HKDSE Biology &
Combined Science (Biology)

Report on Assessment

Ben Tsui
Manager (Biology), HKEAA

23 & 30 Nov 2012
# Program

<table>
<thead>
<tr>
<th>Time</th>
<th>23/11</th>
<th>30/11</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00-2:25</td>
<td>Mr Tsui Chi Shing</td>
<td>Mr Tsui Chi Shing</td>
</tr>
<tr>
<td>2:25-2:45</td>
<td>Mr Wong Yuk Hing</td>
<td>Mr Pak Chi On</td>
</tr>
<tr>
<td>2:45-3:05</td>
<td>Mr Chen Yau Hip</td>
<td>Mr Leung Ho Wah</td>
</tr>
<tr>
<td>3:05-3:25</td>
<td>Mr Law Siu Wing</td>
<td>Mr Sin Wai Hung</td>
</tr>
<tr>
<td>3:25-3:45</td>
<td>Mr Tong Lan San</td>
<td>Mr Tong Lan San</td>
</tr>
<tr>
<td>3:45-4:00</td>
<td>Q&amp;A</td>
<td>Q&amp;A</td>
</tr>
</tbody>
</table>
### Overview

<table>
<thead>
<tr>
<th>Paper</th>
<th>Biology</th>
<th>CS(Bio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A (MC)</td>
<td>Mean : 24 out of 36 (i.e. 67%)</td>
<td>Mean : 16 out of 24 (i.e. 67%)</td>
</tr>
<tr>
<td>1B</td>
<td>~48%</td>
<td>~43%</td>
</tr>
<tr>
<td>2</td>
<td>~40%</td>
<td>N.A.</td>
</tr>
<tr>
<td>SBA</td>
<td>~70%</td>
<td>~70%</td>
</tr>
<tr>
<td>Subject</td>
<td>~50%</td>
<td>~49%</td>
</tr>
<tr>
<td>Candidature</td>
<td>17 191</td>
<td>5 340</td>
</tr>
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</table>
Marking & Grading

<table>
<thead>
<tr>
<th>On-screen marking (OSM) panels</th>
<th>Biology</th>
<th>CS(Bio)</th>
</tr>
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<tbody>
<tr>
<td>1B-1: Q.1-5</td>
<td>1B-1: Q.1-5</td>
<td></td>
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<tr>
<td>1B-2: Q.6,7,8,9,10</td>
<td>1B-2: Q.6,7</td>
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<tr>
<td>1B-3: Q.11</td>
<td>1B-3: Q.8</td>
<td></td>
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<tr>
<td>2A: Human Physiology</td>
<td></td>
<td>---</td>
</tr>
<tr>
<td>2B: Applied Ecology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2C: Microorganisms &amp; Humans</td>
<td></td>
<td></td>
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<tr>
<td>2D: Biotechnology</td>
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</tbody>
</table>

SBA marks *stat. moderated* with both *Mean* and *SD* adjusted (outlining cases reviewed by Supervisors)
Marking & Grading

- Expert Panel (Examiners, 5 ~ 6 persons) determine level boundaries/cut scores by making reference to
  - Level descriptors
  - Group Ability Indicator (GAI)
  - Viewing candidate samples
- CS(Bio) graded by common items and viewing candidate samples
- Endorsement by Senior Management/Exam Board
## Results

### Biology

<table>
<thead>
<tr>
<th>Level</th>
<th>5**</th>
<th>5*+</th>
<th>5+</th>
<th>4+</th>
<th>3+</th>
<th>2+</th>
<th>1+</th>
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</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>1.6%</td>
<td>6.1%</td>
<td>15.6%</td>
<td>40.7%</td>
<td>70.0%</td>
<td>88.8%</td>
<td>96.5%</td>
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### CS(Bio)

<table>
<thead>
<tr>
<th>Level</th>
<th>5**</th>
<th>5*+</th>
<th>5+</th>
<th>4+</th>
<th>3+</th>
<th>2+</th>
<th>1+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>1%</td>
<td>3.8%</td>
<td>9.4%</td>
<td>29.1%</td>
<td>59.9%</td>
<td>83.8%</td>
<td>94.8%</td>
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## DSE VS AL

<table>
<thead>
<tr>
<th>Number of candidates attaining top levels for Biology</th>
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<tbody>
<tr>
<td><strong>DSE 5</strong> **</td>
</tr>
<tr>
<td>DSE 5*</td>
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<tr>
<td>DSE 5</td>
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## Paper 1A

