

Ideal Gas

- 1 At which temperature and pressure will a sample of neon gas behave most like an ideal gas?
 - (1) 300. K and 2.0 atm (3) 500. K and 2.0 atm
 - (2) 300. K and 4.0 atm (4) 500. K and 4.0 atm

- 2 At which temperature and pressure would a sample of helium behave most like an ideal gas?
 - (1) 75 K and 500. kPa (3) 300. K and 50. kPa
 - (2) 150. K and 500. kPa (4) 600. K and 50. kPa

- 3 A real gas behaves most like an ideal gas at
 - (1) low pressure and high temperature
 - (2) low pressure and low temperature
 - (3) high pressure and high temperature
 - (4) high pressure and low temperature

- 4 Compared to a sample of helium at STP, the same sample of helium at a higher temperature and a lower pressure
 - (1) condenses to a liquid
 - (2) is more soluble in water
 - (3) forms diatomic molecules
 - (4) behaves more like an ideal gas

- 5 A sample of hydrogen gas will behave most like an ideal gas under the conditions of
 - (1) low pressure and low temperature
 - (2) low pressure and high temperature
 - (3) high pressure and low temperature
 - (4) high pressure and high temperature

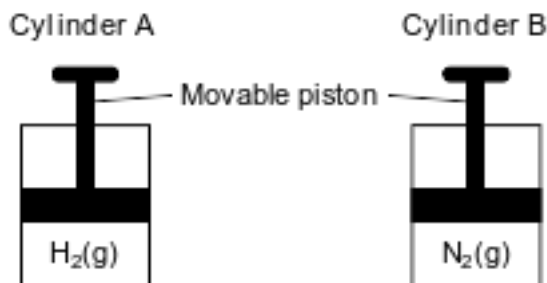
- 6 Under which conditions of temperature and pressure does a real gas behave most like an ideal gas?
 - (1) 37 K and 1 atm (3) 347 K and 1 atm
 - (2) 37 K and 8 atm (4) 347 K and 8 atm

- 7 Under which conditions of temperature and pressure does a real gas behave most like an ideal gas?
 - (1) low temperature and low pressure
 - (2) low temperature and high pressure
 - (3) high temperature and low pressure
 - (4) high temperature and high pressure

- 8 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?
 - (1) 0 K and 1.00 atm (3) 273 K and 1.00 atm
 - (2) 150. K and 0.50 atm (4) 600. K and 0.50 atm

Base your answers to questions 9 on the information below and on your knowledge of chemistry.

Cylinder A and cylinder B are sealed, rigid cylinders with movable pistons. Each cylinder contains 500. milliliters of a gas sample at 101.3 kPa and 298 K. Cylinder A contains $\text{H}_2(\text{g})$ and cylinder B contains $\text{N}_2(\text{g})$. The diagrams below represent these two cylinders.



- 9 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.

Base your answers to questions 10 on the information below and on your knowledge of chemistry.

The enclosed cabin of a submarine has a volume of 2.4×10^5 liters, a temperature of 312 K, and a pressure of 116 kPa. As people in the cabin breathe, carbon dioxide gas, $\text{CO}_2(\text{g})$, can build up to unsafe levels. Air in the cabin becomes unsafe to breathe when the mass of $\text{CO}_2(\text{g})$ in this cabin exceeds 2156 grams.

- 10 Show a numerical setup for calculating the pressure in the submarine cabin if the cabin temperature changes to 293 K.

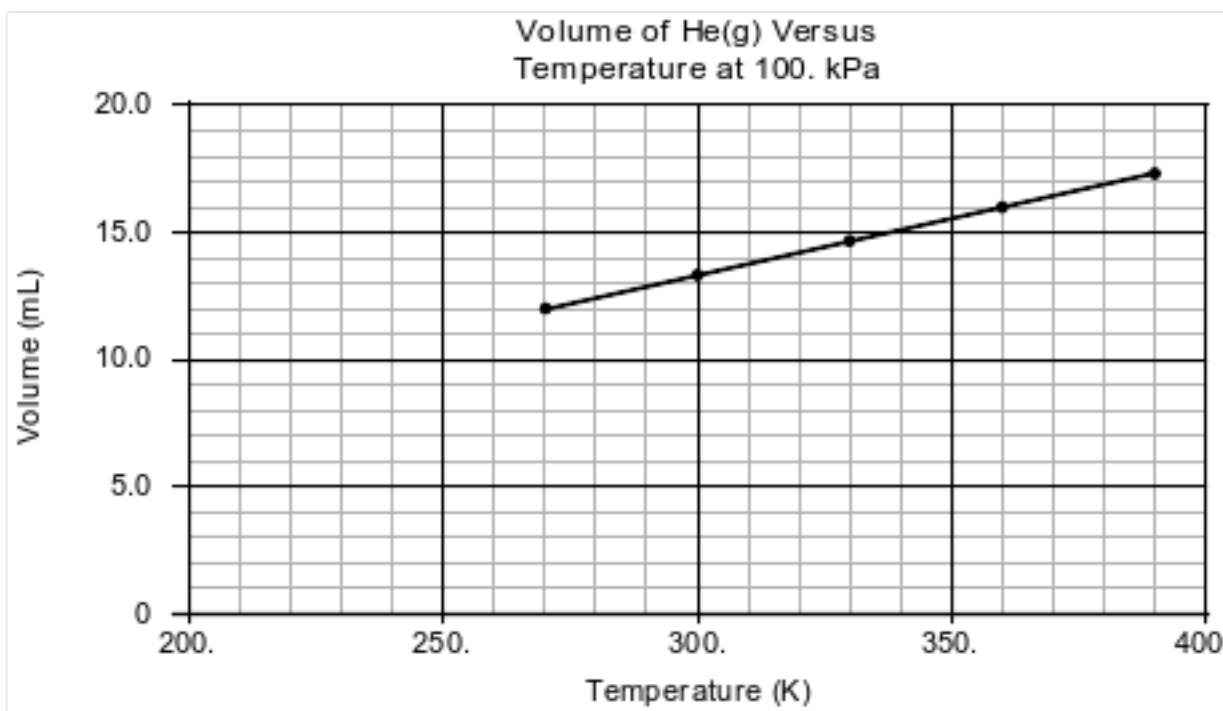
Base your answers to questions 11 on the information below and on your knowledge of chemistry.

