

TJHHST Biology Olympiad, 2015-16

Sponsor: Dr. Locklear

Captains: Jeffrey Liu and Tiger Zhang

Teaching Coordinators: Tarun Kamath and Neeraj Prasad

Treasurer: Ashwin Srinivasan

Webmaster: Prathik Naidu

Introduction

Biology Olympiad is a rigorous academic club at Thomas Jefferson, geared towards preparing for national-levelled biology competition exams. Meetings will occur every Friday B block in Room 123. During 8th period practices, lectures will be supplemented by notes based off of the primary text, Campbell and Reece's *Biology 8th Edition*. Practice quiz questions will worked into lectures to solidify understanding of lecture material.

This year, after-school practices will be held on Friday afternoons from 4 to 6 p.m. in room 135. Full tests with past competition problems will be completed and analyzed with the captain and teaching coordinators.

Our primary goal is to prepare students for the U.S.A. Biology Olympiad Open and Semi-final exams. Note that while our distributed note packets and practice exams will help with biology competitions, individual inquiry is the ultimate factor for success in these competition exams. We hope that the enthusiasm for biology fostered within the club, combined with our helpful resources will drive students to achieve their own goals.

Competitions

The main exam of the year is the USA Biology Olympiad. A competition with high prestige, USABO consists of three rounds: Open, Semifinal, and Finals.

The first test, a 50-question Open exam encompasses general theoretical biology. This year, it will be administered on either February 12th (tentative) at TJ during an 8th period. Next, the Semifinal includes multiple choice problems, matching, and a free response to total between 120 to 180 points (varied). While there is no lab portion, this test applies practical statistical analyses and reaches beyond the scope of general theoretical knowledge. The semi-final Exam is taken by students who score among the top 10% in the Open and will be given on March 27th.

The twenty top-scoring individuals on the semi-final exam are invited annually to Purdue University for National Finals, a two-week training camp dedicated to practical and theoretical biology. The Final exam consists of test-taking and lab portions. Four finalists are selected to represent the U.S. in the International Biology Olympiad.

Additional information is available here: <http://www.usabo-trc.org/>

The University of Toronto National Biology Competition will be offered on April 30th at TJ. It is a fifty question multiple choice test that covers general biology, and less difficult than the USABO. The top 50 overall performers receive National Biology Scholar with Distinction awards and receive monetary compensation. Other top scorers are deemed National Biology Scholars. Last year, for the fifth consecutive year, TJ placed as the first overall school.

Check out the website, which contains additional information, including practice tests:

<http://www.biocomp.utoronto.ca/>

We also will host our own contests this year, the Biology Olympiad Winter Contest (BOWC) and the Biology Olympiad Spring Contest (BOSC). The BOWC is a 30 question multiple-choice test that will be written by this year's officers and will take place on December 18th, 2015. The BOSC will take place on April 15th, 2016. Topics covered on the two contests will include all of the lectures topics before the contest date. The officers will grade the contests and post the results online. An answer key with explanations to all the questions will also be posted. There will be three divisions (currently taking or have already taken IBET, currently taking AP Bio, already taken AP Bio.) The top two winners in each division will receive prizes.

Resources and Text

Biology by Campbell and Reece is the premiere introductory college text in the country, and it is strongly recommended that competitive club members carefully study each chapter, as the USABO Open and National Biology Exams are both directly based upon them. The 7th and 8th editions of the text are preferable.

Ancillary recommended books provide more depth and specificity: *Biology* by Raven, Losos, Mason, and Singer; *Biology of Plants* by Raven, Evert, and Eichhorn; *Molecular Biology of the Cell* by Alberts and Johnson.

The webmaster-maintained website contains plentiful resources for reviewing material and practicing test-taking technique. Links to high-quality graphic videos and college lectures are posted all year, and files of practice tests and previous USABO open exams will become available throughout the year. Resources like MIT OpenCourseWare are highly recommended.

Media

TJ Biology Olympiad email: tjhsst.biologyolympiad@gmail.com

Website (must create account to access files): www.tjbio.webs.com

Includes powerpoints, lecture notes, detailed calendar, and practice tests, and other external resources

Facebook Group: "TJHSST Biology Olympiad 2015-2016"

Elections

In order to be eligible to vote, you must have attended a minimum of six Biology Olympiad meetings this school year.

In order to be eligible to run for office, you must have attended at least nine Biology Olympiad meetings for the school year. Additionally, if you plan to run for the position of captain or teaching coordinator, you must have given at least one lecture this school year.

The available officer positions (6) are as follows; all officers are expected to attend meetings regularly throughout the school year:

- Captains (2): Responsible for club oversight, communications with the teacher sponsor and TJ administration, managing communications between all team officers, coordinating and registering for competitions, and carrying responsibility for weekly lectures and practices.
- Teaching Coordinators (2): Head of writing and delivering 8th period lectures, practice tests, and games; responsible for assisting the captain when needed.

- Treasurer (1): Accountable for maintaining the club bank account, organizing fundraisers, and managing all transactions with club members, officers, and faculty (e.g. paid registration for USABO and Toronto)
- Webmaster (1): Responsible for weekly upkeep of the Biology Olympiad website, which consists of posting lectures and practice exams, as well as updating the club calendar. Experience with web design and/or computer science is highly recommended.

