BIOLOGY
Mark Scheme

LM10 - FACTORS AFFECTING PERMEABILITY

Q1)

a) High temperature causes phospholipid molecules to vibrate faster **(1)** Intermolecular forces holding these molecules together will break due to high energy **(1)** Phospholipids are now 'free' and the bilayer is no longer intact **(1)**

b) The main role of channel proteins is to form pores filled with water and to transport water molecules across the membrane (**1)**

c) High temperature causes proteins within the membrane to denature **(1)** The change in shape means that these proteins may become smaller preventing molecules to pass through **(1)** OR bigger allowing molecules through that normally would not be able to **(1)**

(Maximum of 2 marks)

Q2)

a) Phospholipids in the membrane cluster together in low temperatures as they have low energy **(1)** which causes intermolecular interactions between them to strengthen **(1)** This decreases the permeability of the cell membrane (making it more rigid) **(1)**

b) Ice crystals piercing through the cell will disrupt the membrane **(1)** which means that the membrane can no longer regulate its contents **(1)**

c) B - The permeability of membranes increases at high temperature **(1)**

Q3)

a) High concentration of solutes increase the permeability of the membrane **(1)**

b) They can cause the forces between phospholipids to weaken when dissolving between them **(1)** This creates bigger 'spaces' between phospholipids and allows for bigger molecules to pass through **(1)**

c) As they are hydrophobic and non-polar molecules **(1)** so can sit between tails of phospholipids and form interactions with them **(1)**

Q4)

a) Saturated phospholipid tails contain only single carbon bonds **(1)** while unsaturated contain at least one double/ triple carbon bond **(1)** Saturated phospholipid tails look more 'straight' structurally **(1)** while unsaturated phospholipid tails have slight 'kinks' structurally **(1)**

b) D - Saturated molecules only contain single bonds **(1)**

c) High concentration of unsaturated phospholipid tails will cause the membrane to be more permeable **(1)** This is because the arrangement of unsaturated tails causes more distance between different phospholipids **(1)** as the shape of these tails have a slight 'bend' **(1)** Therefore they will have less intermolecular interactions **(1)**

d) Saturated phospholipid tails are arranged more closely as the shape of the phospholipid tails are 'straight' **(1)** This means they can have more interactions between each other **(1)** which decreases the permeability of the cell membrane **(1)**

Q5)

a) The role of cholesterol is to regulate the fluidity of the cell membrane **(1)**

b) Due to phospholipids being further apart in high temperatures, cholesterol causes these molecules to come closer together **(1)** to increases the interactions between phospholipids **(1)**

c) This decreases the permeability of the cell membrane **(1)**