

Biochemistry Boxing

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A competitive hands-on approach
to learning.

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Activity 1: Biochemistry Boxing

Teacher notes: Model this activity before asking the student to do it.

Overview: Students will compete against each other by keeping track of how many boxes they can match up with each macromolecule (carbohydrate, lipid, protein, and nucleic acid). Each student will keep track of their opponent's correct answers using the score card.

1. The student keeping score should use the macromolecule box (labeled carbohydrate, lipid, protein, and nucleic acid) to show the other student what they need to match.
2. The other student will use the other four boxes and attempt to correctly match them with the macromolecule being shown by their opponent.
3. Using the key, the student keeping score should check their opponent's answers and record the number of correctly matched boxes. Students should continue until each player has done all four macromolecules. After both students complete round one they should proceed to the next round.

Example: One student (score keeper) shows “carbohydrate” to their opponent. The opponent should look at each of the four boxes and determine which structure, function, picture and examples match with carbohydrates.

The score keeper could use the provided key to determine how many boxes were correctly identified as being a carbohydrate. The score keeper will record total number boxes that were correct under round 1-carbohydrate. Next, the score keeper could show the box nucleic acid, protein or lipid.

Activity 2: Group competition

Teachers Note: This is a great activity for a test review. I offer homework passes to the winning group.

1. Place students in into pairs or small groups
2. Give each group one set of boxes.
3. The teacher will say the name of a macromolecule.
4. The groups will compete to correctly stack the boxes as quickly as possible. When the time is up all members of the group should put both hands up and refrain from touching the boxes until their work is checked or they will be disqualified and will not receive the point.
5. The groups with the correct answers receive one point.
 - a. Note: Use a timer (5-15 seconds ,decrease the time as the students get better)
6. Note: Do not begin checking groups until the time is up.
7. Keep track of the points on the board.

Activity 3: Warm up or Closure

This is an excellent and quick activity to assess students. I have used this for a warm ups and closures.

1. Distribute one box to each student. (not the box with the lipid, protein, carbohydrate and nucleic acid on it)
2. Ask the students to hold up the side of the box that represents one of the macromolecules (carbohydrate, lipid, protein and nucleic acid).
3. The teacher should circulate the room and give the students feedback or hints.

