
Questions 1 – 13 cover material from Exam 1

1. Which of the following is a correct match?

A. gold: compound

C. oxygen: compound

B. water: element

D. air: mixture

2. Which of the following is **chemical** property?

A. boiling point

C. melting point

B. density

D. flammability

3. Chemical energy is a type of

A. kinetic energy.

C. thermal energy.

B. potential energy.

D. mechanical energy.

4. What is the product of the following calculation in proper scientific notation?

$$65 \mu\text{m} \times 17 \text{ nm} =$$

A. $1.1 \times 10^{-12} \text{ m}$

C. $11 \times 10^{-11} \text{ m}$

B. 11 m

D. $1.1 \times 10^{-15} \text{ m}$

5. A new sports car has a fuel economy of 26 miles per gallon. What is the fuel economy in kilometers per liter? (1 mile = 1.609 km, 1 gallon = 3.8 liters)

A. 88 km/L

C. 11 km/L

B. 13 km/L

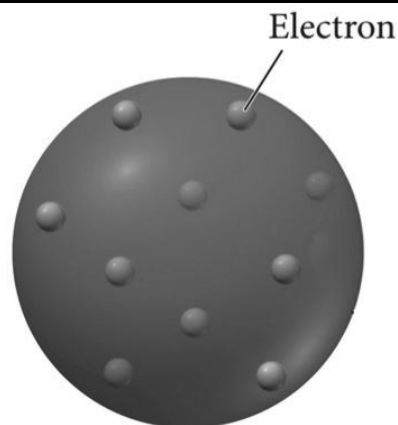
D. 26 km/L

6. What is the result of the following calculation using the correct number of significant figures?

$$0.60 + 1.979 \times 19.84 - 0.1955^3 =$$

- A. 39.856
B. 49.86
C. 39.8558
D. 39.86

7. The “plum-pudding” model of the atom states that electrons are evenly distributed in a sea of positive charge as described in the following figure. What atomic structure discovery disproved the “plum-pudding” model?



- A. quantum numbers
B. neutrons
C. nuclear model
D. valence electrons

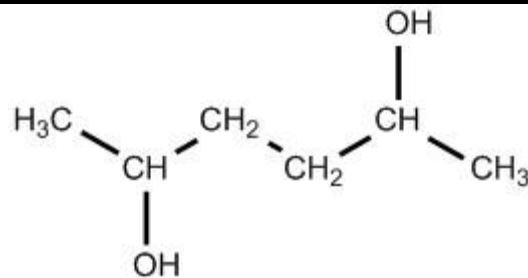
8. Which of the following ions/atom has 10 total electrons?

- A. Ne^+
B. F^+
C. Na
D. Na^+

9. How many **atoms** are in 90.0 grams of caffeine ($\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$, 194.19 g/mol)?

- A. 2.28×10^{24} atoms
B. 5.58×10^{24} atoms
C. 6.70×10^{24} atoms
D. 6.02×10^{23} atoms
-

10. What is the **empirical formula** of this structural formula?



- A. CH_{7/3}O_{1/3} C. C₃H₇O
B. C₂H₅O D. C₆H₁₄O₂

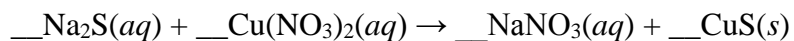
11. What is the name of Fe₂O₃?

- A. diiron trioxide C. iron(VI) oxide
B. iron(III) oxide D. iron oxide

12. How many grams of carbon are in 500. mg of acetylsalicylic acid (C₉H₈O₄, 180.16 g/mol)?

- A. 1.50 × 10⁻¹ g C. 4.50 × 10⁻¹ g
B. 3.00 × 10⁻¹ g D. 5.00 × 10⁻¹ g

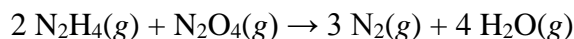
13. What is the **sum of the molar coefficients** when the following chemical equation is balanced?



- A. 3 C. 4
B. 5 D. 6
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Questions 14 – 26 cover material from Exam 2

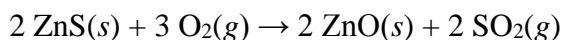
14. Consider the following balanced chemical equation.



How many moles of water are produced when 8.5 moles of N_2H_4 completely react?

