1) Drawing upon your experience in this class, name two risk factors for promoting coronary artery disease (CAD) and explain in detail how these risk factors influence the disease and how their effects can be minimized. Two treatments. (1) feeding of gritty cationic polymers (cholestyramine) and (2) taking the drug Lovastain have been shown to reduce the risk of CAD. Explain how for each one. (11)

II. 1. Amin exchange resins bind bile acids and stop them from being reabsorbed in the intestine. The liver takes up more LDL to make more bile acids in response. Thus LDL goes down and does not circulate as long so fewer fatty streaks form.

2. Statin drugs inhibit HMG-CoA reductase, the committed step in cholesterol synthesis. Cells must take in more LDL to make up the difference and so LDL in serum goes down. Also LDL circulates for less time due to those extra LDL receptors on cells.
2) Arrange the 12 intermediates of IMP biosynthesis in correct order (first to last). (6)

\[ E \quad B \quad L \quad A \quad C \quad I \quad K \quad G \quad F \quad J \quad H \quad D \]

1st \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 11 \ 12

Steps
3) Draw all the possible transamination products for the following molecules (if any) (8):

\[ \text{A} \quad -\text{OOC} - \text{H} - \text{C} - \text{CH}_2 - \text{CH}_2 - \text{C} - \text{NH}_2 \rightarrow -\text{OOC} - \text{H} - \text{C} - \text{CH}_2 - \text{CH}_2 - \text{C} - \text{NH}_2 \]

\[ \text{B} \quad \text{H} - \text{C} - \text{H}_2 - \text{C} - \text{H}_2 - \text{NH}_2 \rightarrow \text{H} - \text{C} - \text{H}_2 - \text{C} - \text{H}_2 - \text{COO}^- \]

\[ \text{C} \quad \text{CH}_3 - \text{C} - \text{COO}^- \rightarrow \text{CH}_3 - \text{C} - \text{COO}^- \]

\[ \text{D} \quad -\text{OOC} - \text{H} - \text{C} - \text{CH}_2 - \text{CH}_2 - \text{NH}_3^+ \rightarrow -\text{OOC} - \text{H} - \text{C} - \text{CH}_2 - \text{CH}_2 - \text{NH}_3^+ \]

II. Multiple Choice: THERE MAY BE MORE THAN ONE ANSWER (15)

1) \( \text{B} \) Which of the following is NOT a precursor or intermediate in the synthesis of sphingomyelin?

A) palmitoyl CoA
B) lysophatidic acid
C) CDP-choline
D) Acyl CoA

2) \( \text{A} \) Which of the following are common features of the synthesis of mevalonic acid and ketone bodies?

- A) both involve 3-hydroxy-3-methylglutaryl CoA (HMG CoA).
- B) Both require NADPH
- C) Both require HMG-CoA cleavage enzyme
- D) Both occur in the mitochondria
- E) Both occur in liver cells
3) In which compartment of the cell does ganglioside \( G_{M2} \) accumulate in Tay-Sachs patients?

   A) nucleus
   B) Golgi apparatus
   C) lysosome
   D) mitochondria

4) Which of the following answers complete the sentence correctly?

   Glutathione ________

   A) cycles between oxidized and reduced forms in the cell.
   B) is involved in the detoxification of \( H_2O_2 \) and organic peroxides.
   C) donates amide groups from its \( \gamma \)-glutamyl residue during biosynthetic reactions.
   D) contains an Se atom.

5) Which of the following are intermediates or precursors in the synthesis of heme?

   A) \( \delta \)-aminolevulnic acid
   B) bilirubin
   C) porphobilinogen
   D) biliverdin
   E) glycine
   F) succinyl CoA
   G) \( Fe^{2+} \)

BONUS (5)

The psychoactive mushroom compound, psilocybin (below) is synthesized from tryptophan. Outline the most likely biosynthetic route from tryptophan including all expected soluble or enzyme bound cofactors, products and reactants (e.g. \( O_2 \), PLP, biotin, FAD, methylene-THF, NADPH, \( H_2O \) etc., etc.) This conversion will have more than one step, no miracles please!