
Module 11
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BIOC 141

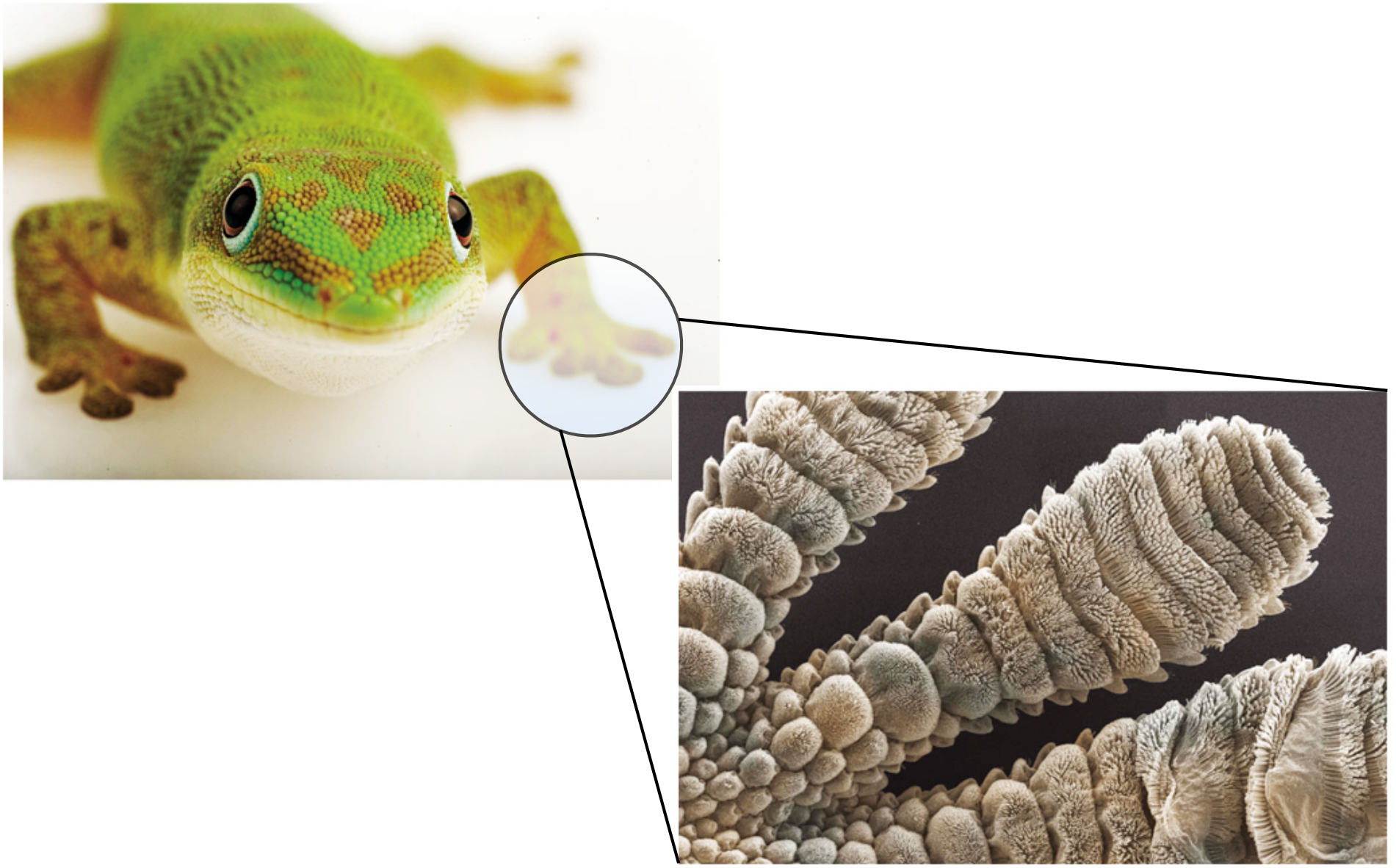
Intermolecular Forces (Section 8.1)

Intermolecular Forces (IMFs) are the **attractive** forces that exist between molecules.