A 200.-milliliter sample of $\text{CO}_2(\text{g})$ is placed in a sealed, rigid cylinder with a movable piston at 296 K and 101.3 kPa.

- 11 State a change in temperature and a change in pressure of the $\text{CO}_2(\text{g})$ that would cause it to behave more like an ideal gas.

Base your answers to questions 12 on the information below and on your knowledge of chemistry.

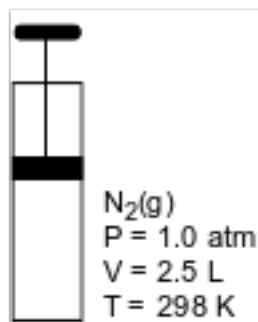
In a laboratory activity, the volume of helium gas in a rigid cylinder with a movable piston is varied by changing the temperature of the gas. The activity is done at a constant pressure of 100. kPa. Data from the activity are plotted on the graph below.



- 12 State a change in pressure that will cause the helium in the cylinder to behave more like an ideal gas.

Base your answers to questions 13 on the information below and on your knowledge of chemistry.

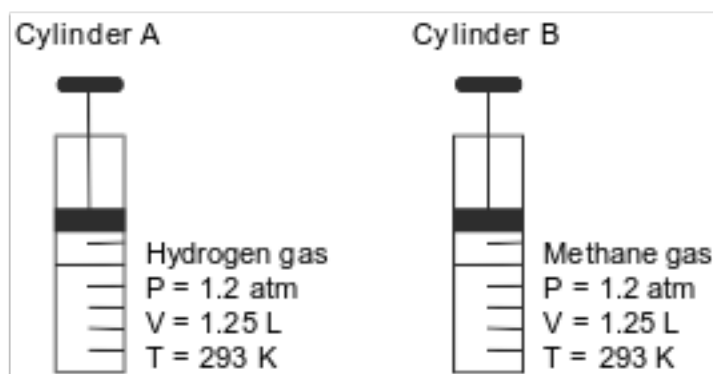
The diagram and data below represent a gas and the conditions of pressure, volume, and temperature of the gas in a rigid cylinder with a moveable piston.



- 13 State one change in temperature and one change in pressure that will cause the gas in the cylinder to behave more like an ideal gas.

Base your answers to questions 14 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.



- 14 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.

Answer Keys

1 3

2 4

3 1

4 4

5 2

6 3

7 3

8 4

9 Allow 1 credit. Acceptable responses include, but are not limited to:

- Temperature: increase
- Pressure: decrease
- Temperature: above 25°C
- Pressure: below 1.00 atm. Temperature: any temperature above 298 K. Pressure: any pressure below 101.3 kPa

10 Allow 1 credit. Acceptable responses include, but are not limited to:

$$\frac{(116\text{kPa})(2.4 \times 10^5\text{L})}{312\text{ K}} = \frac{P_2(2.4 \times 10^5\text{L})}{293\text{ K}}$$

11 Allow 1 credit. Acceptable responses include, but are not limited to:

- Temperature: increase. Pressure: decrease
- Temperature: higher. Pressure: lower
- Temperature: any temperature above 296 K. Pressure: any pressure lower than 101.3 kPa

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- lower the pressure
- decrease pressure
- any pressure below 100. kPa

13 Allow 1 credit. Acceptable responses include, but are not limited to:

- Temperature: higher/increase
- Pressure: lower/decrease
- Temperature: above 298 K
- Pressure: below 1.0 atm

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- Temperature: above 293 K. Pressure: below 1.2 atm
- Temperature: higher. Pressure: lower