Answers to end-of-chapter questions

Cells and life processes

Chapter 2 Diffusion

It is very important that you are able to answer the questions on your own, using your own knowledge of Biology. Have a go at the questions first, and then check your answers using this page. If you get a question wrong, try to work out where you have made an error.

1 High, low, diffusion, water, dilute, concentrated, partially, turgid, stem, wilts, membrane, wall, plasmolysed.

2 a) A gas diffuses faster than a liquid because the molecules are more spread out / are able to fill up more space.
   b) The rate of diffusion of salt molecules would increase as they would move about faster and collide more often as the temperature increases. Diffusion is faster in warmer temperatures.
   c) i) Oxygen, nutrients and, for plants, carbon dioxide.
     ii) Carbon dioxide, waste chemicals and, for plants, oxygen and water.

3 a) The blue dye has diffused from a region of high concentration through the agar jelly.
   b) The agar jelly is a denser material than water so it takes longer for diffusion of particles to take place.

4 a) Partially permeable
   b) Permeable
   c) i) Chip A. Since the cell sap in the potato cells was more concentrated, water passed into the cells by osmosis, the cells became turgid and the length of the chip the increased to 55 mm.
     ii) Chip B. Since the external solution was more concentrated than the cell sap in the potato cells, water passed out of the cells by osmosis, the cells became flaccid and the length of the chip decreased to 45 mm.

5 a) The cytoplasm inside the red blood cells represents a concentrated solution. Water passes into the cells across the cell membrane by osmosis. There is no rigid cell wall to prevent the cells from expanding so eventually they burst.
   b) Water will also enter Amoeba by osmosis. But the water is taken into a contractile vacuole which eventually becomes full and moves to the cell membrane where it bursts removing the water from the cell.
   c) The concentration of the cell sap in the plant cells is the same as that of the external solution. That is, they are isotonic. So water neither moves into or out of the plant cells.

6 a) Water passed through the Visking tubing into the concentrated sugar solution by osmosis, causing the liquid to rise in the tube.
   b) 100 mm
   c) 4 minutes
   d) If the sugar solution was more dilute it would take longer for the liquid to reach the top of the tube. This is because the concentration gradient would be less and so the rate of osmosis would be slower.
7  a) Water or a dilute solution.
   b) The cells of the chip contained a more concentrated solution than the colourless liquid. So water passed from the external solution into the potato cells by osmosis, making them turgid. They were therefore more rigid and able to support the weight.
   c) A concentrated solution.
   d) The external solution was more concentrated than the solution in the cells of the chip. So water passed out of the potato cells into the external solution by osmosis. The potato cells became flaccid and therefore less rigid and less able to support the weight. So the chip bent.

8  a) Osmosis
   b) Turgid
   c) The potato cells at X would be far more rigid and firm than those at Y.
   d) 0.25