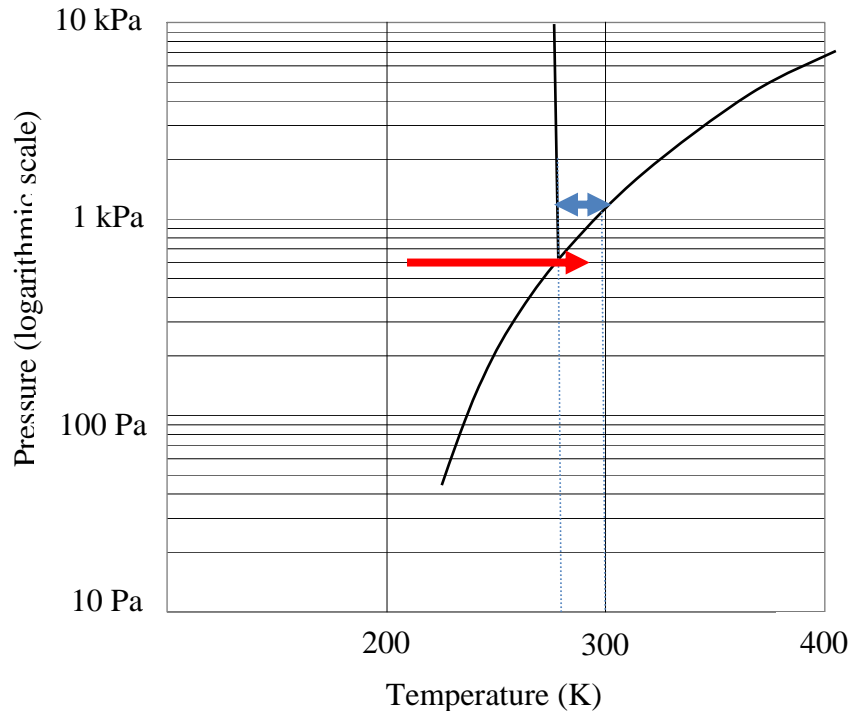


- The diagram below shows part of the phase diagram of water.



The average pressure on the surface of Mars is around 0.6 kPa. If the night time temperature is  $-60\text{ }^{\circ}\text{C}$  and a summer day temperature is  $20\text{ }^{\circ}\text{C}$ , describe what happens to any water on the surface of Mars as the sun rises.

**This process is illustrated by the red arrow in the phase diagram above. The process occurs just *below* the triple point so the phase changes from solid (at  $-60\text{ }^{\circ}\text{C}$ ) to gas (at  $20\text{ }^{\circ}\text{C}$ ).**

**Water sublimates as the sun rises on Mars.**

**(Note the logarithmic scale on the graph. Each horizontal line between 100 Pa (0.1 kPa) and 1 kPa (1000 Pa) represents an increase of 100 Pa (0.1 kPa).)**

The highest surface pressure on Mars is thought to occur at the Hellas Basin, a low-lying area created by the impact of a large asteroid. If the pressure in this region is 1.2 kPa, use the phase diagram to estimate the temperature range in which liquid water will occur. Show your working on the phase diagram.

**At 1.2 kPa, water is a liquid in the temperature range covered by the double-headed blue arrow in the phase diagram above.**

**Within the accuracy possible on the diagram, this corresponds to the temperature range 272 – 305 K.**