

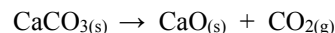
- *This is practice - Do NOT cheat yourself of finding out what you are capable of doing. Be sure you follow the testing conditions outlined below.*
- *DO NOT USE A CALCULATOR. You may use ONLY the green periodic table.*
- *Try to work at a pace of 1.5 min per question. Time yourself. It is important that you practice working for speed.*
- *Then when time is up, continue working and finish as necessary.*

- Two flexible containers for gases are at the same temperature and pressure. One holds 14 g of nitrogen and the other holds 22 g of carbon dioxide. Which of the following statements about these gas samples is true?
  - The volume of the carbon dioxide container is the same as the volume of the nitrogen container.
  - The number of molecules in the carbon dioxide container is greater than the number of molecules in the nitrogen container.
  - The density of the carbon dioxide sample is the same as that of the nitrogen sample.
  - The average kinetic energy of the carbon dioxide molecules is greater than the average kinetic energy of the nitrogen molecules.
  - The average speed of the carbon dioxide molecules is greater than the average speed of the nitrogen molecules.
- A sample of 0.010 mole of nitrogen dioxide gas is confined at 127°C and 2.5 atmospheres. What would be the pressure of this sample at 27°C and the same volume?
  - 0.033 atm
  - 0.33 atm
  - 0.53 atm
  - 1.25 atm
  - 1.88 atm
- A hydrocarbon gas with the empirical formula CH<sub>2</sub> has a density of 1.3 g/L at 0°C and 1.00 atm. A possible formula for the hydrocarbon is:
  - CH<sub>2</sub>
  - C<sub>2</sub>H<sub>4</sub>
  - C<sub>3</sub>H<sub>6</sub>
  - C<sub>4</sub>H<sub>8</sub>
  - C<sub>5</sub>H<sub>10</sub>

- The reaction below takes place in a closed, rigid vessel. The initial pressure of N<sub>2(g)</sub> is 1.0 atm, and that of O<sub>2(g)</sub> is 1.5 atm. No N<sub>2</sub>O<sub>4(g)</sub> is initially present. The experiment is carried out at a constant temperature. What is the total pressure in the container when the partial pressure of N<sub>2</sub>O<sub>4</sub> reaches 0.75 atm?



- 0.25 atm
  - 0.75 atm
  - 1.0 atm
  - 2.0 atm
  - 2.5 atm
- A 0.33 mole sample of CaCO<sub>3(s)</sub> is placed in a 1 L evacuated flask, which is then sealed and heated. The CaCO<sub>3(s)</sub> decomposes completely according to the balanced equation below. The total pressure in the flask is measured at 300 K is closest to which of the following? (The gas constant, R = 0.082 L atm/mol K)



- 2.0 atm
  - 4.1 atm
  - 8.1 atm
  - 16 atm
  - 18 atm
- Equal numbers of moles of CO<sub>2(g)</sub>, N<sub>2(g)</sub>, and NH<sub>3(g)</sub> are placed in a sealed vessel at room temperature. If the vessel has a pinhole-size leak, which of the following will be true after some of the gas mixture has effused?
    - The mole fraction of CO<sub>2</sub> in the sample will increase.
    - The N<sub>2</sub> will effuse the fastest since it is the lightest.
    - All gases will effuse at the same rate since the temperature is held constant.
- I only
  - III only
  - I and II
  - II and III
  - I, II, and III