London Dispersion Forces

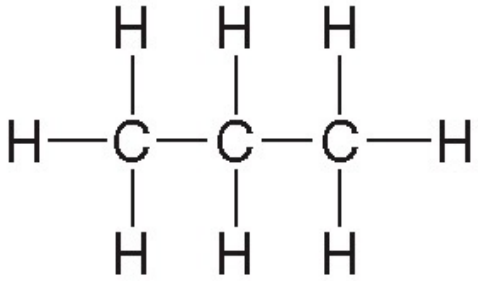
Very weak temporary interactions

Wall Walking

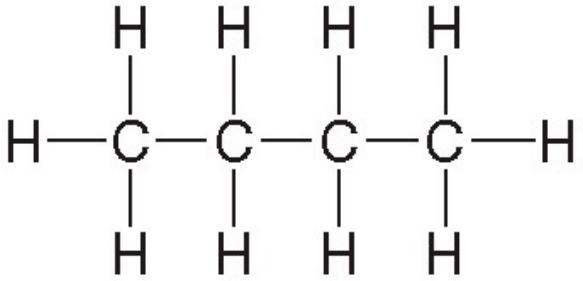


London Dispersion Forces

Larger Size = Stronger Attraction



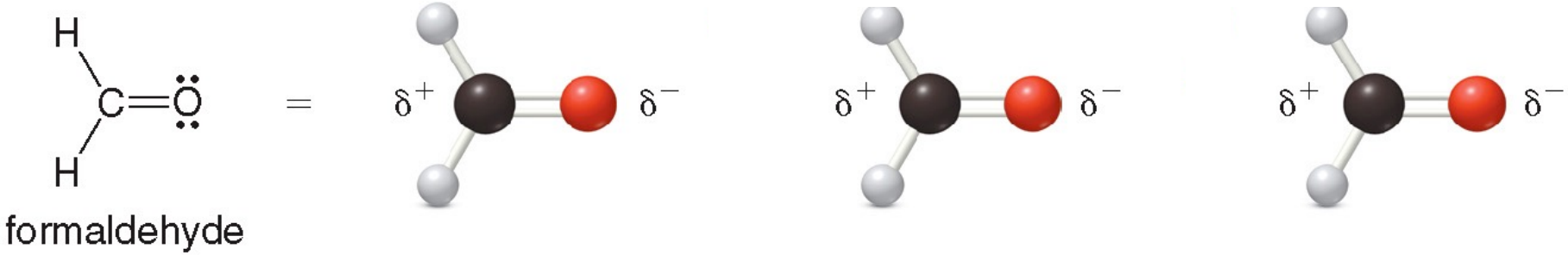
propane



butane

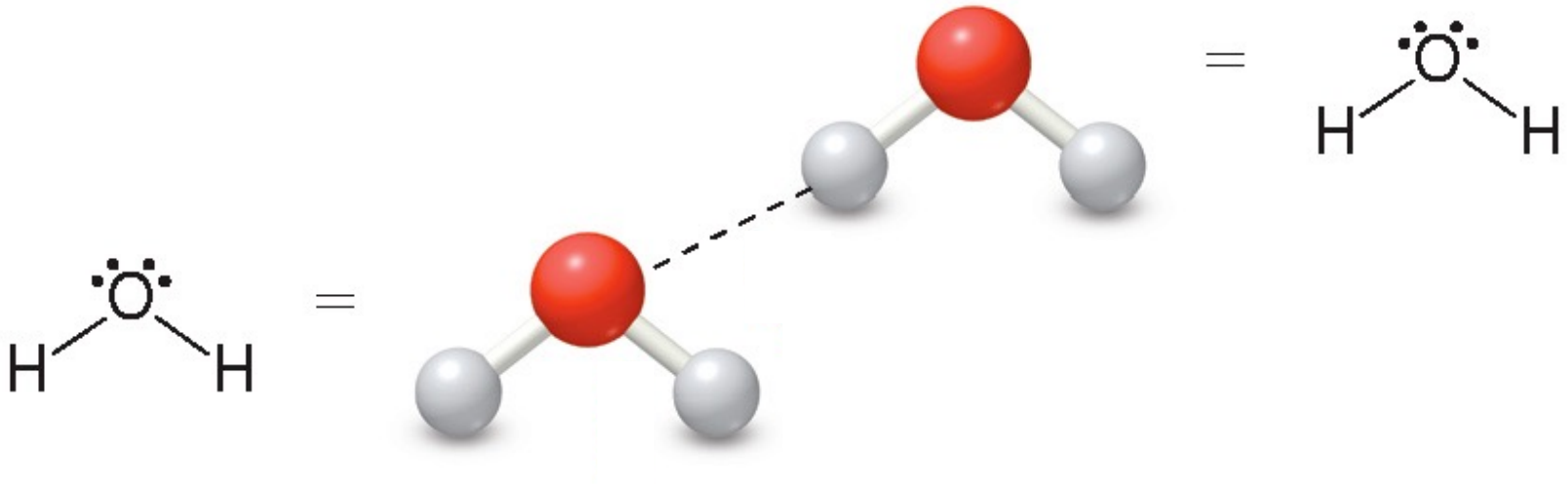
Dipole-Dipole Interactions

Attractive forces between permanent dipoles.



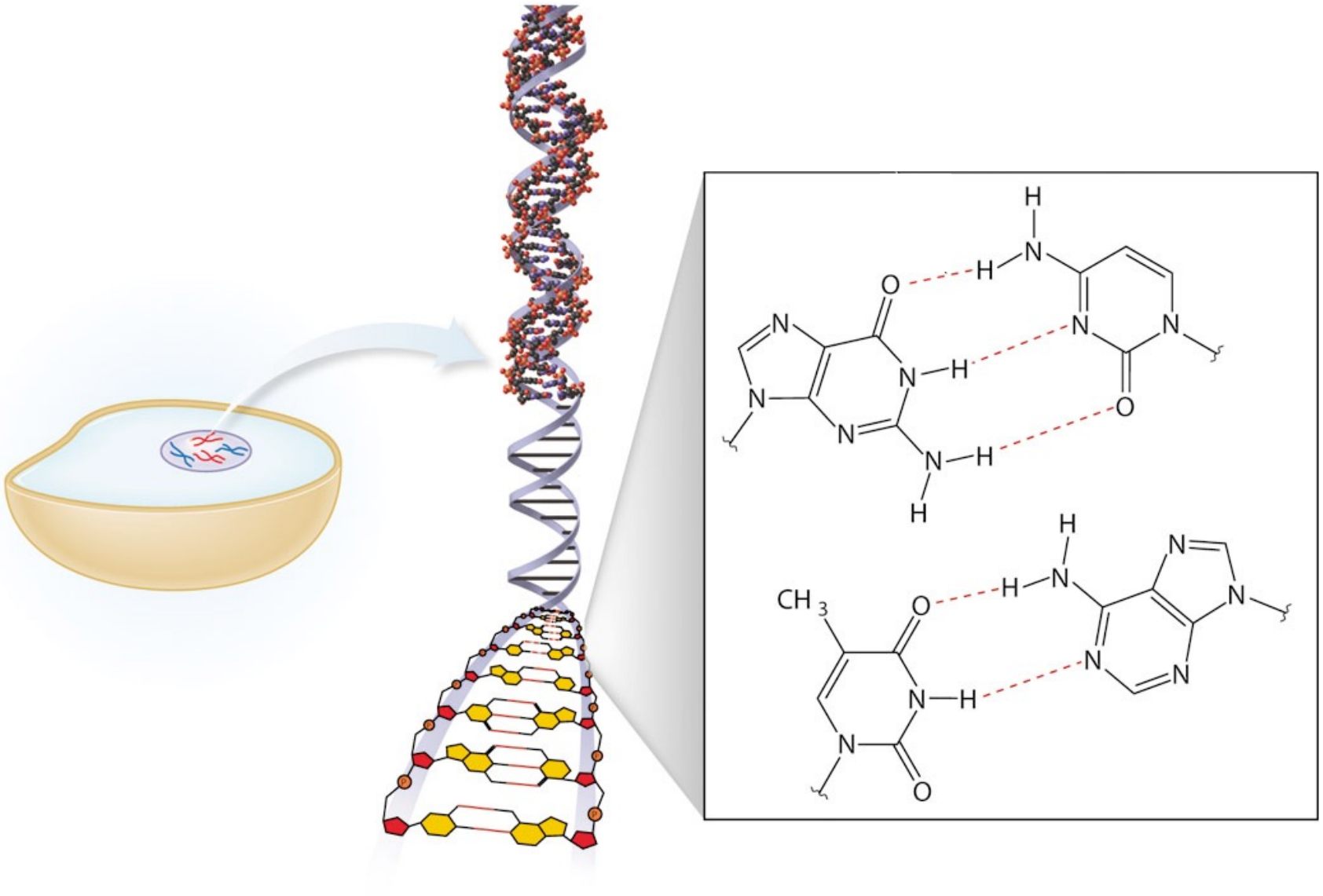
Hydrogen Bonding

Hydrogen bonding occurs between a hydrogen atom bonded to N, O, or F and a lone pair.



