Exam 2 Notes

1. Other biological entities
2. Viruses (non-living entities)
    a. Viroids
        i. Even simpler and smaller than viruses
        ii. Fragments of **single-stranded RNA** with NO protein coat
        iii. Hijack cells; infects plant cells including citrus trees, potatoes, and avocados
    b. Prions
        i. Unusual infectious particles
        ii. Protein particle with **no genetic material** (DNA or RNA)
        iii. Mad cow disease, Creutzfeldt-Jakob disease, and kuru
        iv. Prions consist of a protein that is folded incorrectly and makes other proteins fold wrong
        v. Origin? Developed as a by-product of living organisms
3. Prokaryotes (**all prokaryotes are microbes**)
    a. Bacteria and Archaea domains
    b. 12,000 species described, may be 100-1000x that number
    c. 1st organism to appear on earth, 3.5 billion years ago
    d. Common characteristics
        i. **Cell wall**=semi-rigid, permeable, made of peptidoglycan (carbohydrate with amino acids attached). Gives bacteria shapes. Animals don't have cell walls around their cells (have cell membrane), but bacteria and archaea do.
        ii. Shapes
            1. Bacilli – rod shaped
            2. Cocci – sphere shaped
        iii. Capsules and slime layers
            1. Capsule – highly organized, firmly attached to cell wall
            2. Slime layer – less organized, loosely attached to cell wall
                a. These structures help the cells retain water and stay alive
                b. Help them attach to where they are
            3. Pili – hair-like structures on surface of bacteria which aid in attachment to substrate
            4. Rotating flagella
                a. 50% of bacterial species are motile
                b. Flagella are used to locomotion
        iv. Taxis – means bacteria is moving
            1. Positive taxis - moves towards something
            2. Negative taxis- swims away from something
            3. Positive chemo taxis – swims towards a beneficial chemical
            4. Positive photo taxis – swims towards light
            5. Negative photo taxis – swims away from light
        v. Endospore - Protective "resting" structures, bacteria surrounded by durable cell wall; Resistant to extreme conditions
        vi. Reproduction
            1. Prokaryotes reproduce mostly **asexually** in the form of **binary fission**
                a. Only **eukaryotic** cells go through **mitosis and meiosis**, prokaryotes do not

b. Sexually in form of conjugation using sex pili to transfer plasmids

2. Prokaryotes generally have **circular** chromosomes, eukaryotes have **linear** chromosomes
3. Sexual in the form of conjugation using plasmids

vii. Energy sources
1. **Autotrophs** use **photosynthesis or chemosynthesis** (energy from inorganic chemicals) Bioremediation – cleaning up mess
2. **Heterotrophs** including **symbiotes**

viii. How do prokaryotes affect other organisms?
1. Prokaryotes capture the nitrogen needed by plants
2. Prokaryotes are nature's great recyclers
a. Bacteria and Eukarya (Fungi)

ix. Human Diseases: Gonorrhea, syphilis, tuberculosis, lyme disease

x. All are human **pathogens: disease causing!**

xi. Bacterial antibiotic resistance

Chapter 22 The Fungi

1. Fungi is the kingdom that animals are most closely related to
2. Fungal Structures: **My Hot College Slut Self ;)**
a. Mycelium: the feeding network of a fungus
i. The body of the fungus, the actual "mushroom"
ii. May be very large
iii. Usually underground or inside a decaying or living organism
iv. Composed of a woven mesh of hyphae
b. Hyphae (singular hypha)
i. The threadlike filaments of a fungus
ii. Fungi have tubular cell walls that contains chitin
iii. Glucose and nitrogen
iv. Surrounds the plasma membrane and cytoplasm
c. Chitin:
i. Structural polysaccharide of modified sugars
ii. Polymer with glucose subunits and N-containing functional groups
iii. Makes up insect exoskeletons and fungus cell walls
iv. Wraps around individual cells in the fungus, making them extremely strong
d. Septa:
i. Structures which partially separate the cytoplasm inside the hyphae, found in many fungi
ii. Allows controlled movement of materials from one cell to another
iii. Not all fungi have this structure
e. Spores:
i. **All** fungi produce spores
ii. Haploid 1n or diploid 2n cells, which can grow directly into a hyphal strand
1. Haploid – one copy of each chromosome in the spore
2. Human sex cells are also haploid between
3. Fungus, for most of its life, is haploid; its diploid phase is actually very short, which is the opposite for animals
iii. There are **no sexes with fungi**, instead there are **mating types**

iv. When mating type 1 and mating type 5 come together millions of offspring are created, every baby/spore that is created is different
v. Why bother with sexual reproduction? **For variation**

3. Fungal lifestyles
    a. Use absorption to obtain their food
    b. Three variations depending on the food type
        i. **Saprobes**: decomposers of dead material (most fungi); feed on dead material
        ii. **Parasites**: fungi which grow on living organisms (Dutch elm disease, Corn smut, Athletes foot, Jock itch, Yeast infections)
        iii. **Mutuallsts**: fungi that live interdependently with photosynthetic organisms
            1. **Lichens**: symbiotic relationship between a fungal species and either a cyanobacteria or unicellular photosynthetic eukaryote
            Ex: Algal layer → fungal hyphae → attachment structure
                a. Cyanobacteria is a photosynthetic prokaryote
                b. Obligate symbiotic relationship: One cannot live without the other
            2. **Mycorrhlzae**:
                a. Symbiotic relationships between fungi and the roots of a plant
                    i. The majority of plants today have this relationship with fungus, about 90%
                    ii. Fungi help send the plant water, minerals and nutrients
                    iii. Some of the sugars the plant produces are absorbed by the fungus

4. Fungal divisions (phyla)
    a. Over 100,000 fungal species identified and more are added each year
    b. Five major divisions of the Kingdom Fungi
    c. These divisions are based on DNA sequence data, on the presence of septa in the fungi, and on the sexual life cycle.
        i. Zygote fungi-Division Zygomycota
        ii. Named for the zygospore which has a thick cell wall

1. Fungal divisions

a. Phylum: Chytrids
    i. Ancient group – diverged earliest from the other fungi
    ii. Aquatic - the only fungi with flagellated spores (zoospores); These spores can swim & require water for them to move around
    iii. Sparobic
        1. Decompose dead material
        2. Majority of them are saprobic
    iv. Only some are parasitic
b. Phylum: Zygote fungi
    i. Sexual reproduction via zygosporangia (resistant heterokaryons) that produce genetically variable spores
        1. During sexual reproduction this fungus creates thick cells that are called zygosporangium
    ii. Asexual reproduction via sporangia that produce spores
    iii. Mostly saprobic decayers of organic matter, e.g. soft fruit, rot fungi, and black break mold