Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_

AP Biology Dirty Dozen Labs Review Packet

Lab 1 (Diffusion and osmosis)

1. List the 2 components affecting the water potential of a system.

**A)  
  
B)**

1. Would a cell placed into a hypertonic solution shrink, swell, or stay the same? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Would a cell placed into a hypotonic solution shrink, swell, or stay the same? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Would a cell placed into an isotonic solution shrink, swell, or stay the same? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Zucchini cores placed in sucrose solution at 27C resulted in the following percent changes after 24 hours.

|  |  |
| --- | --- |
| % change in mass | Sucrose Molarity |
| 20% | Distilled Water |
| 10% | 0.2M |
| -3% | 0.4M |
| -17% | 0.6M |
| -25% | 0.8M |
| -30% | 1.0M |

Graph the data on the axes below. (note: you must determine what variable is ind. And dep. Before doing so). Be sure to label the graph fully.



1. What is the approximate molar concentration of the zucchini cells? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is plasmolysis?

Lab 2 (Enzyme Catalysis)

1. What do enzymes do?
2. What was the substrate in this experiment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What was the purpose of the H2SO4 and how did it work?
4. How does raising the temperature of a solution effect the reaction rate of an enzyme catalyzed reaction. Explain your answer.
5. List 2 other variables (besides temperature) that will affect the rate of an enzymatic reaction.
6. Calculate the rate of the enzymatic reaction shown in the graph below. Be sure to use proper units, show work and circle your final answer.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Lab 3 (Mitosis and meiosis)   1. Draw what a cell should look like at each stage of the cell cycle. (mitosis)  A) Interphase- D) Anaphase   B) Prophase- E) Telophase  C) Metaphase-   1. In which phase do cells spend most of their time?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. What is crossing over? Draw a picture showing it. 3. In a given plant cell, genes A and B have a crossover rate of 33%. Genes A and C have a crossover rate of 20%. Based on that information, which of the following statements is accurate (circle as many as apply).    1. A and B and A and C are linked genes.    2. A is located closer to B than it is located to C.    3. A is located closer to C than it is located to B.    4. Genes A and B are located on different chromosomes.   Lab 4 (Plant pigments and photosynthesis)   1. If a pigment has less hydrogen bonds and hence is less attracted to the chromatography paper, will it end up   Close to the solvent front or closer to the bottom of the paper?   1. Using the table below calculate the Rf values for the pigments. (The solvent front moved 100 mm.)  |  |  |  | | --- | --- | --- | | **Band #** | **Distance (mm)** | **Rf value** | | 1 | 10 |  | | 2 | 35 |  | | 3 | 42 |  | | 4 | 66 |  |   B. Which band (#1-4) contained the MOST hydrogen bonds? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |  | |  | |  | |

Lab 5 (Cell respiration)

1. Using #1-4 with 1 being the highest mL oxygen consumed and 4 being the least, write #1-4 in the boxes below based on which condition should have the highest mL oxygen consumed.

|  |  |
| --- | --- |
| **Conditions** | **mL oxygen consumed per minute** |
| Germinating peas @ 5 degrees Celsius |  |
| Germinating peas @ room temperature |  |
| Dry peas @ 5 degrees Celsius |  |
| Dry peas @ room temperature |  |

1. What was the purpose of the beads?
2. Draw a picture to show how the respirometer was set up in the lab. Explain the function of KOH and explain how data was collected.
3. The mL of oxygen consumed per minute is a direct measure of what cellular process? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. If the temperature increases, will the mL of oxygen consumed per minute increase or decrease? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Define germination.
6. The graph below shows data taken from Lab 5.
   * 1. Calculate the rate of cellular respiration for line A and line B. Show your work and include proper units.
     2. Which line (A or B) shows germinating peas? \_\_\_\_\_\_

Lab 6 (Molecular biology)

1. Define the following terms:
   * 1. Restriction enzyme
     2. Plasmid
     3. Transformation
     4. Competent cells

1. Which fragments of DNA migrate further along a gel electrophoresis plate, long or short fragments?
2. Transformed cells will contain a plasmid for ampicillin (an antibiotic that normally kills bacteria) resistance. They will also glow pink to indicate that transformation has occurred. LB is the nutrient broth needed by all bacteria for food.

In each of the following bacterial cultures, list the results that will occur: “lawn” (all bacteria live), “pink colonies”, or “all die”?

