Example Questions for Quiz 8

Chapters 12 and 13 – Organic Chemistry and Nuclear Reactions

Here are some questions that are similar to what will be on Quiz 8.
The quiz will have a total of 20 points selected from these possibilities.
You may use your equation and symbol sheets as well as your Periodic Table of Elements.

1. (1 point) Carbon atoms form molecules using __**4**__ bond(s). (answer is a number)

2. (1 point) Oxygen atoms form molecules using __**2**__ bond(s). (answer is a number)

3. (2 point) Sulfur atoms usually form molecules using __**2**__ bond(s), but can form molecules with __**6**__ bonds as in the blood pressure medication hydrochlorothiazide. (answers are numbers)

4. (1 point) Nitrogen atoms usually form molecules using __**3**__ bond(s). (answer is a number)

5. (1 point) Chlorine atoms always form molecules using __**1**__ bond(s). (answer is a number)

6. (2 points) Phosphorus atoms usually form molecules using __**5**__ bond(s), but often might use __**3**__ bond(s). (answers are numbers)

7. (1 point) The molecule ethane C_2H_6 has its carbons connected by a (**single**, ~~double~~, ~~triple~~) bond.

8. (1 point) The molecule ethene (aka ethylene) C_2H_4 has its carbons connected by a (~~single~~, **double**, ~~triple~~) bond.

9. (1 point) The molecule ethyne (aka acetylene) C_2H_2 has its carbons connected by a (~~single~~, ~~double~~, **triple**) bond.

10. (2 point) Molecules that have the same chemical formula, but different, structures are called **__isomers___**.

11. (2 points) Benzene has a chemical formula of __**C_6H_6**___ and is in the shape of a __**hexagon/ring**__.

12. (2 points) Cyclohexane has a chemical formula of __**C_6H_{12}**__ and is in the shape of a __**hexagon/ring**__.

13. (2 points) The general formula for the molecules in petroleum is __**C_nH_{2n+2}**__ where n=1, 2, 3, …

14. (4 points) The triglyceride molecule we built was made from a glycerol molecule and three __**fatty**__ acids. With the addition of each of those three, a **__water__** molecule was released.

15. (4 points) At room temperature, __**single**___ bonds freely rotate, but __**double**__ bonds do not.

16. (4 points) The oxytocin molecule we build used nine **__amino__** acids linked together. With the addition of each of those, a __**water**__ molecule was released.

17. (1 point) A water molecule has a (**bent**, ~~straight~~) structure.

18. (1 point) A carbon dioxide molecule has a (~~bent~~, **straight**) structure.

19. (2 points) **_functional__ __groups__** are the parts of organic molecules that are usually involved when connecting to other molecules.

20. (4 points) When amino acids are connected together to make polypeptides, proteins, or enzymes, the connections are made by the __**NH_2**__ group on one amino acid with the __**OH**__ functional group on the next amino acid.

21. (2 points) Alcohols are simple molecules with an __**OH** __ functional group added.

22. (2 points) The flavors of bananas, oranges, pineapples, and apricots are caused by their (**ester**, ~~amine~~, ~~aldehyde~~, ~~ketone~~, ~~alcohol~~) functional group.

23. (2 points) The chemical that turned the Styrofoam cup to mush in lab was the organic solvent named **__acetone___**.

24. (4 points) Soap is made from **_lye/soaked ashes**__ and __ **fats/tallow/fatty acids** __.

25. (2 points) Molecules that have the same formula but structures that are mirror images can have the (~~same~~, **different**) effect in living organisms.

26. (1 point) Biology on earth uses sugars that are (**right-handed**, ~~left-handed~~).

27. (1 point) Biology on earth primarily uses amino acids that are (~~right-handed~~, **left-handed**).

28. (2 points) Name two atoms that our body needs to build DNA that we cannot get from eating carbohydrates and fats are __**N**__ and __**P**__.

29. (4 points) The plastics polyethylene, polypropylene, polystyrene, and many others are built from monomers that have a **__double__** bond that __**breaks**__ __**apart**__ to connect to the next molecule in the chain.

30. (1 point) Chemical reactions only rearrange atoms, but nuclear reactions can change one kind of atom to another. (**true**, ~~false~~)

31. (4 points) Atoms with the same number of __**protons**__ are said to be the same element even though they might have different numbers of **__neutrons___**.

32. (4 points) A lone neutron will decay into a(n) __**proton**___, a(n) __**electron**__ and an anti-neutrino with a half-life of 14.7 minutes, but when it is part of a stable nucleus like $^{12}_{6}C_{6}$, it will never decay.

33. (2 points) In the symbol for radioactive carbon-14, $^{14}_{6}C_{8}$, the number in the upper-left is the total number of **__nucleons__**.

34. (2 points) In the symbol for radioactive carbon-14, $^{14}_{6}C_{8}$, the number in the lower-left is the total number of **__protons___**.

35. (2 points) In the symbol for radioactive carbon-14, $^{14}_{6}C_{8}$, the number in the lower-right is the total number of **__neutrons__**.

