BIOME

The BIOlogy Education MEssenger

(An ATBS eNewsletter)

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From The Editorial Team.....

The months of March-April are a stressful time for teachers and students with examinations around the corner! Teachers are busy setting and evaluating papers while students are busy cramming up information from the several reference books and notes. The enjoyment and satisfaction of having learnt new things in the academic year gone by is many a times ignored in this attempt to achieve good marks. We are glad to come out with the second issue of the ATBS eNewsletter – The BIOME during this month. We hope you will find this issue to be a good read for the upcoming vacations. With this issue, we have started a new section 'Through the teacher's glasses' wherein we would like to encourage teachers to share their experiences, anecdotes, difficult situations and remedial attempts during their academic interaction with students. This issue includes an article from one such experienced teacher. The exchange of ideas through such articles would help teachers connect with each other in a better way. The Biology Olympiad Cell at HBCSE has been developing experimental tasks as well as challenging and logical theory questions during the past several years as part of the Olympiad programme. One such task, in a simplified format is included in this issue. We hope teachers would find these articles helpful in their effort of making biology interesting to students.

Happy reading and do send us your feedback!!

With best wishes.....

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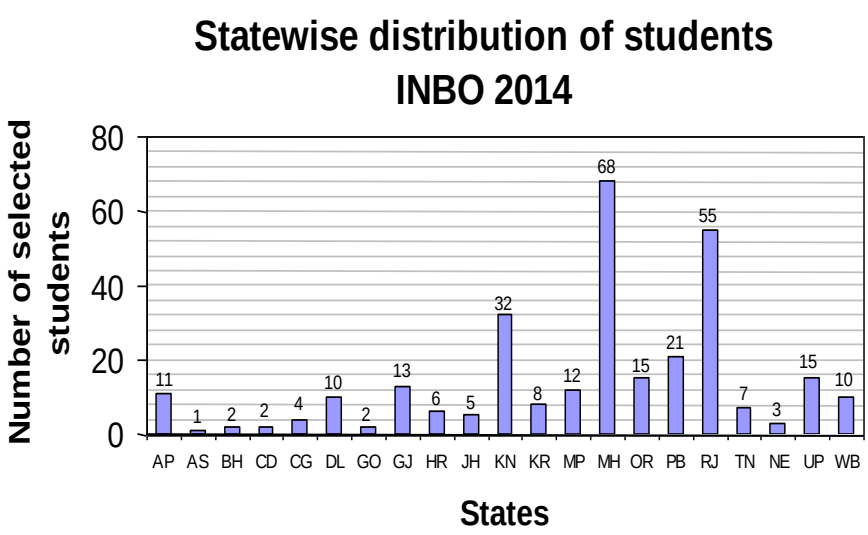
Activities during the last six months!!

- The annual ATBS Convention was held on 1st and 2nd February, 2014 at Vaze College, Mumbai

Indian National Biology Olympiad – 2014

The Olympiad year has begun! The second level selection test for Biology Olympiad was conducted on February 2nd 2014. 302 students selected from across the country appeared for this theory exam. The following chart gives the state wise split up of students who were selected after the first round of exam held in November 2013. As has been the trend in past, Maharashtra and Rajasthan were the states from which maximum representation was observed. The smallest number was from Assam (1) followed by Bihar, Chandigarh and Goa (2 each).

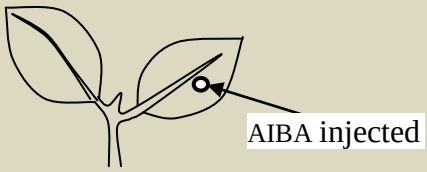


Activities during the last six months!!

