Viscosity and the Particle Theory

Using the PARTICLE THEORY, we can explain why liquids and gases flow, but solids do not!

The FIVE major points of The Particle Theory:

1. All matter is made up of very small particles.
2. Different substances are made of different particles.
3. There is space between the particles.
4. The particles are always moving. When they gain energy, they move faster.
5. The particles in a substance are attracted to one another. The strength of attraction depends on the type of particle!

SOLIDS (According to Particle Theory) Analogy: Bees in a hive.

- Solids are made up of particles that are tightly packed together.

- In fact, they are SO close, that they cannot move around freely; they can only vibrate!

- Many solids can be broken into such small pieces that they can slip passed each other when they are poured.
  - Ex. sugar, salt, flour, detergent, etc.

- BUT each smaller piece is like a mini solid itself! This is why solids form a pile when they are poured, and do not keep flowing.
LIQUIDS (According to Particle Theory)  
Analogy: Dance party!

- Liquids are made up of particles that have enough energy to pull away from each other and slide around each other, while still vibrating at the same time.

- Unlike particles in solids, particles in liquids do not form rigid clumps. Because of this, they cannot hold their shape. Instead, they take the shape of their container!

GASES (According to Particle Theory)

- All liquids can be transformed into their gas state when they are heated.

- Gases are made up of particles that are so far apart from each other that there is a lot of empty space between them.

- In fact, particle theory explains that most gases seem invisible to you because you are looking at mostly empty space.

- Because gas particles have so much space and are moving so quickly, they have no difficulty moving past each other, and that’s why they flow so easily.
Check Your Understanding: Viscosity and the Particle Theory

1. In your own words, what does “to flow” mean?
   To move along steadily and continuously in a current or stream.

2. Classify the following items as fluids or non-fluids. Of the fluids, which have high viscosity (very thick) and which ones have low viscosity (not thick)?
   - a. Shampoo  **high viscosity**
   - b. thread
   - c. blood  **low viscosity**
   - d. sugar
   - e. pencil
   - f. air  **low viscosity**
   - g. honey  **high viscosity**
   - h. paper
   - i. lava  **high viscosity**
   - j. ash
   - k. nails
   - l. nail polish  **low viscosity**
   - m. smoke  **high viscosity**
   - n. gravel
   - o. hairspray  **low viscosity**
   - p. balloon
   - q. perfume  **low viscosity**
   - r. snow

3. How could you test whether or not something is a fluid?
   Can you pour it? Does it flow? Does it take the shape of its container? If you answered yes to all of the above, it must be a fluid!

4. A substance has a definite volume, but not a definite shape. Is the substance a solid, liquid, or gas?
   **The substance is a liquid.**