Welcome to the Region 12 2015 Michigan Science Olympiad Coaches Clinic

December 10, 2014

Website

www.gvsu.edu/mso-r12

SCIENCE OLYMPIAD

Exploring the World of Science

REGION 12

Michigan Science Olympiad

Grand Valley State University will host the Region 12 Michigan Science Olympiad on March 28, 2015

Does your school do Science Olympiad?

If not, you may want to consider the following...

Science Olympiad is an international non-profit organization devoted to improving the quality of science education, increasing student interest in science and providing recognition for outstanding achievement in science education by both students and teachers. These goals are accomplished through classroom activities, research, training workshops and the encouragement of intramural, district, regional, state and national tournaments. Science Olympiad tournaments are rigorous academic interscholastic competitions that consist of a series of team events, which students prepare for during the year. These challenging and motivational events are well balanced between the various science disciplines of biology, earth science, chemistry, physics and

We would like to thank GVSU President Thomas J. Haas and College of Liberal Arts and Sciences Dean Frederick J. Antczak for their continuing support of Science Olympiad!

Click here to read Dean Antczak's Opening Ceremonies Address from the 2014 Tournament.

Calendar of Events

Region 12 Coaches' Meeting
December 10, 2014 4:15 PM - 6:00 PM
Register Online

WOSO Div C Invitational
January 24, 2015 8:00 AM - 5:00 PM
Registration form

Grandville Div B Invitational
January 31, 2015 7:45 AM - 5:00 PM
Registration form

Allendale Div B Invitational
February 28, 2015 8:00 AM - 5:00 PM

Essential Websites

- National Science Olympiad Site

  soinc.org

- Student Wiki

  scioly.org

Mission Possible C

Rube Goldberg Device

Golf balls are used to set off and measure a series of actions or energy transfers to trigger a buzzer.

Start Task

Actions/ Energy Transfers

Final Task

Points

Timing – Device runs a maximum of 180 s (3 min) but an ideal time of 60s. Make a good timer! Electricity can not be used to optimize timing.

Dimensions: max 60cmx60cmx60cm

Golf balls
Energy Transfers

Golf Ball Points +2

Golf balls go from below jug into the jug initiating transfers or actions along the way.

Golf balls must drop into jug one at a time

Prior to scoring the ball must initiate action to start subsequent golf ball

Jug must:
Have sides at least 10 cm high
Be unaltered inside

Energy Transfer Points +50 pts

To earn points all energy transfers must be listed in the ASL

All transfers must be unique and transfer between 2 different forms of energy

M, C, E, T, VL

All transfers must be initiated by a golf ball moving into jug and ends by starting another golf ball toward the scoring jug. Both balls must score.

Action Sequence List

Must be uploaded or emailed to RMSC by **Monday March 23, 5pm**

Must have each action/ transfer that contributes to the operation of the device.

Must have scorable tasks numbered in order corresponding to numbers on the device

Reminders

Make sure you can explain the device

Bring extra copies of your ASL

Bring a repair kit/leveling shims

All sources of energy/ actions must be contained within the box at all times

Questions:

Would you like a supervised early device dropoff in the competition area?

Air Trajectory

GOAL

- Design, construct, and calibrate a device capable of using air power to launch projectiles into a target area

- Launch devices, copies of graphs, and all materials the team will use (other than eye protection and calculators) must be impounded

Air is created by a falling mass

The falling mass does not itself propel the projectile

- The falling mass must move air to push that ball down the lane
- Mass must be <=3.5 kg Div. C or <=5.0 kg Div. B
- Any part of the device whose gravitational energy decreases and provides launch energy is considered part of the mass!
- You should be able to disconnect the mass from your device

Triggers and Projectiles

- The trigger is not part of the device and cannot contribute energy.
- Must extend out of the launch area.
  - Competitors must be at least 1.00 m away from launch area

- Unmodified (labeling permitted)
  - Tennis ball
  - Racquet ball
  - Ping-pong ball
  - Plastic practice golf balls
  - No other type of ball may be used

Targets

- 2 shots maximum at each target.
- Option of shooting at a bucket instead of taking second shot at target.
- Teams with Bucket Shot attempt will not have a third and/or fourth tie breaker