### Biology (36 MC)

<table>
<thead>
<tr>
<th>% of cand. correct</th>
<th>&gt;70%</th>
<th>50%-70%</th>
<th>&lt;50%</th>
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</thead>
<tbody>
<tr>
<td>No. of Q</td>
<td>18</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>

### CS (Bio) (24 MC)

<table>
<thead>
<tr>
<th>% of cand. correct</th>
<th>&gt;70%</th>
<th>50%-70%</th>
<th>&lt;50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Q</td>
<td>10</td>
<td>11</td>
<td>3</td>
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</table>
# Paper 1B

## Biology

<table>
<thead>
<tr>
<th>% mark</th>
<th>&gt;60%</th>
<th>60%-40%</th>
<th>&lt;40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Qs</td>
<td>1</td>
<td>6</td>
<td>4</td>
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</tbody>
</table>

**Easy**  
**Difficult**

## CS (Bio) (% mark)

<table>
<thead>
<tr>
<th>% mark</th>
<th>&gt;60%</th>
<th>60%-40%</th>
<th>&lt;40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Qs</td>
<td>1</td>
<td>3</td>
<td>4</td>
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</table>

**Easy**  
**Difficult**
# Paper 2

Mean mark of the questions

<table>
<thead>
<tr>
<th>Elective</th>
<th>Popularity</th>
<th>Compare with paper mean</th>
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<tbody>
<tr>
<td>Human Physiology</td>
<td>95%</td>
<td>&gt; 3%</td>
</tr>
<tr>
<td>Applied Ecology</td>
<td>62%</td>
<td>&lt; 6%</td>
</tr>
<tr>
<td>Microorganisms &amp; Humans</td>
<td>11%</td>
<td>&lt; 9%</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>32%</td>
<td>&gt; 1.5%</td>
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</table>

Greatest mean difference ~ 2 marks
## Performance: Bio VS CS(Bio)

<table>
<thead>
<tr>
<th>Common items</th>
<th>Performance</th>
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</thead>
<tbody>
<tr>
<td><strong>Bio</strong></td>
<td><strong>CS(Bio)</strong></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
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<tr>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>
Observations

- Candidates were generally able to answer questions that require the recall of basic biological knowledge.
- Candidates tended to regurgitate textbook materials, as a result, their performance in questions that require the integration of biological concepts and the application of knowledge in daily life scenarios was poor.
- For data analysis, candidates were generally able to describe the data set but they often failed to recognize meaningful trends and patterns and weak in providing explanations.
- Essay questions or parts that require description were effective in discriminating the wide ability range of candidates. Not many could present precise and concise answers.
### 2013 VS 2012 candidatures

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
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</thead>
<tbody>
<tr>
<td><strong>Biology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>8 915</td>
<td>9 344</td>
</tr>
<tr>
<td>C</td>
<td>8 558</td>
<td>8 982</td>
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<tr>
<td>Total</td>
<td>17 473</td>
<td>18 326</td>
</tr>
<tr>
<td><strong>CS(Bio)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>2 934</td>
<td>2 348</td>
</tr>
<tr>
<td>C</td>
<td>2 522</td>
<td>2 188</td>
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<tr>
<td>Total</td>
<td>5 456</td>
<td>4 536</td>
</tr>
<tr>
<td><strong>Bio + CS(Bio)</strong></td>
<td>22 929</td>
<td>22 862</td>
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</table>
2013 Exam

- Exam Date: 24/4/2013
- Markers Meeting: 1/5/2013 AM (Tentative)
- OSM Training: 4/5/2013 AM
- Release of Results: 15/7/2013
- Remarking: 21/7/2013-1/8/2013 (Tentative)
THANK YOU
The samples used in the following PowerPoint presentations are just part of the scripts from candidates awarded with different levels for illustration of the strengths and weaknesses of the candidates. The level awarded are based on the overall performance of a candidate rather than his/her performance in some questions.
The graph below shows the oxygen production rate and carbon dioxide production rate of a local plant on a summer day:

Key:
- Dashed line: Oxygen
- Solid line: Carbon dioxide
(c) The area below the line showing the oxygen production rate is usually greater than the area below the line showing the carbon dioxide production rate. Explain the importance of this observation.

