

Name:

## Gases Review Packet 2016

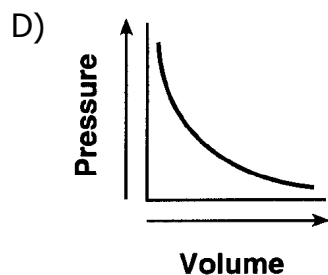
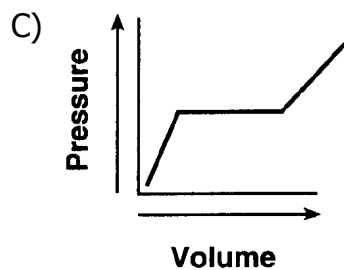
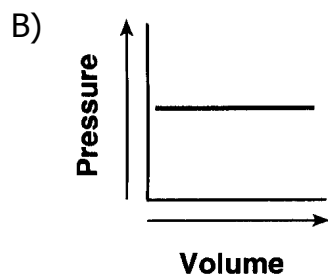
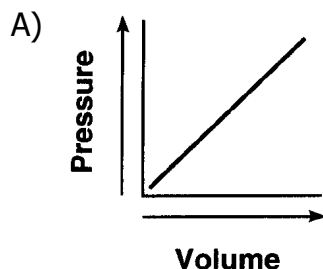
- Which statement correctly describes a sample of gas confined in a sealed container?
  - It always has a definite volume, and it takes the shape of the container.
  - It takes the shape and the volume of any container in which it is confined.
  - It has a crystalline structure.
  - It consists of particles arranged in a regular geometric pattern.
- A sample of helium gas is in a sealed, rigid container. What occurs as the temperature of the sample is increased?
  - The mass of the sample decreases.
  - The number of moles of gas increases.
  - The volume of each atom decreases.
  - The frequency of collisions between atoms increases.
- Which sample of water contains particles having the highest average kinetic energy?
  - 25 mL of water at 95°C
  - 45 mL of water at 75°C
  - 75 mL of water at 75°C
  - 95 mL of water at 25°C
- A sample of chlorine gas is at 300. K and 1.00 atmosphere. At which temperature and pressure would the sample behave more like an ideal gas?
  - 0 K and 1.00 atm
  150. K and 0.50 atm
  - 273 K and 1.00 atm
  600. K and 0.50 atm
- Which statement describes the particles of an ideal gas?
  - The particles move in well-defined, circular paths.
  - When the particles collide, energy is lost.
  - There are forces of attraction between the particles.
  - The volume of the particles is negligible.
- When a sample of a gas is heated at constant pressure, the average kinetic energy of its molecules
  - decreases, and the volume of the gas increases
  - decreases, and the volume of the gas decreases
  - increases, and the volume of the gas increases
  - increases, and the volume of the gas decreases
- A real gas differs from an ideal gas because the molecules of real gas have
  - some volume and no attraction for each other
  - some volume and some attraction for each other
  - no volume and no attraction for each other
  - no volume and some attraction for each other
- Under the same conditions of temperature and pressure, which of the following gases would behave most like an ideal gas?

A) He(g)	B) NH <sub>3</sub> (g)
C) Cl <sub>2</sub> (g)	D) CO <sub>2</sub> (g)
- Which rigid cylinder contains the same number of gas molecules at STP as a 2.0-liter rigid cylinder containing H<sub>2</sub>(g) at STP?
  - 1.0-L cylinder of O<sub>2</sub>(g)
  - 2.0-L cylinder of CH<sub>4</sub>(g)
  - 1.5-L cylinder of NH<sub>3</sub>(g)
  - 4.0-L cylinder of He(g)
- Which set of values represents standard pressure and standard temperature?
  - 1 atm and 101.3 K
  - 1 kPa and 273 K
  - 101.3 kPa and 0°C
  - 101.3 atm and 273°C

11. A cylinder with a movable piston contains a sample of gas having a volume of 6.0 liters at 293 K and 1.0 atmosphere. What is the volume of the sample after the gas is heated to 303 K, while the pressure is held at 1.0 atmosphere?

- A) 9.0 L                      B) 6.2 L  
C) 5.8 L                      D) 4.0 L

12. Which graph represents the relationship between pressure and volume for a sample of an ideal gas at constant temperature?



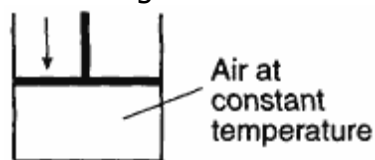
13. A sample of gas occupies a volume of 50.0 milliliters in a cylinder with a movable piston. The pressure of the sample is 0.90 atmosphere and the temperature is 298 K. What is the volume of the sample at STP?

- A) 41 mL                      B) 49 mL  
C) 51 mL                      D) 55 mL

14. As the temperature of a gas increases at constant pressure, the volume of the gas

- A) decreases  
B) increases  
C) remains the same

15. A cylinder with a tightly fitted piston is shown in the diagram below.



As the piston moves downward, the number of molecules of air in the cylinder

- A) decreases  
B) increases  
C) remains the same

16. The volume of a sample of a gas at 0°C is 100 liters. If the volume of the gas is increased to 200 liters at constant pressure, what is the new temperature of the gas in degrees Kelvin?