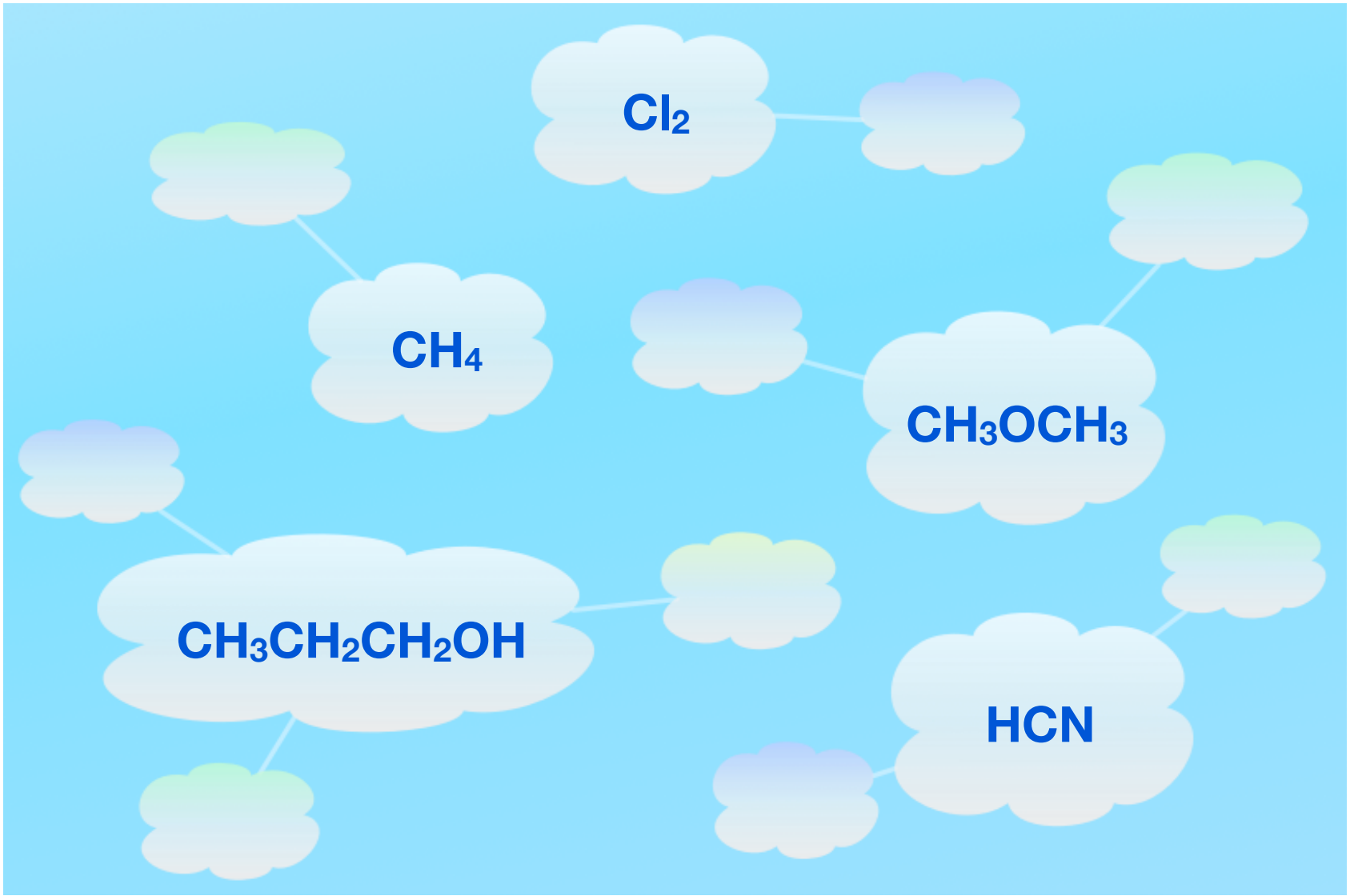
Strongest of the three types.

Hydrogen Bonding



Concept Check

Indicate which IMFs each molecule below displays



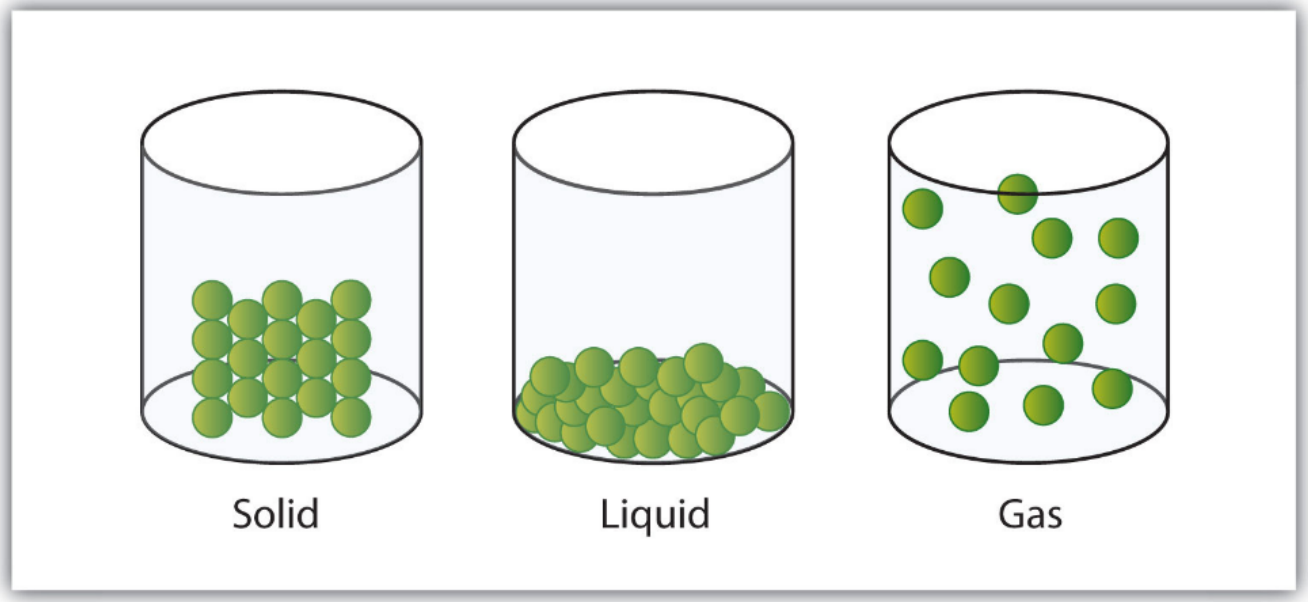
Concept Review (Section 8.1)

CONCEPT REVIEW EXERCISE

1. What types of intermolecular interactions can exist in compounds?

Practice Problems: 5-10

States of Matter (Section 8.2)



Characteristic	Solid	Liquid	Gas
shape	definite	indefinite	indefinite
volume	definite	definite	indefinite
relative intermolecular interaction strength	strong	moderate	weak
relative particle positions	in contact and fixed in place	in contact but not fixed	not in contact, random positions

Concept Review (Section 8.2)

