
1. To convert from mass to moles

A. divide by the molar mass.

C. divide by Avogadro's number.

B. multiply by the molar mass.

D. multiply by Avogadro's number.

2. How many grams of Cl are present in 125 grams of CCl_4 (molar mass 153.81 g/mol) and what is the percent composition by mass of Cl in CCl_4 ?

A. 0.922 g and 0.738%

C. 115 g and 92.0%

B. 28.8 g and 23.0%

D. 142 g and 113%

3. Analysis of a compound found that it contained 38.67% carbon, 16.23% hydrogen, and 45.10% nitrogen by mass. What is the **empirical formula** of the compound?

A. C_2HN_3

C. $\text{C}_2\text{H}_5\text{N}$

B. $\text{C}_3\text{H}_{16}\text{N}_3$

D. CH_5N

4. What is the **molecular formula** of a compound with an empirical formula of $\text{C}_2\text{H}_5\text{O}_2$ and a molar mass of 183.2 g/mol?

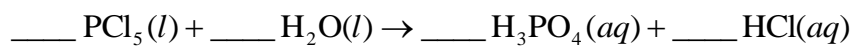
A. $\text{C}_3\text{H}_7\text{O}_3$

C. $\text{C}_4\text{H}_{10}\text{O}_4$

B. $\text{C}_2\text{H}_5\text{O}_2$

D. $\text{C}_6\text{H}_{15}\text{O}_6$

5. What is the coefficient of $\text{H}_2\text{O}(l)$ in the balanced chemical equation?



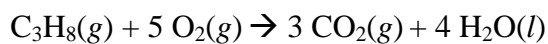
A. 1

C. 4

B. 2

D. 5

6. Propane (C_3H_8) burns to form CO_2 and H_2O . What mass of H_2O is produced from the complete combustion of 15.0 g propane?



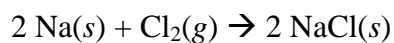
A. 1.53 g

C. 14.6 g

B. 6.13 g

D. 24.5 g

7. Sodium metal and chlorine gas react to form sodium chloride according to the following chemical reaction.



If 5.80 g of sodium react with 11.2 g of chlorine to give 10.17 g of NaCl , what is the percent yield of the sodium chloride produced?

A. 55.0%

C. 69.2%

B. 57.0%

D. 90.8%

8. How much AgNO_3 is required to prepare 500 mL of a 0.100 M AgNO_3 solution?

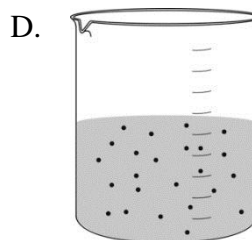
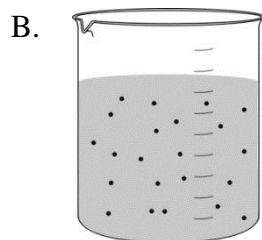
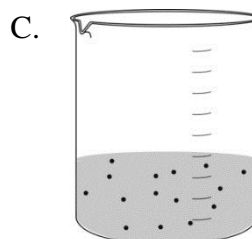
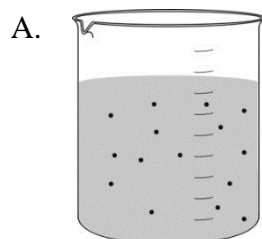
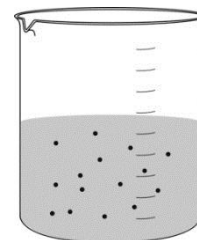
A. 5.39 g

C. 17.0 g

B. 8.49 g

D. 8.49×10^3 g

9. The solution pictured at right is diluted. Which figure best represents the resulting diluted solution?



10. Which statement is true?

A. Table sugar (sucrose, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$) dissolves in water because it is a weak electrolyte.

B. Aqueous solutions of the weak electrolyte, acetic acid ($\text{HC}_2\text{H}_3\text{O}_2$), do not conduct electricity.

C. An aqueous solution of hydrogen bromide, $\text{HBr}(aq)$, contains roughly equal concentrations of intact HBr molecules, H^+ ions and Br^- ions.

D. Potassium nitrate, KNO_3 , dissolves in water because the interactions of water with K^+ and NO_3^- ions are stronger than the attractions of K^+ and NO_3^- ions toward one another in the solid.

11. Which of the following compounds precipitates from an aqueous reaction?

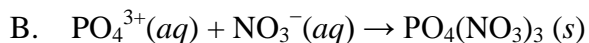
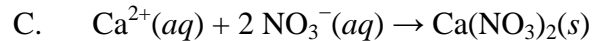
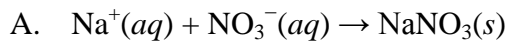
A. NaOH

C. KNO_3

B. LiCl

D. BaCO_3

12. What is the net ionic equation for the reaction that occurs when solutions of $\text{Ca}(\text{NO}_3)_2$ and Na_3PO_4 are combined?



