

SOL Questions

Each of the following questions below appeared on an SOL Chemistry Exam between 2000 and 2003. For each of the following circle the best answer.

1. A student wants to study the effects of volume on gas pressure. During his experiment he recorded the data to the right. How could he now study the effects of temperature on gas pressure?

- Vary the temperature and volume of the gas.
- Vary the volume of the gas only.
- Vary the pressure and temperature of the gas.
- Vary the temperature but keep the gas volume constant.

Trial	Volume	Pressure	Temperature
1	100 mL	250 mm Hg	298 K
2	300 mL	83 mm Hg	298 K
3	500 mL	50 mm Hg	298 K

2. A sample of nitrogen gas is collected over water at 20°C. The vapor pressure of water at 20°C is 18 mmHg. What is the partial pressure of the nitrogen if the total pressure is 765 mmHg?

- 18 mmHg
- 747 mmHg
- 765 mmHg
- 783 mmHg

3. A gas has a volume of 50.0 cm³ at a temperature of -73°C. What volume would the gas occupy at a temperature of -123°C if the pressure stays constant?

- 3.75 cm³
- 5.0 cm³
- 37.5 cm³
- 50.0 cm³

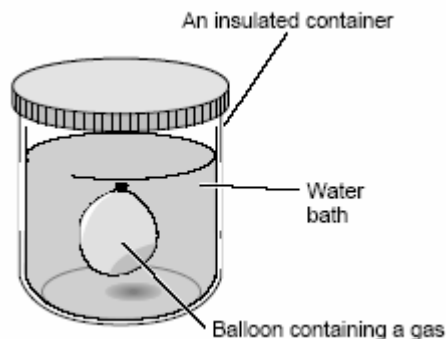
4.

$$\text{Ideal Gas Law constant} = 8.31 \frac{\text{dm}^3 \cdot \text{kPa}}{\text{K} \cdot \text{mol}}$$

How many moles of CO₂ are there in a 50.0 dm³ sample of the gas at a pressure of 100.0 kPa and a temperature of 50.0°C?

- 1.20 moles
- 1.86 moles
- 2.0 moles
- 12.0 moles

5. One way to increase the volume of the gas in the balloon in the diagram to the left is to –



- cool the gas and the balloon only
- increase the temperature of the water
- push the balloon farther down into the water bath
- seal the top of the water bath

6. One of the main assumptions of the kinetic molecular theory of gases is that the particles of an ideal gas –

- must be single atoms instead of molecules
- are in constant motion
- must be maintained at very high pressures
- must be highly chemically reactive

7. The average kinetic energy of a sample of water molecules is –

- increased as the temperature is decreased
- increased as the temperature is increased
- unaffected by temperature changes
- always equal to zero

8. If the pressure exerted on a confined gas is doubled, then the volume of the gas –

- increased four times
- decreases by one-fourth
- is doubled
- is halved

9. A sample of oxygen gas is collected over water at 22°C and 98.67 kPa pressure. If the partial pressure of the water is 2.67 kPa, the partial pressure of oxygen gas is –

- 93.33 kPa
- 96.00 kPa
- 98.66 kPa
- 101.33 kPa

10. A sample of hydrogen gas is collected over water at 25°C. The vapor pressure of water at 25°C is 23.8 mmHg. If the total pressure is 523.8 mmHg, what is the partial pressure of the hydrogen?

- 23.8 mmHg
- 47.6 mmHg
- 500.0 mmHg
- 523.8 mmHg

11. According to the graph to the right, what happens at the triple point of water?
- Only ice and liquid water exist in equilibrium.
 - Water exists only as a solid.
 - Water exists only as a gas.
 - Ice, water vapor, and liquid water exist in equilibrium.

12. According to the graph to the right, at a temperature of 100°C and a pressure of 0.61 kPa what state is water in?
- solid
 - liquid
 - gas
 - solid, liquid and gas

13.

$$R = 8.31 \frac{\text{kPa} \cdot \text{dm}^3}{\text{moles} \cdot \text{K}}$$

A gas cylinder with a volume of 3.00 dm³ contains 8.00 moles of oxygen gas at a temperature of 50.0 K. What is the pressure inside the cylinder?