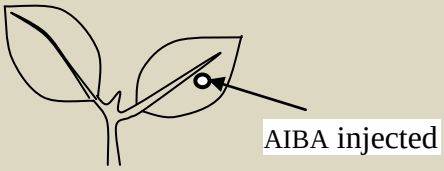
- **Biology Olympiad Exposure Camp for selected teachers was held from 4th – 6th September, 2013 at HBCSE**

The Indian National Biology Olympiad (INBO) theory examination (Level 2) was conducted in the month of February, 2014. The paper comprised of challenging problems that tested students' analytical skills and reasoning abilities. Two representative 'type A' questions (multiple choice with single correct answer) from the INBO question paper are discussed.

1. Cytokinins influence the movement of nutrients into leaves from other parts of the plant. This phenomenon is known as cytokinin-induced nutrient mobilization. In an experiment with cucumber seedlings, the left cotyledon of a seedling A and right of seedling B were treated with 50 mM kinetin. The [^{14}C] amino iso-butyric acid (AIBA) was injected into the right cotyledon of each of these seedlings.



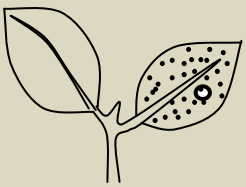
Seedling A



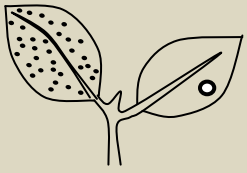
Seedling B

After a few hours the seedlings were subjected to autoradiography. What would be the results?

a.



Seedling A

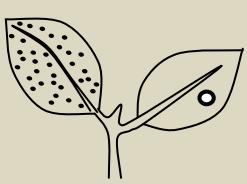


Seedling B

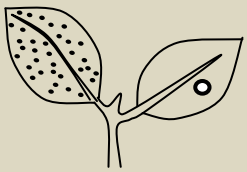
Activities during the last six months!!

- **National Initiative On Undergraduate Science (NIUS): A nurture camp was held for selected undergraduate students during 28th October to 1st November,2013**

b.

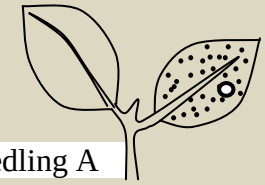


Seedling A

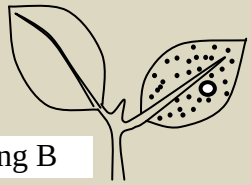


Seedling B

c.

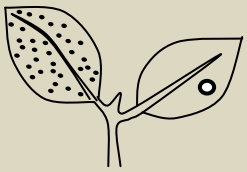


Seedling A

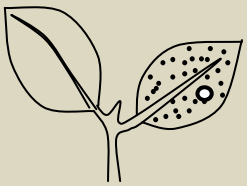


Seedling B

d.



Seedling A



Seedling B

The correct choice for this question is (d).
Answering the question involves prior knowledge as well as analytical skill. The only prior knowledge required is that Kinetin is a type of cytokinin. As it mobilizes nutrients from other parts of plants (fact given in the stem of the question), it can be easily worked out that AIBA will move from left part to right in seedling A while there will be no effect in seedling B. 34.3% students answered this question correctly.

2. When treated with proteases, the extract of which of the endocrine glands would lose its hormonal influence?

a. Ovary
b. Pineal gland
c. Pituitary gland

d. Adrenal cortex

The correct choice for this question is (c).
Answering of this question requires reasoning that hormones which are proteinaceous in nature will only lose their activity when treated with proteases. Among the four glands listed above, only pituitary gland secretes hormones that are proteins or peptides. 61.6% students answered this question correctly.

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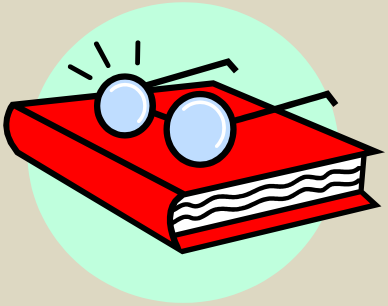
Olympiad Update!!
(September 2013 to March 2014)

- 1st Level Exam: National Standard Examination in Biology (NSEB) was held on 24th November, 2013
- 2nd Level Exam: Indian National Biology Olympiad (INBO) was held on 2nd February, 2014. Out of the 268 students who appeared for this exam, 37 have been selected to attend the Orientation Cum Selection Camp (OCSC) to be held in June, 2014.

