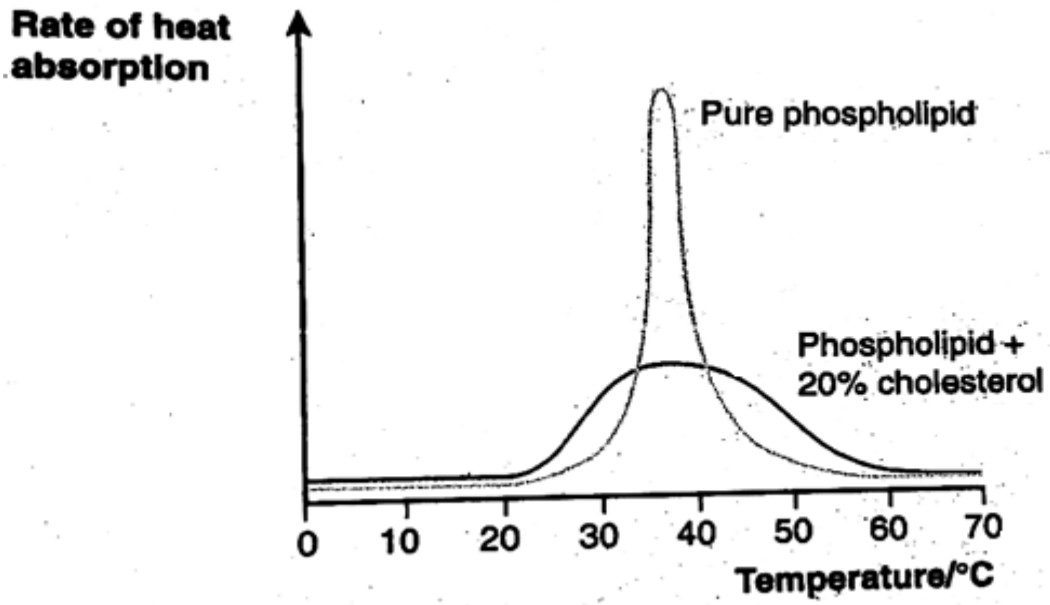
1. **The graph below shows the effect of temperature on the rate of heat absorption of pure phospholipid bilayer and one with 20% cholesterol added. Study it carefully and answer questions that follow.**



a (i) Compare the rate of heat absorption by the pure phospholipids and one with 20% cholesterol.

Question	Answers	Marks allotted	A-Accept I-ignore AW-Alternative wording.
a(i)	**Similarities** (In both) the rate of heat absorption decreases back to the initial rate of heat absorption; From 0°C to 20.1°C, rate of heat absorption remained constant; Rate of heat absorption reaches/attains maximum value; Rate of heat absorption is equal at 32°C and 41°C; Heat absorption does not begin at zero; Heat absorption increases; and decreases; AW **Differences** At 0°C, rate of heat absorption is higher in phospholipids with 20% cholesterol while lower in pure phospholipids; AW	[Max 7]	A-Falls back to initial(Minimum) rate of heat absorption Accept same AW

	Below 33°C, rate of heat absorption of phospholipids with 20% cholesterol is higher while pure phospholipids was lower; Pure phospholipid peaks while phospholipids with 20% cholesterol does not peak; Pure phospholipids attain a higher maximum rate of heat absorption while phospholipids with 20% cholesterol attains a lower maximum rate of heat absorption; Between 33°C and 42°c, rate of heat absorption is higher in pure phospholipids while lower in phospholipids with 20% cholesterol;		AVP

(ii) Explain the rate of heat absorption by the pure phospholipids

(ii)	At 0°C, rate of heat absorption was (very) low; Because of (very) low temperatures; lipid bilayer (very) stable; due to relatively stronger; vandarwaals forces; between adjacent hydrocarbon tails; and hydrophobic interactions; between opposite hydrocarbon tails; and intramolecular covalent bonds; intact; From 0°C to 20°C, rate of heat absorption remained constant; low temperatures; vandarwaals; and hydrophobic interactions; are not overcome; membrane structure stable; From 20°C to 33°C, rate of heat absorption increased gradually; due to gradual increase in temperature; resulting into breaking down of fewer/some vandarwaals and hydrophobic interactions; some phospholipids become mobile/free; easily absorb heat; From 33°C to 35°C, rate of heat absorption increased rapidly; to a maximum/peak; due to higher temperatures; leading to complete breakdown vandarwaals and hydrophobic interactions; phospholipids become mobile;	[Max 20]	Accept mutual attractions between hydrocarbon tails Accept 33°C as critical temperature.

	due to higher kinetic energy; absorb heat rapidly or readily; From 35°C to 60°C, rate of heat absorption decreases rapidly; later gradually; because of the breakdown of intramolecular; covalent bonds of hydrocarbon tails; due to very higher temperatures; melt/adopt liquid phase; Beyond 60°C, rate of heat absorption remained constant; all phospholipids melted/behaving like a liquid; lipid bilayer lost; bilayer collapsed		Integrity of the cell membrane lost.

(iii) Explain the reasons why heat absorption of the pure phospholipids differs from that of the 20% cholesterol

(iii)	Rate of heat absorption is lower in pure phospholipids while higher in phospholipids with 20% cholesterol at lower temperatures; Accept-below 20°C Because cholesterol regulates heat absorption; so as plasma membrane fluidity is maintained within favourable/ideal/suitable limits; so as activities such as membrane transport; membrane fusion can occur; for survival; Cholesterol polar ends interacts with hydrophilic head and the non-polar end interacts with hydrocarbon; disturbing close packing so absorption is higher at lower temperatures reducing the magnitude/effect of vandarwaals forces; between adjacent hydrocarbon tails. Heat absorption is higher in pure phospholipid at high temperatures than with cholesterol; because the absence of cholesterol results into fast melting or phase transion among lipids; due to no regulation of the amount of heat absorbed;		Accept higher maximum and lower maximum respectively. Accept AW AVP

	At very high temperatures, rate of heat absorption decreases more gradually in phospholipids with 20% cholesterol while less gradually in pure phospholipids; because cholesterol slows rate of melting; of phospholipids.		**Cholesterol increases the critical temperature and also increases the melting point of phospholipids.**

b) Explain how does phospholipid behaving like a liquid affect permeability of the plasma membrane

c) Explain the importance of fluidity of the plasma membrane

b)	***Permeability increases; membrane becomes leaky; selective transport of materials lost;***	**[Max 3]**	**AW**
c)	***Affects activities like ease of membrane fusion with others; activity of the membrane- bound enzymes; transport proteins;***	**[Max 3]**	**AW**