



1. Which statement about a covalent bond is untrue?

- (A) **Covalent bonds bond two neon atoms together.**
- (B) Covalent bonds always form when two identical atoms bond into a molecule.
- (C) In a covalent bond, the electrons are shared equally between two atoms.
- (D) In a covalent bond, the shared electrons are situated between the two atoms.

The correct answer is A. Neon, helium, and argon do not need to bond to another atom in order to fill up their outer rings, so those atoms float about as single atoms. In a covalent bond, electrons are shared equally between the two atoms, so the atoms tend to remain between the two atoms. When two identical atoms bond, there is no way for one atom to hog the shared electrons, so two identical atoms always form an equal-sharing covalent bond.

2. The reason(s) that carbon and hydrogen share electrons equally in a covalent bond include:

- (A) each of carbon's four bonds with hydrogen are equally spaced around the carbon atom.
- (B) hydrogen has no intervening electrons blocking its view of the shared electrons
- (C) carbon's nucleus is only six times larger than hydrogen's nucleus.
- (D) **hydrogen's nucleus is closer to the shared electrons than carbon's nucleus, and hydrogen's nucleus has no intervening electrons blocking its view of the shared electrons.**

The correct answer is D. Carbon's nucleus is further from the shared electrons than hydrogen's nucleus is, and carbon's nucleus has two electrons in its ring 1 blocking its view of the shared electrons.

3. Which answer does not explain why methane is a gas at room temperature?

- (A) Methane is a small molecule.
- (B) Each carbon-hydrogen bond is nonpolar.
- (C) All four carbon-hydrogen bonds in a methane molecule are equally spaced apart.
- (D) **The carbon atom itself is nonpolar.**

The correct answer is D. Methane is a small nonpolar molecule and therefore a gas at room temperature. You know methane is nonpolar is that nonpolar because any way you slice methane in half, each side has the same electrical charge. The fact that carbon is nonpolar has no bearing on methane being nonpolar, because all atoms by themselves are nonpolar.

4. Electrolysis allows water molecules to be split into their individual atoms of hydrogen and oxygen. Twice as much hydrogen gas accumulates as oxygen gas. What do you predict would result if we placed the hydrogen and oxygen gases in the same container and lit the mixture with a match flame?

- (A) Nothing would happen other than the gas mixture would heat up.
- (B) The hydrogen gas would explode, leaving the oxygen gas intact.
- (C) The oxygen gas would burn bright, leaving the hydrogen gas intact.
- (D) Water droplets would form.**

The correct answer is D. Fire from the match would provide the energy for hydrogen and oxygen to recombine into H_2O , water.

5. How many electrons does each oxygen atom share when two oxygen atoms bond and form a molecule of oxygen gas?

- (A) 2 electrons**
- (B) 3 electrons
- (C) 4 electrons
- (D) 5 electrons

The correct answer is A. Each oxygen atom pitches in two electrons so that four total electrons are shared. That way, each oxygen atom has four unshared electrons in its outer ring, ring 2, and four shared electrons, a total of eight electrons in its outer ring.