1. A gaseous sample of a substance is cooled at constant pressure. Which of the following diagrams best represents the situation if the final temperature is (i) above the boiling point of the substance and (ii) below the boiling point but above the freezing point of the substance?

![Diagram](image1.png)

2. Consider the following gaseous sample in a cylinder fitted with a movable piston. Initially there are $n$ moles of the gas at temperature $T$, pressure $P$, and volume $V$. Choose the cylinder that correctly represents the gas after each of the following changes. (i) The pressure on the piston is tripled at constant $n$ and $T$. (ii) The temperature is doubled at constant $n$ and $P$. (iii) $n$ moles of another gas are added at constant $T$ and $P$. (iv) $T$ is halved and pressure on the piston is reduced to a quarter of its original value.

![Diagram](image2.png)

3. A gas occupying a volume of 725 mL at a pressure of 0.970 atm is allowed to expand at constant temperature until its pressure reaches 0.541 atm. What is its final volume?

4. At 46°C a sample of ammonia gas exerts a pressure of 5.3 atm. What is the pressure when the volume of the gas is reduced to one-tenth (0.10) of the original value at the same temperature?

5. The volume of a gas is 5.80 L, measure at 1.00 atm. What is the pressure of the gas in mmHg if the volume is changed to 9.65 L? (The temperature remains constant.)

6. A sample of air occupies 3.8 L when the pressure is 1.2 atm. (a) What volume does it occupy at 6.6 atm? (b) What pressure is required in order to compress it to 0.075 L? (The temperature is kept constant.)

7. A 36.4-L volume of methane gas is heated from 25°C to 88°C at constant pressure. What is the final volume of the gas?

8. Under constant-pressure conditions a sample of hydrogen gas initially at 88°C and 9.6 L is cooled until its final volume is 3.4 L. what is its final temperature?

9. Ammonia burns in oxygen gas to form nitric oxide (NO) and water vapor. How many volumes of NO are obtained from one volume of ammonia at the same temperature and pressure?

10. Molecular chlorine and molecular fluorine combine to form a gaseous product. Under the same conditions of temperature and pressure it is found that one volume of $\text{Cl}_2$ reacts with three volumes of $\text{F}_2$ to yield two volumes of the product? (*Challenging)