

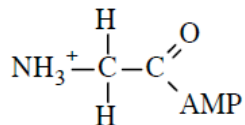
Abbreviated Answers to Sample Qs for Exam-II

Question #1

- a) Lyase or synthase
- b) One molecule of carbonic anhydrase converts (turns over) 1.5×10^5 molecules of CO_2 to product every second under 100% active site filling conditions.
- c) (i) $E = 19.5 \mu\text{g}$.
(ii) $K_m = 5.88 \text{ mmol/min} \times 1.5 \text{ min/L} = 8.8 \text{ mM}$
(iii) K_m represents the $[S]$ required to maintain 50% filling of the enzyme active sites during the course of the enzyme assay and thus yield a reaction rate, $v = 1/2 V_{\text{max}}$.
- d) i. No
- ii. If the inhibitor was binding in the active site one should be able to overcome the inhibition by using a high concentration of substrate. The graph indicates increasing the concentration of $[S]$ does not overcome the effect of the inhibitor, that is, the lower (+I) curve does not approach the upper (-I) curve as the $[S]$ is increased. This is not consistent with competitive inhibition.

Question # 2

- a) $\Delta G^\circ = + 5.7 \text{ kJ/mol}$
- b) Q_{cell} cannot equal or exceed 3.78×10^4
- c) Step #1: Carboxylate-O⁻ of N-terminal glycine = nucleophile; PPi = leaving group
Step #2: NH_2 (not NH_3^+) of C-terminal glycine = nucleophile; AMP = leaving group
- d) HEI shown below:



Question #3

- a) 1 and 0
- b) i. Cytochrome c or Complex IV.
ii. For both components 0.5:1 - using $4\text{H}^+/\text{ATP}$.

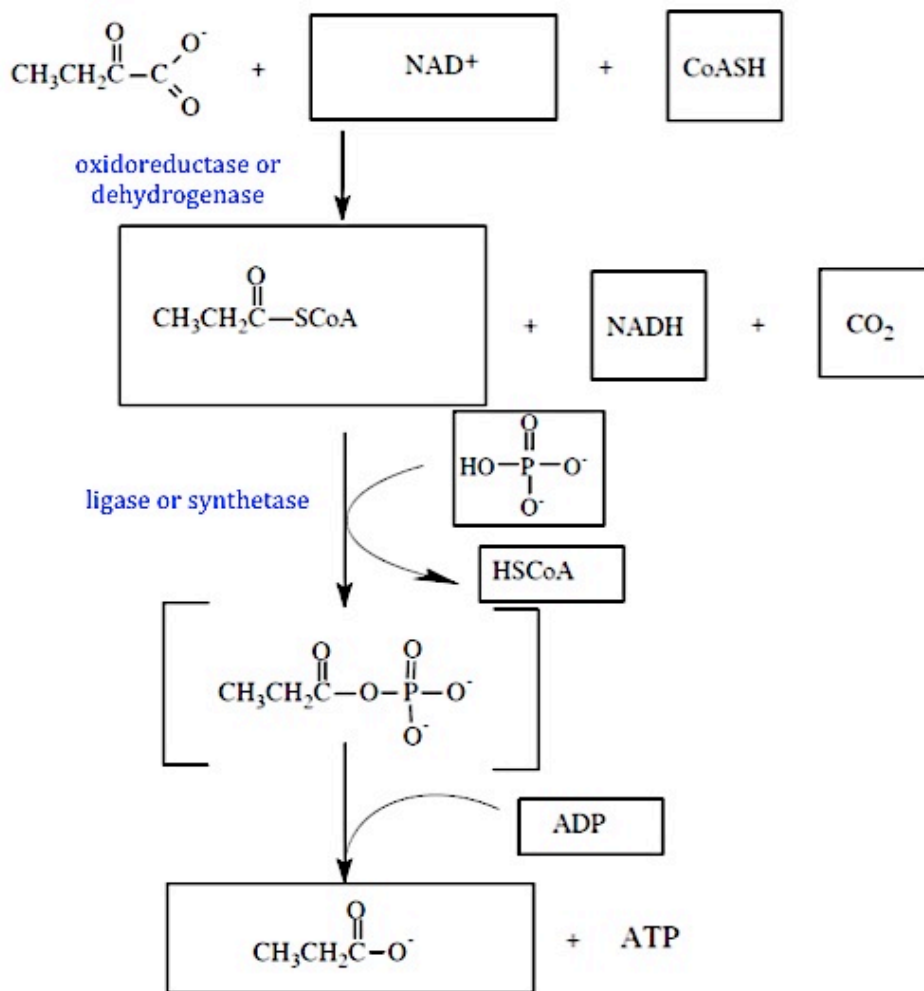
c) i. Yes. Work to synthesize 4 mol of ATP = 126 kJ. Energy from oxidation of 1 mol of Vitamin C = 146.3 kJ. Since $146.3 > 126$ kJ there is enough energy to do the work required with enough left over to give the overall process a $\Delta G^{0'} < 0$.

ii. $\Delta G' = -23.0$ kJ/mol H^+ transported.