13. What volume of 0.64 M sulfuric acid is required to neutralize 27 mL of 0.39 M sodium hydroxide?

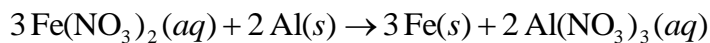
A. 8.2 mL

C. 27 mL

B. 16 mL

D. 33 mL

14. What is the **oxidizing agent** in the following reaction (proceeding to the right)?



A. Al

C. Fe^{2+}

B. Fe

D. NO_3^-

15. Which pressures are equivalent?

A. 452 torr = 526 mmHg

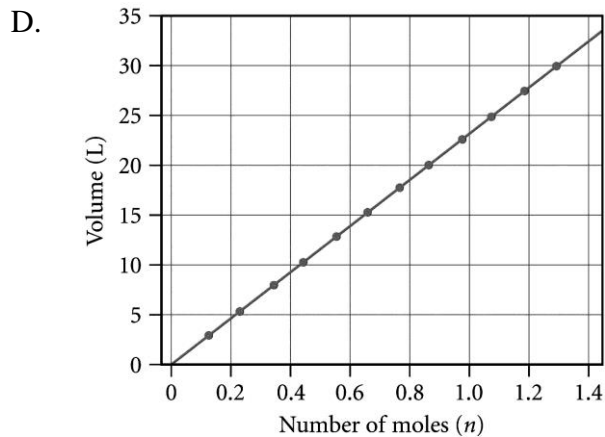
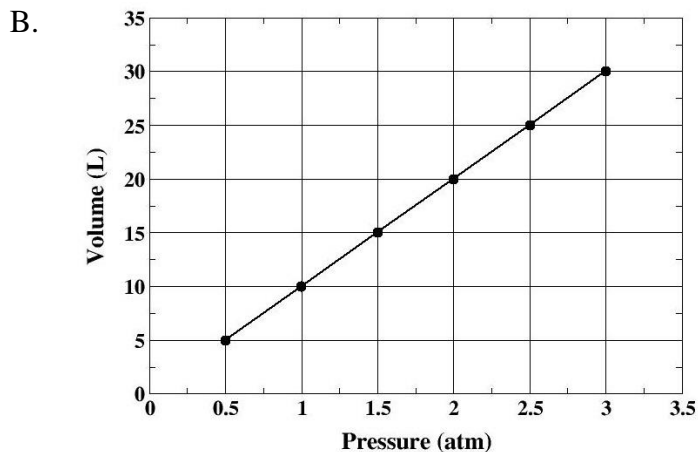
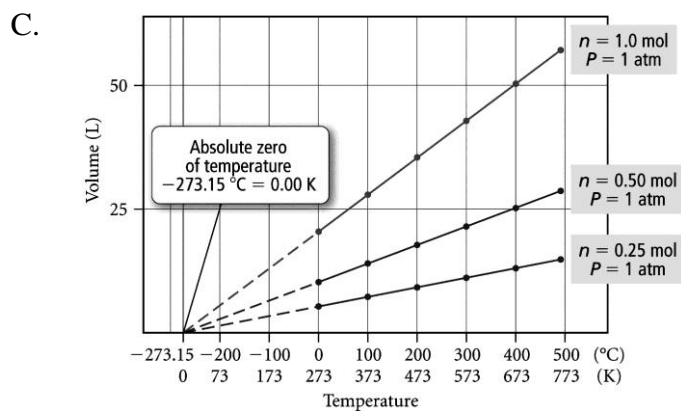
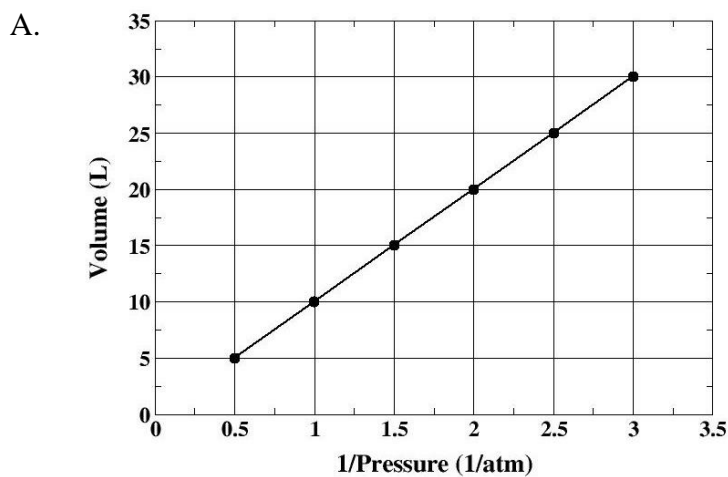
C. 0.890 atm = 676 torr