It indicates that the net oxygen produced by plant is greater than that of carbon dioxide. This provides oxygen to other organisms for aerobic respiration for energy. Since other organisms cannot produce oxygen and have a net release of carbon dioxide, the net production of oxygen by plant is essential in maintaining the balance of composition of oxygen and carbon dioxide in atmosphere.
• Only some candidates related the areas to food production and food consumption in the plant.
Mitosis and meiosis are important processes that ensure the continuity of life. Contrast the two processes and state the significance of their differences. (11 marks)

Mitosis is a cell division for growth, repair and asexual reproduction. The daughter cells are genetically identical to the mother cell. During the cell division, the genetic materials will be copied and the chromosome will form sister chromatids which carrying the same genetic materials. There are a total of five steps for cell division including prophase, interphase, anaphase, metaphase and telophase. The sister chromatids will be separated in metaphase as they are carrying the same DNA. The cells divided is also genetically identical. Also, the cell divided is haploid in mitotic cell division.
Some candidates gave lengthy separate descriptions of the various events that take place during mitosis and meiosis instead of concisely pointing out the differences between the two processes.
(b) Describe how these cells contribute to the support of the plant. (4 marks)

Cell P is xylem of the plant. It transports water and minerals to the plant. It has a rigid cell wall to provide mechanical support to the plant. Cell Q is the phloem phloem. It transports carbohydrates, proteins and lipids to the plant through sieve plates and sieve pores.
Some candidates simply gave the function of the phloem and xylem in transport rather than support of plants
Candidates’ Performance in Marking Panel 2

Questions 6-10
Question 6 (a)

- Wrong calculation method more commonly used in lower level

**Level 3**

In the space below, calculate the percentage decrease in energy content from unicellular phytoplankton to krill.

\[
\frac{100000000 - 1000000}{100000000} \times 100\% = 99.2\% 
\]

**Level 2**

在以下的空位，計算由單細胞浮游植物到磷蝦，在能量含量方面下降的百分率。

\[
\frac{1}{5} \times 100\% = 20\% 
\]
Question 6 (c)

- Candidates of higher level can provide more details in their explanation

*Level 5 (different approaches, knowledge well-integrated)*

The value would be even greater because most of the energy in trees is stored in form of lignified cell wall or cellulose which is indigestible to caterpillar. A smaller amount of energy is available to incorporate into caterpillar’s trophic level.

 geç (a) 動，因為樹木產有其能量含量包括葉肉細胞，樹幹和其他能量高食物，相反而難以消化，相反近端及末端消化大比例細節能源，因此近食物鏈比較高的能量下

譴責為
Question 6 (c)

- Candidates in lower level did not aware that the situation is an atypical case

   Level 3 (the typical case was adopted)
   The percentage decrease will be smaller as it has one trophic levels less than the food chain in the diagram, less energy is loss.

   Level 2 (simply treated it as pyramids of number)
Question 7 (a)

- Candidates of higher level can deduce from data clearly and logically
  Level 5 (data from both graphs were quoted and compared with logical deduction made)

- It is insulin dependent diabetes. After drinking the glucose solution, a high blood glucose level is observed. However, the blood insulin level of Tom remains much lower level than a healthy person. It shows that Tom’s pancreas fail to produce sufficient insulin into blood and lead to diabetes.
Question 7 (a)

- Candidates of higher level can deduce from data clearly and logically
  
  Level 4 (Showed good understanding of type I diabetes but did not show clear deduction from data set)

  Tom suffers from type I diabetes, which is insulin-dependent diabetes. Healthy person should have a fast decrease of blood glucose level after intake of glucose solution due to an increase in blood insulin to convert glucose to glycogen for storage. However, Tom has very little insulin produced when comparing to normal people, his blood glucose level thus decreases very slowly due to insufficient of insulin.
Question 7 (a)

- Candidates of lower level ignore the requirement of the questions

*Level 1 (gave simple descriptions of graph only, no deduction made)*

- Low sugar corn causes great diabetes effects. It is because as we can see the graph, the blood glucose level of corn increases after taking a large volume of glucose but decreases rapidly in time intervals, and the insulin level does not show any changes.

- Healthy person glucose level increases and keep constant after a certain time interval, so as the insulin level.
Question 8 (a)

- Candidates of higher levels can tackle unfamiliar situation

*Level 4*

(a) **參考滲透作用，解釋為什麼在乾燥後甜玉米的玉米粒變成濕皮，但是多澱粉玉米的玉米粒則仍然光滑。**

澱粉粒的分子大，不能溶解水，因此不會影響滲透作用，所以當玉米的水勢下降，而玉米細胞的水勢便透過滲透作用淨移動至含糖份的溶液中，因此，玉米細胞失水，出現質壁分離，細胞變得軟縮，因此幹皮拉變。
Question 8 (a)

- Common weaknesses
  - Failed to relate the answer to the process of seed development
  - Some gave correct effect of water potentials, but when the direction of water movement was wrong
  - Thought that sugar molecules could move out
  - Thought that the process of drying up was due to osmosis as well, no mention of evaporation
Question 8 (b)

- Candidates of higher levels showed an attempt to use the law of independent assortment to account for the results.

