SBI3U Exam Review (VERY BASIC)

Please Note: This review is to JUST GET YOU STARTED. You must study all of your NOTES and previous quizzes /tests to be completely prepared for the examination

CELLS

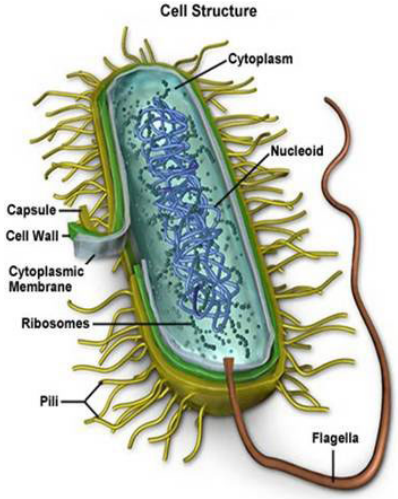
1. **a) Name the four main types of biological macromolecules.**
   Carbohydrates, proteins, lipids, nucleic acids

   b) List and provide examples for the monomers and polymers of each type of macromolecule.

	monomers	**polymers**
carbohydrates	glucose, galactose, fructose	**Starch, glycogen, cellulose**
proteins	Amino acids	**polypeptides**
lipids	3 Fatty acids + glycerol	**Triglycerides, steroids, phospholipids**
nucleic acids	Nucleotides	**DNA**

Cell Organelle	**Major Function**
cytoplasm	A gel like substance between the nucleus and the cell membrane.
Endoplasmic reticulum	Extension of the nucleus that contains ribosomes. Aids in protein folding, packaging and transport.
Vacuole	Accumulates waste material and excess water.
Mitochondrion	Double membraned organelle that makes ATP (energy).
Lysosomes	Contains digestive enzymes that break down materials.
Nucleus	The organelle that contains the heredity material in eukaryotes.
Golgi Apparatus	Packages proteins for transport (using vesicles) to other areas of the cell of outside of the cell.
Ribosome	The Site of protein synthesis.

2. a) Draw and label a typical bacterium.



b) State AT LEAST five differences between prokaryotic and eukaryotic cells.

Prokaryotes	**Eukaryotes**
Very small	larger
No nucleus (DNA in nucleoid region)	Nucleus contains DNA
Evolved first.	Evolved after prokaryotes.
No membrane-bound organelles	Membrane bound organelles
Some aerobic/many anaerobic	Mostly aerobic
Smaller ribosomes	Larger ribosomes
Mostly asexual reproduction	Mostly sexual reproduction

BIOLOGICAL DIVERSITY

1. **List the 6 kingdoms as we currently know them.**
   Archaebacteria, Eubacteria, Protsista, Fungi, Plantae, Animalia
2. **List two similarities and two differences between Kingdom Eubacteria and Kingdom Archaebacteria.**

Similarities:

- *no nucleus or membrane bound organelles*
- *both possess cell walls and ribosomes*

Differences:

- *Archaebacteria are older and live in very harsh conditions*
- *Eubacteria probably evolved more recently and live in "everyday" conditions.*

3. **Why are viruses not considered living organisms by most biologists?**

- *Only possess protein and nucleic acid (not carbohydrates and lipids)*
- *Cannot replicate without a host cell.*
- *Cannot perform metabolic reactions.*

4. **a) How do antibiotics work (and on what type of organisms)?**
   Antibiotics work on bacteria only. They do not all work in the same way; some interfere with cell membrane synthesis, protein synthesis, cell wall synthesis, etc...
   b) What is antibiotic resistance and how does it occur?
   *The ability of some bacteria to not be affected by a certain type of antibiotics . It occurs by **natural selection**. All susceptible bacteria will die off if exposed to antibiotics. Leaving those bacteria that are not as susceptible to reproduce (passing on their genes). Bacteria can undergo sexual reproduction by conjugation and pass their antibiotic resistant genes to any bacteria.*

