

2 | Biology: worked solutions

- 1 A hydrogen bond is a relatively weak intermolecular force that occurs when a hydrogen atom, already covalently bonded to a highly electronegative atom like oxygen, nitrogen, or fluorine, is attracted to another electronegative atom nearby (correct answer: **E**). This interaction plays a crucial role in many biological and chemical processes, such as the structure of water and the stability of DNA. Although weaker than covalent bonds, hydrogen bonds significantly influence the physical properties of substances.
- 2 To answer the question we have to indicate which bond must be broken to form two amino acids from the proposed molecule, a dipeptide, that is formed by two amino acids joined by a peptide bond. The latter is a covalent bond that involves the -COOH group of one amino acid and the -NH_2 group of the other. To form the two amino acids, it is necessary to break the peptide bond, which in the scheme is indicated by number 3. Exact answer is **D**.
- 3 When a fatty acid reacts with glycerol one H_2O molecule is lost and the reaction is named "condensation". Since three fatty acids are reacting with the glycerol, three H_2O molecules are lost and the final formula of the triglyceride can be obtained from the sum of the three fatty acids and the glycerol minus three H_2O . For each atom:
C: $(8 \times 3) + 3 = 27$
H: $(16 \times 3) + 8 - (3 \times 2) = 50$
O: $(2 \times 3) + 3 - (3 \times 1) = 6$
C is the correct choice.
- 4 Cholesterol is a type of lipid, precursor of some, but not all, hormones (choice **B** is not correct) and it is also a structural component of the cell membrane, where its main function is maintaining the fluidity of the membrane by intercalating among hydrophobic phospholipid tails and preventing thus their clustering. **A** is the correct choice.
- 5 Glycoproteins are proteins to which a carbohydrate component is linked. Protein synthesis is based on the information contained in the nucleus (DNA); the synthesis takes place in the cytoplasm and involves the rough endoplasmic reticulum. The proteins produced in this structure are then modified in the cisterns of the Golgi apparatus. The centrioles are not involved in these processes, so the exact answer is **B**.
- 6 Intercellular (more precisely, intracellular) compartmentalisation is a defining feature of eukaryotic cells. These cells contain membrane-bound organelles, such as the nucleus, mitochondria, and endoplasmic reticulum, which separate different cellular processes. This organization allows for greater efficiency and specialization of functions. In contrast, prokaryotes (like bacteria) lack membrane-bound organelles and therefore do not exhibit this level of compartmentalisation. Answer: **C**.