Penalties

- Warned for not correctly wearing eye protection
- Within 1.00 m of launch area or in front of launch area when a launch occurs **Leaning in!**
- Approaching a target before the supervisor indicates they may
- No warning prior to launch
- Any part of the device is outside the launch area prior to or after a launch

Scoring

- Any number of graphs and data tables may be impounded
  - indicate up to 4 graphs to be used for graph score
- Distance from Targets
  - Far target 4000- distance away in mm
  - Near target 2000-distance away in mm
- Bucket points

ROBOCROSS

- Design and build a robot (remotely operated vehicle)
- Must perform certain tasks on a prescribed playing field

Robot Construction

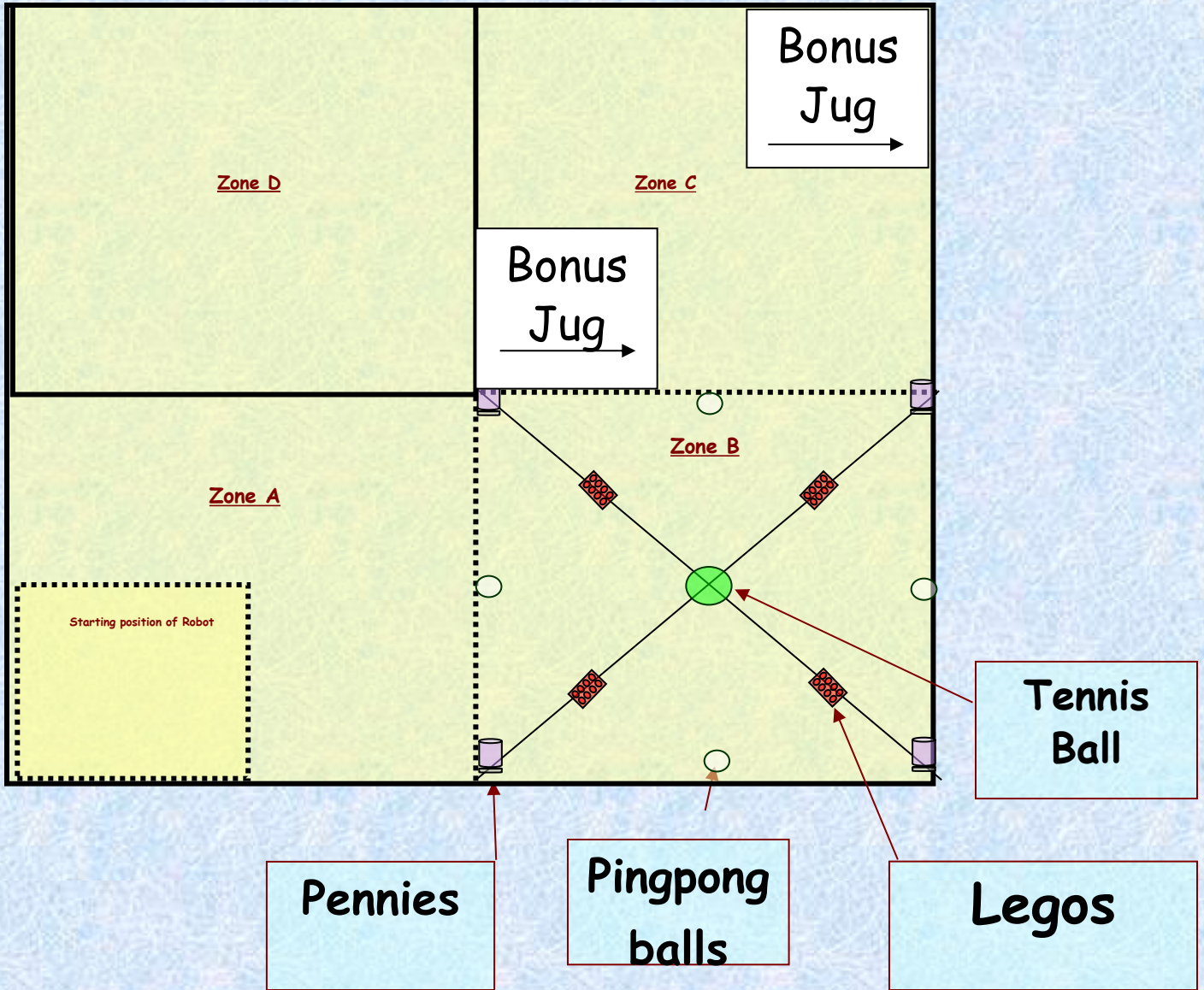
- Robot, in ready to run position
  - Fit, entirely, (without compression) in a 28cm x 28cm x 28cm cube
  - Robot may change dimensions during the run
  - Batteries labeled, ≤14.4V
  - Remote frequencies check online

