Answer Key for Exam 2. NESA Biochemistry Summer 2002

1. C 2. D 3. B 4. C 5. A 6. D
7. A

Fatty acids are synthesized from acetyl CoA, units of two carbon atoms. Palmitic acid was 16 carbon atoms, so it is synthesized form 8 acetyl–SCoA (Ac–SCoA) molecules. One Ac–SCoA is produced from 1 pyruvate. Two pyruvate molecules are generated from the metabolism of 1 glucose molecules through glycolysis. Thus four glucose molecules would be needed to produce the Ac–SCoA needed to synthesize palmitic acid. Since maltose is a disaccharide of two glucose molecules, *2 maltose molecules* would be needed.

8. All of the amino acids are both glucogenic and ketogenic. It is clear that Threonine is both glucogenic and ketogenic since it can eventually produce Ac–SCoA (used to synthesize fatty acids, triacylglycerols and possibly keytone bodies) and pyruvate (first reagent in the gluconeogensis chain). All of the other amino acids in the displayed pathway produce just pyruvate, making them glucogenic. Pyruvate can be converted to Ac–SCoA through oxidative decarboxylation. Thus the carbon atoms from these amino acids could find themselves within a fatty acid.

9. The peptide Ala–Cys–Thr–Ser is hydrolyzed into the amino acids: Thr, Ser, Ala, and Cys. Each one of these is metabolized via a specific set of reactions. So of these are explained in the answer to question 8.

- *Metabolism of Ser, Ala, & Cys* yields 3 pyruvate
- *Metabolism of Thr* yields Gly and Ac–SCoA
- *Metabolism of Gly* yields NADH and Ser. Ser → pyruvate

Oxidative decarboxylation:
4 pyruvate → 4 NADH + 4 Ac–SCoA + 4 CO_2

Citric Acid Cycle (CAC):
Total Ac–SCoA: 4 from oxidative decarboxylation + 1 from metabolism of Thr = 5 Ac–SCoA
Yield: 5x3 NADH, 5x1 $FADH_2$, 5x1 ATP

Electron Transport chain (ETC):

Cycle	NADH	$FADH_2$
Oxidative decarboxylation	4	0
Citric Acid Cycle	15	5
Metab. Gly (possibly 1 for Thr as well)	1	0
Total	**20**	**5**

Ideal (3 ATP/NADH, 2 ATP/ $FADH_2$)	Empirical (2.5 ATP/NADH, 1.5 ATP/ $FADH_2$
20 • 3 + 5 • 2 = 70 ATPs	20 • 2.5 + 5 • 1.5 = 57.5 ≈ 57 ATPs

Total amount of ATP:

Cycle	Ideal	Empirical
ETC	70	57
CAC	5	5
Total	**75 ATPs**	**62 ATPs**