A) LB with plasmid   
  
B) LB without plasmid   
  
C) LB with plasmid and ampicillin   
  
D) LB with ampicillin but without plasmid

1. Put the following stages of transformation in order starting with the first stage.

\_\_\_\_\_\_\_\_A) Insert DNA containing gene of interest into plasmid

\_\_\_\_\_\_\_\_B) Recombinant DNA multiplied and cloned

\_\_\_\_\_\_\_\_C) Genes used for research or proteins harvested

\_\_\_\_\_\_\_\_D) Obtain plasmid isolated from bacterial cell

\_\_\_\_\_\_\_\_E) Recombinant DNA molecule formed

\_\_\_\_\_\_\_\_F) Recombinant DNA plasmid put into bacterial cell

1. Explain the function of the following biotechnology processes.
   * + 1. Polymerase chain reaction
       2. Gene therapy

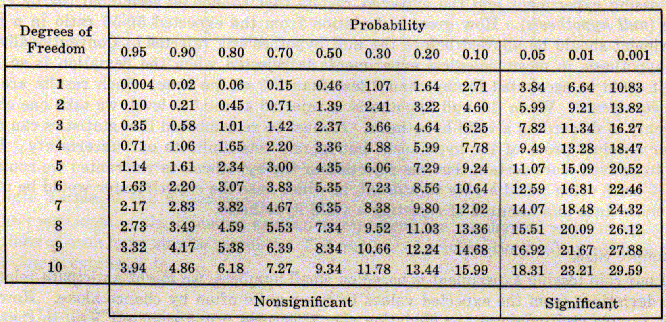
Lab 7 (Genetics & chi-square)

1. What does chi-square used to measure?
2. What is the probability of getting the following offspring from a cross of AaBbCC x AaBBCc  
   genotype of AaBBCC?
3. Complete the following table for the following incomplete dominance monohybrid cross:  
   Bb x Bb

where BB= black fur; Bb= auburn fur; bb= albino fur

|  |  |  |
| --- | --- | --- |
| **Observed phenotype** | **Expected phenotype** | **Chi square (show work!)** |
| 30 black |  |  |
| 40 brown |  |  |
| 30 albino |  |  |

1. At the 0.05 probability level, is the data statistically significant? (NOTE: be sure to use proper degrees of freedom) Explain your answer.



Lab 8 (Population genetics)

1. What are the 5 assumptions for Hardy-Weinberg equilibrium?

**A)  
  
B)  
  
C)  
  
D)  
  
E)**

1. What do the following stand for:   
     
   **A)** p2  
     
     
   **B)** q2  
     
     
   **C)** p2+2pq
2. In a Hardy-Weinberg population, the frequency of the a allele is 0.4. What is the frequency of individuals with Aa genotype? Show work.
3. In a population with 2 alleles, A and a, the frequency of a is 0.6. What would be the frequency of heterozygotes if the population is in Hardy-Weinberg equilibrium? Show work.
4. Why was the heterozygous condition for sickle cell favorable against malaria? (heterozygote advantage)

Lab 9 (Transpiration)

1. Write a 1-2 sentence description of how to carry out a transpiration experiment using the whole plant. (as we did in class). What did you measure and what was your control?
2. Explain how and why each of the following variables will affect the rate of transpiration.   
     
   **A)** a plant in high light conditions

**B)** a plant only exposed to green light

**C)** a plant in very dry conditions

Lab 10 (Physiology of Circulatory System) 

1. Contrast systolic vs. diastolic blood pressure.
2. What is a normal blood pressure reading?
3. Why does your heart rate go up when you exercise?
4. Explain what the baroreceptor reflex is and how it affects blood pressure.

Lab 11 (Animal Behavior)

1. Define and give an example of each of the following:
   * 1. Taxis
     2. Kinesis
     3. Phototaxis
     4. Fixed action pattern
     5. Sexual dimorphism
2. In this lab, pill bugs (isopods/ terrestrial crustaceans/arthropods) were used. After the pill bugs have been in the choice chamber for 10 minutes, you might observe one of these situations:

Situation A: Wet: 5 pill bugs Dry: 5 pill bugs  
Situation B: Wet: 7 pill bugs Dry: 3 pill bugs  
Situation C: Wet: 2 pill bugs Dry: 8 pill bugs

Pill bugs are crustaceans, and they respire through gills. Because of this characteristic, which situation would you predict to occur: A, B, or C?   
  
  
Explain your answer.

1. Courtship Behavior in Fruit Flies: Courtship between male and female animals usually is a ritual with specific behaviors. Is there an advantage to these rituals for the species and/or individual?  Explain your answer.

Lab 12 (Dissolved Oxygen and Primary Productivity) 

1. Does the amount of dissolved oxygen increase or decrease when:
   1. Temperature increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Salinity of water increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. The number of plants in the water increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Contrast net primary productivity vs. gross primary productivity. What cellular processes are accounted for in each type?
3. Why is net productivity lower than gross productivity?

1. What process occurs at night in water systems that lowers the amount of oxygen present?

|  |  |
| --- | --- |
| % Light Reaching Water Sample | Amount of Dissolved Oxygen |
| 100 | 4.0 |
| 65 | 2.5 |
| 0 | 0.8 |

1. As shown in the data table above, as the amount of light reaching a water sample decreases, the amount of dissolved oxygen in the water sample decreases. Explain why.