Technical documentation

- Teams must develop and submit at
  - Check-in:
  - Illustration (3.a)
  - Operating Description (3.b)
  - Written practice log (3.c)

- Teams with incomplete documentation - 5%
- Teams with no documentation -20%

Playing Field



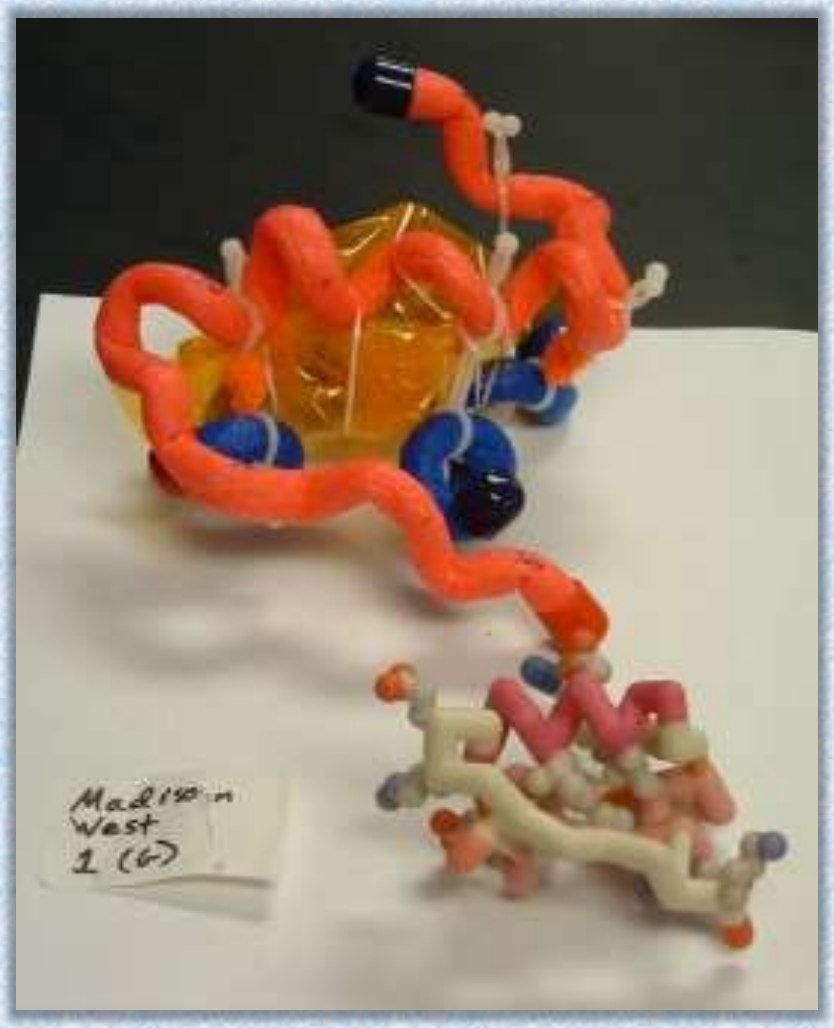
Competition

- Event Supervisor will count aloud “1. 2,.3, Go”. Teams have 3 minutes.
- Time stops when team says “Science” or
  - Robot or bonus Jug is Out of Bounds (Touching the floor outside of the Playing Field)
  - The Robot is physically moved by wires connecting it to the control box
  - The team touches the Robot, the Bonus Jugs, or the scoreable objects
  - A team member steps on the Playing Field after the team has received a warning

Scoring

- At the end of competition, points will be awarded based on the number and types of items that are in the specified scoring areas
- and RunTime
- Tie breaker
  - Lowest mass of the **Device**

Protein Modeling Event



- Identify basic features of protein structure
- Explore protein structure with a computer visualization program called Jmol
- Create physical models using the flexible modeling media, Mini-Toobers (or alternative materials)