- 504 kPa
 - 1110 kPa
 - 2220 kPa
 - 3320 kPa
14. A tank contains N₂ at 1.0 atm and O₂ at 2.0 atm. Helium is added to this tank until the total pressure is 6.0 atm. What is the partial pressure of the helium?
- 4.0 atm
 - 3.0 atm
 - 2.0 atm
 - 1.0 atm
15. A heated liquid placed in a closed container will vaporize until –
- the boundary between liquid and vapor disappears
 - all the liquid molecules become vapor molecules
 - the vapor pressure is greater than the atmospheric pressure
 - the number of liquid molecules vaporizing equals the number of vapor molecules condensing
16. Which of the following liquids would exhibit the highest vapor pressure at 25°C?
- water, boiling point = 100°C
 - glycerine, boiling point = 290°C
 - ether, boiling point = 34.6°C
 - ethyl alcohol, boiling point = 78.3°C

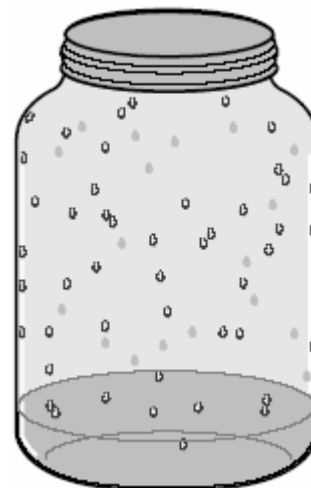
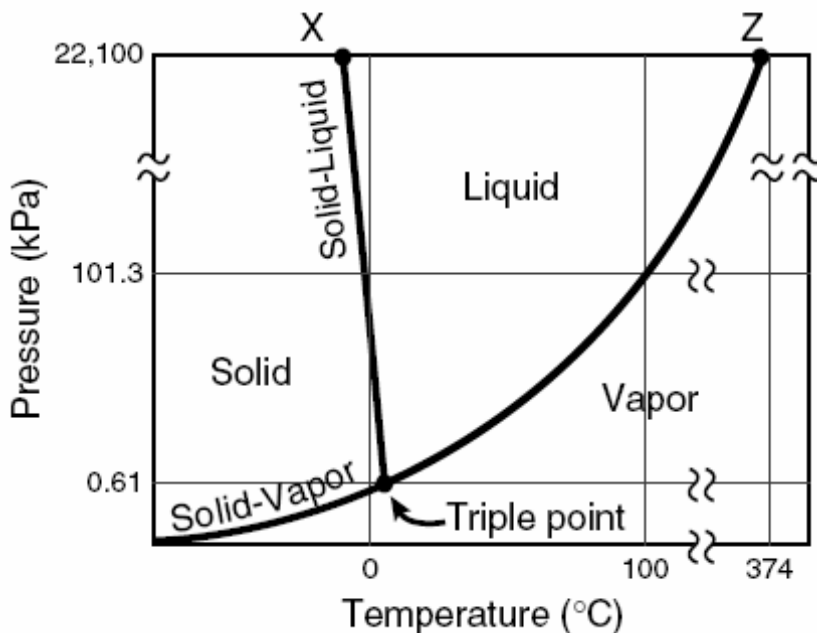
17.

$$R = 8.31 \frac{\text{kPa} \cdot \text{dm}^3}{\text{moles} \cdot \text{K}}$$

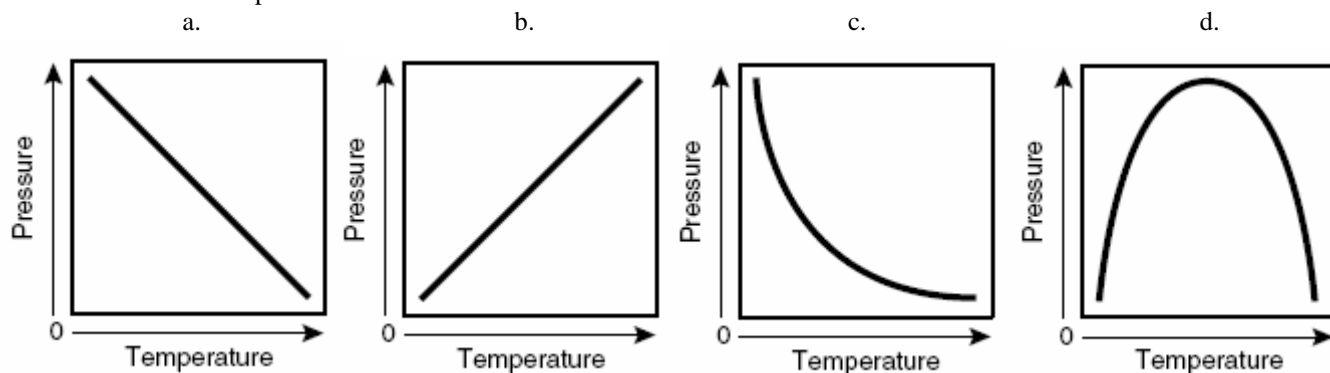
A gas cylinder is filled with 4.00 moles of oxygen gas at 300.0 K. The piston is compressed to yield a pressure of 400.0 kPa. What is the volume inside the cylinder?