**Level 5**

The corn would show character of purple and smooth, purple and wrinkled, yellow and smooth, and yellow and wrinkled in a ratio approximately of 1:1:1:1. Thus, F₁ can produce Gamete with alleles of four different combinations of character as mentioned under, while the pure-bred yellow and wrinkled kernels can only produce Gamete with alleles of yellow and wrinkled character. The offspring produced will be in such ratio under large population. Each pair of...

According to law of independent assortment, the separation of alleles to different gamete is independent to any other pair.
Question 8 (b)

- Common weaknesses
  - Failed to recognize the emergence of new phenotypes (yellow & smooth, purple & wrinkle) in the offspring
  - Failed to account for the production of 4 types of gametes from F1 parents due to independent assortment
  - Many simply recited the ratios of dihybrid crosses, e.g. 9:3:3:1
Question 9 (a) & (b)

- Candidates of higher levels showed good understanding of the respiratory pathway and its dynamics
- They can identify crucial pieces of information from the data to complete their answers
Question 9 (a) & (b)

**Level 5 (different perspectives were used to explain part (a), and the dynamic natures of the cycle was clearly understood in (b))**

(a) Suggest the key process that is inhibited by drug X. Explain your answer. (3 marks)

Drug X mainly inhibit the *glycolysis* because the percentage of pyruvate is low under the effect of X. Pyruvate is the main end product of *glycolysis*.

The inhibition of this link reaction thus further slow down Krebs cycle and oxidative phosphorylation and lead to low ATP and NADH level.

(b) Suggest the key process that is inhibited by drug Y. Explain why there is an accumulation of pyruvate in the muscle cells after treatment with drug Y. (3 marks)

Drug Y mainly inhibit the *Krebs cycle*. Since the rate of *Krebs cycle* is slow, the pyruvate is incorporated into the cycle in a slower rate. While pyruvate is continuously produced from *glycolysis*, Pyruvate level thus slowly accumulate.
Question 9 (a) & (b)

- Common weaknesses
  - Failed to recognize the data that lead to valid deduction
  - Some went into the details of each steps, ignore the highlight of key processes in the question stem
  - Some regurgitated the knowledge about competitive inhibition and non-competitive inhibition, which were totally irrelevant
Question 10 (c)

- Common weaknesses
  - Did not understand what is “in vitro”
  - Failed to recognize the necessity of adding lipase in their designs
  - Failed to provide quantitative measurement in their designs
HKDSE Biology Paper 2

Paper 2 consisted of four sections:

- Section A on ‘Human Physiology: Regulation and Control’,
- Section B on ‘Applied Ecology’,
- Section C on ‘Microorganisms and Humans’
- Section D on ‘Biotechnology’.

Candidates were required to attempt all questions in two of the sections.
The performance in part (a) was satisfactory. Some candidates failed to give the general patterns in part (a)(i), however. Candidates chose the correct sports drink based on the urine output but most of them missed out fluid balance in their answers for part (a)(iii).

The performance in part (b) was satisfactory. Quite a number of candidates missed out breathing as one of the ways of losing water while some mixed up respiration with breathing in part (b)(i). Most candidates were well aware of the heat loss problem associated with the given conditions but they often missed out the fact that heat was produced during exercise in part (b)(ii). Some candidates were not aware of the importance of restoring the blood pH to normal in part (b) (iii).
<table>
<thead>
<tr>
<th>Section</th>
<th>Popularity %</th>
<th>Performance in General</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>11</td>
<td>The performance in part (a) was <strong>poor</strong>. Most candidates answered part (a)(i) correctly. In part (a)(ii), many candidates wrongly thought that the <strong>growth of viruses</strong> was similar to that of other microorganisms. As a result, they mentioned that the slow growth rate in Phase I was due to the fact that it took time for viruses to adapt to the new environment. Many candidates were not aware that <strong>viruses are non-living things</strong> and failed to use the term ‘disintegrate’ in their answers in part (a)(iii). In part (a)(iv), many candidates were <strong>not aware that viral infection was species specific</strong> and therefore failed to give a correct explanation. In part (a)(v), many candidates <strong>failed to evaluate the methods in relation to biological knowledge</strong>. Instead, they mentioned the costs or equipment in their answers.</td>
</tr>
<tr>
<td>Section</td>
<td>Popularity %</td>
<td>Performance in General</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>C</td>
<td>11</td>
<td>The performance in part (b) was unsatisfactory. Some candidates simply gave the name of the equipment for determining the population size of bacteria rather than the methods in part (b)(i). Many candidates focused on the difference between the growth rates in part (b)(ii) but failed to explain why there was such a difference. Some candidates wrongly thought that cell walls can control the water movement. Most candidates answered part (b)(iii) but they often missed the point about the stationary phase in their answers.</td>
</tr>
</tbody>
</table>
**General comments and recommendations:**

