Section 13.5
Phase Diagrams

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Phase Diagrams

In this section…

a. Phase changes involving solids
b. Phase diagrams as predictors of phase
c. Supercritical Fluids
d. Phase diagrams as predictors of phase changes

Phase changes involving solids

Table 12.5.1: Selected Heats of Fusion and Vaporization at the Temperature of the Normal Phase Transition

	ΔH_{fusion} (kJ/mol)	Melting Point (°C)	ΔH_{vap} (kJ/mol)	Boiling Point (°C)
Methane	0.94	–182.5	8.2	–161.6
Ethane	2.86	–182.8	14.7	–88.6
Propane	3.53	–187.6	19.0	–42.1
Methanol	3.16	–97.0	35.3	64.7
Ethanol	5.02	–114.3	38.6	78.4
1-Propanol	5.20	–127	41.4	97.2
Water	6.01	0.0	40.7	100.0
Na	2.60	97.82	97.42	881.4
NaBr	26.11	755	160.7	1390

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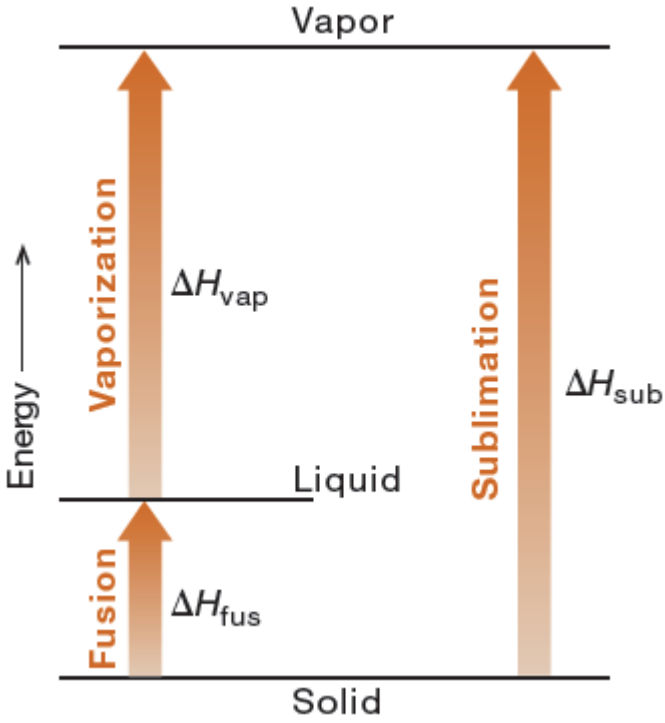
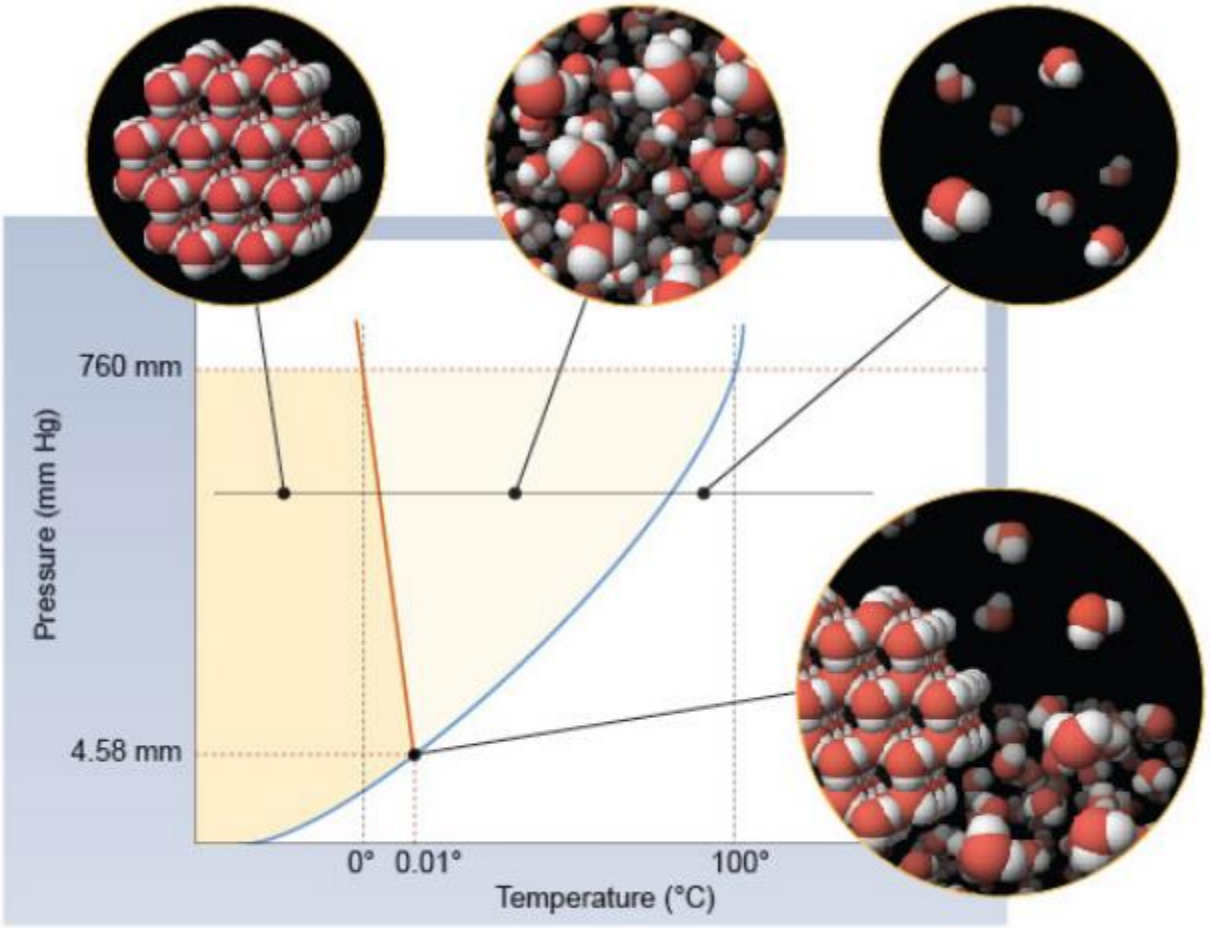
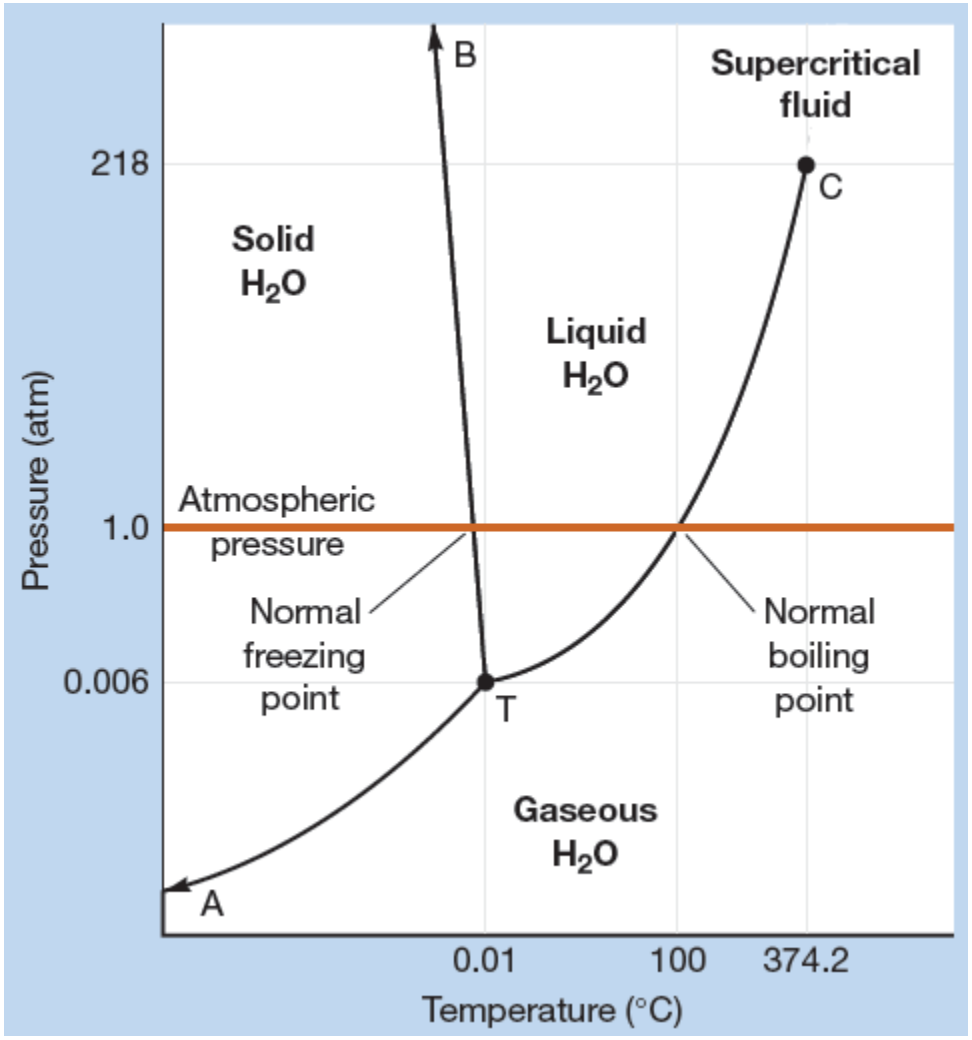


