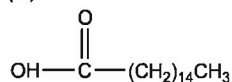


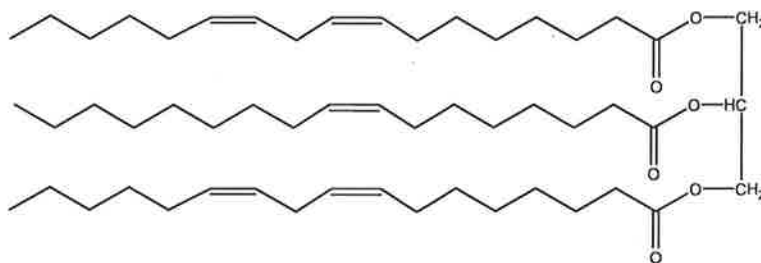
### 3.9 Triglycerides

1. (a)

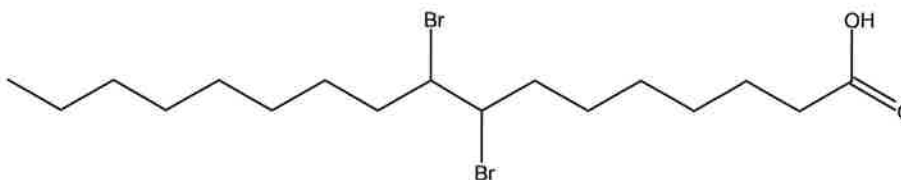


- (b)
- iodine reacts with the carbon-carbon double bonds in hydrocarbons, causing it to decolourise
  - tripalmitate does not contain any carbon-carbon double bonds

2. (a) must contain at least one of each long chain carboxylic acid  
For example

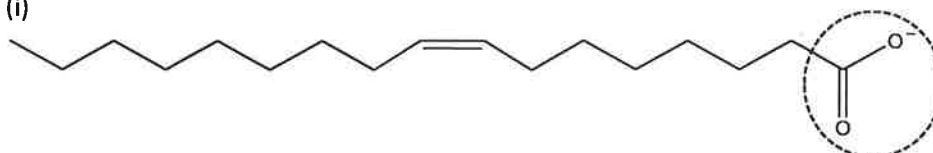


(b)

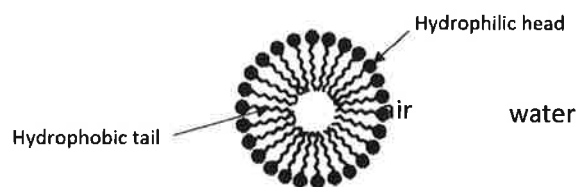


- (c)
- sesame oil
  - more saturated means the hydrocarbon chains can pack more closely together
  - more dispersion forces are able to be formed
  - requires a greater amount of heat energy to separate molecules

(d) (i)



- (ii)
- The hydrophilic charged anionic head of the soap dissolves in the aqueous layer
  - as it can form ion-dipole interactions with polar water molecules.
  - The hydrophobic non-polar hydrocarbon chain of the soap dissolves in non-polar air.

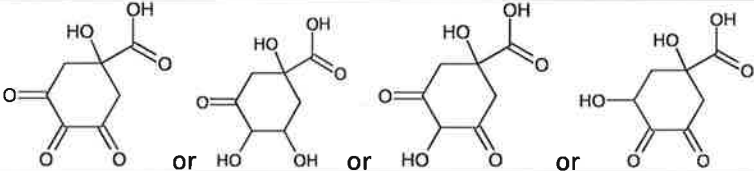
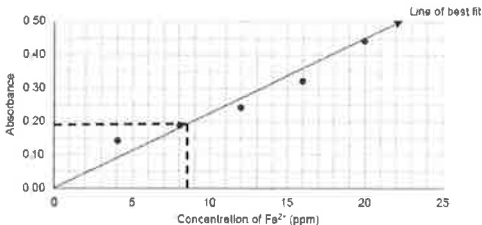


3. (a)
- triglyceride is almost fully saturated, containing only one carbon-carbon double bond
  - means the hydrocarbon chains can pack more closely together
  - more dispersion forces can be formed
  - not enough heat energy present at room temperature to melt butter
- (b) 1,2,3-propanetriol/propane-1,2,3-triol


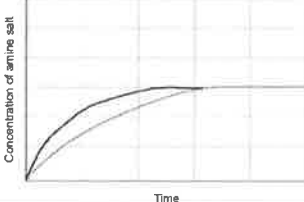
## Suggested Annotated Solutions 2025 SACE Examination

Solutions are not the official set of solutions used by the SACE Board of South Australia.