The performance in this paper showed that candidates were generally able to answer questions that required the recall of basic biological knowledge. Many candidates relied too heavily on textbooks and tended to regurgitate textbook materials when answering the questions, however. Hence, their performance in questions that required the integration of biological concepts and the application of knowledge in daily life scenarios was poor. This was also reflected in the questions related to the interpretation of photographs, data and graphs. Most candidates successfully described the data set but they failed to recognise meaningful general trends and patterns from the data. Some candidates failed to provide explanations to address the trends or changes shown in the graph. They simply reproduced facts on related topics with little selection or adaptation.

**Spelling mistakes were common.** Some candidates did not use biological terms correctly; they tended to use layman’s terms, which did not have the same, precise meaning.
MS for Q1 (a)(i) Describe the general patterns of urine output after consuming drinks with different sodium concentrations

- regardless of the sodium concentration of the drinks, the greatest urine output occurred over the 1 hr period (1)
- the urine output then dropped continuously (1) until the 5th hour
  the urine outputs became more or less the same (1)
- the urine outputs of the participants who consumed drinks with higher sodium content are usually smaller than those participants who consumed drinks with lower sodium content (1), or vice versa
Level 5 Q1(a)(i) with general trend and pattern from graph

Question 1

(a)(i) The general pattern of urine output of 3 different sodium concentration decreases throughout 6 hours. The rate of decrease of 0 mmol/L sodium is the greatest between 2 to 3 hour. Besides, the volume of urine produced is the greatest after drinking 0 mmol/L sodium than 50 mmol/L sodium and least for 100 mmol/L sodium. For 50 mmol/L sodium and 100 mmol/L sodium, the rate of decrease of urine volume decreases greatly at 1 to 2 hour. Three of them finally reach 50 ml level around 5 to 6 hour.
Level 5 Q1(a)(i) with general trend and pattern from graph

(a)(i) 飲用钠浓度较低时，尿液中钠含量会随时间延长而逐渐增多，由图中显示，0 mmol/L钠的尿容积最高，接着为50 mmol/L钠，随后是100 mmol/L钠。随著时间，尿排泄量便会不断减少，直至到达同一水平。
The higher amount of sodium contained in the sports drink, the less volume of urine is collected. The person with the sports drink without sodium. Then, the person consuming the sports drink with the amount of 50 mmol/L of sodium has less volume of urine and finally, the one who consumed 100 mmol/L of sodium has the least volume of urine.
Level 4 Q1(a)(i) with general trend and pattern from graph

01. 飲用運動飲料，尿液首先一小時後排出，並於後的4小時（2-5小時），平均的尿液積持續下降，直至第6小時，飲用不同鈉濃度的多士者平均尿液體積降至相約。 (下降的幅度不斷減少)
Level 1 Q1 (a)(i) with general trend and pattern from graph

Question 1

(a)(i) The general patterns of the urine output after consuming drinks with different sodium concentrations was decreasing.
(ii) after drinking the sports drink with 0 mmol/L sodium, the hypothalamus detected an increased in the water potential of the blood (1)

- the pituitary gland release less ADH into the blood circulation (1)

- as a result, the wall of the collecting ducts of the kidney tubule becomes less permeable to water (1)