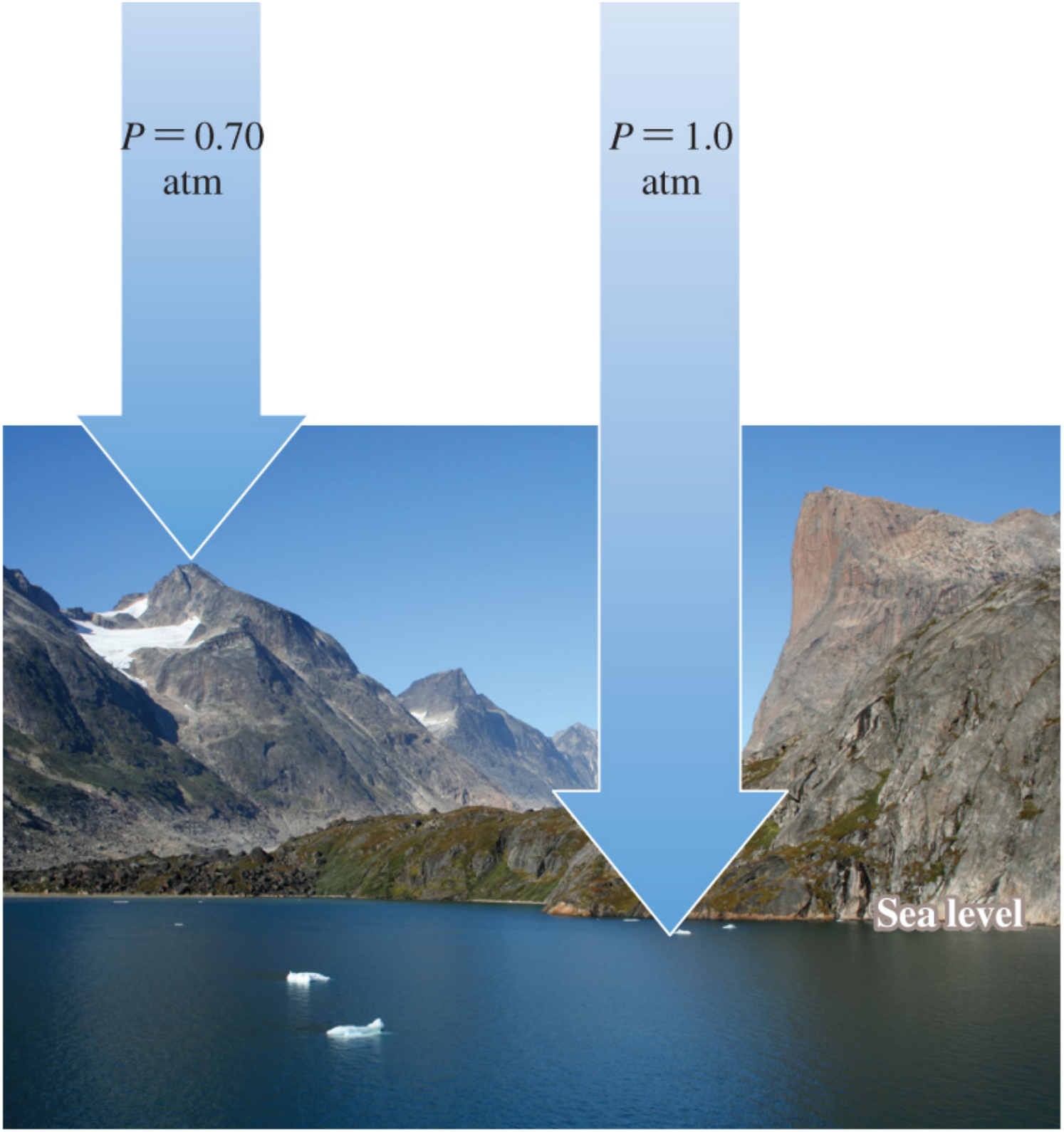
CONCEPT REVIEW EXERCISE

1. How do the strengths of intermolecular interactions in solids and liquids differ?

Practice Problems: 1-12

Gases and Pressure (Section 8.3)


Normal Blood Pressure
The pressure of blood in the vessels when the heart beats:
systolic pressure
The pressure between beats when the heart relaxes:
diastolic pressure
less than
120/80 mmHg
millimeters of mercury
High blood pressure
140/90 mmHg or higher
Prehypertension
between 120-139 mmHg and/or 80-89 mmHg
Normal blood pressure
less than 120/80 mmHg


$P = 0.70$ atm
$P = 1.0$ atm
Sea level

Pressure and Temperature Units

1 atm = 760 mmHg = 760 torr

= 14.7 psi = 101.3 kPa

$$K = °C + 273$$

$$°F = 1.8(°C) + 32$$

Concept Review (Section 8.3)

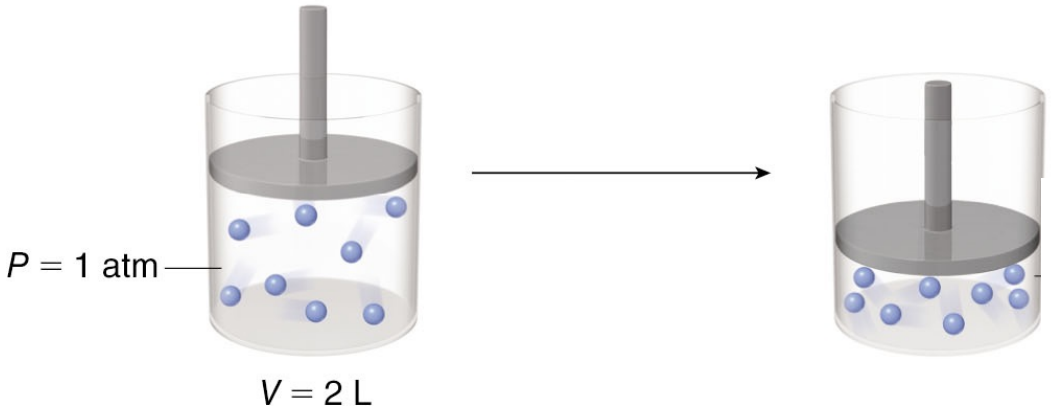
CONCEPT REVIEW EXERCISE

1. What is pressure, and what units do we use to express it?

Practice Problems: 5-9

Gas Laws (Section 8.4) - Boyle's Law

When the amount and temperature of a gas are constant, the Pressure and Volume are inversely related.