Through The Teacher's Glasses....



Teaching Biology is Enquiring Life

Dr. Sasikumar Menon

It was cold and breezy but a pleasant winter morning. The bell in the tower above the school was still swinging gently, after it had rung. The class had just settled in with all the colorful finery of students in winter uniforms. Beyond the glass paned windows of the class room, one could see the school playground soaking itself in the morning sun. The gentle breeze blowing across the ground was slowly filling the room with freshness of the winter sun. The class was in all silence expect for the intermittent "caws" of the House Crow echoing from the nearby mango tree and the incessant short whistles of the Sunbird from the *Hibiscus* in full bloom. All in all, it was one of those perfect days for an absorbing Science class.

Oblivious of the world beyond the windows, the students were busy getting ready with their Biology notebooks, before the teacher arrived. Expectations were writ large on their faces as the teacher walked in with a rolled-up chart and long pointed stick. As the chart was being rolled down from the customary nail near the black board, the students were craning their necks to get the best view from their seats.

Lo Behold! It was a colorful picture of the Tiger butterfly with its life cycle stages of egg, larva and pupa. After the initial childish expressions of awe with "Wow"s and "Ooh"s, the class settled down to learn about *Lepidopterans* and their biology. As a surprising "natural" coincidence, a Common Crow butterfly fluttered into the class room through the window with its characteristic undulating flight. Totally unaware of the activity in the class, the unexpected entry of the winged visitor startled the girl sitting next to the window. With a loud shriek, she stood up with a fright and in the process, pushed her bench-mate out of her seat. The commotion between the two cascaded into a frenzy of excitement among other students. The startled butterfly ventured further into the class room

Dr. Sasikumar Menon has been a teacher for the past more than 30 years years. He has been teaching at the undergraduate as well as postgraduate levels. He is currently Deputy Director at the Therapeutic Drug Monitoring Laboratory, Sion, Mumbai. He has several students pursuing their Ph. D. under his mentorship. He is a wildlife and nature conservation enthusiast as well as puts in great efforts to sensitize students, teachers and decision-makers to environmental issues during his interactions with them.

triggering more commotions. The teacher aghast at the confusion, started after the butterfly armed with taut roll of papers. Swwisshhh !, Swaasshhh !! and Phlaaat !!! The butterfly was down on the desk , lying on its side, making last few feeble beats of its wing ! The teacher promptly picked up the dead butterfly, threw it outside the window and ordered the class to settle down for further studies on butterflies !

The tragedy that befell the butterfly reflects the state of teaching Biology in most of the class rooms across the country. Biology, which is supposed to be an inquisitive inquiry into life, is turned into a monotonous commentary on life forms. Our teaching methods and evaluation techniques not only sucks life out of Biology but also kills any inquisitiveness left within the students. Laboratory sessions are designed to give emphasis on the drawing and copying skills of the students. Rather than augmenting the observation skills, the laboratory journals record the artistic talent of the student. Biology is perceived as a subject best pursued by those with artistic talent on hands. Another area which a Biology teacher wrongly emphasizes is the fluency in using scientific names of living things. This further alienates the student from the subject by creating a wrong impression that Biology is all about memorizing seemingly difficult Latin names. Most of the Biology teachers either use museums inaptly or use them merely to show-case neatly labeled dead specimens. Classification of living beings is taught like a shopping list with no link to the being's existence in the biosphere, its survival strategies, its ecology and its linkage to human existence.

