Teacher Preparation

For Lesson 1 – Construction of “Placemats” and “tRNA Amino Acid Stamps”

Materials:
DNA Sequence Placement (“Placemat 1”) (2 pages)
Transcription and Translation Placement (“Placemat 2”) (2 pages)
Legal size paper, 4 sheets per student
Tape
Black marker
tRNA Amino Acid Stamp Labels (twenty 3”x4” labels)
14-ply Chipboard, 1 piece, 22” x 28”
60 cotton swabs
Glue gun and glue gun sticks
School glue
Foam letter set

To prepare Placemats 1 and 2:

- Download and print Placemat 1 and Placemat 2 (see PDF’s), 2 pages each on LEGAL size paper (8.5” x 14”).
- Identify top and bottom of each sheet then place them together into one vertical document.
- Flip the sheets face down on tabletop and tape them together on the backside. Some text/imagery exists where the two pages join together. If printer fails to print to edge and a small portion of the letter/square is cut off, a black marker can be used to “connect the dots.”
- Fold in half for easy storage.

For Lesson 2 – Create the DNA Sequence

Materials:
Color Wheel (Use any readily available image of a color wheel with primary, secondary and tertiary colors.)
Nitrogen Base Color Coding Key.pdf
Placemat 1 (has DNA coding strand sequence) (PDF 2-4)
White printmaking paper, torn into 26” x 3.5” pieces, one per student (If overall paper size is 26” x 40”, you can get 11 student pieces per sheet.)
Watercolor pencils (red, orange, yellow, green, blue, violet at the least). Note: students can share with a partner or two, if necessary.
Paintbrushes (¼ to ½ inch, flat) or cotton swabs, one per student
Small cups for water
Paper towels
Doubled-sided mounting (foam) tape, 6” per student
White 14-ply poster board (1st piece of 3), cut into 28” x 6” pieces, one per student (If overall poster board size is 22” x 28”, you can get 3 student pieces per sheet.)

Teacher instructions for lesson 2:

- Introduce project and review DNA basics.
- Discuss color palette and complete “Nitrogen Base Color Coding Key”.

- Complete Placemat 1 – DNA Sequence Placemat – Write complementary DNA code on template strand and make color tick marks for corresponding nitrogen bases, according to the key.
- Using information from Placemat 1, crosshatch colored squares for both strands of the DNA sequence on printmaking paper with water color pencils. Add water.
- Unzip DNA – Draw “roadmap” on placemat then tear between the nitrogen bases on the printmaking paper, using appropriate spacing for purines and pyrimidines. (Panel 1 poster board and ripped printmaking paper (unzipped DNA strand) to be assembled in Lesson 2.)

For Lesson 3 – Transcription

Materials:
Students’ completed Placemat 1 & Placemat 2
Students’ completed Nitrogen Base Color Coding Key from previous lesson
White 14-ply poster board (2nd piece of 3), cut into 28” x 6” pieces, one per student (If overall poster board size is 22” x 28”, you can get 3 student pieces per sheet.)
White shipping/marking tags, 1 ¾” x 1 3/32”, 23 tags per student
Doubled-sided mounting (foam) tape, 26” per student
Watercolor pencils (red, orange, yellow, green, blue, violet at the least). Note: students can share with a partner or two, if necessary.
Paintbrushes (¼ to ½ inch flat), or cotton swabs, one per student
Small cups for water
Paper towels

Teacher instructions for lesson 3:
- Transcribe DNA template strand into mRNA code on "Placemat 2" – Transcription and Translation Placemat
- Make color tick marks for corresponding nitrogen bases, according to the key.
- Stick double-sided foam mounting tape on second panel of poster board.
- Stick delivery tags onto the tape.
- Using information from "Placemat 2", crosshatch colored squares onto “delivery” tags with colored pencils for the mRNA. Add water.
- “Anneal” DNA to poster board (Panel 1), using double-sided foam mounting tape.

For Lesson 4 – Translation

Materials:
Students’ in-progress Placemat 2
White 14-ply poster board (3rd piece of 3), cut into 28” x 6” pieces, one per student (If overall poster board size is 22” x 28”, you can get 3 student pieces per sheet.)
Acrylic paints, 2 oz. bottles, 5 colors chosen by students (see Lesson 2) from the following:
red
red-orange
orange
yellow-orange
yellow
yellow-green
green
blue-green

blue
blue-violet
violet
red-violet
Gray acrylic paint, 2 oz. bottle
Small Styrofoam/paper plates for paint
5 Paintbrushes (¼ to ½ inch flat), or cotton swabs
tRNA/Amino Acid Stamp Tools (previously constructed, see Construction of "Placemats" and "tRNA/Amino Acid Stamps".)

Note: The teacher, can create the tRNA Amino Acid Stamps prior to Lesson 4. Alternatively, students who complete Lesson 2 (panel 1) and Lesson 3 (panel 2) more quickly than their classmates, can construct the stamps.

Teacher instructions for lesson 4:

- Download, print and complete tRNA Amino Acid Stamp Labels (PDF 4-2).
- Cut chipboard into 3.5" x 3.5" pieces to fit the labels (2 pieces of chipboard for each of the 20 amino acids – or fewer if you are only making the amino acids produced by the 23 nucleotide sequence provided in this exercise).
- Sandwich 3 cotton swabs between one labeled chipboard piece and one blank chipboard piece, making sure they are evenly spaced and stick halfway out of the bottom of the chipboard pieces. Use hot glue to secure.
- Stick labels onto one side of each of the tRNA Amino Acid stamps. The anticodon portion of the label should be closest to the cotton swabs. There will be a small amount of excess label. Fold that excess (the part that says "Amino Acid") over the top of the stamp and adhere it to the backside.
- On the back (blank) side of the chipboard, using school glue (do NOT remove the paper lining and expose the factory adhesive), adhere foam letters that correspond to the amino acid abbreviation found on the front (labeled) piece of chipboard. Letters MUST run perpendicular to the label and parallel to the cotton swabs (Hint: the bottom of the stamp is the right-hand side of the label.) The letters must also be adhered backwards, as a mirror image. (Hint: the first letter of the abbreviation should be closest to the cotton swabs.) Mirrors or cell phones can assist in double checking the orientation.
- After a color palette is determined by students (see Lesson 1), use the five chosen acrylic paints to color code the cotton swabs. This represents the anticodons of the tRNA that are indicated on the label.