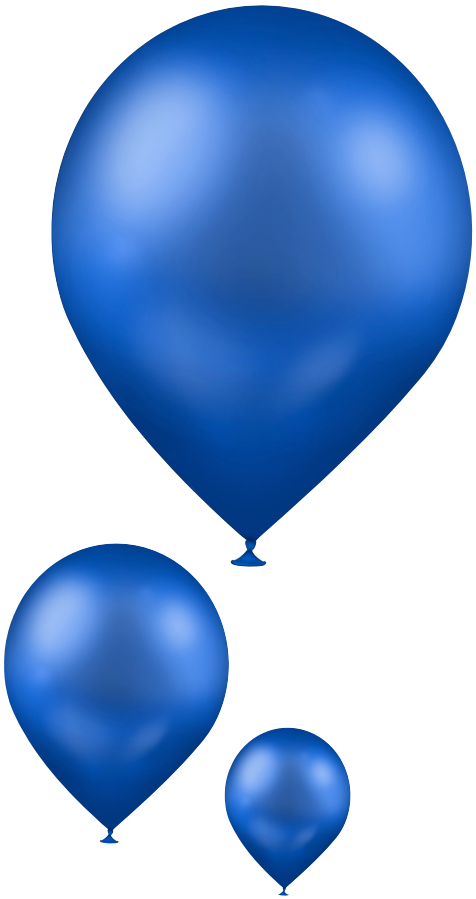


$$P_1 \times V_1 = P_2 \times V_2$$

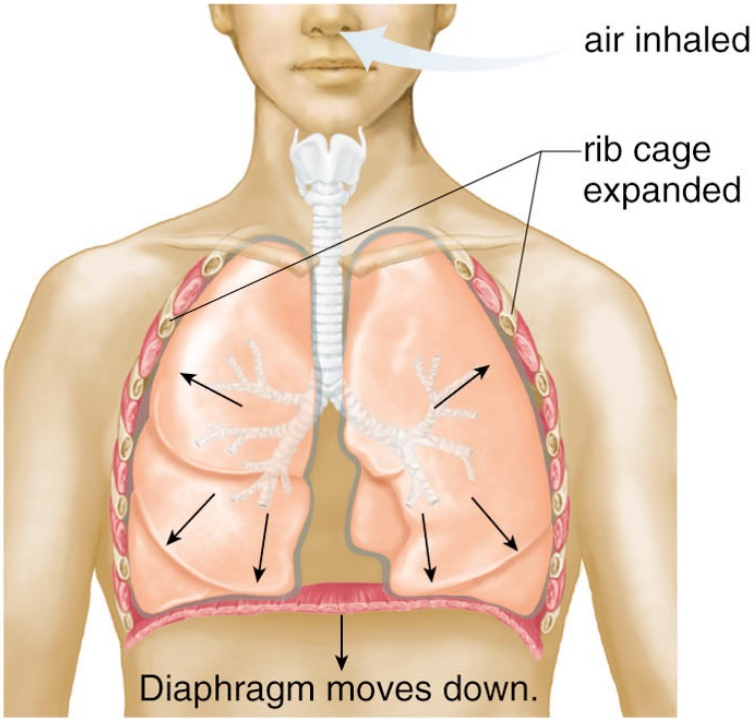
initial conditions **new conditions**

Boyle's Law

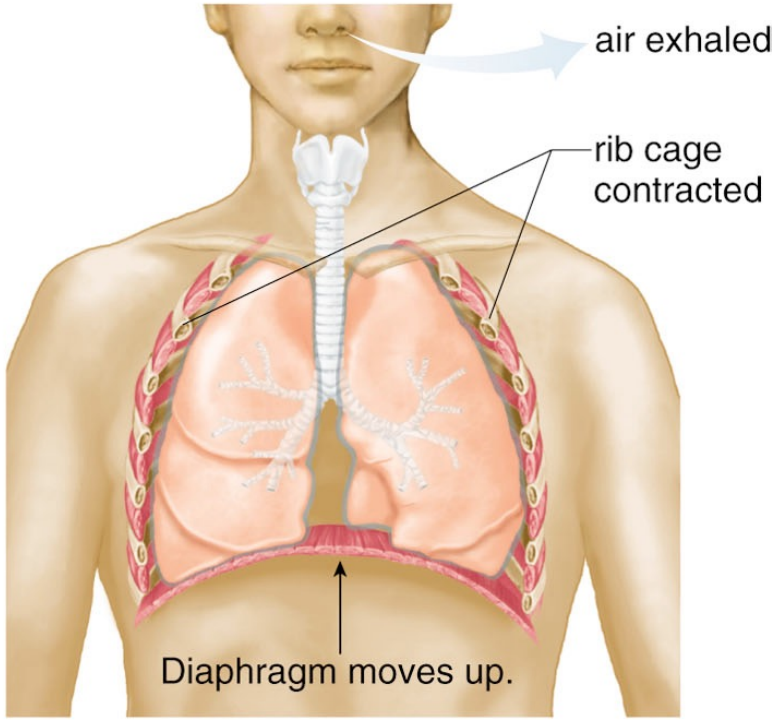
If a 4.0 L He balloon has a pressure of 10.0 atm, what is the new pressure if the volume is increased to 6.0 L?