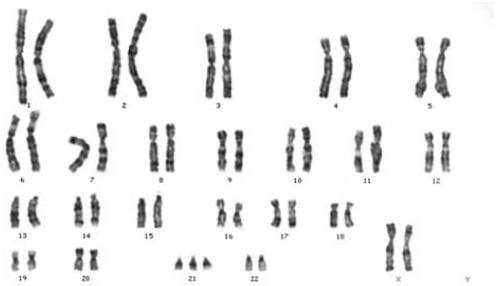
GENETICS

1. **Describe a DNA molecule.**

- *Monomer – nucleotide, consisting of a sugar, phosphate, and a nitrogenous base.*
- *Two strands – sugar phosphate backbones. Strands are joined by hydrogen bonds between the nitrogenous bases.*
- *Four nitrogenous bases: adenine (A), guanine (G), thymine (T), and cytosine (C).*
- *A and T always H-Bond, C and G always H- bond.*

2. **Explain the difference between the following terms:**
   a) mitosis & meiosis
   b) cytokinesis & mitosis
   c) nondisjunction & crossing over
   d) homologous chromosomes & sister chromatids
   e) crossing over & independent assortment
   f) allele & gene locus
   g) diploid & haploid
   h) autosomal recessive & X-linked heredity

3.

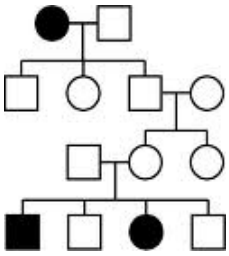


a) **What is the name of the picture in the left?** *Karyotype*

b) **Is this a male or a female?** *female*

c) **Are there any chromosomal abnormalities? Explain.** *Yes, Trisomy 21- 3 chromsomes on the 21st pair.*

4.



What type of inheritance does this pedigree represent? Explain.
Autosomal recessive – Found in both males and females, skips a generation.

5. **In dogs, dark coat (D) colour is dominate over albino and short hair (H) is dominate over long. If these traits are caused by two independently assorting genes, what parental genotypes would produce a litter of puppies having equal number of dark – short hair and dark – long hair?**
Three Parental Possibilities: (1) DDHH x Ddhh
(2) DdHH x DDh
(3) DDHH x DDhh

6. **A haemophiliac man with group AB blood has children with a woman who has normal blood clotting and group A blood. The woman's father was a group O haemophiliac. Use a Punnett square to show a cross between the man and the woman. Determine genotype and phenotype frequencies of the offspring.**

Man: $X^hYI^AI^B$ *Woman:* X^hXI^Ai

***GenotypeFrequencies**: all 6.25% (1/16)*

- $X^hX^hI^AI^A$
- $X^hX^hI^Ai$
- $X^hXI^AI^A$
- X^hXI^Ai
- $X^hX^hI^AI^B$
- $X^hX^hI^Bi$
- $X^hXI^AI^B$
- X^hXI^Bi
- $X^hYI^AI^A$
- X^hYI^Ai
- XYI^AI^A
- XYI^Ai
- $X^hYI^AI^B$
- X^hYI^Bi
- XYI^AI^B
- XYI^Bi

Phenotype Frequencies:

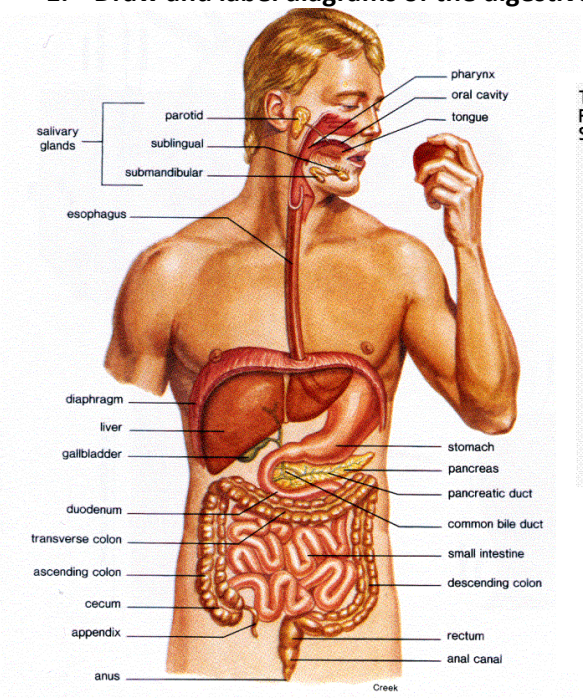
- *Female hemopheliac,Type A Blood: 12.5% (1/8)*
- *Female carrier,Type A Blood: 12.5% (1/8)*
- *Female hemopheliac,Type AB Blood: 6.25%(1/16)*
- *Female hemopheliac,Type B Blood: 6.25% (1/16)*
- *Female carrier,Type AB Blood: 6.25% (1/16)*
- *Female carrier,Type b Blood: 6.25% (1/16)*
- *Male hemopheliac,Type A Blood: 12.5% (1/8)*
- *Normal Male, Type A Blood: 12.5% (1/8)*
- *Male hemopheliac,Type AB Blood: 6.25% (1/16)*
- *Male hemopheliac,Type B Blood: 6.25% (1/16)*
- *Normal Male, Type AB Blood: 6.25% (1/16)*
- *Normal Male, Type B Blood: 6.25% (1/16)*

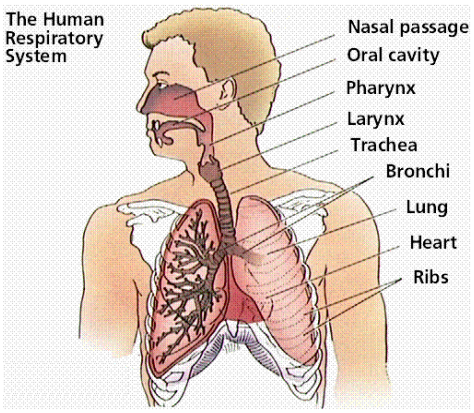
7. **A plant with red petals is crossed with a plant of the same species with yellow petals.**
   a) **Describe the results of the cross if petal colour followed incomplete dominance inheritance.**
   R = red, r = yellow *RR x rr*
   All offspring are Rr and have orange petals.
   b) **Describe the results of the cross if petal colour followed co – dominance inheritance**
   P^R = red, P^y = yellow *P^RP^R x P^yP^y*
   All offspring are P^RP^y and have petals that are both red and yellow.

8. **Mutations**

INTERNAL SYSTEMS

1. **Draw and label diagrams of the digestive and respiratory, in humans.**





2. **Describe when carbohydrates first begin to be broken down in the digestive system and what enzyme(s) accomplish this breakdown**.
   Mouth, amylase
3. **Describe when proteins first begin to be broken down in the digestive system and what enzyme(s) accomplish this breakdown.**
   Stomach, pepsin (then small intestine, trypsin and other proteases)
4. **Describe when lipids first begin to be broken down in the digestive system and what enzyme(s) accomplish this breakdown.**
   Small intestine, lipases and bile (although bile is an emulsifier, not an enzyme)

5. **What is the function of the following structures in the digestive system?**
   a) pancreas b) gall bladder c) liver d) colon e) stomach f) small intestine

6. **What is peristalsis?**
   Involuntary, wave- like contractions of smooth muscle throughout the digestive tract that push a bolus of food along the digestive tract, regardless of gravity.

7. **In this chapter, we learned about structures in the systems that have increased surface area. Describe these structures and explain why increased surface area is beneficial for each system.**
   Digestive system *– villi & microvilli in small intestine (increases SA for nutrient absorption)*

Respiratory System *– Alveoli (grape like clusters at the end of bronchioles). Increased SA for faster O_2/CO_2 diffusion (gas exchange)*
Circulatory System *– capillaries have small diameters(thus, larger SA for RBC's) for faster gas exchange with alveoli and body cells*

More…

Cell Structure & Processes (Biochemical Compounds, Organelles):

1. Define: osmosis, diffusion, ATP, enzyme, crossing over
2. Name cell organelles, both plant & animal and describe their functions.
3. List & describe phases as well as results in somatic (body cell) nuclear division **(**mitosis).
4. List & describe phases as well as results in gamete (sex cell) nuclear division (meiosis).
5. Explain the significance of mitosis & meiosis.
6. Write the balanced equations for photosynthesis.
7. Explain the effects of placing cells in hypertonic, hypotonic, isotonic solutions. Be sure to understand factors affecting direction and rate of osmosis.
8. Describe structure and properties of lipids (i.e.phospholipids, triglyceride, etc), proteins, amino acids, DNA and sugars.