Protein Modeling

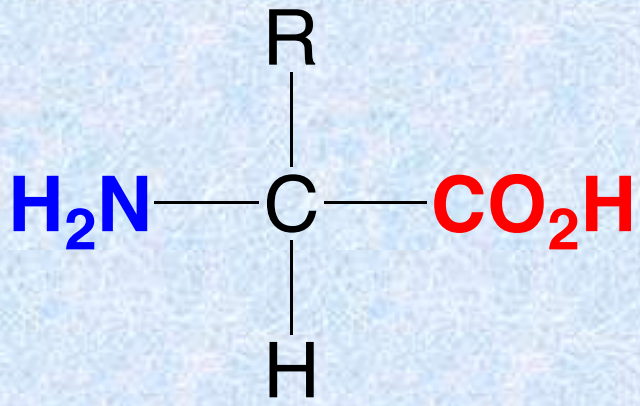
- Pre-build model
  - Students will bring their pre-built models to the assigned impound
- On-site build model
  - Students will sit at a computer, access a file of the protein structure and build a specific region of a protein with the toober provided, guided Jmol/JSmol program
- Exam

Start with the website: http://cbm.msoe.edu/scienceOlympiad/

Protein Structure: In the Beginning

Use the Protein structure tutorial information on website.

Have your students first learn basic amino acid structure.

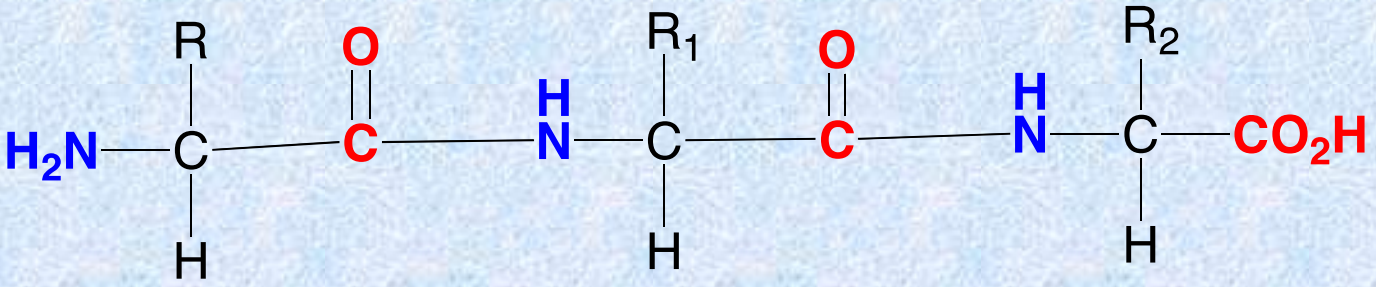


As R changes 20 different amino acids are produced

Other resources

Use introductory general/organic/biochemistry textbooks (GOB)

Have your students learn how amino acids combine to form proteins.



As number and types of amino acids connect different proteins are produced

What do you build with?

You should practice with any flexible tubing- housing wire, flexties, or pipe cleaners.
RMSC will provide Prebuild Kits that we have purchased

