36. Anoxygenic photosynthesis is often limited by
   a) too much low energy (long wavelength) light
   b) too much high energy (short wavelength) light
   c) * low amounts of reduced compounds to use as electron donors
   d) the bacteriochlorophyll A structure
   e) too low CO_2 concentrations for carbon fixation

37. External antenna pigments productively absorb radiation of _____ than the reaction center pigment.
   a) longer wavelengths
   b) * shorter wavelengths
   c) the same wavelengths
   d) both a and b
   e) a, b, and c

38. Why are there two photosystems in oxygenic photosynthesis?
   a) because two photosystems are required to split water
   b) because two photosystems are required to reduce NADP
   c) * because one photosystem is not enough to both split water and reduce NADP
   d) because two photosystems are required to make ATP
   e) to pump H+ ions to make ATP

39. To make NADPH (E'_0 = -324 mV) it must be coupled to a reaction with a
   a) * more negative E'_0
   b) more positive E'_0
   c) the same E'_0
   d) a positive ΔG

40. What is the molecule that can transfer an electron to NADPH for CO_2 fixation?
   a) p680*
   b) p680+
   c) p680
   d) p700
   e) * p700*

41. The molecule that provides the oxidative power for photolysis of water is:
   a) p680*
   b) * $p680^+$
   c) p680
   d) p700
   e) p700*

42. Why does Chlorophyll A absorb mostly in the blue portions of the spectrum?
   a) to protect the plant
   b) * because these are high energy photons
   c) to allow the plant to be green
   d) because the reaction center absorbs ultraviolet light

43. Why does the action spectrum so closely parallel the absorption spectrum?
   a) because chlorophyll A can absorp so many wavelenghts of light
   b) * because most of the light is used for photosynthesis
   c) because plants are green
   d) because the action spectrum and the absorption spectrum are the same thing

44. How many electrons are released per molecule of water that is photolysed?
   a) 1
   b) * 2
   c) 4
   d) 8

45. Reduced ferridoxin:
   a) can pass electrons to $NADP^+$
   b) is associated with photosystem II
   c) is involved in cyclic photophosphorylation
   d) all of the above
   e) * a and c

46. The proton motive force (PMF) that drives ATP synthesis in chloroplasts is mostly generated by:
   α) $\Delta\Psi$
   b) $*\ \Delta pH$
   c) the production of NADPH
   d) a combination of $\Delta\Psi$ and ΔpH
   e) the F-type ATPase

47. C_3 plants are called C_3 plants because:
   a) their stomata have 3 spines
   b) * ^{14}C from $^{14}CO_2$ accumulates in compounds with 3 carbon atoms
   c) 3 CO_2 molecules are fixed per Calvin cycle in these plants
   d) their Rubisco enzyme has 3 subunits
   e) ^{14}C from $^{14}CO_2$ is incorporated at the C_3 position of glucose

48. Rubisco can:
   a) add CO_2 to ribulose bis phosphate
   b) add O_2 to ribulose bis phosphate
   c) split 6-carbon molecules into 2 3-carbon molecules
   d) a and b
   e) * a, b and c

49. Why are 12 molecules of PGA needed per Calvin cycle?
   a) * If there were less than 12 there would not be enough to remake the ribulose bisphosphate substrate for Rubisco after using 2 GAP to make glucose
   b) The Rubisco enzyme binds 12 PGA molecules
   c) The enzymes of the Calvin Cycle need to use 12 NADPH per cycle
   d) 24 ATPs have to be hydrolyzed per cycle
   e) There is too much PGA in the chloroplast

50. Why do C_4 plants in hot environments spend extra energy to fix low concentrations of CO_2?
   a) * because the CO_2 concentration in their stomata gets very low
   b) because they get more energy from C_4 compounds
   c) because CO_2 concentration in hot air is lower than in cool air
   d) because they have large amounts of phosphoenolpyruvate in their cells
   e) because they have higher ATP pools than C_3 plants