Biology is thus completely weaned away from everything related to human life except for the human anatomy! Instead of learning by enquiry driven techniques, information gathering techniques are preferred by teachers. In a frenzy to complete curriculum in the stipulated time, teachers tend to circumvent the process of satisfying the innate curiosity of the student about life and its existence on this planet. This leaves the student with several unanswered questions, unresolved mysteries and unsolved puzzles. The student is forced to accept life and its existence as a creation by an unknown force that cannot be fully understood.

The power to bring about the change is with all of us who are associated with teaching Biology at different levels. With advancement in technology many tools could be integrated into our teaching which provide vivid visuals of topics under discussion. Curriculum to a Biology teacher should only be a guideline and the natural inquisitiveness of the students should be the cue to tackle a topic while teaching. There is no point in teaching anatomy and

physiology of mammalian heart without touching upon more familiar topics like cardiac arrest, angiography, bypass surgery and stress test. The understanding of Ecology and interdependence is not complete if the student is unable to understand the link between protecting tigers and alleviating poverty in the country. It is a pity that most of our students still wonder why tigers and lions cannot coexist? The concept of a living being as a bundle of adaptations is very poorly understood. The subtle inter-linkage between the ecosystem, food chains and food webs with human survival is somewhere left behind. Therefore, they are inadequately sensitized to potential ecological threats and they tend to approach ecological issues with a "not in my backyard" attitude. Teaching Biology must incite curiosity among students, nurture their enquiry skills, horn their observation and problem solving skills, instill respect for all living forms and bring about an understanding about the existence of life in the universe. . . a tall order indeed!

A CLASS PROJECT : EVALUATING USE OF NEST BUILDING MATERIAL BY BULBULS

Identify several active Bulbul (*Pycnonotus cafer*) nests in your neighborhood and keep an eye on their activity without disturbing the nest and the nesting pair. The breeding season may vary regionally but usually starts from mid-summer and may extend till early winter. When the nesting is over and the fledglings are confirmed to have left the nest, gently collect the nest. Collect at least six to eight nests. Carry out following evaluation on each nest;

- First weigh the nest and record its weight (up to the second decimal).
- Separate the soft padding material and note its weight separately.
- List down the ingredients of the padding material (take help of your teacher to identify the source of the material)
- Gently, patiently and skillfully separate each of the twigs used to build the nest-cup. Do not break any of them. (if any of them breaks, use a cello-tape to join them together)
- Use a thread and measure the length of each twig used (in cm.).
- Prepare a frequency table with appropriate class interval for the twig lengths.
- For each class find the total weight of the twigs.

- Use suitable statistical technique to evaluate and represent your observations.

EVALUATION:

- Do Bulbuls show a preference to twig lengths for building the nest-cup?
- What are the preferred materials for padding?
- What are the major differences in the use of nesting materials between the nests surveyed?
- Can the differences be attributed to age of the bird / availability of nesting material / host tree or bush used / habitat where the nest is made?
- Can you correlate your observation to support the fact that nest building is a combination of both innate and learned behaviors ?
- "Nesting materials can affect carrying capacity of a bird-habitat"; comment on the basis of your evaluation.

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In the Bio Lab……..

Enzyme assays are generally easy to carry out in an undergraduate lab. Depending on the source of enzyme used, such assays can be included either in a plant sciences or an animal sciences lab. Here we have described one such assay. Although this assay is a qualitative one, it helps in clarifying concepts such as the use of controls as well as what are the experimental set-ups that one needs to include/exclude when testing a hypothesis. In fact, the hypothesis to be tested can be put before the students and they can be asked to design the experiment. The teacher can then discuss why a certain set-up needs to be included/excluded to come to definite conclusions.

Detection of the enzyme peroxidase in the given vegetable extract

Enzymes carry out vital functions in all living organisms. Conventionally, enzymes are classified according to the type of reactions catalysed by them eg. Hydrolases, ligases, electron transferring enzymes etc. The electron transferring enzymes include various oxidising enzymes. Of these, two enzymes are considered here.

1. oxidase; 2. peroxidase.