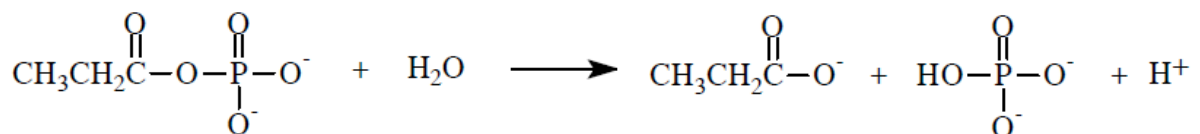
Therefore, $\Delta G'$ from 3 mol of H^+ transported via the ATP synthase = 23.0 kJ x 3 mol H^+ = 69 kJ energy produced.

Question #4

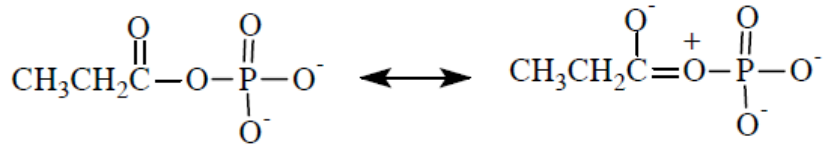
(a)



(b) (i)



(ii)



Question #5

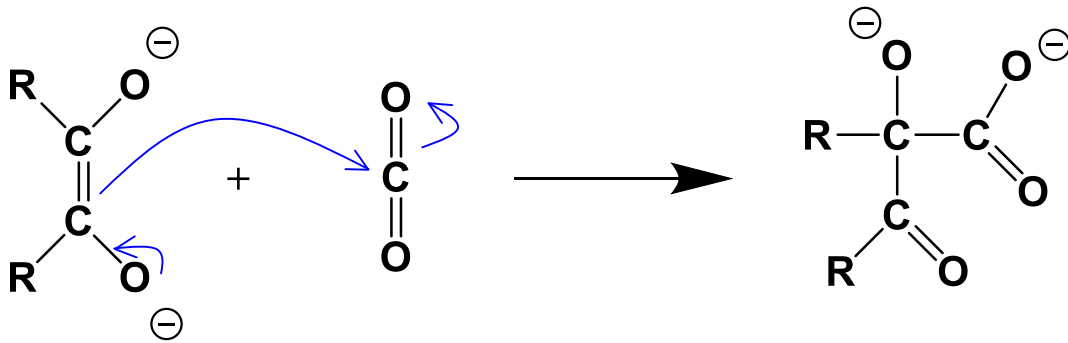
- i. alkaloid
- ii. polyketide
- iii. terpenoid, phenolic, & polyketide
- iv. terpenoid

Question #6

a) differences: presence of phosphate,
one used in catabolism, the other in anabolism

similarities: electron donors
overall structure

b)



