A. General questions

1. (12) Very high doses of vitamins are sometimes successfully used to treat inborn errors of metabolism.
   
a. Give an example of one vitamin responsive inborn error of metabolism.
   
   many answers possible
   
b. What enzyme is involved.
   
c. What is the vitamin used.
   
d. What coenzyme is involved.
   
e. Does the enzyme have a high Km or a low Km for the coenzyme?
   
f. What are the observed sign or symptoms associated with the inborn error listed?

2. (10) Sometimes you will see unusually high doses of specific vitamins used for special therapeutic purposes. For each of the situations below, list one vitamin most associated with use to treat or prevent that situation.

   a. Migraine headache
      niacin B2
   
   b. Mosquito repellant
      Thiamin B1
   
   c. Nausea
      B6
   
   d. Carpal tunnel
      B6
   
   e. High triglycerides
      niacin B3
3. (14) Draw the oral dose plasma saturation curve for vitamin C. Label the X and Y axes.

a. On the graph, show the Daily Value for vitamin C.
b. Show the Upper Limit value.
c. Show the daily dose that might be ideal for a one month treatment to hasten wound healing.
d. Explain your reasoning for both safe and effective.

250 - 500 mg is nearly saturated. Not much is gained by increasing the dose further but the risk for kidney stones does increase.

e. Why might vitamin C be effective for hastening wound healing?

It would enhance collagen synthesis rate.

4. (5) Briefly explain the regulatory difference in the United States between the DV and the RDA.

DV - is used for labeling purposes and represents the 1968 RDA data. It is established by the FDA.

RDA - is a more contemporary estimate of the requirement to avoid a deficiency. It is not used in labeling purposes as yet. It is for informational purposes.
5. (5) The following shows the structure of the anti TB drug isoniazid and the structure of pyridoxal phosphate. Draw a chemical reaction that explains why symptoms of a vitamin B6 deficiency are often seen with isoniazid therapy. What is the most common symptom observed?

6. (4) Explain why megaloblastic anemia is seen first as a symptom of a lack of intrinsic factor.

without intrinsic factor, B12 is not absorbed

without B12, folates are not recycled and megaloblastic anemia is seen.
B. (50) Multiple choice questions

1. Niaspan® is a) an immediate release niacin b) an extended release niacin c) a sustained release niacin d) a prodrug of niacin

2. The UL value for riboflavin is a) 1.7 mg  b) 17 mg  c) 37 mg  d) not listed

3. What is FALSE about niacin a) there is niacin in cornmeal b) there is low tryptophan in cornmeal c) peanuts are a good dietary source d) niacin is contraindicated with lovastatin.

4. A low erythrocyte glutathione reductase would be a sign of a deficiency of what vitamin: a) B6 b) vitamin C c) riboflavin d) thiamin

5. Glossitis, stomatitis and a rash are deficiency symptoms of which water soluble vitamin a) riboflavin b) folic acid c) B12 d) thiamin

6. Vitamin C is involved in a) conversion of niacin to NADP b) hydroxylation of lysine c) absorption of calcium d) synthesis of glutathione

7. The richest dietary source of vitamin B12 in the USA is a) fruits b) meats c) cereals d) cruciferous vegetables

8. Alcohol decreases circulating thiamin by a) decreasing absorption of thiamin b) decreasing activity of the reductase enzyme c) inhibiting transketolase action d) all of the above

9. The EAR or “average intake” would be expected to be a) higher than the RDA b) equal to the RDA c) lower than the RDA d) equal to the UL

10. The “active” portion of the thiamin molecule involved in adduct formation with alpha ketoacids is a) pyrimidine b) thiazole c) the thiazole-o-methyl d) the pyrimidine-o-methyl

11. Adverse effects associated with vitamin B6 in doses over the UL include a) peripheral neuritis b) flushing c) cardiomyopathy d) kidney stones

12. The DV value for folic acid is a) 1.5 mg  b) 1.7 mg  c) 2 mg  d) 0.4 mg

13. A diagnostic result indicating low vitamin B12 would be a) low glutathione reductase activity b) low aspartate aminotransferase c) low transketolase d) low methylmalonyl mutase

14. Pyruvate dehydrogenase is a mitochondrial enzyme complex that is thiamin pyrophosphate dependent. What other vitamin is needed for the full dehydrogenase activity? a) riboflavin b) vitamin B6 c) pantothenic acid d) vitamin B12

15. Conversion of dietary niacinamide to its coenzyme form requires a) TPP b) guanine triphosphate c) PLP d) ATP

16. Folic acid is on prescription in doses of what per tablet a) 80 ug  b) 500 ug  c) 800 ug  d) 1000 ug
17. A key test for detecting pyridoxine deficiency is to measure the activity of: a) glutamate-aspartate transaminase  b) glutathione peroxidase  c) methylmalonyl CoA isomerase  d) transketolase

18. Vitamin C in gram doses per day puts a patient at risk for a) oxalate urinary stones  b) macrocytic anemia  c) acidosis  d) microcytic anemia

19. Some depression associated with higher dose oral contraceptive use is related to low serotonin levels. In this case, megadoses of what vitamin might help  a) B1  b) riboflavin  c) B6  d) B12

20. A high alcohol intake could shut down what metabolic pathway a) glycolysis  b) pentose phosphate pathway  c) fatty acid catabolism  d) all of the above

21. “The pasta diet” would increase most the requirement for what single vitamin a) thiamin  b) riboflavin  c) vitamin B6  d) vitamin C

22. A patient on L-DOPA (L-dihydroxyphenylalanine) therapy should lower supplement intake of vitamin B6 because a) peripheral DOPA transaminase will be enhanced b) peripheral DOPA decarboxylase will be enhanced  c) vitamin B6 has enhanced toxicity with L-DOPA  d) L-DOPA has enhanced toxicity with B6

23. High dose folic acid is on prescription only status because  a) it is toxic at these doses  b) it decreases absorption of vitamin B12  c) it is teratogenic at these doses  d) it hinders detection of pernicious anemia

24. A coenzyme form of vitamin B12 is a) methylcobalamin  b) cyanocobalamin  c) N-10 methylcobalamin  d) all of the above

25. Propionyl CoA carboxylase requires what vitamin  a) vitamin B6  b) biotin  c) vitamin C  d) thiamin