CONCEPT: TOTAL ENERGY FROM FATTY ACIDS

- To calculate the total ATP yield from complete oxidation of fatty acid, we must consider:
  - □ ATP from _____ oxidation in citric acid cycle.
  - □ ATP from _____ and _____ in oxidative phosphorylation.

	1 Cycle of β-oxidation	Krebs Cycle (Citric Acid)	Oxidative Phosphorylation	TOTALS
Start Molecule	Fatty Acid	1 Acetyl-CoA	NADH & $FADH_2$	
ATP				
$FADH_2$				
NADH				
End Molecule	___Acetyl-CoA	Oxaloacetate	H_2O	

Common metabolic pathway

___ NADH x 2.5 ATP = ____ ATP
\+ ___ $FADH_2$ x 1.5 ATP = ____ ATP
□ ATP molecules*

EXAMPLE: Calculate total ATP yield from complete β-oxidation of myristic acid.

STEP 1: Calculate number of _____ of β-oxidation. $\text{\# of cycles} = \frac{\text{\# C}}{2} - 1$

STEP 2: Calculate total NADH and $FADH_2$ produced during ____-oxidation.

- □ Equals to number of _____.

STEP 3: Calculate total ATP, NADH and $FADH_2$ produced during _____ acid cycle.

- □ Depends on number of acetyl CoA molecules from β-oxidation.

STEP 4: Convert ____ NADH and $FADH_2$ to _____ from oxidative phosphorylation.

- □ 1 NADH = 2.5 ATP, 1 $FADH_2$ = 1.5 ATP.

STEP 5: Add all ATPs, subtract ____ ATP.

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PRACTICE: Rank the following molecules based on amount of energy stored in them in increasing order (per mol).

I. Sucrose II. Arachidic III. Glucose IV. Behenic (22:0)

a) I, III, II, IV

b) III, I, II, IV

c) II, IV, III, I

d) IV, II, I, III

PRACTICE: Provide total moles of ATP produced by complete β-oxidation of 3.4 g of palmitic acid (256.43 g/mol).