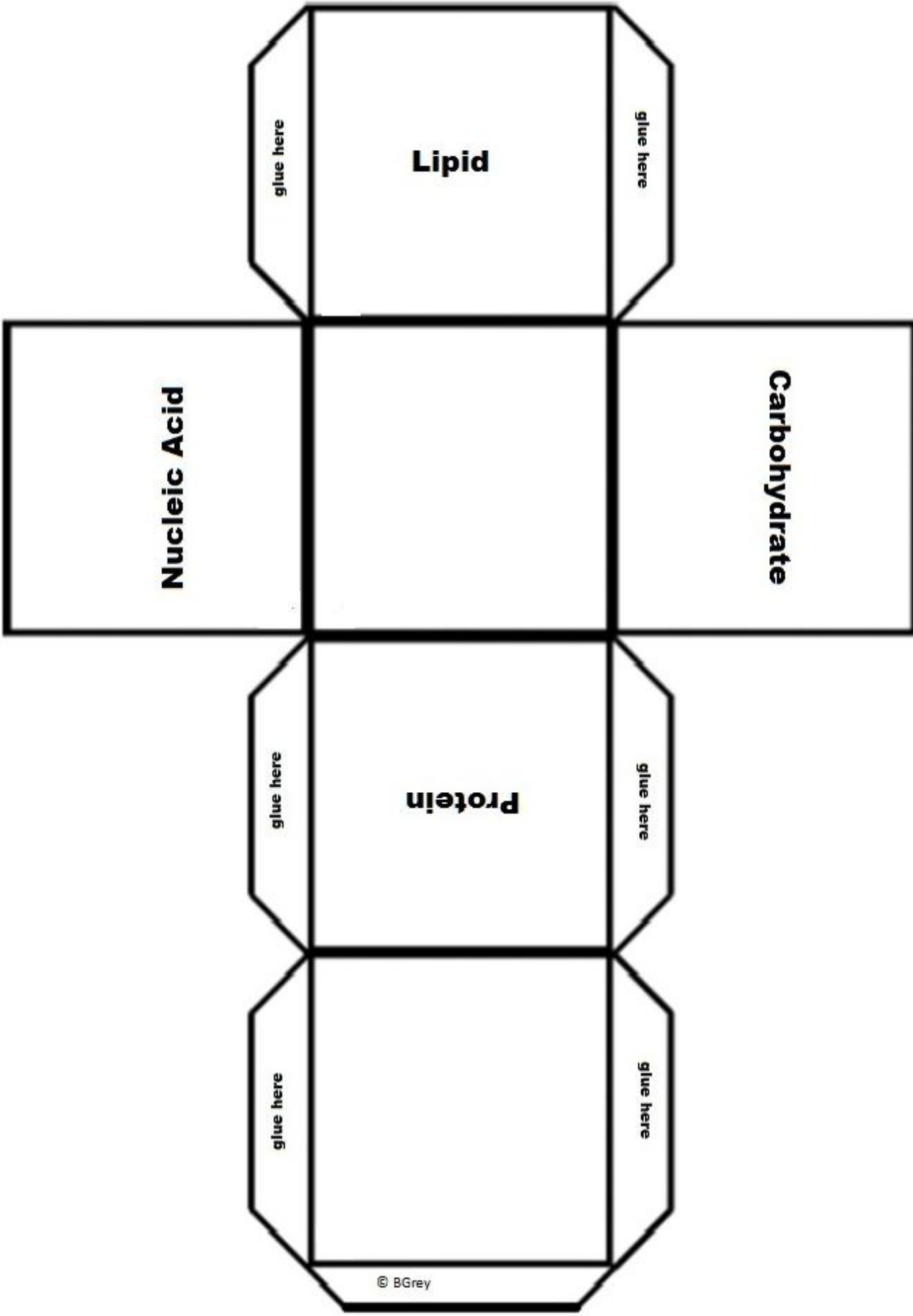
Suggestions:

1. Read the included lesson plan to see how I have effectively used these boxes.

Constructing the boxes:

1. Print the boxes. (Note: I recommend Card Stock Paper however, it will work just fine with regular copy paper.)
2. Carefully cut out the outline of the boxes.
3. Fold the tabs that say glue here.
4. Add glue (Note: I used super glue however, clear tape would be easier but does not look as nice.)

Tip: Find some reliable students to help you with the construction of the boxes especially if you are doing a class set. Use card stock and they should last several years depending on the students.



