LESSON PLAN TEMPLATE

LESSON TOPIC:
An Introduction to Nucleic Acids: DNA & RNA

STANDARD(S) & INDICATOR(S):
5.3.2. A. 1 Group living and nonliving things according to the characteristics that they share.
5.3.8. A 2 Relate the structures of cells, tissues, organs, and systems to their functions in supporting life.

OBJECTIVE(S): Students will be able to:
- Explain how Griffith's bacterial experiments showed that a hereditary factor was involved in transformation by drawing a colorful diagram to illustrate this experiment and writing an explanation of this diagram.
- Summarize how Avery's experiments resulted in the conclusion that DNA is responsible for transformation in bacteria by after reading the Avery's Experiment hand out.
- Compare and contrast Avery, Griffith's and Hershey and Chase experiments after a mini lesson about how Hershey and chase's experiment led to the conclusion that DNA and not protein is the hereditary molecule in viruses.
- Synthesize a complimentary strand that shows base pairing within the DNA molecule, and explain how it allows for the replication of DNA.
- Create a model to explain the process of DNA replication by creating a colorful poster that shows the replication fork, the correct base pairs and enzymes.
- Differentiate between the replication of the leading strand versus the lagging strand of DNA.
- Compare and contrast the structures of DNA and RNA based on the structure, location, chemical composition and function using a Venn diagram to demonstrate an understanding of the two types of nucleic acids.
- Explain the role of RNA in a cell.
- Translate mRNA into amino acids.
- Explain the relationship between codons, anti-codons, amino acids, and proteins.

MATERIALS:
- Hand outs
- Video
- Smart Board
- Power Points
- Modern Biology Text Book Students & Teacher's Edition
- Markers

LIST OF HANDOUTS (attach original copies of each handout - teacher & student edition)
Tutorials on
- DNA Structure, Replication, Transcription and Protein Synthesis
- DNA Structure and Function
- Avery's Experiment
- Protein Synthesis

BACKGROUND INFORMATION:
A two weeks lesson on nucleic acids DNA and RNA using models, articles, journals, diagrams, pictures, relevant videos, laboratory experiments and power points, to help students master the above objectives. These will help students to get background information on the following:

- The experiments that led to the discovery that DNA is the carrier of genetic information.
- Chemical composition of DNA and RNA
- Structure of DNA and RNA
- Functions of DNA and RNA
- The location of DNA and RNA
- DNA Replication:
- Protein Synthesis

CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS) including detailed procedures:
FOCUS: Reading and writing strategy for Days 1:

- Each team of students will read their assigned section of the article DNA Structure and Function that corresponds to the experiments of Griffith, Avery or Hershey and Chase and they will write a read and response journal.
- Each team will write the answer to their team question.
- Read and response journals and answers to team questions will be shared with class in a large group.

INSTUCTIONAL PROCEDURE Day 1:
1 Loop Focus Free Write:

- Write down what you know about DNA.
- What do you like about your DNA?
- What don't you like about your DNA?

Volunteers will share out one of their three free writes.

2. Reading Strategy:

- A read around the room of the first paragraph of the article DNA Structure and Function while students underline what stands out to them.
- Volunteers will share out what they have underlined.

3. Group Activity:
Students will break up into 6 teams, each team will read either Griffith's, Avery's or Hershey and chase experiment and write a response journal that shows an understanding of the experiment and the resul

4. Using Visuals / Mini Lesson:
The experiments of Griffith, Avery and Hershey and Chase will be discussed with students using diagrams on the smart board.

5. Closure:
Students will summarize what they have learned on an index card each day.

SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION: SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:

- How do we know that DNA is the carrier of genetic information?
- What is the importance of proteins in our body?
- How does the body manufacture the proteins that it needs?
- Why does the cell need to copy DNA and how does this happen?
- Imagine what can happen if the information in DNA is copied inaccurately.
- What is the central dogma of molecular genetics?

ASSESSMENT:

- Create your own colorful diagrams to explain the experiments of Griffith, Avery and Hershey and Chase.
- Create a DNA model using twizzles, clay dough, toothpicks and different colors of marsh mellows or candy.
- Write about the differences between the three types of RNA and their roles in protein synthesis.
- Draw a diagram of DNA showing correct base pairing and writing an essay that describes the overall structure of the DNA molecule they have drawn to demonstrate an understanding of DNA structure**.**
- Compare and contrast DNA and RNA based on their location, function structure and chemical composition using a Venn diagram.
- Write a description of the process of transcription.

REFERENCES:

- Modern Biology by Holt, Rinehart and Winston (Student & Teachers Edition)
- Reading and study workbook A by Miller Levine (Student & Teachers Edition)

ACKNOWLEDGEMENT

This material is based upon work supported by the National Science Foundation under Grant Nos. EEC-0908889

Supporting Program: Center for Pre-College Programs, at the New Jersey Institute of Technology

Contributors
Oluyinka Irukera (Bard High School, Newark, NJ) & Ebele Erike –Enwerekowe (West Side High School, Newark, NJ), Primary Authors
Howard Kimmel, Levelle Burr-Alexander, John Carpinelli - Center for pre-College Programs, NJIT.
Dr. Ecevit Bilgili, Dr. Rajesh Dave**,** Afolawemi Afolabi, Mohammad Azad - C-SOPS, NJIT

DNA Extraction Lab

- Aim
- In this lab, you will be isolating nucleic acids (DNA and RNA) from peas.
- Procedure
- Step 1: Make sure you have these materials needed: Ethanol, buffer extraction solution, beaker, empty test tube, coffee filter and peas.
- Step 2: Mash the peas using a glass rod, or with fingers.
- Step 3: Add the pea pulp to a beaker. Then add the buffer solution from step 1.
- Step 4: Stir the content in the beaker for 15 minutes. (Make sure that someone in the group is keeping track of the 15 minutes mark to obtain good results.
- Step 5: Using the coffee filter, filter the mixture into another beaker.
- Step 6: After the filtering process, put pea extract into test tube.
- Step 7: Pour ice cold ethanol onto the beaker with the pea extract.
- Step 8: Leave the tube undisturbed for 10 minutes.
- Step 9: Nucleic acids (DNA and RNA) will precipitate into the upper (ethanol) layer.

ACKNOWLEDGEMENT

This material is based upon work supported by the National Science Foundation under Grant Nos. EEC-0908889

Supporting Program: Center for Pre-College Programs, at the New Jersey Institute of Technology

Contributors
Oluyinka Irukera (Bard High School, Newark, NJ) & Ebele Erike –Enwerekowe (West Side High School, Newark, NJ), Primary Authors
Howard Kimmel, Levelle Burr-Alexander, John Carpinelli - Center for pre-College Programs, NJIT.
Dr. Ecevit Bilgili, Dr. Rajesh Dave**,** Afolawemi Afolabi, Mohammad Azad - C-SOPS, NJIT