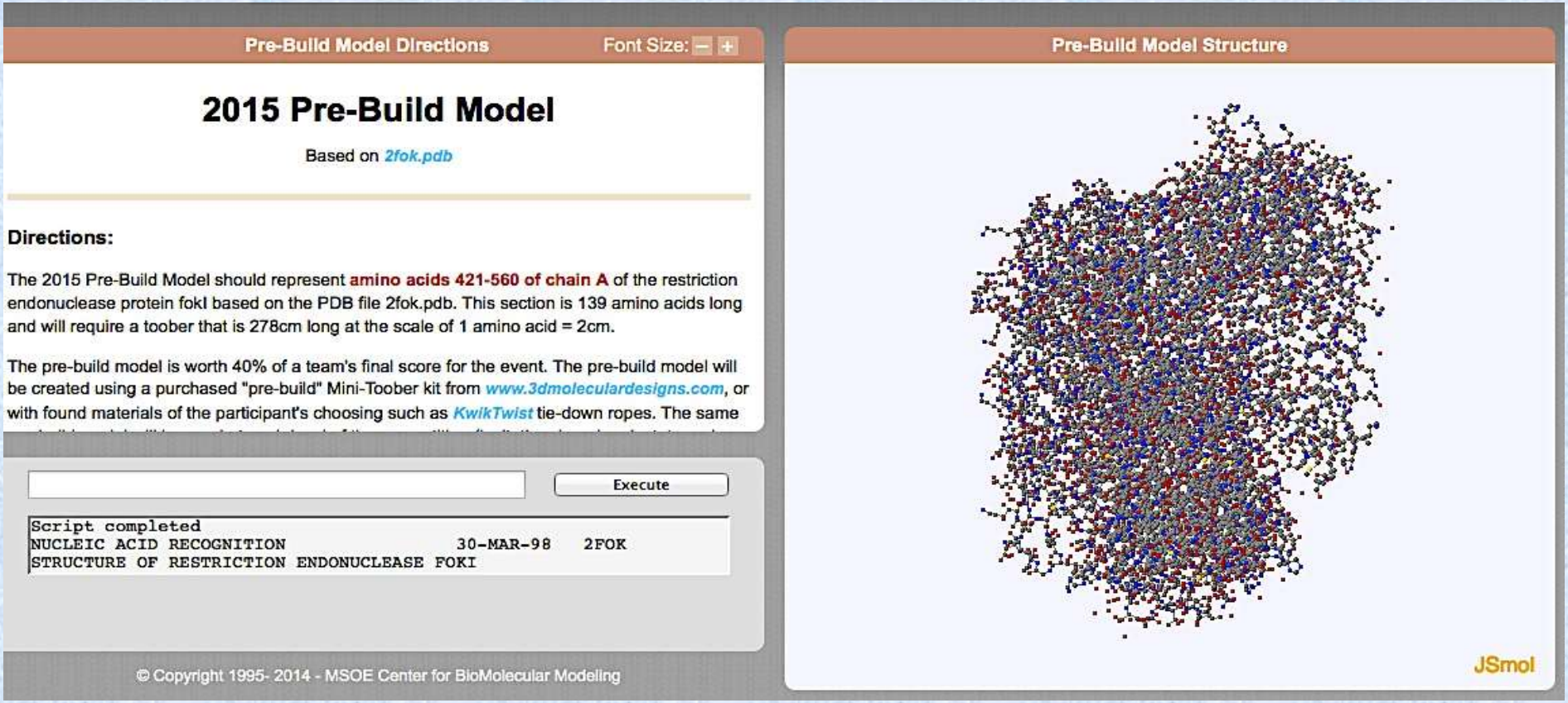
Pick Yours Up Today

These contain the appropriate materials for the Prebuild and **must be used for your impounded structure**

Similar Kits will be supplied for the Site Build.

What Structures are Built?

Regional Competition: Restriction protein fokl
PreBuild:http://cbm.msoe.edu/scienceOlympiad/designEnvironment/prebuild.html



Use Jmol to observe and manipulate specific part of the Protein: Amino acids 421-560 of Chain A

Pre-Build Model Directions Font Size: – +

2015 Pre-Build Model

Based on *2fok.pdb*

Directions:

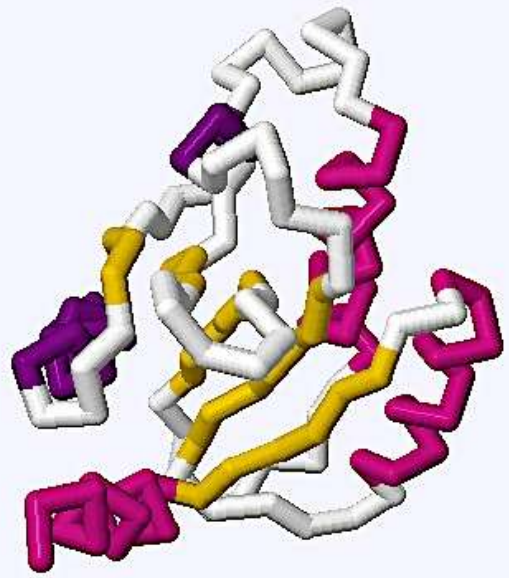
The 2015 Pre-Build Model should represent **amino acids 421-560 of chain A** of the restriction endonuclease protein fokI based on the PDB file 2fok.pdb. This section is 139 amino acids long and will require a toober that is 278cm long at the scale of 1 amino acid = 2cm.