Lipid

Carbohydrate

Protein

Nucleic Acid

glue here

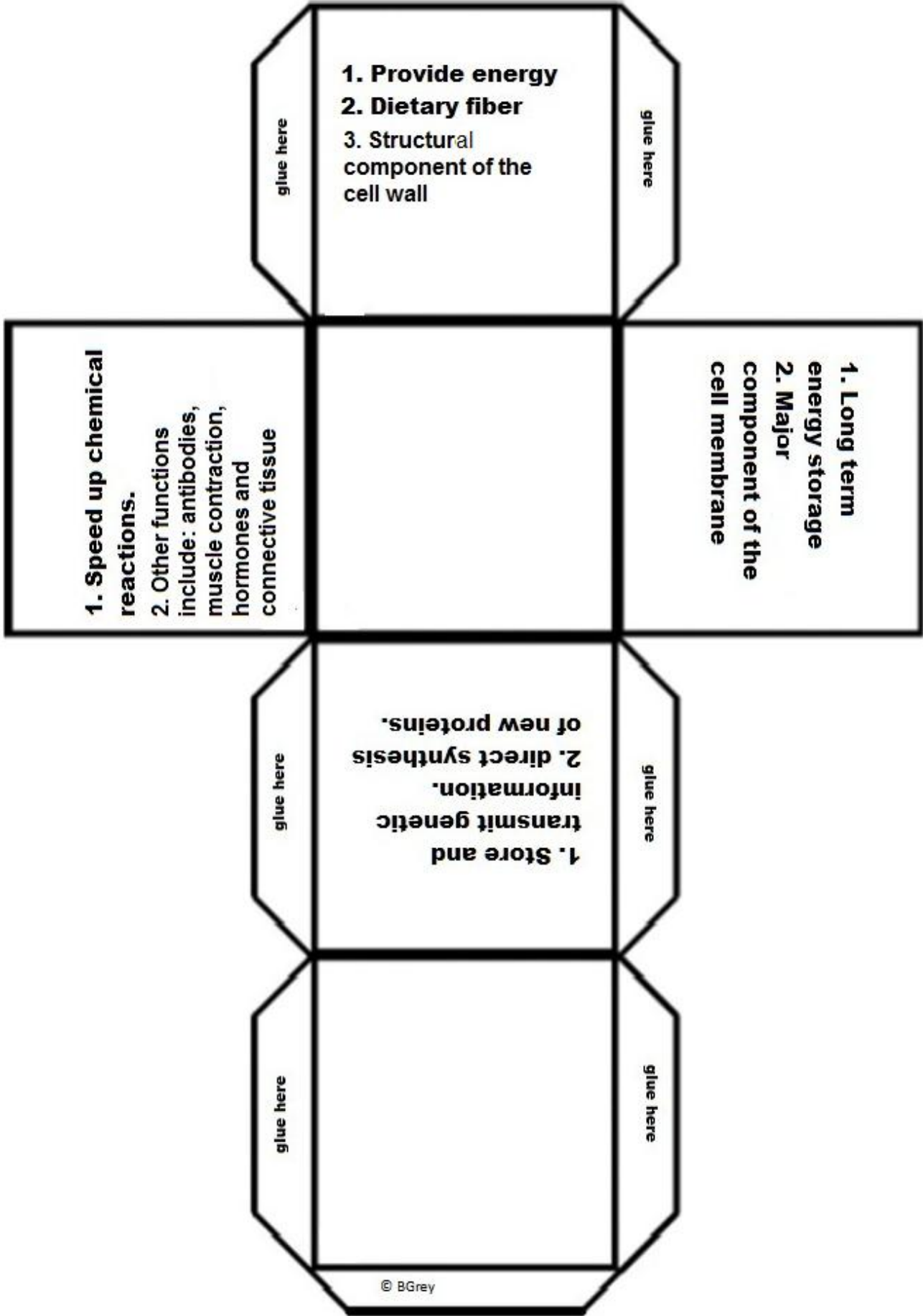
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