7. When a sample of carbon dioxide gas in a closed container of constant volume at 0.5 atm and 200 K is heated until its temperature reaches 400 K, its new pressure is closest to
- 0.25 atm
  - 0.50 atm
  - 1.0 atm
  - 1.5 atm
  - 2.0 atm
8. Liquid nitrogen has a boiling point of  $-196^{\circ}\text{C}$ . This corresponds to
- $-469\text{ K}$
  - $77\text{ K}$
  - $153\text{ K}$
  - $469\text{ K}$
  - $-196\text{ K}$
9. 1.5 atm is the same pressure as
- 1140 mmHg
  - 847 mmHg
  - 507 mmHg
  - 410 mmHg
  - 182 mmHg
10. For an ideal gas, which pair of variables are inversely proportional to each other (if all other factors remain constant)?
- P, V
  - P, T
  - V, T
  - n, P
  - density, molar mass
11. A real gas would act most ideal at
- 1 atm and 273 K
  - 10 atm and 547 K
  - 10 atm and 273 K
  - 0.5 atm and 546 K
  - 0.5 atm and 273 K
12. The coldest possible temperature of a gas is
- $0^{\circ}\text{C}$
  - 273 K
  - $-273\text{ K}$
  - $-273^{\circ}\text{C}$
  - In theory there is no limit as to how cold any theoretical gas can be.
13. The pressure of 4.0 L of an ideal gas in a flexible container is decreased to one-third of its original pressure and its absolute temperature is decreased by one-half. The volume then is
- 1.0 L
  - 4.0 L
  - 6.0 L
  - 8.0 L
  - 24 L
14. A given mass of gas in a rigid container is heated from  $100^{\circ}\text{C}$  to  $300^{\circ}\text{C}$ . Which of the following best describes what will happen to the pressure of the gas? The pressure will...
- decrease by a factor of three
  - increase by a factor of three.
  - increase by a factor less than three.
  - decrease by a factor greater than three.
  - unable to be determined without information about volume.
15. A given mass of a gas occupies 5.00 L at  $65^{\circ}\text{C}$  and 480 mmHg. What is the volume of the gas at 630 mmHg and  $85^{\circ}\text{C}$ ?
- $5.00 \times \frac{65}{85} \times \frac{480}{630}$
  - $5.00 \times \frac{338}{358} \times \frac{480}{630}$
  - $5.00 \times \frac{358}{338} \times \frac{480}{630}$
  - $5.00 \times \frac{358}{338} \times \frac{630}{480}$
  - $5.00 \times \frac{338}{358} \times \frac{630}{480}$
16. The ratio of the average velocities of  $\text{SO}_2(\text{g})$  to  $\text{CH}_4(\text{g})$  at 300 K is
- 1:4
  - 1:2
  - 4:1
  - 2:1
  - 8:1

17. Consider the reaction below, in which 6 atm of ammonium nitrite is added to an evacuated flask with a catalyst and then heated.
- $$\text{NH}_4\text{NO}_3(\text{g}) \rightarrow \text{N}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$$
- At equilibrium the total pressure is 14 atm. Calculate the partial pressure of the water vapor at equilibrium
- 2.0 atm
  - 4.0 atm
  - 6.0 atm
  - 8.0 atm
  - 10.0 atm
18. A 5.0 L sample of gas is collected at 400. mmHg at 727°C. What is its volume if it were cooled to 77°C and increased to 700. mmHg pressure?
- 2.50 L
  - 250 ml
  - 1.0 L
  50. L
  - 129 ml
19. A sealed flask at 20°C contains 1 molecule of carbon dioxide, CO<sub>2</sub> for every 3 atoms of helium, He. If the total pressure is 800 mmHg, the partial pressure of helium is
- 200 mmHg
  - 300 mmHg
  - 400 mmHg
  - 600 mmHg
  - 800 mmHg
20. Ideal gases vary from real gases at conditions of
- high temperature and low pressure
  - both high temperature and high pressure
  - both low temperature and low pressure
  - low temperature and high pressure
  - both high density and low pressure
21. If 2.0 moles of gas in a sealed glass flask is heated from 25°C to 50°C. Select the conditions that are true.
- | kinetic energy    | pressure  | number of moles |
|-------------------|-----------|-----------------|
| a. increases      | increases | stays the same  |
| b. stays the same | increases | stays the same  |
| c. decreases      | increases | stays the same  |
| d. increases      | increases | increases       |
| e. stays the same | increases | increases       |
22. A flask with a pressure of 2000 mmHg contains 6 mol of helium with a partial pressure of 1500 mmHg. The remaining gas is hydrogen, what is the mass of hydrogen in the flask?
- 0.50 g
  - 2.0 g
  - 4.0 g
  - 8.0 g
  - 16 g
23. The temperature of a sample of an ideal gas confined in a 2.0 L container was raised from 27°C to 77°C. If the initial pressure of the gas was 1,200 mmHg, what was the final pressure of the gas?
- 600 mmHg
  - 1,400 mmHg
  - 2,400 mmHg
  - 2,100 mmHg
  - 3,600 mmHg
24. A sealed container containing 8.0 grams of oxygen gas and 7.0 of nitrogen gas is kept at a constant temperature and pressure. Which of the following is true?
- The volume occupied by oxygen is greater than the volume occupied by nitrogen.
  - The volume occupied by oxygen is equal to the volume occupied by nitrogen.
  - The volume occupied by nitrogen is greater than the volume occupied by oxygen.
  - The density of nitrogen gas is greater than the density of oxygen.
  - The average molecular speeds if the two gases are the same.
25. A gas sample contains 0.1 mole of oxygen and 0.4 mole of nitrogen. If the sample is at standard temperature and pressure, what is the partial pressure due to nitrogen?
- 0.1 atm
  - 0.2 atm
  - 0.5 atm
  - 0.8 atm
  - 1.0 atm
26. A mixture of gases contains 1.5 moles of oxygen, 3.0 moles of nitrogen, and 0.5 mole of water vapor. If the total pressure is 700 mmHg, what is the partial pressure of the nitrogen gas?
- 70 mmHg
  - 210 mmHg
  - 280 mmHg
  - 350 mmHg
  - 420 mmHg