How Breathing Works



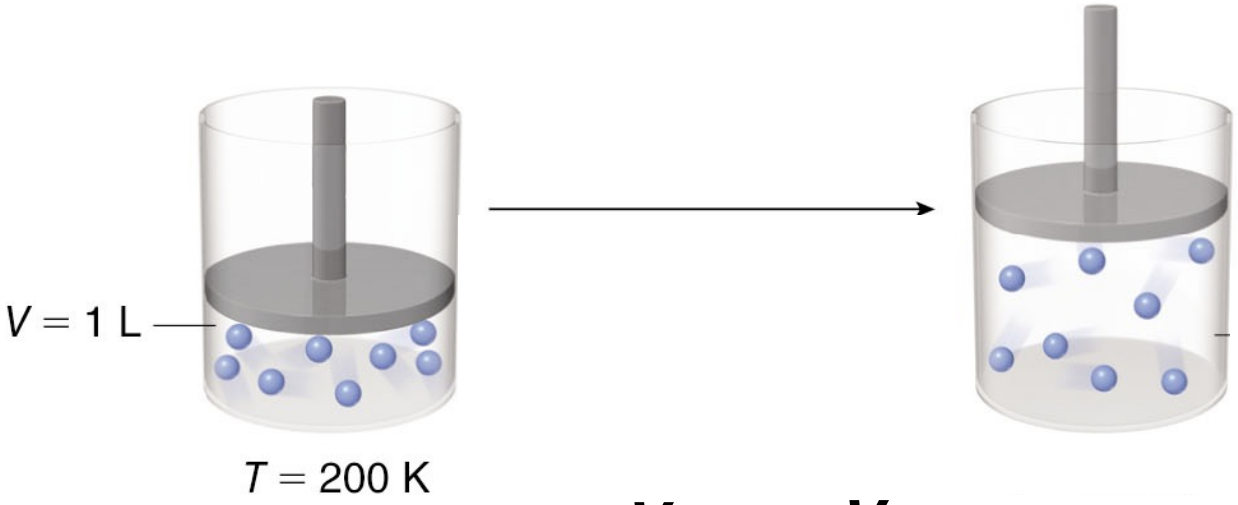
Breathing In



Breathing Out

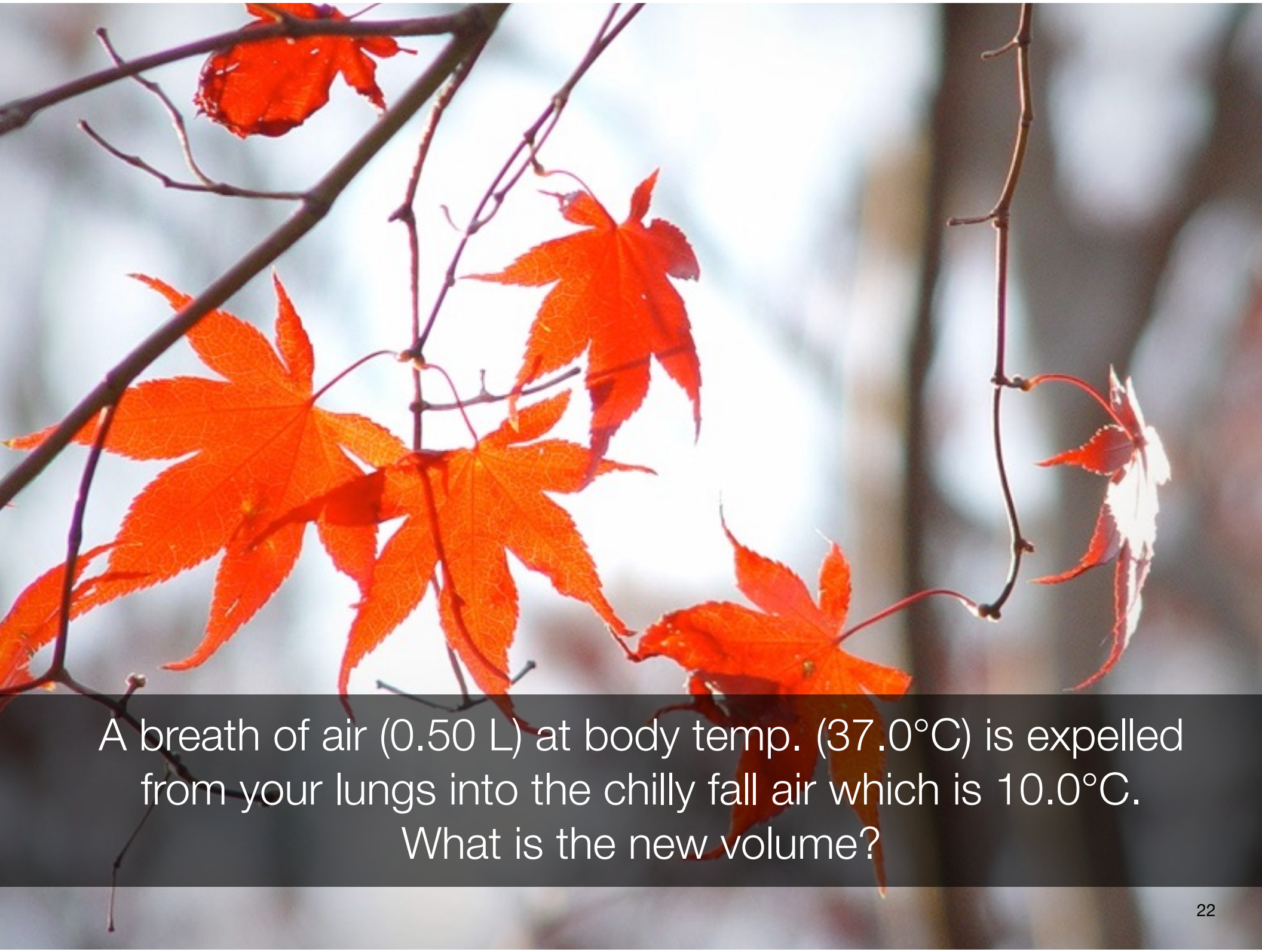
Charles' Law

When the amount and pressure of a gas are constant, the volume and temperature (in Kelvin) are proportional.



$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

initial conditions **new conditions**



A breath of air (0.50 L) at body temp. (37.0°C) is expelled from your lungs into the chilly fall air which is 10.0°C. What is the new volume?

Gay-Lussac's Law

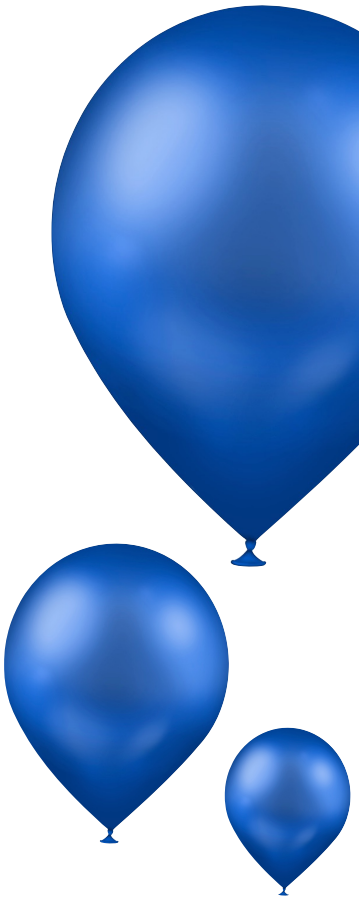
When the amount and volume of a gas are constant, the pressure and temperature (in Kelvin) are proportional.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