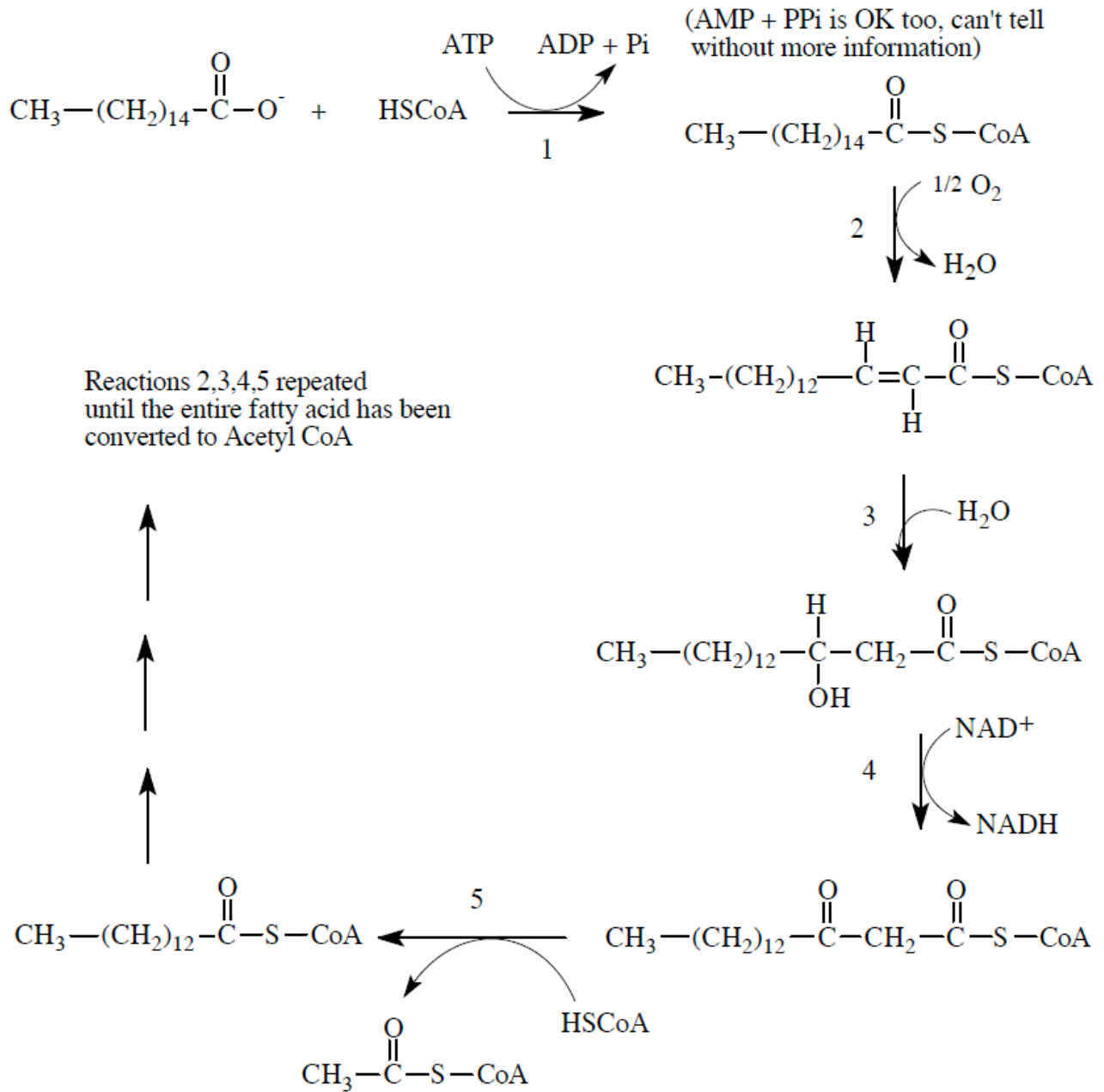
c) $5 \times \text{C}_3 = 3 \times \text{C}_5$

d) dimer; polymer; polymer,
transport; storage; cell wall
all hexose monomers

e) no light
that means: at night, under ground
and/or
no chlorophyll; that means: woody stems, flowers, fruit

Question #7

(a)

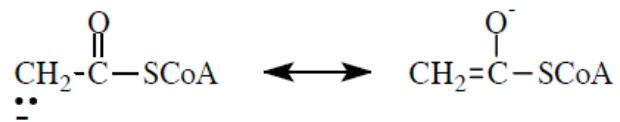


(b) Pantothenic acid

(c)

<u>Reaction</u>	<u>Reaction similar to which Glycolysis or TCA cycle reaction?</u>	<u>Class of enzyme</u>	<u>Names of any vitamin(s) involved in reaction</u>
1	TCA-5	Ligase or synthetase	None
2	TCA-6	Oxidoreductase or Dehydrogenase	Riboflavin
3	TCA-7	Synthase or Lyase	None
4	TCA-8	Oxidoreductase or Dehydrogenase	Niacin

(d) (1) Stabilized by resonance



(2) There will also be a (+) charged active site residue or metal cation (Mg^{+2} , Zn^{+2} etc.) prosthetic group involved in stabilizing the negative charge on the carbanion

(e)

16C Fatty acid → 8 acetyl CoA

SLP = 0

Oxphos

Rxn #2 (like succinate dehydrogenase rxn of TCA/ETC)	7 x 1.5 = 10.5
NADH	7 x 2.5 = 17.5

8 acetyl CoA → 16 CO₂ (TCA cycle)

SLP 8 x 1 = 8

Oxphos

NADH	24 x 2.5 = 60
Succinate	8 x 1.5 = 12

Total = 108

But used 1 ATP so net synthesis of ATP = 108-1 = 107