36. (1 point) An alpha (α) decay is when a nucleus emits a _ $^{4}_{2}\mathbf{He}_{2}$ __ nucleus. (use a symbol for it like $^{x}_{y}A_{z}$)

37. (1 point) A beta $^{-}$ (β^{-}) decay is when a nucleus emits a(n) **_electron __**.

38. (1 point) A positron is the anti-particle of a(n) **__electron__**.

39. (1 point) If an electron and a positron meet, they completely annihilate producing **_2_** gamma ray photons.

40. (1 point) A beta $^{+}$ (β^{+}) decay is when a nucleus emits a(n) **_positron__**.

41. (1 point) A gamma (γ) decay is when a nucleus emits a(n) **_photon___**.

42. (3 points) Our skin is able to protect us from **__alpha__** and **__beta___** rays, but not from **_gamma_** rays.

43. (2 points) When a large, unstable nucleus breaks apart, the processes is called nuclear **__fission__** and energy is (~~required~~, **released**).

44. (2 points) When two small nuclei join together, the process is called nuclear **__fusion__** and energy is (~~required~~, **released**).

45. (1 points) The unstable uranium nucleus used in atomic bombs is ($^{238}_{92}U_{146}$, $^{235}_{92}\mathbf{U}_{143}$)

46. (1 point) In general, the most stable nuclei are those with equal numbers of protons and neutrons. (~~true~~, **false**)

47. (2 point) Heavy nuclei need to have more **__neutrons__** than **__protons___** to be stable.

48. (2 points) What fraction of unstable nuclei remain after 1 half life? **one-half**

49. (2 points) What fraction of unstable nuclei remain after 2 half-lives? **one-fourth**

50. (2 points) What fraction of unstable nuclei remain after 3 half-lives? **one-eight**

51. (2 points) After a nuclear explosion or accident radioactive strontium is produced. If ingested, it will accumulate in the **___bones____** of an animal.

52. (2 points) After a nuclear explosion or accident radioactive iodine is produced. If ingested, it will accumulate in the **___thyroid___** of an animal.

53. (2 points) After a nuclear explosion or accident radioactive cesium is produced. If ingested, it will accumulate in the **__entire body__** of an animal.

54. (2 points) A better name for an “atom” bomb would nuclear _ **fission___** bomb.

55. (2 points) A better name for a “hydrogen” bomb would be nuclear **__fusion** __ bomb.

56. (2 points) An atom bomb is triggered by a(n) __**chemical** ___ explosion.

57. (2 points) A hydrogen bomb is triggered by a(n) __**atom bomb** ___ explosion.

58. (1 point) All current nuclear electric generation plants depend on controlled nuclear (~~fusion~~, **fission**).

59. (2 point) Every second our bodies experience roughly (~~0.01, 1, 100~~, **10,000**, ~~1,000,000~~) nuclear decays.

60. (2 point) Cosmic rays vary widely hour by hour, but during quiet times our bodies experience roughly (~~0.01, 1, 100~~, **10,000**, ~~1,000,000, 100,000,000~~) cosmic rays hits every hour.

61. (2 points) When $^{238}_{92}U_{146}$ decays to $^{206}_{82}Pb_{124}$ via a series of alpha and beta decays, __**radon** ___ is produced, a heavy inert gas that can collect in basements.

According to the United States Environmental Protection Agency, radon is the second most frequent cause of lung cancer, after cigarette smoking, causing 21,000 lung cancer deaths per year in the United States. About 2,900 of these deaths occur among people who have never smoked.

62. (1 point) Magnetic resonance imaging (MRI) uses nuclear magnetic resonance to determine biological activity. If you have an MRI scan done on you, should you be worried about nuclear radiation? (~~yes~~, **no**)

63. (1 point) In medicine, radioactive elements are often used to __**diagnose**__ certain illnesses.

64. (1 point) In biological research, radioactive elements are used to trace biochemical __**reactions**__.

65. (5 points) On March 11, 2011, a magnitude 9.0 earthquake occurred 40 km east of the northeast corner of Japan. The subsequent tsunami was up to 40 m high and swept 10 km inland killing over 16,000 people. When the earthquake struck, a power plant at Fukushima with four nuclear reactors started shutting down and switched to emergency power generators. Unfortunately, the emergency power generators were near the shore and were destroyed by the tsunami. The cooling **__water___** in the reactors then started evaporating away and its **_uranium__** fuel rods overheated. This caused cooling water to react with the zirconium in the fuel rods producing **__hydrogen__** gas which collected in the containment buildings, mixed with **_air/oxygen**___ and exploded. The fuel rods melted through the bottom of the steel and concrete containment vessels. The site will be unusable for many times the __**30**__ -year half-life of its radioactive contents.

66. (1 point) Nuclear (~~fission~~, **fusion**) bombs are about 100 times more powerful than (**fission**, ~~fusion~~) bombs.

67. (2 points) Atomic bombs are possible because $^{235}_{92}U_{143}$ will immediately break apart when struck by a __**neutron**__ and will then produce more than one __**neutron** __ as it breaks apart. This causes a very rapid chain reaction.