

Answer 7

(a)

$$P_1 = Z \quad P_2 = 5 \text{ atm}$$

$$V_1 = 400 \text{ cm}^3 \quad V_2 = 200 \text{ cm}^3$$

$$P_1 V_1 = P_2 V_2$$

$$Z \times 400 = 5 \times 200$$

$$Z = \frac{5 \times 200}{400}$$

$$= 2.5 \text{ atm}$$

(b) Charles' law: Pressure remaining constant, the volume of a given mass of a dry gas increases or decreases by $\frac{1}{273}$ of its original volume at 0°C for each degree centigrade rise or fall in temperature.

Using the absolute scale, Charles' law can be generalised as pressure remaining constant, the volume of a given mass of a gas is directly proportional to the absolute temperature.

(c) Isotopes are the atoms of the same element having the same atomic number but different mass number.

There are three isotopes of hydrogen: protium (${}^1_1\text{H}$), deuterium (${}^2_1\text{H}$), tritium (${}^3_1\text{H}$)

There are two isotopes of carbon: carbon-12 (${}^{12}_6\text{C}$) and carbon-14 (${}^{14}_6\text{C}$)

There are two isotopes of oxygen: ${}^{16}_8\text{O}$ and ${}^{18}_8\text{O}$

Isotopes show similar chemical properties because the number of valence electrons in these atoms is the same.