Physical Phase

Aim

- to compare solids, liquids, and gases

Notes

Definition - Physical phase = solid, liquid, or gas

Characteristics

- ★ Solid - has a definite shape and volume (ie. Shape and volume are not determined by the container)
- ★ Liquid - has a definite volume, but no definite shape (ie. Takes the shape of its container)
- ★ Gas - has no definite shape and no definite volume
  - ☆ Takes the shape of its container
  - ☆ Spreads out to fill its container

Kinetic molecular theory

- ★ Matter is composed of particles that are in constant motion (kinetic energy)
- ★ There are forces of attraction between particles that depend on the distance between the particles
  - ☆ The further apart the particles are, the smaller the forces of attraction between them are
- ★ The higher the temperature (average kinetic energy) is, the faster the particles move

Kinetic molecular theory explains phases

- ★ Solid - the forces of attraction between particles are larger than in other phases
  - ☆ Particles are held in fixed positions
  - ☆ Particles vibrate back and forth
  - ☆ Particles are relatively close together
  - ☆ Therefor the shape and volume are not determined by the container
- ★ Liquids - the forces of attraction between particles are moderate compared to other phases
  - ☆ Particles can move from place to place but cannot separate from each other and move independently
  - ☆ Particles roll and slide over each other
  - ☆ Particles are pulled downhill by gravity causing the liquid to seek its own level
  - ☆ Therefor the shape is determined by the container but the volume is not
- ★ Gases - the forces of attraction between particles are weaker than in other phases
  - ☆ Particles can move from place to place independently of each other because they do NOT attract or repel each other
  - ☆ Particles are relatively far apart. The volume of the particles is small compared to the space between them.
  - ☆ Particles tend to spread out to fill their container
  - ☆ Therefor both the shape and volume are determined by the container

Answer the questions below by circling the number of the correct response

1. Which 5.0-milliliter sample of NH_3 will take the shape of and completely fill a closed 100.0-milliliter container?
   (1) $NH_3(s)$ (3) $NH_3(g)$
   (2) $NH_3(\ell)$ (4) $NH_3(aq)$

2. Which of the following has the strongest forces of attraction?
   (1) $CO_2(s)$ (3) $CO_2(g)$
   (2) $CO_2(\ell)$ (4) $CO_2(aq)$

3. Which of the following can be compressed under pressure?
   (1) $I_2(s)$ (2) $I_2(\ell)$ (3) $I_2(g)$ (4) $I_2(aq)$

4. Which 1.5-liter sample of salt does *NOT* take the shape of its container?
   (1) NaCl(s) (3) NaCl(g)
   (2) NaCl(ℓ) (4) NaCl(aq)

5. A 25.0 mL sample of water is poured from a 50.0 mL graduated cylinder to a 100.0 mL graduated cylinder. The volume of the water
   (1) increases
   (2) decreases
   (3) remains the same