Prize draw for questions submitted to the 2017 UK IBO

The International Biology Olympiad is an annual competition attracting the best pre-university scientists from 70 countries. Assessment at the IBO consists of practical exams and theory papers, which aim to challenge students with cutting edge questions of the highest calibre.

The UK will be hosting the 2017 IBO and is required to write 100 questions for the theory papers. Questions will cover all fields of biology, from molecular to evolutionary science. A competition is running for the submission of question ideas.

Questions submitted by staff of UK institutions will be entered into a substantial prize draw. Any contributed questions providing ideas used in the final papers will be entered for a draw of **£200**, 2 x **£100** and 3 x **£50** prizes. *All* other questions submitted will be entered into a draw of **£50**, 2 x **£20** and 3 x **£10** prizes.

As a power-house in Life Sciences, we are keen to include as much cutting edge UK science as possible in these papers. The final paper will cite the institution providing each question, making this a valuable opportunity to show off your department to the brightest and best young scientists.

Questions must conform to the requirements of the IBO. Each *must* consist of a short-stem, which ideally favours diagrams, pictures and graphs over text. Four short multiple true/false options, which may include calculation, matching or evaluation, will be scored. See over for recent examples (from IBO 2013). Questions *must not* rely on simple factual recall, or rely on substantial amounts of prior knowledge. Ideal questions require data interpretation, problem solving and evaluation.

Submitted questions must include:

1. The stem
2. Four true or false statements
3. A sketch of any figures
4. References (unless unpublished)
5. A brief description of the logic behind the solution of each statement

Your contact details and institution should also be provided.

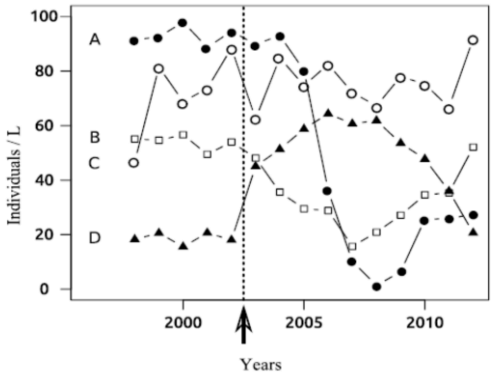
Submitted questions should be kept private to the submitting author. Furthermore, questions will be evaluated for eligibility, and modified to ensure adherence to a common standard before use, by a reviewing panel. Questions submitted *promptly* will be prioritised for review and inclusion in the finalised papers. Last date for submission is 01/10/2016.

Questions should be submitted to **ibo2017questions@gmail.com**

Dr Andrew Treharne, MBE FLS FRSB
Chair
UK Biology Competitions
UKBC is a special interest group of the Royal Society of Biology, registered charity no 277981

Previous IBO papers can be found on this website, the Swiss papers from 2013 use the format we require. Two examples from these papers are reproduced below.

In an accident in spring 2003, a large quantity of fertilizer was spilled into a small lake in Switzerland. The figure shows the abundance of four species of zooplankton measured during August for several years before and after the accident. The accident is indicated with an arrow



Indicate if each of the following statements is true of false.

A. Species C reacts on the accident with a quick decline in population density.

B. The fertilizer is likely to be poisonous for species A.

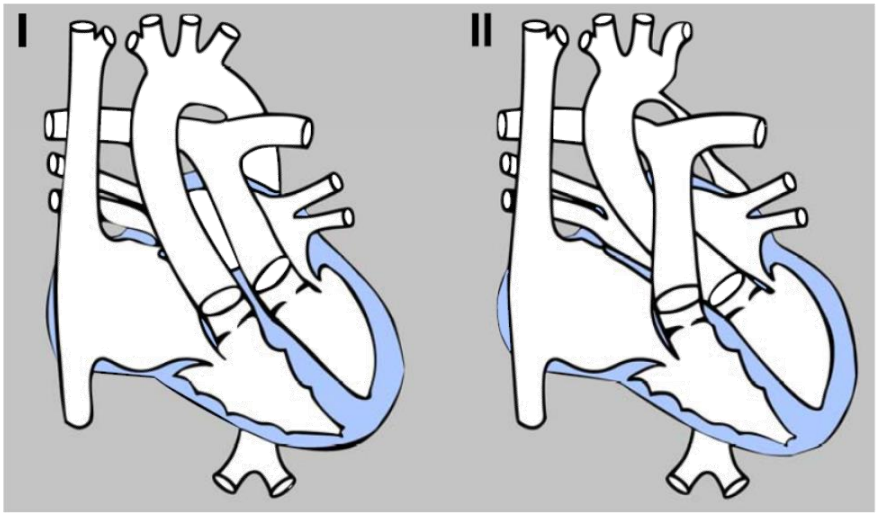
C. Species D is more useful as a bioindicator than is species B or C.

D. The relative species densities in the community are re-established within ten years of the accident.

A. False **B.** False **C.** True **D.** False

Original commentary
Correct answers
A *false*
The decline in density of species C after the accident is in the range of its normal annual fluctuation. A causal relation with the accident is very unlikely.
B *false*
Zooplankton has short generation times. If the fertilizer itself were poisonous, the effect would be a drastic reduction already within the first two years after the accident.
C *true*
After the accident, species A and D show drastic and stable shifts in population densities. Those shifts are much bigger than the stochastic fluctuation before and some years after the accident and therefore seem to be reliable. The shift in population density of species B is much smaller. Species C does not seem to react at all.
D *false*
After 10 years, species is likely to still have a much smaller density than before the accident. During the years 7-9 after the accident, no significant increase in population density happened.

The following schematics illustrate two severe congenital heart malformations occasionally found in newborns.



Indicate if each of the following statements is true or false.

A. In Malformation I, the oxygen saturation is higher in the pulmonary artery than in the carotid artery.

B. Surgically swapping the aorta and the pulmonary artery in the case of Malformation I restores proper blood circulation.

C. In Malformation II, the blood pressure in the carotid artery is increased compared to healthy individuals.

D. Surgically swapping the *venae cavae* and the pulmonary vein in the case of Malformation II restores proper blood circulation.

A. True **B.** True **C.** True **D.** False

Original commentary
Note
In the heart Malformation I, the aorta comes out of the right ventricle (instead of the left one) and the pulmonary artery out of the left ventricle (instead of the right one). In Malformation II, the aorta is narrowed.

Correct answers
A *true*
This is true because there is no connection between the pulmonary blood circulation and the systemic one.
B *true*
As mentioned in the "answer note" the origins of the aorta and pulmonary artery are swapped.
C *true*
The narrowing of the isthmus of the aorta causes an increased resistance at this location leading to a reduced flow downwards the aorta which increases the blood flow in the arteriae of the upper extremities and the head/brain. The latter increases the blood pressure consecutively.
As a second mechanism the decreased blood flow in the aorta descendens/aorta abdominalis and in the flow renal arteries consecutively. As a physiological mechanism the kidney rises the circular blood pressure to try to increase the renal blood flow.
D *false*
The suggested operation does not change the patients problem. What is more it would create the same separation of the pulmonary and systemic circulation as in Malformation I.

References
Universitätsklinikum Bonn; D-Transposition der großen Arterien
Universitätsklinikum Bonn; Aortenisthmusstenose