- thus, a smaller proportion of water is reabsorbed (1) and hence, the volume of urine output increases
(ii) 0 mmol/L sodium sport drink has high water potential. After drinking, our blood water potential increases. Osmoregulatory center in hypothalamus detect such changes and inhibit the posterior pituitary gland to secrete anti-diuretic hormone. It reduces the permeability of collecting duct and distal convoluted tubule to water. Therefore, smaller proportion of water is reabsorbed, the urine output is high.
(ii) 飲用0 mmol/L 鈉的人中，由於水中沒有鈉，經腸道吸收入血後，水腫升幅較50和100 mmol/L鈉高，故血腫壓力測到後，指示腎皮質遠端可保持的抗利尿激素，其尿管管壁對水透性較小，重吸收到的水分，產生大量稀釋尿液，排出量高，使血腫壓力下降。
(ii) They lose more water than reabsorbing it. Due to low concentration of sodium, the body reabsorbs less water. Sodium helps stimulate the secretion of antidiuretic hormone which increases the permeability of the collecting tube in the kidney.
Level 2 Q1 (a)(ii)

ii) As the sports drink with 0 mmol/L sodium is not same in structure as the fluid of body, it leads the net body fluid balance fall below the normal. However, the increase in drinking large amount of drink leads less antidiuretic hormone produce. Less the permeability of collecting ducts leads to high urine output.

Level 1 Q1 (a)(ii)

(iii)
MS for Q1 (b)(ii) In the study described in (a), the participants performed exercise in a room maintained at 34 °C and 60-70% relative humidity.

If the temperature and relative humidity had been set higher, it would be dangerous to the participants. Explain why this is so.

heat is continuously produced during exercise (1) but the participants would experience difficulty in temperature regulation / may suffer from heat stroke (1)/overheating (1) because

• heat could not be lost effectively through evaporation of sweat when the humidity is too high (1)

• heat lost through convection/radiation is hindered/ body may gain heat from the environment (1) when the environmental temperature is high/higher than the body temperature
(ii) If the temperature set is higher than the body temperature i.e. above 37°C, our body cannot lose heat through conduction, convection and radiation. The athlete may even gain heat from the surroundings. Sweating is the only means to lose heat. However, when the relative humidity is high, the diffusion gradient of water vapour decreases because the air is saturated with water. The evaporation of water from our skin is slow, less heat can be taken away. As during exercise, the participant's body temperature increases due to strong muscle contraction etc. In such conditions, heat cannot be taken away and the athletes cannot regulate its body temperature, they may be at risk of heatstroke.
Level 5 Q1 (b)(ii)

(ii) 由於温度高下，皮膚無法纖小動脈舒，血液流經皮膚表面，熱經輻射、對流、傳導散失。同時試度高下，汗亦不能藉蒸發把熱從皮膚帶走，故冷卻效應。

溫體會不斷上升，影響酶活性（酶高溫下變性），影響身體機能，造成中暑，引起昏迷等症狀
b ii) They can get heat stroke since they are doing exercise and the temperature is set high. When they sweat, they can't breath properly because of the humidity. Plus, their sweat can't evaporate too. Because of the high humidity. So, the heat in their body gets trapped and goes higher resulting heat stroke.
Level 1 Q1 (b)(ii)

(ii) It's because it would be too hot and sweaty for them making them lose more water from their body as the humidity was all ready 60-70% which is water loss also quite high. Also if not more but then they would have lost the water from their body too fast.
MS for Q1 (b)(iii). After the exercise, the breathing rate of the participants maintained at a fairly high level. Explain the significance of this.

(iii) • more oxygen is taken in (1)
     • to breakdown lactic acid in the liver/provide additional amount of energy for converting lactic acid in blood to glycogen (1)
     • so as to restore blood pH to normal (1)
(iii) After exercise, the breathing rate is still high because it has to pay oxygen debt. Body are still very active to remove lactic acid. High breathing rate can bring more oxygen and remove carbon dioxide effectively so as to remove lactic acid for storage or release energy effectively.

(gii) 由于运动后，参与者的呼吸速率高，有效肺泡气交换，增加氧扩散入血。额外的气体使细胞分解乳酸，因运动时肌肉细胞进行缺氧呼吸产生乳酸积累，乳酸有毒必须分解。同时，乳酸会影响血 pH 值，影响酶活性。此为氧债。
b(iii) Because of the exercise and the humidity in the room, their bodies need more oxygen for respiration. Since it's humid, there's less oxygen in the air and when doing exercise, our body cells give out more carbon dioxide. So, in order to get rid of the carbon dioxide and intake more oxygen, their rate of breathing should increase.
Level 1 Q1 (b)(iii) 

(iii) It's because energy from our body is taken and as so oxygen is also taken so to regulate the supply of blood and oxygen to the body. The blood pressure increases and as oxygen is not enough people tend to deep breath or breath fast. That is why the breathing rate of the participants remained at a fairly high level.

