Names: _____

DNA: Strawberry Extraction

Physical-Chemical-Molecular Properties

Reading & Viewing:

http://chemconnections.org/general/chem106/Tech%20Prep/DNA-2016.html
https://www.youtube.com/watch?v=usaE_XZx-a8&feature=iv&src_vid=vPGKv53zSRQ

Procedure:

- Obtain one fresh strawberry and remove the green sepals (tops) from the berry.
- Place the strawberry in a re-sealable plastic bag.
- Close the bag slowly, pushing all the air out of the bag as you seal it.
- Being careful not to break the bag, thoroughly mash the strawberry with your hands for two minutes .
- Pour 10 mL of extraction buffer into the bag with the mashed strawberry. Reseal the bag.
- Mash the strawberry for one additional minute.
- Place a funnel into a 50 mL centrifuge tube. Place the cheesecloth in the funnel to create a filter. The cheesecloth may overlap the edge of the funnel.
- Pour the strawberry mixture into the funnel, filtering the contents through the cheesecloth and into the 50 mL centrifuge tube.
- Carefully pour 2 mL of the filtered contents from the 50 mL centrifuge tube into a clean 15 mL tube. Use the lines on the side of the 15 mL tube to help measure the amount added.
- Hold the 15 mL tube at an angle. Using a plastic dropper carefully add 5 mL of cold ethanol by running it down the inside of the tube. Add the ethanol until the total volume is 7 mL (use the lines on the side of the tube to measure). You should have two distinct layers. CAUTION: Do NOT mix the strawberry extract and the ethanol!
- Watch closely as translucent strands of DNA begin to clump together where the ethanol layer meets the strawberry extract layer. You may see tiny bubbles in the ethanol layer appear where the DNA precipitates.
- Slowly and carefully rotate the wooden stick in the ethanol directly above the extract layer to wind (or "spool") the DNA. Remove the wooden stick from the tube and observe the DNA, and show the DNA to Dr. R.
- Rinse and return all plastic containers. All solutions can be disposed of down the drain.

Post Lab Questions:

1. Describe the physical appearance of the DNA that you have extracted. Is it a single molecule? How does it fit in the nucleus of the cell? Briefly explain.

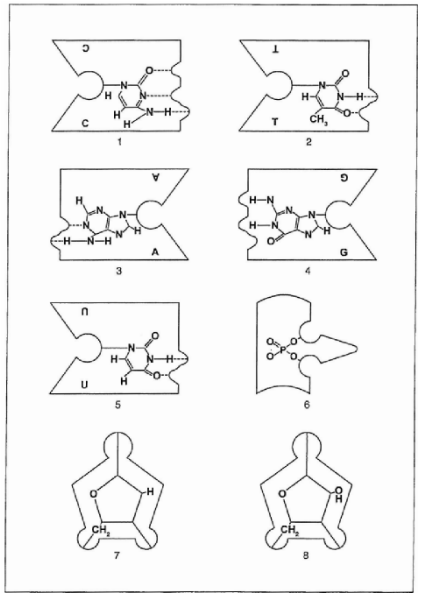
2. Strawberries are octoploid (8 sets of chromosomes). If you were to extract DNA from a diploid banana (2 sets of chromosomes, which humans have as well), how much DNA would you expect to get relative to strawberry, assuming the chromosome sizes are approximately the same?

3. Describe three applications of how a DNA sample can produce useful biological-genetic information. Use the examples in the video that you viewed

Challenge Question (Bonus #1): The DNA in a strawberry cell is ~100,000 times as long as the diameter of a strawberry cell itself (*assuming that the cell is spherical*). Using strawberry cell research data: relative density & number of cells published in G.W. Cheng & P.J. Breen, J. Amer. Soc. Hort. Sci., 117(6):946-950. 1992 (http://journal.ashspublications.org/content/117/6/946.full.pdf), calculate the DNA length in centimeters and feet. Show your calculation on a separate sheet and attach.

Obtain a puzzle set. Your group will make a model of a very short strawberry DNA segment using the puzzle pieces: a phosphate (phosphoric acid) unit, a deoxyribose sugar unit, and an appropriate genetic base unit for each nucleotide in the sequence

4. Match the following:



_____ Deoxyribose Unit

_____ Ribose Unit

_____ Phosphate Unit

_____ Adenine Unit

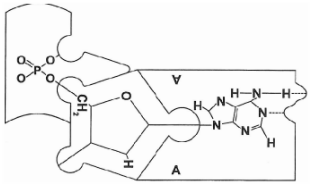
_____ Cytosine Unit

_____ Guanine Unit

_____ Thymine Unit

_____ Uracil Unit

Make a nucleotide: begin with a phosphate unit, add a deoxyribose sugar unit, and then an appropriate base unit (adenine is used in the example below). Attach the pieces to look like:



Use this as one of the nucleotides in the DNA sequence below which is taken from the ***antisense*** DNA strand and connect the remaining nucleotides to complete the DNA segment.

TGCACC

Show the model to Dr. R. before disassembling.

5. Complete the following table:

DNA antisense	*DNA sense*	*mRNA*	*Name of Amino Acid Coded*
T			
G			
C			
A			
C			
C			

6. Reading the antisense genetic base sequence, TGCACC, from left to right, which direction in relation to the deoxyribose saccharide-phosphate direction, 3' to 5' or 5' to 3' is the sequence going? Briefly explain the basis of your selection.

7. Write (draw) a structural formula that correctly shows the arrangement of all the atoms for the dipeptide formed from the 2 coded amino acids. (Use either a Lewis structure, or condensed structure, or line structure.)

8. What is the molecular formula and molar mass of the dipeptide?

9. How many Calories would be provided from eating 10. grams of the dipeptide? (Assume that it is equivalent to the caloric content of a protein.) Show your calculation.

Challenge Question (Bonus #2): If all of the energy (Calories) were transferred to 5.5 liters of water @ 25.0 ^{o}C (about room temperature & approximately the amount of H_2O in your body) what would be the new temperature of the water?

10. Who stole the "magic holographic strawberry" lollipop? (Refer to the reading and links to answer this "Who-done-it?" question.)