Answers to Multiple-Choice Questions

1. **D.** Phospholipids are composed of glycerol molecules bonded to two fatty acids and one phosphate group. The phosphate group is a hydrophilic "head" and the long hydrocarbon chains of fatty acids are hydrophobic "tails." In cell membranes, phospholipids orient themselves into two layers, with the hydrophobic tails pointing to the inside of the "sandwich."
2. **C.** When product E is no longer consumed by other reactions, it is available to inactivate enzyme D'. As quantities of product E accumulate, more and more of D' will be inactivated. As a result, the rate of production of E will decrease and quantities of product D will accumulate. As product D accumulates, the rate of the reverse reaction, of D to C, increases. Now, more of C is available for conversion to J (and then to K and L), and as C increases, the rate of production of J increases. Eventually, the rate of production of D will equal the rate of the reverse reaction (of D to C), and chemical equilibrium between C and D will be reached. The net rate of production of D will become zero.
3. **E.** The effect of the allosteric effector E is to inhibit enzyme C'. As quantities of product E accumulate, increasing amounts of C' would become inactivated. As a result, fewer and fewer quantities of C would be converted to products D and J. Thus, quantities of C increase, which, in turn, increase the rate of the reverse reaction of C to B (and then to A). In the end, A, B, and C would be in chemical equilibrium, and the rate of production of products D, E, J, K, and L would be zero.
4. **B.** Glucose is a monomer consisting of a single glucose molecule. Starch, glycogen, and cellulose are polymers consisting of repeating units of glucose. Protein is a polymer of amino acids.
5. **C.** The activation energy is given by X + Y for curve A or Y for curve B. Curve B shows how the activation energy would be lowered if an enzyme were present. Since the products (right side of the curve) have less energy than the reactants, energy is released. This kind of reaction, where energy is released, is called an exergonic reaction. If the products had more energy than the reactants, it would be an endergonic reaction. The reaction ATP $\rightarrow$ ADP + P_i is an exergonic reaction where the energy released is used as activation energy for other metabolic reactions.
6. **A.** This is the ring structure of glucose.
7. **C.** This is amylose, a starch found in plants.
8. **E.** This polypeptide contains five amino acids.
9. **B.** This is the amino acid histidine. Note the amino group ($-NH_2$) at the left side of the molecule and the carboxyl group (–COOH) on the right side. Between these two groups is a carbon with a hydrogen below. Above the carbon is the R group with a carbon-nitrogen ring.
10. **D.** This is a phospholipid.
11. **D.** Long hydrocarbon chains are nonpolar and, therefore, hydrophobic. Any polar molecule (or polar group of atoms like the hydroxyl group) is hydrophilic. When a substance ionizes in water, it dissolves; thus, it is hydrophilic.
12. **A.** A polypeptide is a protein. Amylose is a starch and, therefore, a carbohydrate.