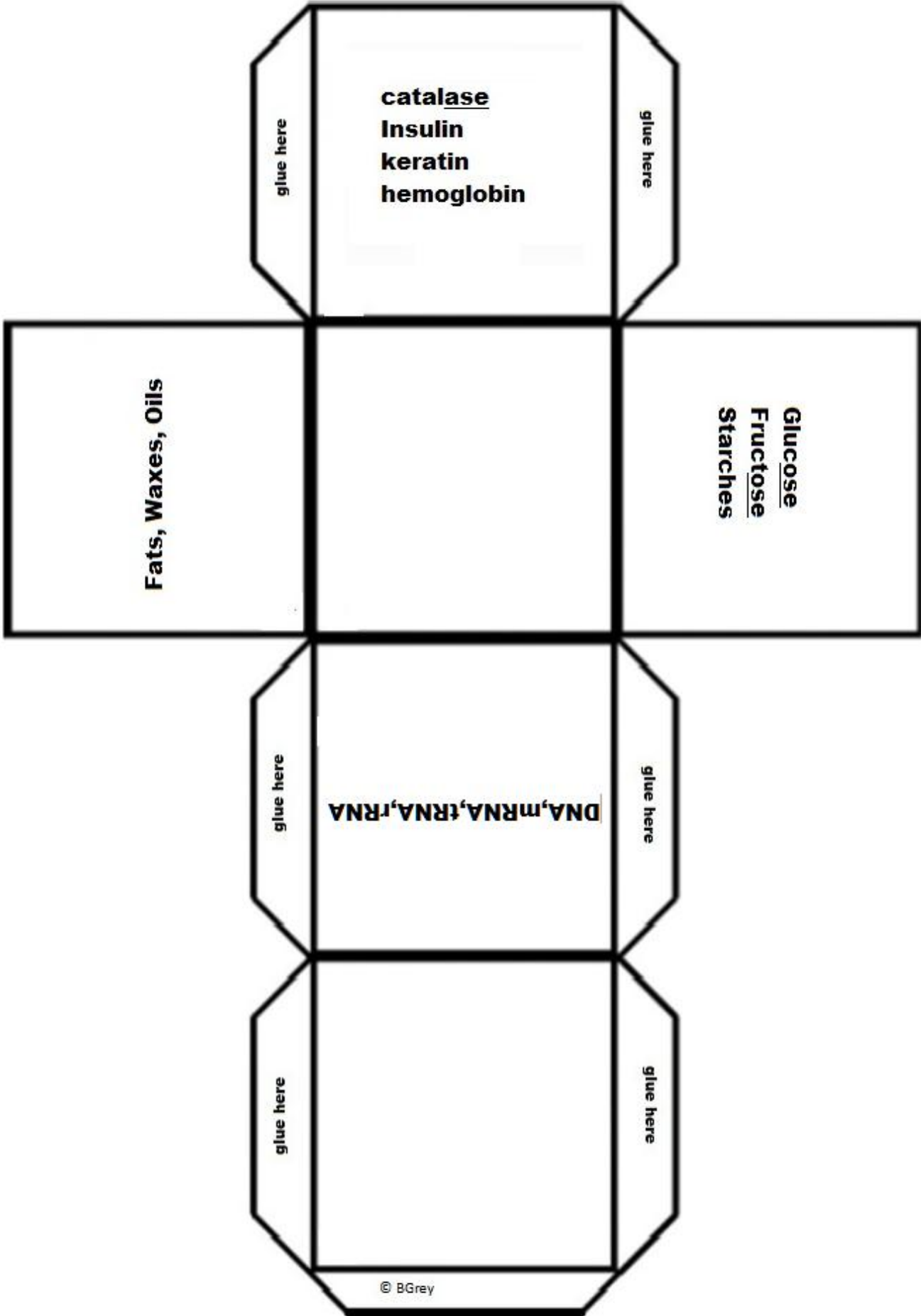
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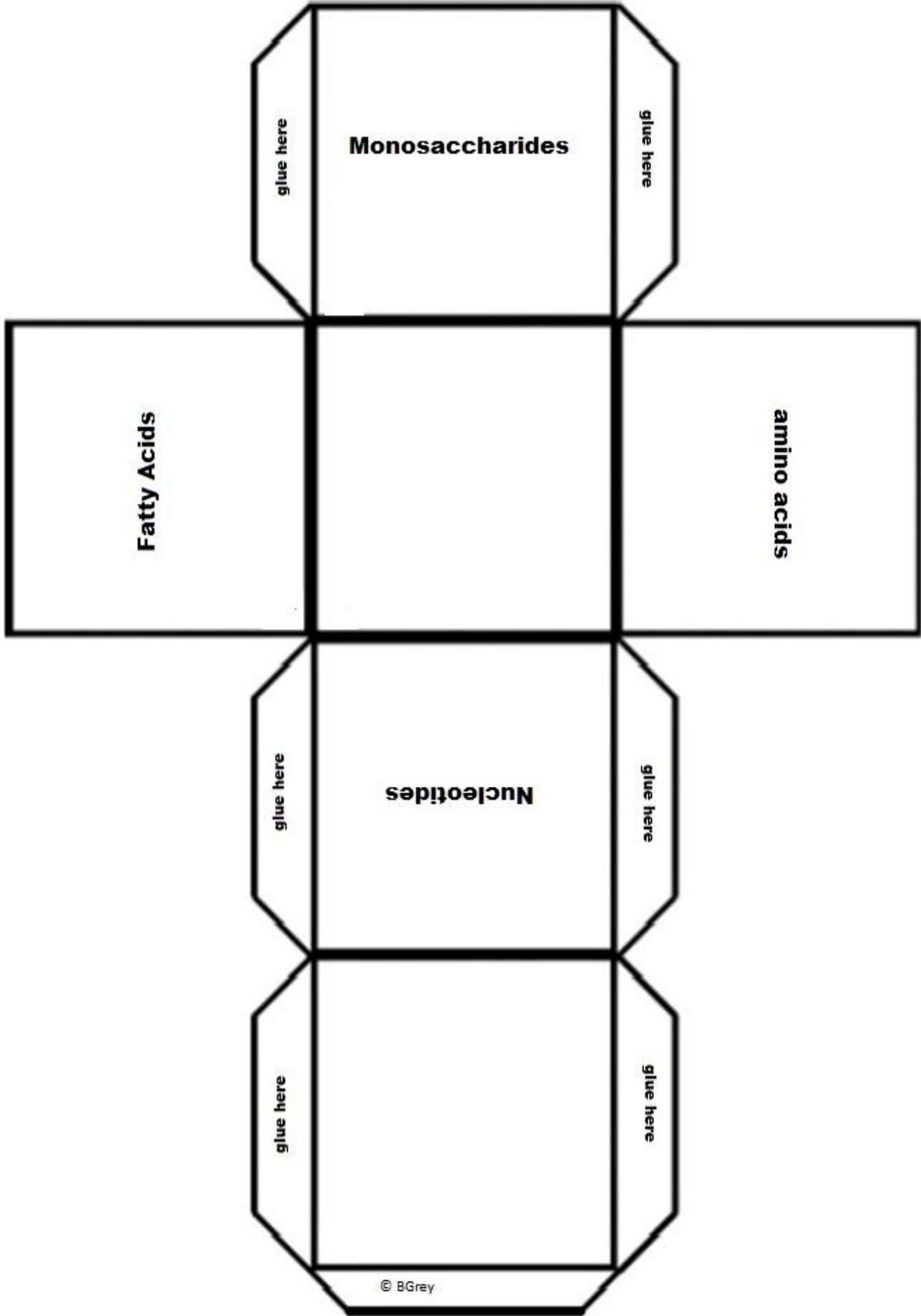