- A) 0 K                              B) 273 K  
C) 100 K                            D) 546 K

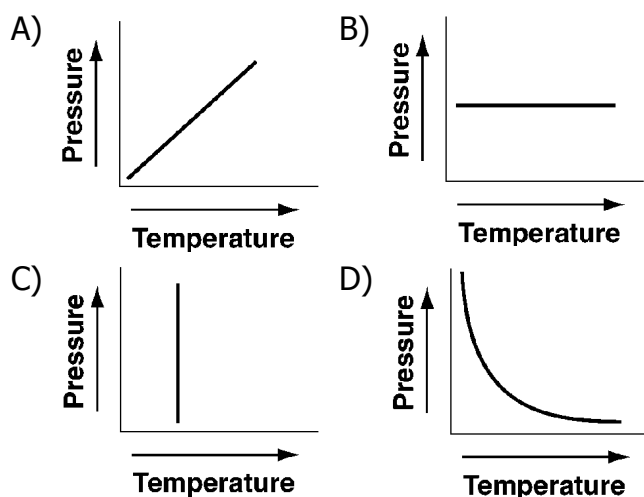
17. According to the kinetic molecular theory, the particles of an ideal gas

- A) have no potential energy  
B) have strong intermolecular forces  
C) are arranged in a regular, repeated geometric pattern  
D) are separated by great distances, compared to their size

18. A real gas behaves more like an ideal gas when the gas molecules are

- A) close and have strong attractive forces between them
- B) close and have weak attractive forces between them
- C) far apart and have strong attractive forces between them
- D) far apart and have weak attractive forces between them

19. Which graph shows the pressure-temperature relationship expected for an ideal gas?



20. At which temperature is the vapor pressure of ethanol equal to 80. kPa?

- A)  $48^{\circ}\text{C}$
- B)  $73^{\circ}\text{C}$
- C)  $80^{\circ}\text{C}$
- D)  $101^{\circ}\text{C}$

21. Using your knowledge of chemistry and the information in Reference Table H, which statement concerning propanone and water at  $50^{\circ}\text{C}$  is true?

- A) Propanone has a higher vapor pressure and stronger intermolecular forces than water.
- B) Propanone has a higher vapor pressure and weaker intermolecular forces than water.
- C) Propanone has a lower vapor pressure and stronger intermolecular forces than water.
- D) Propanone has a lower vapor pressure and weaker intermolecular forces than water.

22. In a closed system, as the temperature of a liquid increases, the vapor pressure of the liquid

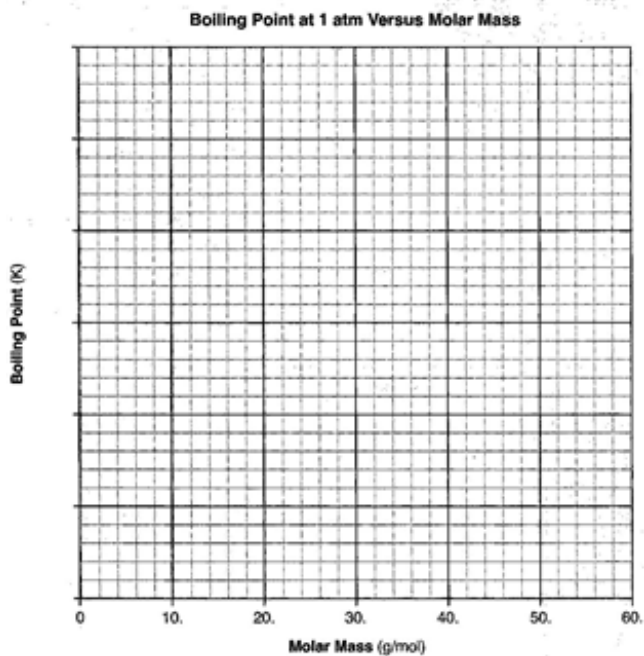
- A) decreases
- B) increases
- C) remains the same

Base your answers to questions **23** through **26** on the information below.

**Molar Mass and Boiling Point of Four Substances**

Substance	Molar Mass (g/mol)	Boiling Point at 1 atm (K)
methane	16	112
ethane	30	185
propane	44	231
butane	58	273

- 23. On the grid below, mark an appropriate scale on the axis labeled "Boiling Point (K)."
- 24. On the same grid, plot the data from the data table. Circle and connect the points.



- 25. Based on the data in the table, state the relationship between the boiling point at 1 atmosphere and molar mass for these four substances.
- 26. State, in terms of intermolecular forces, why the boiling point of propane at 1 atmosphere is lower than the boiling point of butane at 1 atmosphere.

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Base your answers to questions **27** through **29** on the information below and on your knowledge of chemistry.

Cylinder A has a movable piston and contains hydrogen gas. An identical cylinder, B, contains methane gas. The diagram below represents these cylinders and the conditions of pressure, volume, and temperature of the gas in each cylinder.

**Cylinder A**



Hydrogen gas  
 $P = 1.2 \text{ atm}$   
 $V = 1.25 \text{ L}$   
 $T = 293 \text{ K}$

**Cylinder B**



Methane gas  
 $P = 1.2 \text{ atm}$   
 $V = 1.25 \text{ L}$   
 $T = 293 \text{ K}$

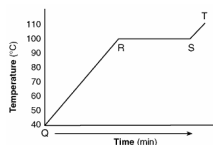
27. Show a numerical setup for calculating the volume of the gas in cylinder B at STP.
  28. State a change in temperature and a change in pressure that will cause the gas in cylinder A to behave more like an ideal gas.
  29. Compare the total number of gas molecules in cylinder A to the total number of gas molecules in cylinder B.
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30. A sample of water is heated from a liquid at 40°C to a gas at 110°C. The graph of the heating curve is shown below.

a. On the heating curve diagram provided below, label each of the following regions:

**Liquid, only**  
**Gas, only**  
**Phase change**



b. For section QR of the graph, state what is happening to the water molecules as heat is added.

c. For section RS of the graph, state what is happening to the water molecules as heat is added.

31. Base your answer to the following question on the properties of propanone.

A liquid's boiling point is the temperature at which its vapor pressure is equal to the atmospheric pressure. Using Reference Table H, what is the boiling point of propanone at an atmospheric pressure of 70 kPa?

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