**Semester 2 Final Review Guide**

**June 2016**

**Genetics and Biotech**

**Introduction to Genetics**

* Define genetics
* Define trait
* Identify the Mendel's principle findings on the patterns of genetics (inheritance patterns)
	+ What does it mean for a trait to be dominant or recessive?
	+ What does the Law of Segregation state? How is this shown during meiosis?
	+ What does the Law of Independent Assortment state? When does this occur during meiosis?
* Define genotype and phenotype
	+ What is an allele?
	+ How is genotype used to determine phenotype?
* Distinguish between a homozygous genotype and a heterozygous genotype
	+ How is a homozygous dominant genotype different from a homozygous recessive genotype?

**Monohybrid & Dihybrid Crosses**

* Identify the purpose of a Punnett square
	+ How is the Law of Segregation demonstrated while using a Punnett square?
	+ How does this demonstrate the Law of Independent Assortment?
	+ How is fertilization demonstrated while using a Punnett square?
	+ Why is it important to realize that this is a PROBABILITY and not a certainty?
* Use a Punnett square to show the possible genotypes of the offspring in a monohybrid cross
* Calculate the genotypic and phenotypic ratio for a monohybrid cross
* Define monohybrid cross and dihybrid cross
* Determine the possible gametes from a parental genotype representing two traits
* Use a Punnett square to show the possible genotypes of the offspring in a dihybrid cross
* Calculate the genotypic and phenotypic ratio for a dihybrid cross

**Biotechnology**

* Identify the purpose of gel electrophoresis
	+ What properties about the molecules allow them to move across the gel at faster or slower rates?
	+ What is being applied to the molecules to make them move?
	+ What is present in each band on the gel electrophoresis?
* Describe the steps for using gel electrophoresis
	+ Where do you place the samples and with what piece of equipment?
	+ What could be in the samples?
* Identify the molecular properties that mostly determine the rate at which those molecules travel through a gel during gel electrophoresis
	+ What charge does DNA and RNA possess? Extra – what gives them this charge?
	+ Which end will these nucleic acids move toward? What is this electrode called?
* Identify and explain the reason why polysaccharide agarose is used to make the gels
	+ What if the two molecules are the same size, what else could make them move faster or slower?
* Identify the roles of the buffer
* Identify potential uses for gel electrophoresis

**Protein Synthesis**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Vocab** | **Concepts** | **Skills** |
| **Proteins** | * **Structural,**
* **signaling,**
* **enzyme,**
* **lysis,**
* **amino acids**
* **polypeptide**
* **RNA**
 | * **Three functions of proteins,**
* **how proteins are built (chain of amino acids)**
* **RNA is a link: DNA into Proteins**
* **Differences between RNA and DNA (there are 3!)**
* **Where do amino acids come from?**
 | * **Identify the different types of proteins**
 |
| **Transcription** | * **Central Dogma**
* **RNA Polymerase**
* **mRNA**
* **tRNA**
* **rRNA/Ribosome**
* **Uracil (U)**
* **Transcription**
 | * **What are the steps, or stages of the Central Dogma, and in what order?**
* **Differences between DNA and RNA**
* **How does transcription happen? (steps of transcription)**
* **Differencence between DnA replication and Transcription**
 | * **How to transcribe (or re-write) DNA into mRNA**
 |
| **Translation** | * **Codon**
* **Start Codon/Met**
* **Stop Codon**
* **Anticodon**
* **Translation**
* **Amino Acids**
* **Ribosome**
* **3 types of RNA**
* **Peptide bond**
 | * **There are 3 letters in the codon that codes for the amino acid**
* **Start codon has an amino acid, tells the ribosome where the protein starts**
* **Stop codon breaks the ribosome and ends protein**
* **Ribosome uses codon and anticodon to connect tRNA to mRNA**
* **Polypeptide chains fold into complex structures to become proteins**
* **Protein function comes from it’s shape!!!!**
 | * **How to read a codon chart to find the amino acid**
* **How and where to write the anticodon**
 |
| **Mutations** | * **Point Mutation**
* **Frame shift Mutation**
* **Silent**
* **Missense**
* **Nonsense**
* **Gene Translocation**
* **Cancer**
* **Natural/Induced Mutation**
* **Somatic/Gamete**
 | * **Different effects of mutations in gametes or somatic cells**
* **What type of mutation effects phenotype**
* **Difference between natural and induced**
* **Different effects of point and frame shift mutations (on codon, amino acid and protein)**
* **Most mutations are corrected!!!!**
* **What is the effect of mutations on a species or population**
 | * **How to identify a mutation in a strand DNA or RNA (including the type of effect on amino acid and codon)**
* **How to identify the effect of a mutation**
 |

