Chapter 13 Reading Guide

This chapter wraps up the vitamins and minerals. I would suggest that you make yourself a well-organized chart of effects, sources, deficiency, etc. for each of the vitamins, minerals, and phytochemicals (listed below). Have this chart next to you when you take the exam… YES, I am telling you that you should treat this part of the exam as open note. By the time you get your chart done, you'll know most of it anyway ☺.

1. Is the risk of toxicity of trace minerals greater or less than it is for the B-vitamins? Why?
2. Why is it particularly important that supplements of trace minerals provide LESS than 100% of the RDA?
3. List some roles of iron in the body/cells.
4. In which two proteins iron found most in the body? What is iron's role as part of these proteins?
5. Is excess iron easily excreted? What is the primary mode of iron regulation (making sure there is enough, but not too much, in the body)?
6. Name the protein that binds and stores dietary iron in intestinal cells, and the protein that carries dietary iron through the blood to where it is needed in the body.
7. List the many factors that a)enhance and b)limit iron absorption.
8. From #7, which 3 seem to be most important?
9. What food sources provide heme irons? Non-heme? Which is better absorbed?
10. Describe some specific ways the body can change how well it absorbs iron.
11. Why is too much circulating iron dangerous?
12. Explain where and how iron is stored, and how that storage changes when iron levels increase.
13. When red blood cells die, is the iron excreted in feces or urine? Explain. How is most iron lost from the body?
14. Sum up and bring together the absorption, circulation, storage, and recycling of iron. Be sure to incorporate in this explanation when and how absorption efficiency can be adjusted. Also be

sure to mention specific proteins (ONLY those I asked you to name in previous questions; that is most, but not all, mentioned by the book). When you get to Zinc, come back to this question and talk about how Zinc interacts with iron absorption and ciruculation.

15. What's the difference between iron-deficiency and iron-deficiency anemia (hint: one includes, but is not the same as, the other).
16. What are some symptoms of early-stage iron deficiency? Of full-blown anemia?
17. What is "pica?"
18. Why is it potentially dangerous to self-diagnose iron deficiency, and begin a regimen of supplements without having blood tests?
19. In men, is iron-deficiency or iron-overload more common?
20. Why is the RDA for iron higher for females in reproductive years than it is for men?
21. Most animal derived foods are good sources of iron. What is an exception to that generality?
22. What are some non-animal derived foods that are good, relatively high bioavailability sources of iron?
23. What approximate percent of iron contributed by iron cookware is absorbed?
24. List several functions of zinc. Be sure to mention its relation to vitamin A.
25. Compare/contrast metallothionein with mucosal ferritin.
26. Why is zinc important for food digestion?
27. What is one specific reason that iron and zinc can interfere with each other, if their relative abundances are highly skewed?
28. Why can a low meat, high grain and legume diet put a vulnerable person at risk for zinc deficiency?
29. Why do vegetables vary in the amount of zinc they contain?
30. There has been some evidence to suggest that high-doses of zinc may help to reduce the length of colds. Is that evidence conclusive?
31. What hormone incorporates iodide into its structure? What effects does this hormone have on cells/the body?

32. Explain why iodine deficiency leads to goiter (see supplemental lecture).
33. What is a goitrogen? List some common goitrogen-containing foods.
34. Explain the cause of cretinism.
35. Why does the typical US diet provide more than the RDA for iodine?
36. List some NATURAL sources of iodine.
37. What are the roles of the 2 primary enzymes selenium is a part of?
38. What vitamin works closely with selenium, and what do they do together?
39. Are selenium supplements recommended? Why or why not?
40. List some sources of selenium.
41. How is copper related to hemoglobin synthesis? (This is the ONLY role you need to know).
42. Are copper deficiencies or toxicities common?
43. List some food sources of copper.
44. The only role of manganese to know: it is required for proper bone development.
45. Are deficiencies or toxicities of manganese **from food** common? What's a more common cause of toxicity?
46. List some sources of manganese.
47. Briefly explain the role of fluoride in tooth development and maintenance.
48. What are some natural sources of fluoride?
49. Describe fluoride toxicity, and how to prevent it.
50. What is chromium's primary role in the body? (This is the only one you need to know).
51. Have chromium supplements been proven an effective way to lose fat?
52. What are some natural sources of chromium?
53. List some other trace minerals.
54. Explain some specific negative effects lead can have on the body/cells.
55. What does the term "phytochemical" mean? Are there any in meat? Eggs? Dairy?

