1. For molecules of comparable size and polarizability, which interaction is generally strongest among these choices?

   ☐ London dispersion

   ☐ dipole-dipole

   ☐ hydrogen bonding

2. Diamond is very hard with a very high melting point. It is a...

   ☐ molecular solid

   ☐ covalent-network solid

   ☐ metallic solid

3. In which state are particles far apart and moving fast and freely?

   ☐ gas

   ☐ liquid

   ☐ solid

4. Temperature is a measure of the particles' average...

   ☐ charge

   ☐ kinetic energy

   ☐ mass

5. Real gases deviate most from ideal behaviour at...

   ☐ low pressure and high temperature

   ☐ they never deviate

   ☐ high pressure and low temperature

6. Dissolve 2 mol of solute to make 4 L of solution. The molarity (in M)?

   _____ M

7. Filtration can separate a dissolved solute from its solvent.

   ☐ True ☐ False

8. Oil (nonpolar) dissolves readily in water (polar).

   ☐ True ☐ False

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☐ True ☐ False

10. With $\varepsilon = 100$ L/(mol · cm), $b = 1$ cm, and $A = 0.5$, what is the concentration in M?

    _____ M

1. **hydrogen bonding**

   For comparable small molecules, hydrogen bonding is generally stronger than ordinary dipole-dipole interactions. This ranking is not universal: large electron clouds can give very strong dispersion forces.

2. **covalent-network solid**

   One giant lattice of strong covalent bonds makes it hard and high-melting.

3. **gas**

   Gas particles are widely spaced and move freely.

4. **kinetic energy**

   Temperature tracks the average kinetic energy of the particles.

5. **high pressure and low temperature**

   Crowded (high P) and slow (low T) is where volume and attractions matter.

6. **0.5 M**

   $M = \text{moles/liters} = 2/4 = 0.5$ M.

7. **False**

   Dissolved particles pass through the filter; use evaporation or distillation.

8. **False**

   Unlike polarities do not mix, so oil and water separate.

9. **False**

   False. $c = \lambda\nu$ is constant, so they are inversely related: a longer wavelength means a lower frequency.

10. **0.005 M**

    Start with $A = \varepsilon bc$ and divide by εb: $c = A/(\varepsilon b) = 0.5/(100 \times 1) = 0.005$ mol/L $= 0.005$ M. Absorbance is dimensionless; the stated units give mol/L.

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