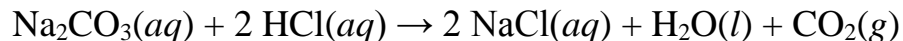
28. A 0.500 mol sample of gas has a density of 1.05 g/L at $23.0\text{ }^\circ\text{C}$ and 1.50 atm. What is the mass of the sample?

- A. 0.665 g
B. 66.7 g
C. 8.51 g
D. 34.5 g

29. A gas sample in a container at a fixed volume and temperature contains 0.50 mol N_2 , 0.25 mol O_2 and an unknown amount of He. The total pressure is 825 torr while the partial pressure of N_2 is 317 torr and of O_2 is 159 torr. How many moles of He are in the container?

- A. 6.0 mol
B. 0.83 mol
C. 0.55 mol
D. 1.1 mol

30. The following reaction was conducted in a 2.00 L evacuated chamber at $25.0\text{ }^\circ\text{C}$:



If the final pressure in the chamber was 2.45 atm, how many moles of HCl were used in the reaction, assuming that all of the HCl was converted to products? (Neglect the vapor pressure of water.)

- A. 0.278 moles
B. 0.523 moles
C. 0.164 moles
D. 0.401 moles
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Answer Key:

1. B
2. B
3. D
4. A
5. C
6. D
7. C
8. B
9. D
- 10.B
- 11.A
- 12.B
- 13.B
- 14.C
- 15.B
- 16.A
- 17.D
- 18.D
- 19.A
- 20.A
- 21.C
- 22.A
- 23.C
- 24.B
- 25.A
- 26.A
- 27.D
- 28.C
- 29.C
- 30.D