- A. 8.5 moles
B. 12.5 moles
C. 12 moles
D. 17 moles

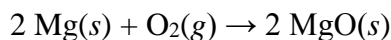
15. Consider the following balanced chemical equation.



What is the limiting reactant if 4.2 moles of zinc(II) sulfide react with 6.8 moles of molecular oxygen?

- A. ZnS
B. ZnO
C. O_2
D. SO_2

16. Consider the following balanced chemical equation.



If the typical percent yield of magnesium oxide is 75.0%, how many grams of magnesium oxide (40.30 g/mol) are expected if 24.31 grams of magnesium react?

- A. 24.3 grams
B. 30.2 grams
C. 26.5 grams
D. 45.8 grams
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17. What is the **molarity** of a solution containing 327 grams of potassium hydroxide (56.11 g/mol) dissolved in water to a volume of 2.2 liters?

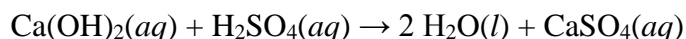
A. 2.7 M

C. 2.1 M

B. 1.2 M

D. 3.8 M

18. Consider the following balanced chemical equation.



Which compound is the **acid** in the chemical equation?

A. Ca(OH)_2

C. CaSO_4

B. H_2O

D. H_2SO_4

19. What is the oxidation number of carbon in NaHCO_3 ?

A. +1

C. +2

B. +4

D. -2

20. Charles's law states that the volume of an ideal gas depends on temperature. Which of the following is a mathematical description of Charles's law?

A. $V \propto 1/T$

C. $V \propto 1/T^2$

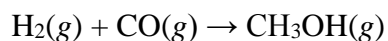
B. $V \propto T$

D. $V \propto P$

-
21. A sample of nitrogen gas at 1.35 atm is in a 1.75 L container at 25.0 °C. How many moles of N₂(g) are in the container?
- A. 0.111 moles C. 0.0966 moles
B. 1.27 moles D. 0.0874 moles

-
22. A 22.4-liter gas sample at STP has a mass of 44.01 grams. What is the gas?
- A. carbon monoxide C. argon
B. carbon dioxide D. krypton

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23. Consider the following balanced chemical equation.

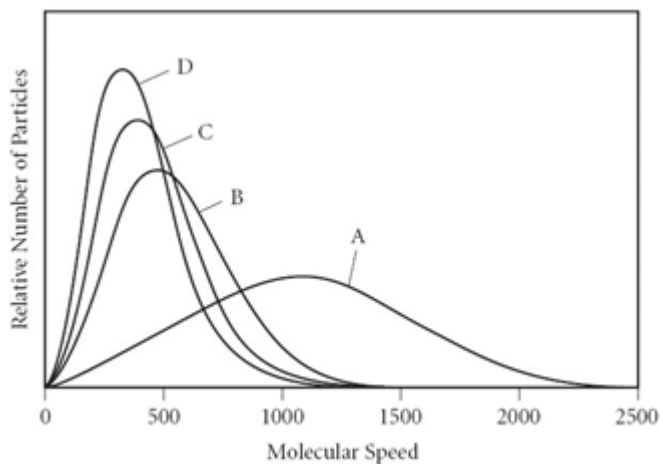


What volume of hydrogen gas is needed to produce 25.8 grams of methanol (CH₃OH, 32.04 g/mol) at 760. mmHg and 359 K, assuming 100% yield?

- A. 11.2 L C. 13.4 L
B. 18.2 L D. 23.7 L
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24. A 275 mL flask of pure helium at a pressure of 752 torr is connected to a 475 mL flask of pure argon at a pressure of 722 torr. The two gases are allowed to mix with one another. What is the partial pressure of **helium** after the two gases are allowed to mix?
- A. 748 torr C. 432 torr
 B. 338 torr D. 276 torr

25. Which of the gases in the plot has the **smallest** molar mass? All measurements are performed at the same temperature.



- A. A C. C
 B. B D. D

26. Deviations from ideal gas behavior occur at low temperature and/or high pressure. The van der Waals equation corrects for non-ideal gas behavior.

$$[P + a(n/V)^2] \times [V - nb] = nRT$$

Which quantity is **not** corrected for by the *a* and *b* terms in the van der Waals equation?

- A. volume C. pressure
 B. temperature D. number of moles

Answer Key:

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