1. In the phospholipid bilayer, the molecules arrange so that:

   ☐ the hydrophilic heads face the water and the hydrophobic tails point inward

   ☐ the tails face the water and the heads point inward

   ☐ there is only one layer

   ☐ all heads point the same way

2. Which molecules cross the membrane by simple diffusion through the bilayer?

   ☐ large polar molecules such as glucose

   ☐ small, non-polar molecules such as oxygen and carbon dioxide

   ☐ whole vesicles

   ☐ charged ions only

3. As a cell gets larger, its surface area to volume ratio:

   ☐ gets smaller, because volume grows faster than surface area

   ☐ becomes zero once the cell stops growing

   ☐ gets larger, because surface area grows faster

   ☐ stays the same, because both grow together

4. Adding a solute to pure water:

   ☐ has no effect on water potential

   ☐ raises its water potential

   ☐ lowers its water potential

   ☐ makes it pure again

5. Why is the model called ”fluid mosaic”?

   ☐ phospholipids slide past each other (fluid) and proteins are dotted through it (mosaic)

   ☐ proteins are fixed in place and cannot move

   ☐ the membrane is a frozen, rigid layer of tiles

   ☐ it is a mosaic of carbohydrates in a fluid

6. Facilitated diffusion uses channel or carrier proteins but needs no energy – it is still passive.

   ☐ True ☐ False

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_____

8. Pure water has the lowest possible water potential.

   ☐ True ☐ False

9. In the fluid mosaic model the phospholipids are locked in place and cannot move.

   ☐ True ☐ False

10. Moving a substance against its gradient using carrier proteins and ATP is called _____ transport.

_____

1. **the hydrophilic heads face the water and the hydrophobic tails point inward**

   Heads are attracted to the water on both sides; the tails hide in the middle, away from water.

2. **small, non-polar molecules such as oxygen and carbon dioxide**

   Only small or non-polar molecules can pass straight through the oily bilayer, down the gradient.

3. **gets smaller, because volume grows faster than surface area**

   Volume (L^3) grows faster than surface area ($6L^2$), so the ratio 6/L falls as L increases.

4. **lowers its water potential**

   Pure water has the highest water potential; dissolving a solute lowers it.

5. **phospholipids slide past each other (fluid) and proteins are dotted through it (mosaic)**

   "Fluid" = the phospholipids move; "mosaic" = proteins scattered through the bilayer like tiles.

6. **True**

   Ions and large polar molecules cross via proteins, but movement is still down the gradient, so no ATP is used.

7. **3**

   ratio = 6 / L = 6 / 2 = 3 (i.e. 3 : 1).

8. **False**

   False. Pure water has the highest water potential, defined as 0 kPa. Adding solute lowers it, making it negative.

9. **False**

   "Fluid" means the opposite – the phospholipids slide past one another, so the membrane can bend and move.

10. **active**

    Active transport pumps a substance from low to high concentration, so it needs carrier proteins and ATP.

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