27. A mixture of helium and neon gases has a total pressure of 1.2 atm. If the mixture contains twice as many moles of helium as neon, what is the partial pressure due to neon?
- 0.2 atm
  - 0.3 atm
  - 0.4 atm
  - 0.8 atm
  - 0.9 atm
28. Nitrogen gas was collected over water at 25°C. If the vapor pressure of water at 25°C is 23 mmHg, and the total pressure in the container is measured at 781 mmHg, what is the partial pressure of the nitrogen gas?
- 23 mmHg
  - 46 mmHg
  - 551 mmHg
  - 735 mmHg
  - 758 mmHg
29. When 4.0 moles of oxygen are confined in a 24-liter vessel at 176°C, the pressure is 6.0 atm. If the oxygen is allowed to expand isothermally until it occupies 36 liters, what will be the new pressure?
- 2 atm
  - 3 atm
  - 4 atm
  - 8 atm
  - 9 atm
30. A gas sample is confined in a 5-liter container. Which of the following will occur if the temperature of the container is increased?
- The kinetic energy of the gas will increase.
  - The pressure of the gas will increase
  - The density of the gas will increase.
- I only
  - II only
  - I and II only
  - I and III only
  - I, II, and III
31. A 14.0 gram sample of an unknown gas occupies 11.2 liters at standard temperature and pressure. Which of the following could be the identity of the gas?
- N<sub>2</sub>
  - CO<sub>2</sub>
  - CO
- I only
  - II only
  - I and III only
  - II and III only
  - I, II, and III
32. A gaseous mixture at a constant temperature contains O<sub>2</sub>, CO<sub>2</sub>, and He. Which of the following lists the three gases in order of increasing average molecular speeds?
- O<sub>2</sub>, CO<sub>2</sub>, He
  - O<sub>2</sub>, He, CO<sub>2</sub>
  - He, CO<sub>2</sub>, O<sub>2</sub>
  - He, O<sub>2</sub>, CO<sub>2</sub>
  - CO<sub>2</sub>, O<sub>2</sub>, He
33. Which of the following conditions would be most likely to cause the ideal gas laws to fail?
- High pressure
  - High temperature
  - Large volume
- I only
  - II only
  - I and II only
  - I and III only
  - II, and III only
34. An ideal gas contained in 5.0 liter chamber at a temperature of 37°C. If the gas exerts a pressure of 2.0 atm on the walls of the chamber, which of the following expressions is equal to the number of moles of the gas?
- $\frac{(2.0)(5.0)}{(0.08)(37)}$  moles
  - $\frac{(2.0)(0.08)}{(5.0)(37)}$  moles
  - $\frac{(2.0)(0.08)}{(5.0)(310)}$  moles
  - $\frac{(2.0)(310)}{(5.0)(0.08)}$  moles
  - $\frac{(2.0)(5.0)}{(310)(0.08)}$  moles
35. Which of the following gases would be expected to have a rate of effusion that is one-third as large as that of H<sub>2</sub>?
- O<sub>2</sub>
  - N<sub>2</sub>
  - He
  - H<sub>2</sub>O
  - CO<sub>2</sub>