Please keep in mind that officers are **accountable to the team** for the entire school year, and are therefore subject to impeachment if the duties listed above are not met. More information on election will be given as the end of the year nears.

Sample Questions

1. Which statement is true about enzymes? Enzymes:

- A. Are made up of a base containing nitrogen, phosphate, and ribose.
- B. Have activity that is independent of temperature and pH
- C. Lose some or all of their normal activity when their 3-D structure is disrupted.
- D. Provide the activation energy needed to activate a reaction.
- E. Work once only and then are destroyed.

2. Which of the following correctly describes how the lifespan of a protein is regulated?

- A. The part of the sequence coded for by the UTR tags it for destruction.
- B. Giant protein complexes called ubiquitins destroy proteins after they have remained in the cell for a certain time.
- C. Proteins are methylated over time; heavily methylated proteins are destroyed by proteasomes.
- D. Proteins are tagged with ubiquitins, which are recognized by proteasomes; the proteasomes destroy the proteins.
- E. Proteins tagged with methyl groups are destroyed by ubiquitins.

3. Which of the following chemicals or groups of chemicals is not a major determinant of flower color?

- A. Flavonols
- B. Carotenoids
- C. Cyanidin
- D. Phytoalexin
- E. Betacyanin

4. Place the following statements regarding photosynthesis in C4 plants in the correct order.

- I. ATP is used to convert pyruvate to phosphoenolpyruvate (PEP).
- II. Mesophyll cells export four-carbon products such as malate through plasmodesmata.
- III. PEP carboxylase adds carbon dioxide to PEP to produce oxaloacetate.
- IV. Carbon dioxide is used to produce G3P in the Calvin cycle.
- V. Carbon dioxide is released in cells that contain the protein rubisco, which binds it.

- A. II, V, IV, I, III
- B. V, II, III, IV, I
- C. I, III, V, II, IV
- D. I, III, II, V, IV
- E. I, V, III, II, IV

5. Which of the following is not formed from neural crest cells?

- A. Peripheral nerves
- B. Bones of the middle ear
- C. Parts of the teeth
- D. Bones of the jaw
- E. Muscles of the face

6. The lymphatic system is most involved in the absorption of nutrients from which of the following foods?

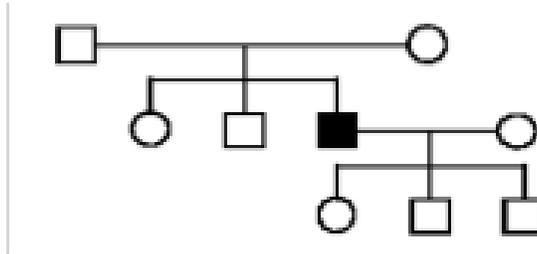
- A. Bacon
- B. Banana
- C. Lettuce
- D. Skim milk
- E. White bread

7. Beriberi, a disease characterized by tingling, poor coordination, and reduced blood circulation, can be avoided by consuming adequate amounts of which of the following?

- A. Zinc
- B. Thiamine
- C. Folic acid
- D. Magnesium
- E. Vitamin A

8. Given the pedigree, what is (are) the possible mode(s) of inheritance?

- I. Autosomal dominant
- II. Autosomal recessive
- III. X-linked dominant
- IV. X-linked recessive



- A. II only
- B. I or III only
- C. II or IV only
- D. all four modes
- E. none of the above

9. The 2011 Nobel Prize in Physiology was awarded to Bruce Beutler, Jules Hoffman, and Ralph Steinman in part for their discovery of the Toll receptors in fruit flies. The Toll-like receptors (TLRs) are their equivalent in mammals. Which of the following statements regarding TLRs is FALSE?

- A. TLRs function in the adaptive immune system as signaling receptors.
- B. TLRs are found both on the plasma membrane of cell walls as the inner surfaces of vesicles.
- C. Specific TLRs are capable of recognizing pathogen-associated molecular patterns (PAMPs) such as flagellin, double-stranded RNA, and lipopolysaccharides (LPS).
- D. Signaling of TLRs promotes phagocytosis of foreign material.
- E. All of the above are true.

10. Which of the following pairs represent two distinct species?

- A. House mouse, Fancy mouse
- B. Mayan Indian, Inuit Indian
- C. Monarch butterfly, Viceroy butterfly
- D. Papillon, Chihuahua
- E. Soldier ant, Drone ant

11. What types of nervous system diseases would be characterized by neurofibrillary tangles, and death of dopamine generating cells, respectively?

- A. Schizophrenia; Parkinson's
- B. Schizophrenia; Major Depression (PTSD)
- C. Alzheimer's; Parkinson's
- D. Alzheimer's; Bipolar Disorder
- E. Parkinson's; Major Depression (PTSD)

12. Why would the presence of cysteine be of importance in determining protein structure (and thus function)?

- A. Cysteines are considered hydrophilic, so, tertiary structure would result in cysteines on the outer parts of the protein.
- B. Cysteines contain thiol (-SH) groups, and along with sulfur containing methionine, can form disulfide bridges which can have a major effect on protein conformation.
- C. Since cysteines are considered reducing agents, resulting disulfide bridge formations are considered mostly unstable unless catalyzed by disulfide isomerases.
- D. A and B
- E. A, B, and C

Answer Key:
1. C
2. D
3. D
4. D
5. E
6. A
7. B
8. C
9. A
10. C
11. C
12. B