56. What are some general characteristics they give to **foods?** What are some general effects they have on the **body?**
57. Explain "functional foods;" what are some potential benefits and risks?
58. Know the names, GENERAL benefits (ex, for those that reduce cancer risk, know reduces risk of cancer… but not HOW that risk is reduced) and main food sources of:
    a. Capsaicin
    b. Carotenoids, specifically lycopene
    c. Flavonoids
    d. Isothiocyanates
    e. Organosulfur compounds
    f. Phenolic acids
    g. Phytoestrogens
    h. Resveratrol

Supplemental Lectures

I. Thyroid gland and goiter: what you need to know.

The thyroid gland makes a precursor to thyroid hormone. That precursor is stored in the gland. When iodide is incorporated into the chemical structure of thyroid hormone, the hormone is complete and can be released from the gland.

The hypothalamus is the part of the brain that monitors blood levels of thyroid hormone (and other conditions of the body, for example, body temperature, that might affect the need for thyroid hormone). When the body needs more thyroid hormone, the hypothalamus will "tell" the thyroid gland to make more thyroid hormone and release it into the blood.

With a lack of iodine in the diet, the precursors cannot be "finished," so the gland will not release them into the blood. The hypothalamus detects declining T-hormones, and directs the thyroid gland to release more. So the gland responds by making more precursor, but again, cannot finish or release the actual hormone. The gland fills up with precursor, and swells.

II. Lead: what is it good for? Absolutely nothing! Well, except things we use: pipes, computers, paint, etc.

Why is lead even around? Lead is NOT supposed to be easily accessible for human consumption. Naturally, lead is deep in the ground, much deeper than typical plant roots reach. So, normally life is not supposed to be exposed to lead; therefore, our bodies have no good specific mechanisms for using it or disposing of it.

Lead is dug up for industry… and before you demonize "industry," this is stuff we all use! A good reason for us to be educated about what has happened in the past and use that information to encourage caution about what will be tried in the future (nobody knew that lead would end up being a toxin). Anyway, it is dug up, and some of it ends up in the air in particulate form, eventually settling into our soils. Plants can uptake lead and incorporate it into their tissues… potentially, you could be exposed by eating these plants. Exposure from this source is probably pretty rare. Most exposure comes from direct contact: paint, water contaminated from old lead pipes, playing or gardening in contaminated soil.

A new idea has been developing to try to "purify" soils that are contaminated with lead and other pollutants: phytoremediation. Researchers are evaluating different plants to see which are "best" at uptaking soil pollutants. The hypothesis is this: grow these particular plants on polluted soils. After a few seasons, remove the plants (including the roots) and dispose of them carefully (I don't know how that would be approached), and you should have cleaner soil. Some preliminary work has been promising.

Anyway, that's interesting and all, but part of the reason I mention this is because in my research of phytoremediation, I found that two food plants show particular promise in removing pollutants from soil: broccoli and tomatoes! What do you do with this information? Well, probably nothing. Chances are very slim you'll ingest high levels of lead from produce, and you'd have no way of knowing what the lead content of the soils they were grown on was.

I highly doubt that growers test their soils for lead, and many of them probably have no reason to.

In the Puget Sound, there are some areas that have tested high for lead content because of the Tacoma smelter. I will include a link to the maps of our areas with results of lead and arsenic tests.