36. A balloon occupies a volume of 1.0 liter when it contains 0.16 g of helium at 37°C and 1 atm pressure. If helium is added to the balloon until it contains 0.80 grams while pressure and temperature are kept constant, what will be the new volume of the balloon?
- 0.50 liter
  - 1.0 liter
  - 2.0 liters
  - 4.0 liters
  - 5.0 liters
37. A gaseous mixture of oxygen and nitrogen is maintained at a constant temperature. Which of the following MUST be true regarding the two gases?
- Their average kinetic energies will be the same.
  - Their average molecular speeds will be the same.
  - Their partial pressures will be the same.
  - Their total masses will be the same
  - Their densities will be the same.
38. An ideal gas fills a balloon at a temperature of 27°C and 1 atm pressure. By what factor will the volume of the balloon change if the gas in the balloon is heated to 127°C at constant pressure?
- $\frac{27}{127}$
  - $\frac{3}{4}$
  - $\frac{4}{3}$
  - $\frac{2}{1}$
  - $\frac{127}{27}$
39. Which of the following assumption(s) is (are) valid based on kinetic molecular theory.
- Gas molecules have negligible volume.
  - Gas molecules have no attractive forces on each other.
  - The temperature of a gas is directly proportional to its kinetic energy.
- I only
  - III only
  - I and III only
  - II and III only
  - I, II, and III
40. A gas sample with a mass of 10 grams occupies 6.0 liters and exerts a pressure of 2.0 atm at a temperature of 26°C. Which of the following expressions is equal to the molecular mass of the gas?
- $\frac{(10)(0.0821)(299)}{(2.0)(6.0)}$  g/mol
  - $\frac{(0.0821)(299)}{(10)(6.0)(2.0)}$  g/mol
  - $\frac{(2.0)(6.0)(299)}{(10)(0.0821)}$  g/mol
  - $\frac{(2.0)(6.0)(10)}{(299)(0.0821)}$  g/mol
  - $\frac{(2.0)(6.0)}{(10)(299)(0.0821)}$  g/mol
41. Consider the combustion of 6.0 g of ethane. What volume of carbon dioxide will be formed at STP?
- 0.20 L
  - 0.40 L
  - 2.2 L
  - 9.0 L
  - 22.4 L
42. Chlorine gas and fluorine gas will combine to form one gaseous product. One L of Cl<sub>2</sub> reacts with 3 L of F<sub>2</sub> to produce 2 L of product. assuming constant temperature and pressure condition, what is the formula of the product?
- ClF
  - Cl<sub>2</sub>F<sub>2</sub>
  - ClF<sub>2</sub>
  - Cl<sub>2</sub>F
  - ClF<sub>3</sub>
43. A sample of helium gas is collected in a container. The helium gas effuses out through a tiny hole at a rate of 0.2 moles per minute. If a sample of methane is allowed to effuse under the same conditions, the rate of effusion of CH<sub>4</sub> will be
- 0.1 moles per minute
  - 0.14 moles per minute
  - 0.2 moles per minute
  - 0.4 moles per minute
  - 0.8 moles per minute

1. a
2. e
3. b
4. c
5. c
6. a
7. c
8. b
9. a
10. a
11. d
12. d
13. c
14. c
15. c
16. b
17. d
18. c
19. d
20. d
21. a
22. c
23. b
24. b
25. d
26. e
27. c
28. e
29. c
30. c
31. c
32. e
33. a
34. e
35. d
36. e
37. a
38. c
39. e
40. a
41. d
42. e
43. a