The pre-build model is worth 40% of a team's final score for the event. The pre-build model will be created using a purchased "pre-build" Mini-Toober kit from *www.3dmoleculardesigns.com*, or with found materials of the participant's choosing such as *KwikTwist* tie-down ropes. The same

Execute

```
1121 atoms selected
script 2 started
Script completed
```

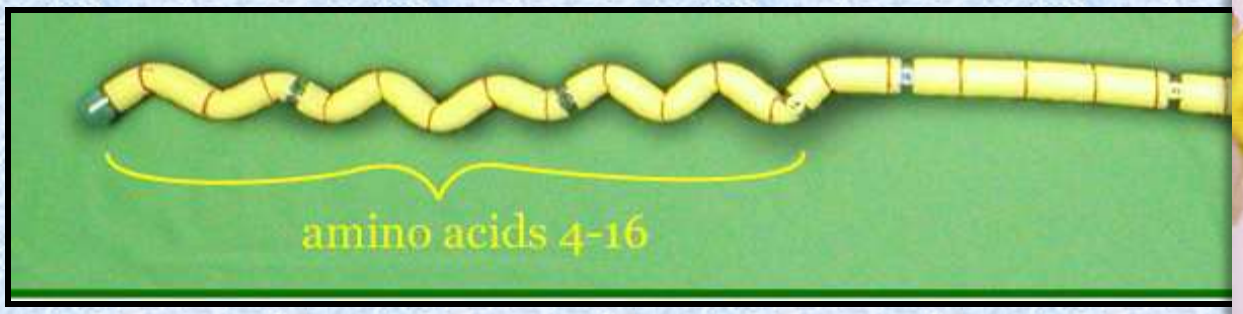

Pre-Build Model Structure



JSmol

Marking and Folding the Toober

- Use Jmol to identify where to fold and what significant amino acids to add.
- Positions of significant amino acids should be marked on the toober as well.
- Fold the toober to mimic the image created using the Jmol visualization program



What we look for when scoring the models

- Positioning of the blue/red end caps correctly
- Correct number of helices/sheets
- Correct positioning of helices/sheets (topology)
- Right-handed helices
- Correct tertiary structure (relative position of helices/sheets to one another)
- Model has correct shape (For prebuild – creative additions to help tell the story
- For onsite build – provided amino acids are positioned correctly, on the toober, but also in 3D space (pointing inward or outward)

Common Mistakes

- Blue cap/red cap in wrong position
- Missing secondary structures
  - Model has 3 helices, and it should have 4
- Left-handed helices
- Tertiary structure is incorrect
- Creative additions on the prebuild are inappropriate
  - Incorrect sidechains
  - Too much information
- Onsite amino acids are positioned incorrectly
  - In the wrong spot
  - Amino acids are pointing in the wrong direction


2015
NOW AVAILABLE
SCIENCE OLYMPIAD
RULES
app
mobile
RULES
Available in Google Play and iTunes

It's About Time

- Tests knowledge of time, astronomy, physics, etc.
- 50% of score from device testing part
  - 5 time trials (between 10 and 300 seconds)
  - soinc.org/its_about_time_c - computer generated MP3s with tones for all possible time trial periods.
- 50% of score from written test part

K.I.S.S Principle

- Water / sand glass
- Simple / torsional pendulums
- Oscillating spring

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Green Generation(B and C)

Aquatic issues, air quality issues, and climate change.

- Part 1 – General Ecological Principles (1/3)
- Part 2 – Problems with Human Impact (1/3)
- Part 3 – Solutions to Human Impact (1/3)

Technical Problem Solving

- Teams will gather and process data to solve problems.
- *Clarification: 3. For 2015 there are TWO stations but only ONE topic and delete 3.c. as it contradicts 3.b.*
- Summer Institute PowerPoint
  - soinc.org/tech_prob_c
  - Vernier based probes including temperature, force, and motion detectors (sonic rangers)
  - TI-84 calculators (provided)
- Stay tuned!

Trial Events

Found on MSO Region 12 site: Event Information

- Come Fly With Me (B and C)

- Game On (B)

  scratch.mit.edu

  Coding practice: code.org

- Hydrogeology (C)

  www.groundwater.org/so.html

Questions

Open Forum/Discussion