

Past-paper walk-through

Membrane Permeability ■ 2.4

eXercise

Questions in this set

- 2017 Q8

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 8

2017 ■ Q8

Estrogens are small hydrophobic lipid hormones that promote cell division and the development of reproductive structures in mammals. Estrogens passively diffuse across the plasma membrane and bind to their receptor proteins in the cytoplasm of target cells.

(a) Describe ONE characteristic of the plasma membrane that allows estrogens to passively cross the membrane.

(b) In a laboratory experiment, a researcher generates antibodies that bind to purified estrogen receptors extracted from cells. The researcher uses the antibodies in an attempt to treat estrogen-dependent cancers but finds that the treatment is ineffective.

Explain the ineffectiveness of the antibodies for treating estrogen-dependent cancers.

Solution 8

(a)

Mark scheme

- The plasma membrane's phospholipid bilayer is hydrophobic/nonpolar, which small hydrophobic/nonpolar estrogen molecules can cross directly; alternatively, the space between phospholipids allows small hydrophobic hormones like estrogen to passively diffuse through the membrane.

Solution 8

(b)

Mark scheme

- Antibodies are large, hydrophilic proteins that are unable to enter/cross into the cell (1 point). Because estrogen receptors are intracellular (in the cytoplasm), the (extracellular) antibodies never reach and cannot bind to the (intracellular) estrogen receptors, so they cannot block estrogen signaling and are ineffective at treating the estrogen-dependent cancer (1 point).