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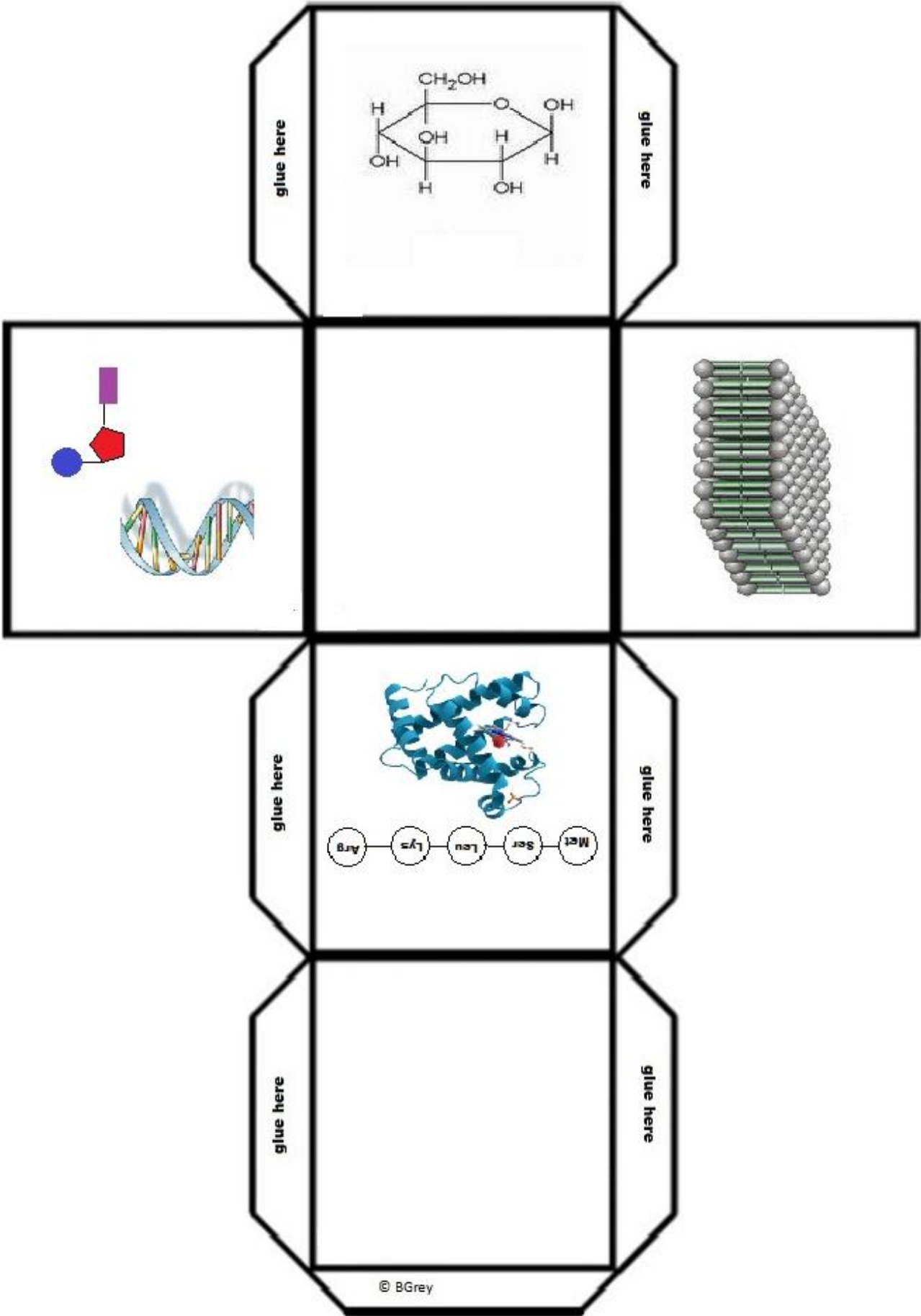
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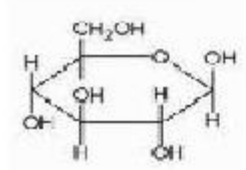
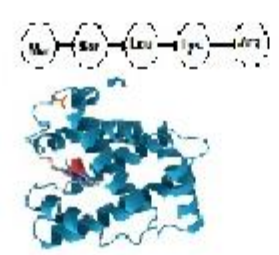
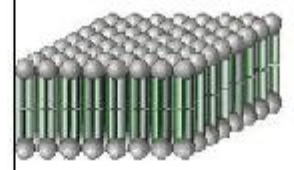
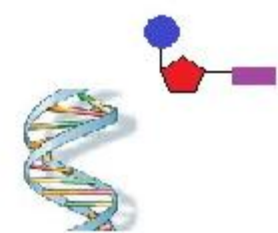