- 3.19 kPa
 - 6.25 kPa
 - 24.9 kPa
 - 31.5 kPa
18. What is the density of carbon dioxide at STP?
- 1.96 g/L
 - 22.0 g/L
 - 46.0 g/L
 - 5.09 x 10¹ g/L

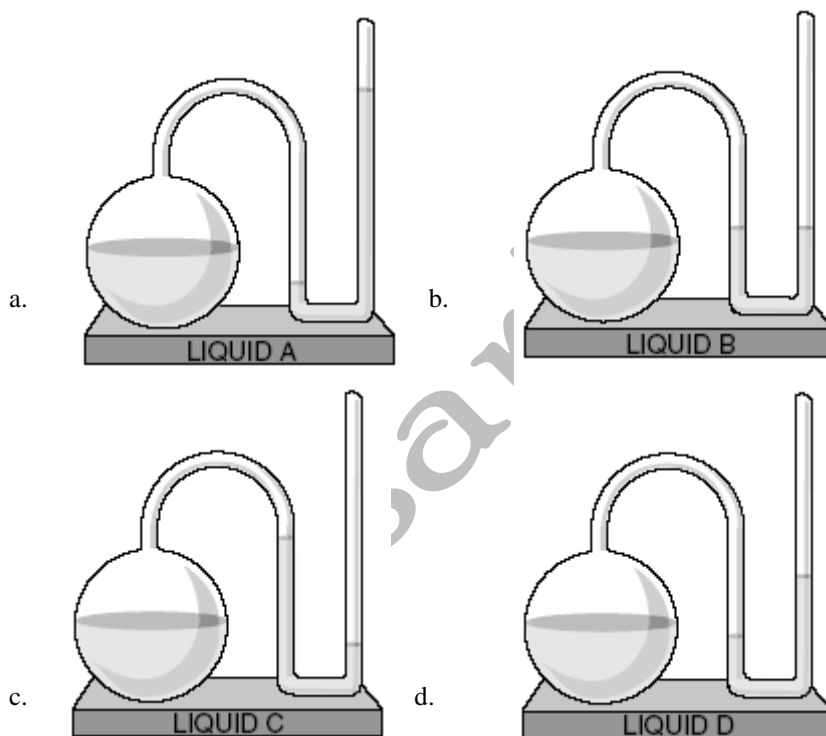
Triple Point of Water



19. At a constant volume, the pressure of a gas will increase as the temperature increases. Which of the following graphics shows that relationship?



20. Equal quantities of different liquids are placed in closed manometers at 20°C. Which liquid has the highest vapor pressure?



21. What mass of nitrogen gas is needed to have 5.70 dm³ at 113.2 kPa and -10 °C?

- a. 0.295 grams b. 8.27 grams
 c. 29.9 grams d. 1.07 grams

$$R = 8.31 \frac{\text{kPa} \cdot \text{dm}^3}{\text{moles} \cdot \text{K}}$$

22. If you heat up a closed tank of helium, what would happen to the pressure inside the tank?

- a. increase b. decrease c. remain constant d. not enough information

23. A balloon has a volume of 7.00 liters at a pressure of 740 mm Hg. If the temperature remains constant, at what pressure will the volume decrease to 2.00 liters?

- a. 749 mm Hg b. 52.9 mm Hg c. 2590 mm Hg d. 211 mm Hg

24. A container contains helium, neon, argon and krypton. Calculate the total pressure if $P_{\text{neon}} = 90. \text{ kPa}$, $P_{\text{argon}} = 20. \text{ kPa}$, $P_{\text{krypton}} = 50. \text{ kPa}$ & $P_{\text{helium}} = 10. \text{ kPa}$.

- a. 170 kPa b. 10 kPa c. 160 kPa d. 30 kPa