Level 2 Q1 (b)(iii) 

(iii) 在运动后，由于参加者在运动时，须加快呼吸的速率，以进行气体交换，向身体的各部分提供氧气，以供应能量。故此，呼吸速率会较快。加上，运动后运动后，在体内还有二氧化碳的不力存在，为了保持血液中二氧化碳和氧气含量的水平，在运动后，呼气吸气速率还是会维持在较高水平，使酶能在较高的碱化值下运作。
Level 5 Q1 some comments

Comments

The candidate’s response shows very good knowledge and understanding of how water content is regulated in the body. He/she can apply the knowledge to give a correct description and interpretation of the data given. The action of ADH is effectively communicated in a logical and coherent way with accurate use of scientific terminology.

Level 3 Q1 some comments

Comments

The candidate shows good knowledge and understanding of oxygen debt and basic understanding of temperature regulation. He/she is aware of the fact that heat is produced during exercise but fails to account for poor heat loss given the conditions in the questions.

Level 1 Q3 some comments

Comments

The candidate can recall elementary facts about bacteria growth but fails to provide explanations for the unfamiliar situations given in the questions.
Level 4 Q1 some comments

評語
考生對體溫的調節及氧債等課題有充分的認識和理解，並能運用相關的知識解釋試題描述的情況。答案清晰及有條理，惟解釋有欠完整。

Level 2-3 Q1 some comments

評語
考生對人體水分調節有一定的認識和理解，並能應用相關的知識來分析試題的資料，給予簡單的描述，惟考生未能說明當中涉及的生理反應。
Paper 2

Question 3
Q3(a) (ii) With reference to the life cycle of virus, explain the difference in the virus population in Phase I and Phase II

- during Phase I, the virus infects the bacteria and takes over its cellular mechanism for replication/virus needs certain amount of time to encounter and attach to the host (1)
- as a result, there is not much change/remain low in the population size of virus (1)
- during Phase II, the bacteria burst and release the viruses (1),
- leading to a rapid / exponential increase in the viral population (1)
Since a virus needs a host to multiply, it doesn't increase in number unless it finds a host. In Phase I, we can see that the population size of bacteria is greater than that of the virus. Since the virus can take the bacteria as a host to multiply itself, in Phase II, the number of virus increased a lot.

3a(ii) 由於階段工時，病毒需要偵測宿主，適應新介質，為生長作準備。所以病毒種群大小少，而階段工，環境變得多適和營養素充足，所以病毒的種群大小以指數生長，直至生長速率等於死亡速率，到達穩定期。
Level 1 Q3 (a)(ii)

(ii) As in phase 1 the virus is starting to give out to new viruses therefore not many virus are there but in Phase II new and old viruses are there and of which they are able to produce more viruses. Also the food there for them are enough for all the virus there.
Q3(b) (ii) With reference to the function of the cell walls, explain the different growth rates observed for the two mutant cultures, B and C.

- In culture C, the water potential of the culture solution is higher than that of the mutant cells (1), water moves into the mutant cells (1).
- Without a cell wall, the mutant cells cannot withstand the increase in cell volume and burst (1).
- Whereas in culture B, the water potential is the same as that of the mutant cells, the mutant cells does not suffer from osmotic lysis (1).
bii) Since the mutant ones are unable to produce a cell wall, the ones in culture B in an isotonic solution would have a higher population than culture C which is hypotonic. In culture C due to high water potential in the medium, the water moves in the bacteria and therefore bursting the cell due to osmosis since they don't have a cell walls to maintain their shape. This explains their low population.

3b(ii) 由於突變體的培育（不能製造細胞壁，而且處於低濃溶液中），所以水分子會藉滲透作用進入突變體 C。所以突變體 C 會因爆裂而死亡。而突變體 B 處於等滲溶液中，所以水分子沒有淨移動進出突變體 B，所以突變體 B 的種群大小多於突變體 C.
Q3(b) (iii) What would happen to the population size of the wild type A if the culture at 400th minute was mixed with an equal volume of the fresh culture medium? Explain your answer.

- the addition of fresh culture solution increases the food availability to the wild type bacteria (1)
- at the same time, it dilutes the toxic waste present in the original culture (1)
- as a result, the bacterial population will increase (1) after a certain period of time, the population size becomes stationary (1) due to the depletion of nutrient and accumulation of waste
Level 1 Q3 (b)(iii)

The population will increase to live in more and more situations. (iii) The supplements for the bacteria could be more plentiful.

