

Points

- (12) 1. Bacterial fatty acid synthesis from acetyl-CoA and malonyl-CoA requires six enzymatic steps involving seven separate proteins. Give the reactants and products of each step (names or structures) and the name (or abbreviation) of the enzyme catalyzing that step.

Page	Points
1	_____
2	_____
3	_____
4	_____
Total	_____

- (8) 2. Radioactive acetate labeled in the carboxyl carbon ( $[1-C^{14}]$ -acetate) was injected in a rat and subsequently several radioactive products were isolated. For each of the following compounds, draw the structure and **circle** the carbon atoms of the compound you would expect to contain radioactivity.

(a) mevalonic acid

(b) squalene

(c) palmitic acid

(d) arachidonic acid

3. Many biosynthetic reactions involve the input of energy from ATP. For the lipid (fatty acid and sterol) biosynthesis reactions we have studied, identify (by giving reactants and products—structure or name) the steps requiring ATP in:

(9) (a) sterol biosynthesis (3 steps).

(3) (b) fatty acid biosynthesis (1 step)

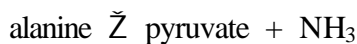
(7) 4. Fill in the blanks with the name of the appropriate intermediates.

\_\_\_\_\_ + \_\_\_\_\_ → phosphatidyl choline + \_\_\_\_\_  
 palmitoyl-CoA + \_\_\_\_\_ → 3-ketosphinganine + \_\_\_\_\_  
 \_\_\_\_\_ + inositol → phosphatidyl inositol + \_\_\_\_\_

(10) 5. For the four plasma lipoproteins, (a) chylomicrons, (b) VLDL, (c) LDL, and (d) HDL, put the letter or letters corresponding to the lipoprotein(s) for which the following statements are true in the blank to the left of the statement:

_____	Contains apoprotein B-100.	_____	Transports dietary triacylglycerols.
_____	Contains apoprotein B-48.	_____	Transports triacylglycerols made in liver
_____	Contains apoprotein A-1.	_____	Is degraded by lipoprotein lipase.
_____	Contains apoprotein C-1.	_____	Is a precursor of LDL.
_____	Source of cholesterol for tissues.	_____	May remove cholesterol from cells.

- (8) 6. The alanine cycle is similar to the Cori cycle, except that alanine instead of lactate is transported from muscle to liver for further metabolism. In addition to providing fuel for synthesis of more glucose in muscle, alanine also serves as a carrier of nitrogen from muscle to liver in times of muscle protein degradation. The following conversion must occur in liver:



Give the reaction steps accomplishing this conversion, including the name of the enzyme catalyzing each step, the **structure** of the **reactants** and **products** of each step, and the name of any coenzyme cosubstrates or coenzyme prosthetic groups involved.

- (6) 7. The urea cycle introduced you to three new amino acids that are not found as constituents of proteins. Two of these amino acids are transported across the mitochondrial membrane during the cycle. Give the **name** and **structure** of these two amino acids.

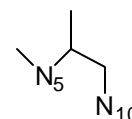
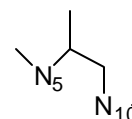
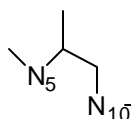
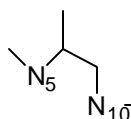
- (8) 8. Identify the following C<sub>1</sub> derivatives of tetrahydrofolic acid by adding the appropriate C<sub>1</sub> structure to the partial structures below. Indicate whether the C<sub>1</sub> unit is at the oxidation level of **methanol**, **formaldehyde**, or **formic acid**.

The product formed from serine.

The precursor of the 2 position of purines.

The C<sub>1</sub> donor in thymidylate biosynthesis.

Donor of the methyl group in methionine biosynthesis



- (6) 9. Adenine contains five nitrogen atoms, each derived from an amino acid. Draw the structure of adenine, and with arrows indicate the amino acid source of each nitrogen atom.

- (9) 10. Mammalian cells have two forms of the enzyme **carbamoyl phosphate synthetase**. (Referred to as **CPS-I** and **CPC-II**). Identify:
- (a) the reactants and products of each form;
  - (b) the cellular location of each form; and
  - (c) the biochemical pathway in which each form participates.
- (10) 11. PRPP is the sugar precursor in nucleotide biosynthesis. Give the **structure** of PRPP, then identify the following reactions in which it is involved by giving **all reactants and products** (names or structures okay).
- Structure:
- (a) synthesis of PRPP
  - (b) a reaction in de novo pyrimidine nucleotide biosynthesis
  - (c) a reaction in de novo purine nucleotide biosynthesis
  - (d) **two** reactions in the purine salvage pathway
- (4) 12. dATP has two kinds of regulatory effects on ribonucleotide reductase. Explain them.