SOLUTIONS

Unit 8: Transport in mammals

8.1: The circulatory system

1. **A**
   The labelled tissue "A" represents the cartilage, which prevents the trachea from collapsing by providing structural support.
2. **D**
   Water has a high specific heat capacity, meaning it absorbs and retains heat, causing it to cool down slowly. This property helps regulate temperature in biological systems like blood and tissue fluid.
3. **A**
   The hydrostatic pressure decreases as blood moves from the arteriole to the venule end, facilitating tissue fluid formation at the arteriole end of capillaries.
4. **C**
   The inner layer of veins and capillaries is lined with endothelium, which forms a smooth surface to reduce resistance to blood flow.
5. **A**
   Carbonic anhydrase accelerates the Bohr shift (1 correct), lower pH leads to haemoglobin dissociation (2 correct), and reduced carbon dioxide increases oxygen binding (3 correct).
6. **A**
   Mature red blood cells lack a nucleus and organelles, preventing cell division, protein synthesis, and phagocytosis. However, they can perform active transport to maintain ion balance.
7. **B**
   Cell X is a lymphocyte, identified by its large nucleus. Cell Y is a neutrophil, noted for its multi-lobed nucleus. Cell Z is a monocyte, recognized by its kidney-shaped nucleus.
8. **D**
   The muscular artery is responsible for distributing blood to organs. Damage to a vein prevents blood from returning to the heart, and damage to an elastic artery disrupts blood pressure regulation.
9. **B**
   The two properties of water that are essential for its role in the transport of blood in mammals are:
   High latent heat of vaporization: Water has a high latent heat of vaporization, which means it requires a significant amount of heat energy to change from a liquid to a vapor. This property is essential for maintaining a stable body temperature in mammals because when blood flows through capillaries, it helps dissipate excess heat through sweating or evaporative cooling.
   Solvent for polar substances: Water is an excellent solvent for polar substances, which is crucial for transporting various solutes in the blood, including ions, gases (e.g., oxygen and carbon dioxide), nutrients, and waste products. The polar nature of water allows it to dissolve and transport these substances efficiently within the bloodstream.