Intermolecular Forces

Choose one answer per question. Circle A, B, C, or D.

1. Which example shows an intermolecular attraction?
   A. The attraction between two neighboring water molecules
   B. The O–H covalent bond inside one water molecule
   C. The attraction that keeps a proton in an atomic nucleus
   D. The bond between the two atoms in a nitrogen molecule

2. Electrons in a nonpolar molecule momentarily bunch toward one side. Which type of attraction can this fluctuation induce with a neighboring molecule?
   A. A covalent bond between the two molecules
   B. An ionic bond between the two molecules
   C. London dispersion
   D. A metallic bond

3. Which arrangement favors dipole–dipole attraction between two polar molecules?
   A. The two partially positive ends closest together
   B. The partially positive end of one near the partially negative end of the other
   C. The two partially negative ends closest together
   D. Both molecules lose their dipoles first

4. Which bond gives a neutral molecule a common site for donating a hydrogen bond?
   A. C–Si
   B. C–C
   C. Cl–Cl
   D. O–H

5. Which property is larger for a liquid that, under otherwise comparable conditions, pours more slowly?
   A. Vapor pressure
   B. Viscosity
   C. Temperature
   D. Volume

6. Carbon dioxide has two polar C=O bonds. Why does a single CO_2 molecule have no permanent dipole?

A. Its linear shape makes the two bond dipoles cancel.
B. Its oxygen atoms neutralize all electrons.
C. The carbon atom has no electrons.
D. Polar bonds can only occur in ions.

7. Which substance can form hydrogen bonds between its own molecules in the standard introductory chemistry model?

A. Dimethyl ether, CH_3OCH_3
B. Methane, CH_4
C. Ethane, C_2H_6
D. Methanol, CH_3OH

8. When sodium ions are surrounded by water molecules, which end of a water molecule tends to face a Na^+ ion?

A. The midpoint between both hydrogen atoms
B. Either partially positive hydrogen end
C. The partially negative oxygen end
D. Neither end, because water has no dipole

9. Two nonpolar molecules have similar shapes. One has a larger, more easily distorted electron cloud. Which property is typically higher for that substance?

A. Normal boiling point
B. Mean kinetic energy at the same temperature
C. Formal charge of each molecule
D. Fraction of molecules that are ions

10. Two equal samples of the same liquid are left in matching shallow dishes. One sample is warmer. Why does the warmer sample usually evaporate faster?

A. Its molecules become heavier.
B. Its molecules no longer attract each other.
C. Its molecules split into atoms as they evaporate.
D. A larger fraction of its molecules can escape from the surface.

11. As liquid bromine, Br_2, becomes Br_2 gas, which attraction is mainly overcome?

A. Hydrogen bonds between Br_2 molecules
B. The covalent Br–Br bond inside every molecule
C. London dispersion attractions between Br_2 molecules
D. Ionic bonds between Br^+ and Br^- in the liquid

12. Straight-chain pentane and highly branched neopentane have the same molecular formula. Straight-chain pentane boils at the higher temperature. Which explanation fits the result?

A. It has a higher molar mass.
B. Its less compact shape allows more contact between neighboring molecules.
C. Branching gives neopentane an O–H bond.
D. Straight chains are held together by ionic bonds.

13. Acetone has an oxygen atom that accepts hydrogen bonds but has no O–H or N–H bond. Which pair can form a hydrogen bond using acetone as the acceptor?

A. Acetone and argon
B. Two acetone molecules
C. Acetone and methane
D. Acetone and water

14. Water rises in a clean, narrow glass tube. Which pair of effects helps explain this capillary rise?

A. Water adheres to glass and water molecules cohere to each other.
B. Water forms covalent bonds with the glass and evaporates.
C. Water becomes less dense near the tube wall and floats above itself.
D. The glass increases the mass of the liquid’s molecules.

15. Two liquids of similar density are on the same clean solid. Liquid A spreads into a film and liquid B stays beaded. What does A’s behavior suggest?

A. It has zero intermolecular attraction.
B. Its molecules must form ionic bonds with one another.
C. Its attraction to the solid is more favorable relative to its internal cohesion.
D. Its molecules must all be nonpolar.