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**BIOL 110 Exam 1 – Practice Test Solutions**

**Problem #1: B.**

1 Half Life = 30 yrs. After 90 yrs, 3 half lives must have occurred ( $90/30 = 3$ ). Since you start with 80 mg, after the first half life, 40 mg remains. After the second half life, 20 mg remains. After the third half-life, 10 mg remains.

**Problem #2: A**

Water has very high Specific Heat Capacity, meaning it takes a lot of energy to raise the temperature of water 1 degree. This is why oceans keep steady temperatures.

**Problem #3: B**

Lipids are highly hydrophobic, as the long hydrocarbons don't interact with water.

**Problem #4: C**

An enzyme is a protein catalyst, an example of a Protein.

**Problem #5: C**

The disaccharide's formula will be the sum of the two monosaccharides ( $C_6H_{12}O_6 + C_5H_{10}O_5$ ) minus the  $H_2O$  released via dehydration synthesis:  $C_{11}H_{20}O_{10}$

**Problem #6: B**

Cholesterol is a type of lipoprotein (lipid combined with protein)

**Problem #7: C**

In RNA, Thymine is replaced with Uracil.

**Problem #8: D**

Dendrochronology is the process of counting the concentric rings of a tree's cross-section to determine its approximate age: each ring represents one year.

**Problem #9: C**

Note that the problem has an error and should state that Species B has "50% D-amino acids" **NOT** "50% R-amino acids"

In both species the percentages are 50% D-amino and 50% L-amino, therefore each has a D:L ratio  $1:1 = 1.0$ , thus both species have been dead for approximately the same amount of time.

**Problem #10: C**

Prokaryotes in domain Archaea do not have peptidoglycan in their cell walls, only those in domain Bacteria do.

**Problem #11: C**

Transduction occurs when a phage (bacterial virus) enters a prokaryote and releases its genetic material into the bacteria

**Problem #12: D**

Prokaryotes rapidly grow and divide due to the following three factors: they have very little genetic material, they have very simple morphologies, and they replicate via binary fission. They do NOT have a lot of organelles.

**Problem #13: A**

Gram Positive bacteria have less complex cell walls and have a lot of peptidoglycan.

**Problem #14: B**

Parasitism is beneficial for the parasite at the expense of the host. Tapeworms living in our intestines feed off of our intake at the expense of the host's loss of nutrients.

**Problem #15: D**

*Rhizobium* is a type of nitrogen fixing bacteria which colonize on the roots of pea plants.

**Problem #16: B**

Bacteria that use sunlight for energy and use organic molecules for carbon are photoheterotrophs.

**Problem #17: B**

A threatening factor is one way in which natural selection can occur, but certainly NOT THE ONLY WAY. For example, a mutation that resulted in a heightened sense of smell could increase its chances of finding nourishment, thus improving its chances of living long enough to produce more offspring and pass on this variation without there being a threat to the species' survival.

**Problem #18: A**

TRUE: Sexual reproduction helps bring about variation, the key to natural selection, as a means of maximizing the species' opportunity to adapt to the unstable and severe environment. Asexual reproduction is performed under stable and unchanging conditions, as there is less need for variation when one's survival is not at risk.

**Problem #19: B**

As the name would suggest, Eukarya belong to eukaryotes, and not to prokaryotes.

**Problem #20: B**

Unlike eukaryotes, prokaryotes cannot be multicellular, they can only be single-celled.

**Problem #21: B**

Steroids are a type of lipid and are typically hydrophobic carbon rings

**Problem #22: D**

Thymine binds to Adenine in DNA, and is replaced by Uracil in RNA

**Problem #23: D**

The four glucose molecules will create a molecule with formula =  $4 \times C_6H_{12}O_6$  minus  $3 \times H_2O$  (for the three bonds formed), which totals  $C_{24}H_{42}O_{21}$ .

**Problem #24: B**

200 years represents 4 half-lives, so starting with 60mg we would drop to 30mg (1 half-life), then 15mg (two half-lives), 7.5mg (three half-lives), and finally 3.75mg (four half-lives).

**Problem #25: B**

Starting at 2.8kg (2800g), we would drop to 1400g (one half-life), then 700g (two half-lives), and finally 350g (three half-lives). Thus it would require three half-lives, which took 12 years in total. So divided equally that would mean 4 years for each half-life.

**Problem #26: B**

Prokaryotes cannot be multicellular.

**Problem #27: D**

Both are prokaryotes, Bacteria have peptidoglycan in cell walls, Archaea have introns.

**Problem #28: A**

Taking DNA from the surroundings is transformation.

**Problem #29: C**

With shorter generations it will take less time overall for variation to enable natural selection, resulting in a species evolving more rapidly.

**Problem #30: C**

Auto means you get your carbon from CO<sub>2</sub>, and hetero means you get it from chemicals.

**Problem #31: C**

Chemo- for getting energy from chemicals, and auto- for getting carbon from CO<sub>2</sub>.

**Problem #32: B**

Only Gram Negative bacteria have an outer layer of lipopolysaccharides.

**Problem #33: A**

When both the host (us, the humans) and the micro-symbiant (the bacteria) benefit from the relationship, it is called mutualism.

**Problem #34: C**

The ability to survive both with and without oxygen classifies you as a Facultative Anaerobe.

**Problem #35: B**

Converting pollutants into something naturally occurring is good for the environment, and is referred to as Bioremediation.

**Problem #36: D**

Conversion of atmospheric nitrogen, N<sub>2</sub>, is essential for organisms to get usable nitrogen into their systems.