B. 845 mmHg = 1.50 atm

D. 2.00 atm = 380 torr

16. A balloon has a volume of 2.48 L at 25 °C. What is its volume at 50 °C?
- A. 4.96 L
 B. 2.69 L
 C. 2.48 L
 D. 1.24 L

17. Which figure exhibits information that is **not** consistent with ideal gas behavior?



18. What is the molar volume of gas with a pressure of 1.23 atm at 35.0°C?

A. 20.6 L

C. 23.4 L

B. 22.4 L

D. 31.1 L

19. The total pressure of a mixture of gases is

A. the sum of the partial pressures of the individual components.

B. the pressure of any one component of the mixture.

C. the number of moles of one component divided by the total number of moles in the mixture.

D. the mole fraction of any one component of the mixture.

20. What volume of N₂ gas is produced in the decomposition of 53 g of NaN₃ at STP according to the following reaction?



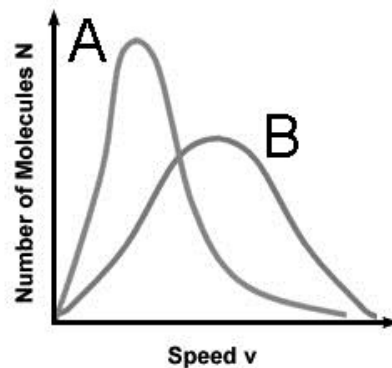
A. 18 L

C. 53 L

B. 27 L

D. 80 L

21. These molecular speed distribution curves can be valid for samples of the same substance at two different temperatures or two different substances at the same temperature. Which statement is true based on the graph?



A. Substance A is at a higher temperature or has a larger molar mass than substance B.

B. Substance A is at a higher temperature or has a lower molar mass than substance B.

C. Substance A is at a lower temperature or has a larger molar mass than substance B.

D. Substance A is at a lower temperature or has a lower molar mass than substance B.

-
22. Under what conditions does the behavior of a real gas deviate the **most** from ideal gas behavior?
- A. high temperature and low pressure
B. high temperature and high pressure
C. low temperature and high pressure
D. All gases behave ideally.
-

23. If 10 J of energy are **released from** a system, what is the energy change of its surroundings?
- A. +20 J
B. +10 J
C. -10 J
D. -20 J
-

24. A piece of copper wire with a mass of 2.50 g left outside in Lexington last week reached $-17.0\text{ }^{\circ}\text{C}$. How much heat is required to warm it up to room temperature, $25.0\text{ }^{\circ}\text{C}$? The specific heat of copper is $0.385\text{ J/g}\cdot^{\circ}\text{C}$.
- A. 40.4 J
B. 24.1 J
C. 7.70 J
D. 0.963 J
-

25. What is the change in internal energy (ΔE) for a system that releases 25.0 kJ of heat while contracting from 12.00 L to 6.00 L at 1.50 atm of pressure? $0.1013\text{ kJ} = 1\text{ L}\cdot\text{atm}$.
- A. -25.9 kJ
B. -24.1 kJ
C. +25.0 kJ
D. +25.9 kJ
-

26. Select the **false** statement.

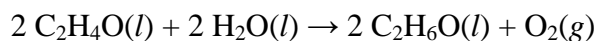
- A. Enthalpy of a system is the sum of its internal energy and the product of its pressure and volume.
- B. A reaction that produces very small amounts of gas has similar values of enthalpy and internal energy.
- C. Heat and enthalpy are equal at constant pressure.
- D. Internal energy of a system is the sum of the kinetic energies of the particles that compose the system.

27. Based on the table to the right, for which substance(s) is(are) the heat of formation exothermic?

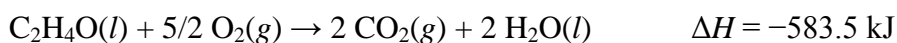
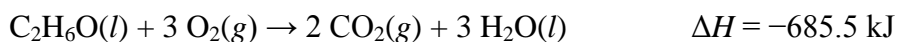
Reactant or product	ΔH_f° (kJ/mol)
NH ₃ (g)	-45.9
O ₂ (g)	0.0
NO(g)	+91.3
H ₂ O(g)	-241.8

- A. NH₃ and H₂O
- B. O₂ only
- C. NO only
- D. NH₃, O₂, NO and H₂O

28. Find the ΔH_{rxn} for the reaction



given the following reactions and ΔH values.



- A. 204.0 kJ
- B. 102.0 kJ
- C. -634.5 kJ
- D. -1269 kJ

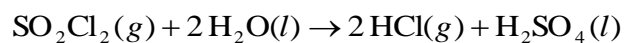
29. Propane burns according to the equation below.



What is the enthalpy change when 48.3 g of H_2O are produced from this reaction?

- A. -555.8 kJ
B. -1487 kJ
C. -2379 kJ
D. -5948 kJ


30. Using the information given, what is $\Delta H_{\text{rxn}}^\circ$ for the following reaction?



Substance	ΔH_f° (kJ/mol)
$\text{SO}_2\text{Cl}_2(g)$	-364
$\text{H}_2\text{O}(l)$	-286
$\text{HCl}(g)$	-92
$\text{H}_2\text{SO}_4(l)$	-814

- A. -422 kJ
B. -256 kJ
C. -62 kJ
D. +161 kJ

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