QUESTION 1 (Total: 16 marks)			
(a)		$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$	2 marks
(b)	(i)	Proteins have unique amino acid sequences Attractions/interactions between side chains or amide groups will occur This causes/results in a fixed shape/unique folding	3 marks
	(ii)	The covalent disulfide bonds are strong So the chain can be pulled back into its original shape	2 marks
(c)			2 marks
(d)	(i)	Polar proteins will adsorb/attract more strongly to the stationary phase than less polar ones so will move less distance Albumin had the lower $R_f$ value Hence albumin is the most polar	3 marks
	(ii)	Distance moved = $R_f \times$ distance of solvent front $= 0.85 \times 8 = 6.8$ cm	1 mark
	(iii)	(1) albumin and casein    or    gliadin and glutenin	1 mark
		(2) The polarity of the mobile phase/stationary phase could be changed The $R_f$ values will be further apart/there is a greater difference in solubility in the mobile phase (adsorption to the stationary phase) or the TLC plate could be much longer which will result in a greater distance between the two components	2 marks

QUESTION 3 (Total: 28 marks)				
(a)			$1s^22s^22p^63s^23p^63d^6$	2 marks
(b)	(i)		$C_7H_{12}O_6$	2 marks
	(ii)		It is not a carbohydrate It does not contain an aldehyde or ketone group	2 marks
	(1)		Orange to green/brown	2 marks
	(2)			2 marks
(c)	(i)	(1)	Iron atoms have electrons in unique energy levels Electrons absorb energy equal to the difference in energy levels/transition levels/gaps in energy levels This amount of energy corresponds to a specific wavelength of light	3 marks
	(2)	(A)	 <p>8.3 or 8.4</p>	2 marks
		(B)	<p>Any two of</p> <p>A linear line of best fit for these points does not seem appropriate; a curve would result in less scatter and better fit this data.</p> <p>or</p> <p>An arrow at the upper end of line of best fit is not appropriate as we do not know whether the data continues to follow the same trend.</p> <p>or</p> <p>The line is appropriate as the relationship is expected to be linear and to have no absorbance at zero concentration of <math>Fe^{2+}</math>.</p>	2 marks
	(ii)	(1)	burette	1 mark
		(2)	(A) $(16.93+17.00+16.98)/3 = 16.97$ mL	1 mark
		(B)	$n(Cr_2O_7^{2-}) = cV = 3.50 \times 10^{-5} \times 0.01697$ $= 5.9395 \times 10^{-7}$ mol $n(Cr_2O_7^{2-}) : n(Fe^{2+}) = 1:6$ $n(Fe^{2+}) = 6 \times 5.9395 \times 10^{-7} \text{ mol} = 3.5637 \times 10^{-6}$ mol $c(Fe^{2+}) = n/V = 3.5637 \times 10^{-6} / 0.02000 = 1.7819 \times 10^{-4}$ $= 1.78 \times 10^{-4} \text{ mol L}^{-1}$ (3sf)	5 marks
	(iii)		$\text{ppm} = \text{mg L}^{-1}$ $30 \text{ mg} / 0.005 \text{ L} = 6000 \text{ ppm}$	2 marks
(d)			incomplete combustion occurring in gas heaters/car engines/exhaust fumes	2 marks

QUESTION 4 (Total: 14 marks)			
(a)		$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$	2 marks
(b)	(i)	No carbon dioxide/greenhouse gases are emitted Climate change/enhanced greenhouse effect is slowed/mitigated	2 marks
	(ii)	(1) $\text{Fe}^{3+} + 3\text{e}^- \rightarrow \text{Fe}$	2 marks
		(2) Reduction occurs at the cathode/the cathode is the negative electrode in electrolysis/reduction occurs at the negative electrode in electrolysis/electrons are gained at the cathode	1 mark
		(3) Oxygen/ $\text{O}_2$	2 marks
(c)	(i)	$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$	2 marks
	(ii)	0.9 megatonnes = $0.9 \times 10^6$ tonne = $0.9 \times 10^9$ kg = $9.0 \times 10^{11}$ g $n_{\text{(methane)}} = \frac{9.0 \times 10^{11}}{16.042} = 5.61 \times 10^{10}$ mol $q = n\Delta H = 5.61 \times 10^{10} \times 890 = 5.0 \times 10^{13}$ kJ	3 marks

QUESTION 5 (Total: 17 marks)			
(a)		By-product Because it has a use/commercial value/can be used in another application	2 marks
(b)		primary	1 mark
(c)		Allows increased rate of reaction/speeds up the reaction/product is obtained faster Without loss of volatile components	2 marks
(d)	(i)	$\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$  or 	2 marks
	(ii)	At higher temperatures a greater proportion n of particles will possess energy equal to or greater than the activation energy Hence there will be more frequent collision which lead to a higher proportion of successful collisions per unit time Hence the product will be made more quickly leading to more profit for the manufacturer	4 marks
(e)	(i)		2 marks
	(ii)	The protonated form is charged Can form ion-dipole interactions with polar water These are stronger interactions than the original hydrogen bonds between water and the unprotonated form.	4 marks