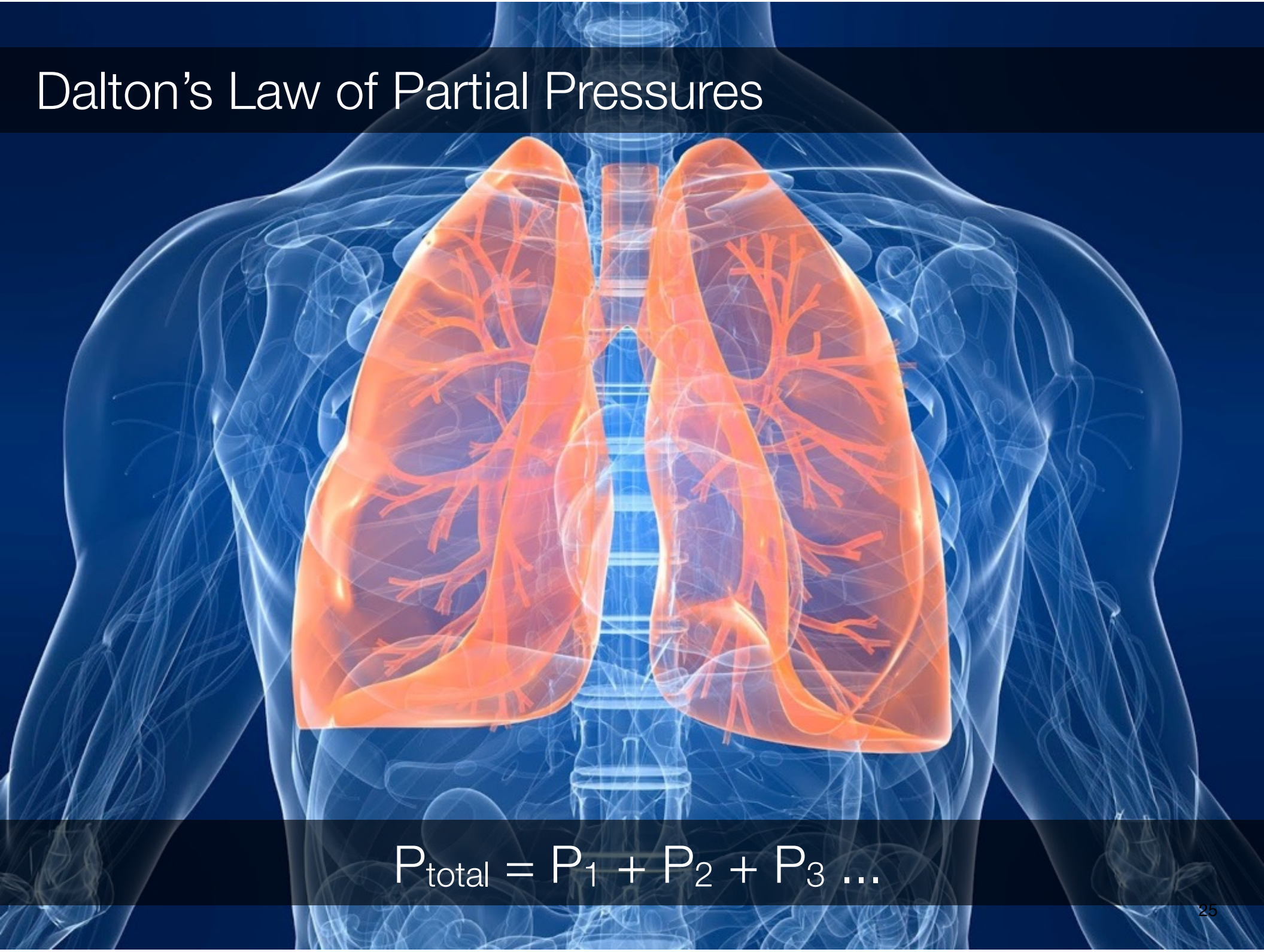
initial conditions **new conditions**

Concept Check

A sample of CO_2 gas has a temperature of 100.0°C and at 1.05 atm. What is the new temp. if the pressure is increased to 2.47 atm?