		Score Card					
Player 1	Round 1	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
Name:	# of correct boxes						
	Round 2	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 3	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 4	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 5	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 6	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 7	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 8	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						

		Score Card					
Player 2	Round 1	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
Name:	# of correct boxes						
	Round 2	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 3	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 4	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 5	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 6	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 7	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						
	Round 8	Lipids	Carbohydrates	Nucleic Acids	Proteins	Total	
	# of correct boxes						

Biochemistry Boxing Answer Key

Carbohydrate	Protein	Lipid	Nucleic Acid
<p>1. Provide energy</p> <p>2. Dietary fiber</p> <p>3. Structural component of the cell wall</p>	<p>1. Speed up chemical reactions.</p> <p>2. Other functions include: antibodies, muscle contraction, hormones and connective tissue</p>	<p>1. Long term energy storage</p> <p>2. Major component of the cell membrane</p>	<p>1. Store and transmit genetic information.</p> <p>2. direct synthesis of new proteins.</p>
Monosaccharides	amino acids	Fatty Acids	Nucleotides
<p><u>Glucose</u></p> <p><u>Fructose</u></p> <p>Starches</p>	<p><u>catalase</u></p> <p>Insulin</p> <p>keratin</p> <p>hemoglobin</p>	Fats, Waxes, Oils	DNA, mRNA, tRNA, rRNA
			

Macromolecule Organizers:

Carbohydrates		Lipids	
Elements	Monomer/Subunit	Elements	Monomer/Subunit
Example	Function	Example	Function
Sketch:		Sketch:	

Proteins		Nucleic Acids	
Elements	Monomer/Subunit	Elements	Monomer/Subunit
Example	Function	Example	Function
Sketch:		Sketch:	

Exit Tickets Questions:

- 1.) If you had to choose to eat only one type of carbohydrate (monosaccharide, disaccharide, polysaccharide) for month what kind would you choose?

Why? _____

- 2.) What do you think would happen if all of the lipids disappeared from our bodies?

- 3.) What similarities and differences do DNA and RNA share in terms of structure and function?

- 4.) What would happen if you no longer had protein available to eat? Explain.

Lesson Plan -Biochemistry

UNIT TITLE: Biochemistry GRADE: 9-12

LESSON TITLE: Macromolecules

Learning/Lesson Plan

Instructional indicators (based on Content Standards/Core Learning Goals)

Concepts of Biology - The student will demonstrate the ability to use scientific skills and processes (Core Learning Goal 1) and major biological concepts to explain the uniqueness and interdependence of living organisms, their interactions with the environment, and the continuation of life on earth.

CLG– The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.

Indicator– The student will be able to describe the unique characteristics of chemical substances and macromolecules utilized by living systems.

Assessment Limits:

- Carbohydrates
- Lipids
- Proteins
- Nucleic acids

Objective(s):

(What will a student know [content] and be able to do [skills/process]?)

1. Identify the building blocks of carbohydrates, proteins, lipids, and nucleic acids and how each is utilized in the human body.
2. Analyze the chemical composition and stored energy in each type of macromolecule.

Assessments Summative and Formative

(What strategies will be employed? How will we know instruction has been successful?)

1. Biochemistry Boxing Activities
2. Student responses during class discussions
3. Exit tickets
4. Quizzes
5. Test

Materials Needed

(Include materials for the basic lesson)

Biochemistry Boxes (constructed)

Scissors

Glue/Tape

Internet Access and Projector (for animations and video clips)

Time Allotment

(Use minutes, as the length of class and ability levels vary from school to school.)

5-7 days (50 minute class period)

1 day – Biochemistry Exam

Setting the Stage/Beginning the Lesson/Engagement*

(How will new learning be introduced? How will students get motivated/excited regarding new learning? How will prior knowledge be tapped and assessed?)

Show the video on NFL athletes at: The Video discuss the protein carbohydrate and fats (lipids):

<http://www.youtube.com/watch?v=PZwav9S-OGg> (you can download videos to your flash drive if your school doesn't allow youtube. Just go to <http://video.onlineconvert.com/convert-to-wmv>

1. The teacher will utilize "Classroom Discussion Routines" techniques as the students attempt to describe what is happening in the videos.
2. The teacher should focus the discussion on what is a healthy diet and what are the consequences of a poor diet.
3. The teacher should also discuss the definition of organic in a grocery market vs. organic molecules in science.

Acquisition of Skills/Developing the Lesson/Exploration*/Explanation*/ Elaboration*

(What will Modeling, Guided Practice, Independent Practice, and Checking for Understanding look like?)

Day 1:

1. The teacher will review the Power point presentation titled "[Macromolecule Presentation](#)"(download free from TpT). Up to Proteins. (stop at Proteins)
2. The teacher will distribute the "macromolecule organizer" worksheet. Students will complete the carbohydrate and lipid portion of the "macromolecule organizer."