**Evolution**

**Biological Evolution**

* Describe how a population can evolve instead of an individual organism
* Identify and describe Lamarck’s theory of evolution
	+ What is an “acquired” characteristic? How does your knowledge of genes help to explain that acquired characteristics can’t be passed down?
	+ Use an example organism to describe how Lamarck thought biological evolution occurred. (Giraffe used on powerpoint)
* Identify and describe Darwin and Wallace’s theory of evolution
	+ How does variation play a role in the theory?
	+ Why is reproduction so important?
* Define evolution
* Identify and describe factors that can change gene frequency in a population or species over time (3 mentioned)
* Identify and explain the three tenets of the theory of evolution
* Apply these three tenets of the theory of evolution to an example scenario/organism
* Identify causes of (genetic) variation
	+ Is variation directional? What does that mean?
	+ What must be true about a mutation for it to be passed on to offspring?
* Define differential survival
	+ Is the “selection process” directional? What does that mean?
* Define genetic drift
	+ Can you apply this concept to a real-life population? Try it. ☺
* Define speciation
	+ What is the definition we use for a species in biology? (it’s not perfect…but it’s what we’ve got!)
* List/describe steps that could lead to a new species
	+ Apply these steps to an example – consider using the finches on the Galapagos Islands
	+ What do you think is a “selective pressure”?
* Hypothesize what could happen to a species that is unable to adapt
* Identify how many major extinction events have occurred in the history of life
	+ What is the percentage of species that have ever lived on Earth that are estimated to be extinct?

**Examples and Evidence for Evolution**

* Identify and describe examples of biological evolution
	+ Be able to use Peppered Moths, Antibacterial Resistance, and Artificial Selection as examples (and applying the 3 tenets of biological evolution)
	+ What is the selective pressure in artificial selection?
* Identify different types of evidence that we can use to support biological evolution
* Explain how fossils can show evidence for change over time
* Describe what a vestigial structure is
	+ What are examples of vestigial structures?
* Define homologous structure
	+ How are forelimbs used to provide evidence for evolution? What could be used in other organisms?
* Identify how embryonic development is used as evidence for biological evolution
	+ How is Darwin’s view different from Haeckel’s theory?
* Identify how DNA can be used to demonstrate relatedness among organisms

**Cladograms**

* Construct a cladogram
	+ What does each point where two branches separate show?
	+ How is this used to describe the evolutionary process?
* Know Cladogram vocabulary
	+ Node
	+ Clade
	+ Cladistics

**Characteristics of Life and Classification**

* Characteristics of Life
	+ Name the 8 characteristics
		- Describe and give examples of each
		- Categories of metabolism and what they mean
* Classification
	+ Taxonomy
		- 7 levels in order (KPCOFGS)
		- Binomial system of nomenclature (eg. Homo sapien)
	+ 6 kingdoms
		- General characteristics of each and examples for each kingdom
			* Eubacteria
			* Archaebacteria
			* Plante
			* Fungi
			* Protista
			* Animalia
		- Kingdom animalia
			* Know the phyla, and general characteristics
				+ Porifera
				+ Radiata
				+ Platyhelminthes
				+ Nematodes
				+ Rotifers
				+ Mollusca
				+ Annelida
				+ Arthropoda
				+ Echinodermata
				+ Chordata

 Cellular organization

 Prokaryote vs. eukaryote

 Unicellular vs. multicellular

 Definition of species