Genetic Continuity (Mendelian Genetics, Meiosis, Heredity):

1. Define: diploid (2n), haploid (n)
2. Calculate phenotypic and genotypic ratios for dihybrid crosses. Be able to solve problems involving a variety of situations (incomplete dominance, sex-linked, co-dominance, multiple alleles, etc…).
3. Explain inheritance of blood types.
4. Describe the structure of DNA and complementarity of nucleotides.
5. Interpret karyotypes and explain causes of the following disorders: Down's syndrome, Turner syndrome, Klinefelter syndrome.

Respiratory System & Digestive System:

1. Explain the role of hemoglobin and iron.
2. Define: tidal volume, residual volume, expiratory reserve, vital capacity, inspiratory reserve
3. Explain gas exchange in the lungs (external respiration) as well as body tissues/cells (internal respiration).
4. Describe the process of breathing (inhaling and exhaling) & muscles involved. Include changes in the diaphragm and thoracic pressure.
5. Explain the result of high carbon dioxide levels in blood, its effect on breathing rate. Include how hemoglobin is involved in this process.
6. List all structures involved in the breathing process in order.
7. Name the source & function of human enzymes for the digestion of proteins, carbohydrates, and fats.
8. Name the location of bile production, storage, and its function.
9. Describe in detail the digestive system's role in maintaining homeostasis within the body and cells (ex. insulin levels, blood sugar level, etc…).
10. Describe the function of the epiglottis.
11. Describe where and how nutrients are absorbed from the intestine into the bloodstream; explain the role of the liver in nutrient processing.
12. List all structures involved with digestion in order.

Diversity of Living Things (Classification, Taxonomy, Bacteria & Viruses):

1. Define: prokaryotic, eukaryotic, bacteriophage, bacteria, virus, dichotomous key, taxonomy, phylogenic tree.
2. Describe conjugation, binary fission.
3. Compare the size of bacteria, viruses, and eukaryotic cells.
4. Compare the lytic & lysogenic cycles and describe structure of viruses.
5. Describe the six kingdom system of classification, characteristics for each kingdom (cell type, unicellular/multicellular, habitat, metabolism), provide a representative organism.
6. Compare prokaryotes vs. eukaryotes.

Vascular Plants (Anatomy, Growth, Functions):

1. Describe structures which make plant cells different from animal cells.
2. Write the word equation as well as balanced molecular equation for photosynthesis.
3. Explain the structure and function of xylem and factors influencing movement of water.
4. Describe stomata function.
5. Explain transpiration and the role it plays in maintaining homeostasis within the plant (include climatic factors).
6. Describe function of phloem & factors influencing movement of material through these vessels.
7. Describe the leaf structure (diagram) and adaptations to cope with different habitats.

8. Define: cambium, meristem, guard cells, angiosperms, gymnosperms, herbaceous and woody stems.
9. Where is xylem and phloem found in a tree?

Down syndrome (Trisomy 21) 1:700	Recognized at birth	Physical growth delays, intellectual disability, poor muscle tone, flat and wide face, short neck, excessive joint flexibility, big toe, etc…
Turner syndrome (Monosomy X) 1:1500-2500	Not recognized until adolescence	Affect development in female, common in early loss of ovarian function, skeletal abnormalities, kidney problem, heart defect, extra folds of skin, low hairline at the back of the neck, etc…
Klinefelter Syndrome (47 XXY) 1:500-1000	Might never diagnosed	There might be 48XXXY or 49 XXXXY, typically is not inherited but due to nondisjunction during meiosis, lack of speech ability, low sex hormone, enlarged breasts, normal life expectancy, etc…