Day 2:

1. **Re-engagement:** Go to the following website:
http://bcs.whfreeman.com/webpub/Ektron/pol1e/Animated%20Tutorials/at0202/at_0202_carbs_lipids.html
Show them the animations on both carbohydrates and lipids. The teacher will utilize "Classroom

Discussion Routines” techniques as the students attempt to describe what is happening in the animations.

2. Using cards with student’s names on them randomly draw cards (Student names) and use questioning techniques to review the notes on carbohydrates and lipids. Encourage students to use their notes to answer questions
3. The teacher will review the protein portion of the Biochemistry Power point presentation.
4. Students will complete the protein portion of the macromolecule organizer.

Day 3:

1. *Re-engagement:* Go to the following website:
http://bcs.whfreeman.com/webpub/Ektron/pol1e/Animated%20Tutorials/at0301/at_0301_nucleic_acid_protein.html

Show them the animation on proteins. The teacher will utilize “Classroom Discussion Routines” techniques as the students attempt to describe what is happening in the animations.

2. Give students a mini quiz (5 public release questions) on carbohydrates, lipids and Proteins. I have students rate their knowledge of the information using scale of 1-5 and compare it to their scores that they receive on the quiz.
3. The teacher will review the Nucleic Acid portion of the Biochemistry Power point presentation.
4. The teacher will complete activity 3 from Biochemistry Boxing. The teacher will distribute one box to each student and assess their knowledge of each of the macromolecules.

Day 4:

1. *Re-engagement:* Go to the following website:
<http://bcs.whfreeman.com/thelifewire/content/chp03/0302002.html>
Show them the animation on nucleic acid. The teacher will utilize “Classroom Discussion Routines” techniques as the students attempt to describe what is happening in the animations.

2. Students will complete activity one of Biochemistry Boxing (competition). The teacher will model how to play the game before beginning.
3. Students will compete against each other using the Biochemistry boxes.

Day 5

1. Re-engagement: Use student name cards to ask questions from their note about each macromolecule. (The name cards keep students on their toes since it is completely random)
2. The teacher will give each student a “Point of View” slip with a designated macromolecule. This will be a think-pair-share activity. The students will complete the slip on their own, then they will be paired up and they will describe the macromolecule that they have been given without telling their partner its name. The partner must figure out which molecule is being described and then they switch role.
3. Students will be broke into groups. Student will complete the Biochemistry Boxing activity 2: Group competition. (offer homework passes to the top one or two groups)

Closing the Lesson/Summary of Learning/Evaluation*

(How will learning be explained, summarized, applied to assure student understanding?)

Day 1 - Students will complete exit ticket number 1 and 2 using their notes.

Day 2 - Student will complete exit ticket number 3

Day 3 –Students will complete exit ticket 4.

Day 4 – Students will stand up based on the color they are wearing. Each student will tell the class one thing they learned or remember most from the day.

Day 5 – Students will be randomly selected to present the macromolecule from their point of view interview while the class interviews them.

Differentiating the Lesson

(What modifications/adaptations in addition to those found on the student’s IEP or 504 will suit students who need additional support, and/or structure? How can learning be accelerated for those who need enrichment? What possibilities are offered for students who get engaged in the topic(s)?)

Differentiations will be based on students’ needs:

Higher Differentiation – Students should build a model of one of the macromolecule. Student will have a debate on which macromolecule is the most important in their body using the model as a supporting evidence to their claims.

Lower Differentiation - The teacher should focus on more basic models for the macromolecule posters, and have students complete it as part of a teacher guided activity. The teacher may extend the unit 2 days to allow more time for repetition during the Biochemistry Boxing Activities.

Learning/Lesson Reflection

(What went well? What may need revision the next time I use this lesson? How did students react? etc.)

Learning/Lesson Extension

(What web sites, references, field experiences, related topics, or activities might offer enriched or enhanced learning opportunities?)

- 1. Have students complete a graphic organizer for macromolecules.**
- 2. Show students more animations.**
- 3. Use the [beach ball activity](#) to review the macromolecules or previous vocabulary.**