Note that both the above enzymes, namely oxidase and peroxidase oxidise the substrate. However, the source of oxygen utilised by these two enzyme-types are different. Peroxidase utilises oxygen from peroxide while oxidase uses atmospheric oxygen.

Materials Required:

1. Source of enzyme:
Freshly prepared cabbage extract – 1g cabbage is cut into fine pieces, macerated in distilled water and filtered to make the final volume 10ml.

2. Hydroquinone (also known as Quinol) solution: 0.5% w/v.
Hydroquinone is a redox indicator. Its reduced form is colourless and it turns amber coloured when oxidized.

3. Hydrogen peroxide solution: 6% v/v

4. Distilled water

To test for the presence of the enzyme peroxidise in the given cabbage extract, the protocol given in the table is followed:

Solutions	tt1	tt2	tt3	tt4
1. Veg extract (1ml)	+	+	-	+
2. Hydroquinone soln (1 ml)	+	+	+	-
3. Hydrogen peroxide soln (0.4ml)	+	-	+	+
4. Distilled water	-	0.1ml	1ml	1ml

Shake test tube no. 2 vigorously.

Fill up the colour grades obtained in the 4 test tubes in the table I below. Grading of colour is described at the bottom of the table.

Table I

Test tube number	1	2	3	4
Colour grade obtained				

COLOUR GRADES:
0 = no amber colour
1 = very faint amber colour
2 = Amber colour

---- By the Biology Olympiad Cell,
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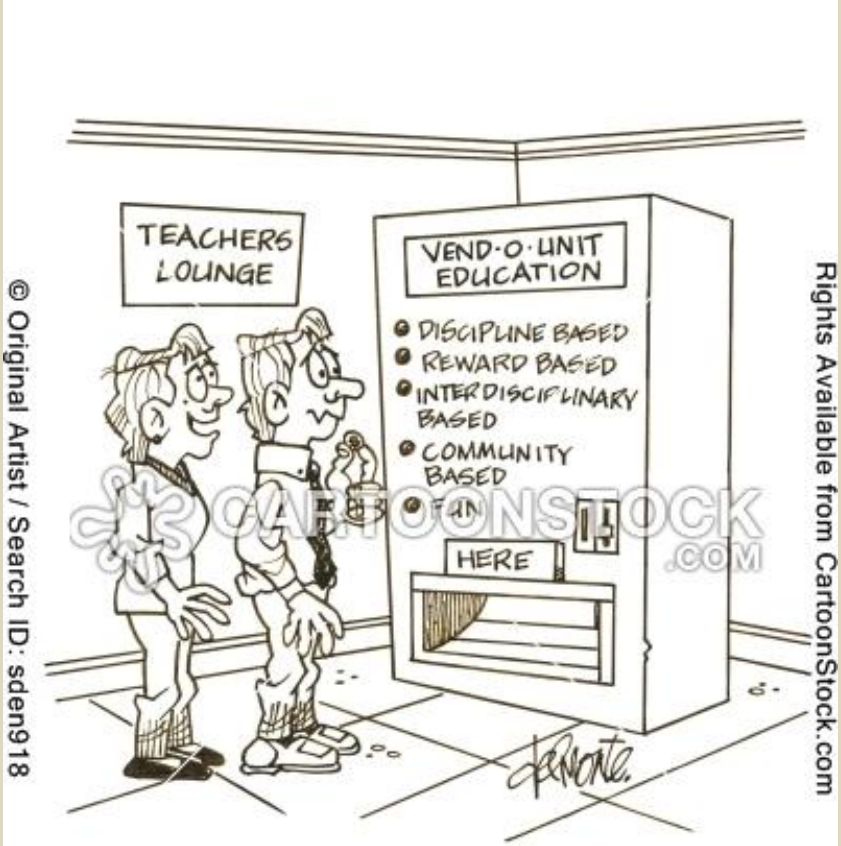

"Well, which approach shall we try this year?"

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