Helium and thermal energy

Chemistry, life, the universe & everything - Cooper & Klymkowsky

Q 1

- Draw a picture of what you imagine solid Helium looks like.

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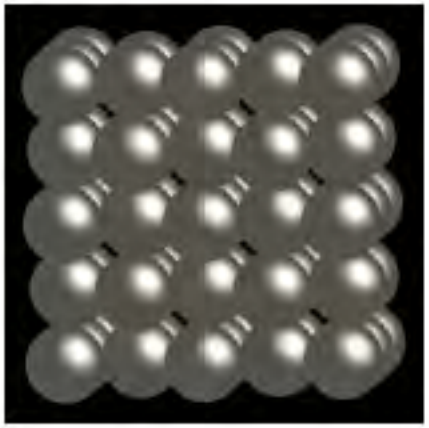
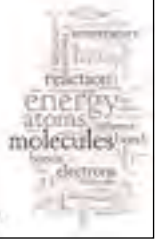


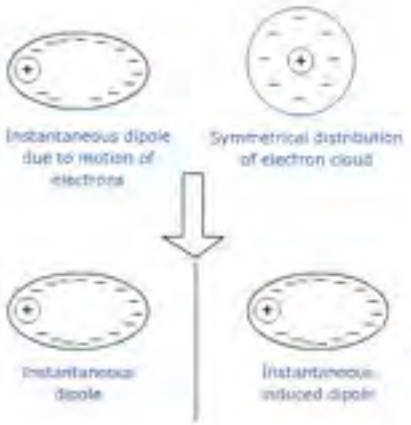
Q 2

- What is preventing the He atoms from flying apart? (why do they stick together?)
- Draw a picture of two or three He atoms showing the forces that are attracting them to each other



Q 2

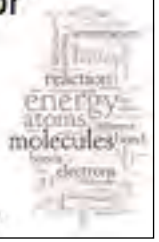
- What is preventing the He atoms from flying apart? (why do they stick together?)
- London dispersion forces



Q 3

- What happens when you add thermal energy (raise the temperature) to the Helium atoms? Why?

- The kinetic energy of the molecules increases, they move faster, collide and/or vibrate with more energy.



Q4: How to the He atoms "know" the

The energy is transferred from other atoms that have collided with the walls of the container, that were directly heated.

Q 4

- Compared to Ne you think the London Dispersion forces between Xe atoms are
  A. larger
  B. Smaller
  C. The same?

Q5

- Which do you think would have larger melting and/or boiling points
  A. Ne
  B. Xe
  C. Same

Helium has a melting point of 1K, and Xenon has a melting point of 161K. Was your prediction right?

London Dispersion Forces

- Increase with size of particle (number of electrons)
- Increase with surface area
- Part of a range of intermolecular forces (between particles)

Q 6

- If a container with He solid in it is heated (for example by placing the container on a heated block), the solid will melt and then evaporate. Draw a diagram showing how the energy from the solid block is transferred to the He atoms.

Q7

Draw a graph showing how the potential energy of a two Helium atom system changes as the He atoms approach each other. Use a solid line for He. Now, using the same graph, and using a dotted line ------ show how the potential energy changes when two Xe atoms approach each other. Explain how and why the two curves differ from each other.

A range of interactions between atoms

- van der Waals – can be between atoms or molecules – (intermolecular)
- Bonds – more permanent – stronger harder to break.