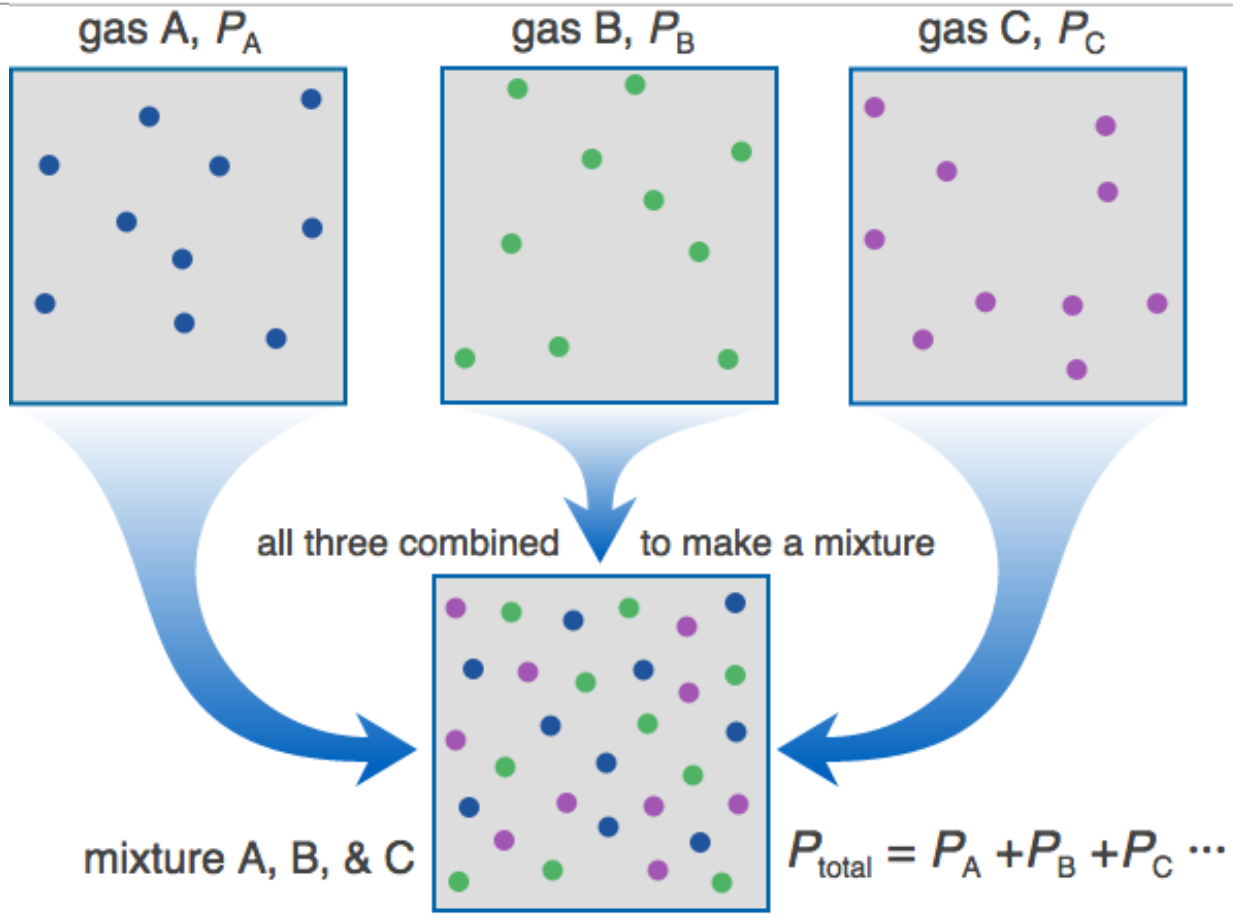


Dalton's Law of Partial Pressures

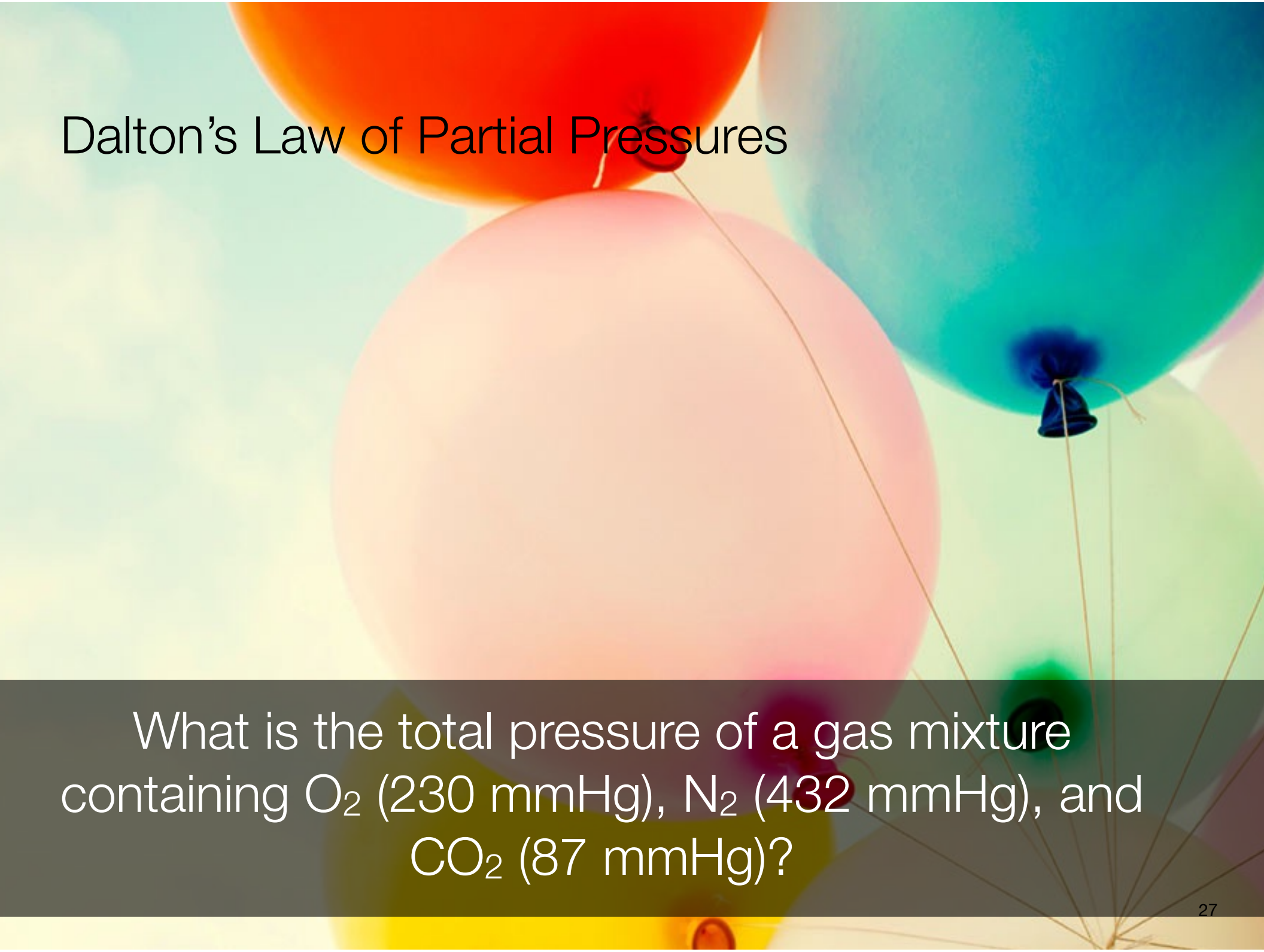


$$P_{total} = P_1 + P_2 + P_3 \ldots$$

Dalton's Law of Partial Pressures

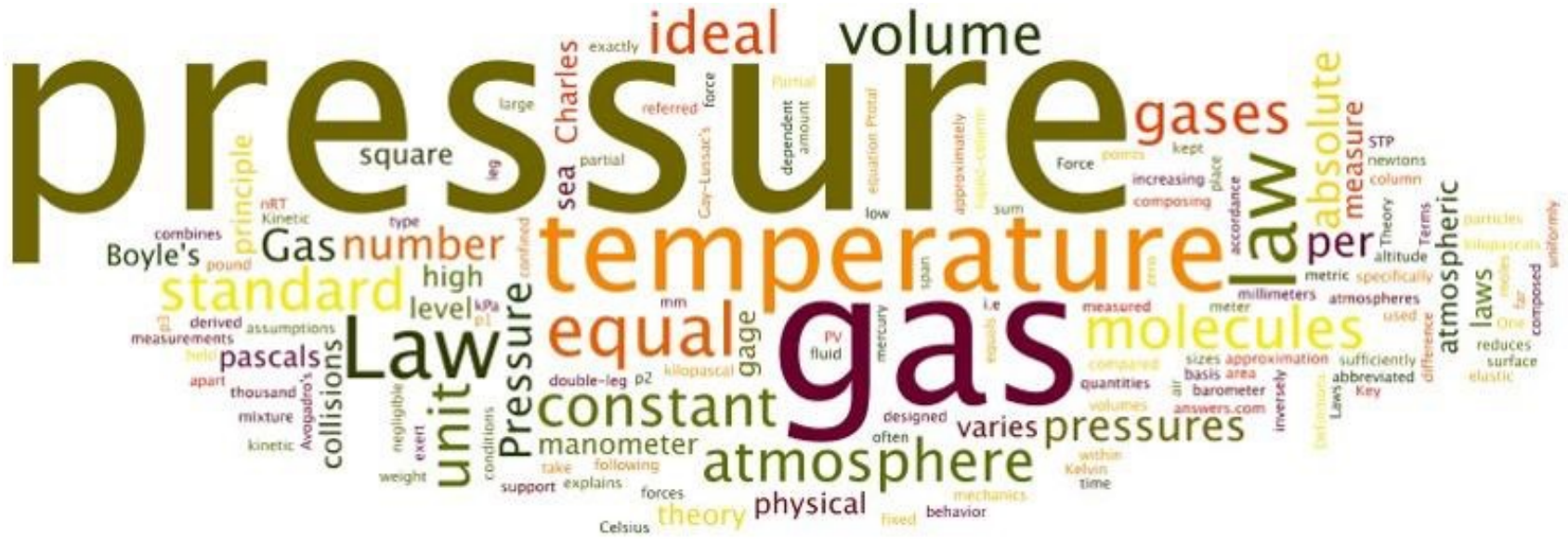


Dalton's Law of Partial Pressures



What is the total pressure of a gas mixture containing O_2 (230 mmHg), N_2 (432 mmHg), and CO_2 (87 mmHg)?

Concept Review (Section 8.4)



Practice Problems: Module 11 Worksheet