Phase Diagram for Water



Phase diagrams as predictors of phase



Supercritical Fluids

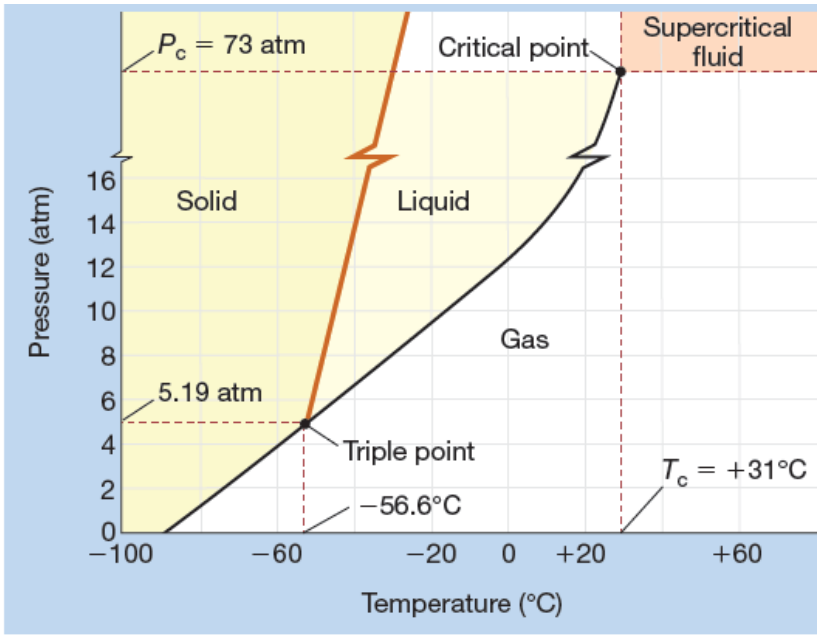


Figure 12.5.3 The phase diagram for carbon dioxide

Above the critical temperature, the gas has too much kinetic energy for a liquid to form, regardless of the external pressure.

Below the critical pressure, a gas is an impermanent gas because it can be liquefied by applying pressure.

Above the critical pressure, a gas is a permanent gas because it can not be liquefied, no matter how great the pressure.

Table 12.5.2 Selected Critical Temperatures and Pressures

	Critical Temperature (°C)	Critical Pressure (atm)
NH_3	132.5	111.5
Ar	−122.4	48.1
Br_2	310.8	102
Cl_2	143.8	76.0
F_2	−128.85	51.5
He	−267.96	2.24
H_2	−239.95	12.8
Kr	−63.8	54.3
CH_4	−82.1	45.8
Ne	−228.75	27.2
N_2	−146.9	33.5
O_2	−118.6	49.8
SO_2	157.8	77.7
H_2O	373.936	217.7
Xe	16.6	57.6

Phase diagrams as predictors of phase changes