2.4 Membranes – *Summary of Past Mark Schemes*

2.4.1 Draw and label a diagram to show the structure of membranes.

Mark Scheme

A. a double layer of lipid / phospholipid molecules with head and tails;
B. hydrophilic / phosphate / polar heads and hydrophobic / hydrocarbon / fatty acid / non-polar tails labelled;
C. integral protein - passing completely through the lipid bilayer;
D. peripheral protein - shown on the surface and not penetrating the lipid bilayer;
E. glycoprotein with carbohydrate attached on outside;
F. cholesterol shown embedded in bilayer;
G. thickness indicated (10 (+/- 3) nm);

2.4.2 Explain how the hydrophobic and hydrophilic properties of phospholipids help to maintain the structure of cell membranes.

Mark Scheme

A. hydrophobic tail / hydrophilic head;
B. head made from glycerol and phosphate;
C. tail made from two fatty acids;
D. saturated / unsaturated fatty acid (in tail);
E. phospholipids form a bilayer;
F. stability to membrane brought about by attraction between hydrophobic tails / between hydrophilic heads and water;
G. phospholipid bilayer forms with heads in contact with water on both sides of membrane / with environment and cytoplasm;
H. hydrophobic tails found in center (of bilayer) away from water;
I. phospholipids allow for membrane fluidity / flexibility;
J. fluidity / flexibility helps membranes to be (functionally) stable;
K. phospholipids with short fatty acids / unsaturated fatty acids are more fluid;
L. fluidity is important in breaking and remaking membranes (eg endocytosis / exocytosis);
M. phospholipids can move about / move horizontally / “flip flop” to increase fluidity;
N. hydrophilic / hydrophobic layers restrict entry / exit of substances;

2.4.3 List the functions of membrane proteins.

Mark Scheme

A. hormone binding sites;
B. enzymes;
C. electron carriers;
D. channels for (passive) transport;
E. (pumps) for active transport;
F. cell to cell recognition;
G. receptors for neurotransmitters;

2.4.4 Define *diffusion* and *osmosis*.

Mark Scheme

A. osmosis is the diffusion of water across a partially permeable membrane;
B. from a more dilute solution / region of lower solute concentration to a more concentrated solution / region of higher solute concentration;

C. diffusion is the movement of molecules / particles from an area of high concentration to an area of low concentration;
D. down a concentration gradient;

2.4.5 Explain passive transport across membranes by simple diffusion and facilitated diffusion.

Mark Scheme

A. passive transport requires no energy;

diffusion;

B. from high to low concentration;
C. partial / selective permeability of membrane;

D. example of simple diffusion;
E. small uncharged molecules move by diffusion;

facilitated diffusion;

F. molecules move from a region of higher concentration to a region of lower concentration;
G. requires specific protein channels in plasma membrane;
H. example of facilitated diffusion;
I. charged molecules move by facilitated diffusion;

2.4.6 Explain the role of protein pumps and ATP in active transport across membranes.

Mark Scheme

active transport:

A. lower to higher (solute) concentration / against concentration gradient;
B. uses energy / ATP;
C. requires a protein in the cell membrane / pump / carrier protein (reject channel);
D. gives a cell control;
E. protein pumps transport specific substances;
F. example of active transport;
G. involves a conformational change in the pump / protein / diagram to show this;

2.4.7 Explain how vesicles are used to transport materials within a cell between the rough endoplasmic reticulum, Golgi apparatus and plasma membrane.

Mark Scheme

A. vesicle is made by pinching off a piece of membrane;
B. fluidity of membrane allows this;
C. vesicles can be used to transport material around inside cells;
D. proteins are transported in vesicles;
E. from the rough endoplasmic reticulum to the Golgi apparatus;
F. from the Golgi apparatus to the plasma membrane;
G. formation of vesicle from plasma membrane allows material to be taken in;
H. endocytosis / pinocytosis / phagocytosis / phagolysosome is absorption of material using a vesicle;
I. fusion of vesicle with plasma membrane allows material to be secreted / passed out;
J. exocytosis is secretion of material using a vesicle;
K. named example of endocytosis or exocytosis;

2.4.8 Describe how the fluidity of the membrane allows it to change shape, break and re-form during endocytosis and exocytosis.

Mark Scheme

A. exocytosis uses (membrane bound) vesicles to transport molecules;
B. fuses with plasma membrane to release molecules outside the cell;
C. endocytosis is the mechanism whereby cells take in solids and / or solutions;
D. involves the formation of vesicles;
E. infolding of cell membrane;
F. called phagocytosis when solids / organisms are engulfed;
G. phagocytosis is called feeding in some unicellular organisms;
H. called pinocytosis when solutions are taken in (vesicles are much smaller);
I. may be receptor-mediated (eg HIV);
J. requires energy / active process;