Level 3 Q3 (b)(iii)

Strain (i) wild type (A) has a large population, and wild type (A) cells would be more resistant to more supplements. Therefore, wild type (A) would have a higher population.
Thank you
Paper 2
Section B & D
Comments on Students’ Performance
Paper 2 Section B
Part (a)(i)

» Not aware of secondary succession taken place from Stage II to Stage III
» Many irrelevant answers
Paper 2 Section B
Part (a)(i)

» Level 5

2(a)i) 发生次生演替，由於棄置土地有植物根部和种子，故
当环境适合时，种子萌发及营养繁殖器官萌芽，使植物长出，
及及吸引动物。植物和动物死亡时，分解作用，使土壤層变厚，
有更多植物生长，以及動物棲息。有機物积聚，植被重建。

» Level 2

(a) i) The abandoned land was added with some organic fertilizers
to enhance the nutrients of the soil. The organic fertilizers
break down and “dissolve in the soil for accumulating the
nutrients for the further use.
Paper 2 Section B
Part (a)(ii)

» Some students did not give the difference in the annual runoff between Stage I and Stage III

□ Did not understand the requirement of the question

» Could not give correct agricultural activities as explanation (e.g. deforestation, monoculture)
Level 5

(正的水分流失比工低。因为)

(ii) A 階段工時，表土裸露造成土壤侵蝕，故泥土流失水分量很高。另外，是大規模種植作物，在採割農作物時，會中斷物質循環，植物不會因死亡而把養分釋回泥土，泥土腐殖质下降，黏固土粒能力低，水分易流失。相反段工有植物覆蓋，沒受農業活動乾擾，植物自然生長，樹木能抓根緊泥土。同時工的植物死亡後能在泥土被分解者分解，泥土腐殖質可補充，水分流失減低。
In the stage I, it is adopt deforestation to remove the trees on the land by burning. The deforestation still keep the nutrients in the soil for the use of growing crop.

77) 轮回生之
　小清生之

以上两种农业活动需要大量土壤的肥力，促使农民继续耕作者。但由于经过过渡阶段，因此阶段三
Some mixed up minerals and their respective functions

Some answered “nitrates”, but wrongly stated “for protein synthesis” as explanation

Level 4

The soil nutrient, magnesium is lacking. Magnesium is important in plants for formation of chlorophyll. If magnesium is lacking, chlorophyll can be formed, causing the leaves to change from green to yellow.
Most could point out “leaching”
Not many could also point out “soil erosion”
Most could point out that the AR site has a higher no. of species than sandy seabed area.

Many could not point out correcting the patterns of the data:

- AR site: increased from year 1 to 8, remained constant from year 8 to year 10
- Sandy bed: remained constant from year 1 to 10
(b) i. At the beginning, the number of fish species in both AR site and sandy seabed area are the same. However, the number of fish species in AR site increases gradually while the number of fish species in the sandy seabed area remains constant.

(b) ii. The number of fish species going ups and downs flucturatively and there only a few number of species are being increased in sandy seabed area in 10 years time. Whereas the number of fish species in the AR site continue to increase in 10 years time.
Good understanding on the role of AR as site of shelter and breeding

Only a few could realize that AR can provide different habitats and increase in biodiversity can attract new species to AR site

Some answered the increased in no. of species is due to more algae, crabs and shrimps living there
Paper 2 Section B
Part (b)(ii)

» Level 5

(ii) AR是人工魚礁，有人類良好管理規劃，確保魚礁適合AR的魚繁殖和棲息。AR地的魚有良好環境和食物等資源，繁殖更多及種數目增加。物種數增加吸引捕食者來AR地點，使魚類物種數目也增加。由此AR使AR地的魚種增加。
Paper 2 Section B
Part (b)(ii)

» Level 3

7) By placing ARs in the surrounding areas, fish are attracted to ARs and AR areas. Due to the AR, it is provided a stable environment for fish to thrive.

» Level 2

ii) It is because the AR can provide a shelter for the fish that is not easily to destroy. Meanwhile, there are nutrients provided to the fish that attract them to stay at the AR sites.
Paper 2 Section B
Part (b)(iii)

» Quite a lot could state that the material should be durable and non-toxic

» Many used inappropriate terms, e.g.:
  - non-biodegradable
  - non-chemical
  - clean
  - suitable for fish to live (vague)
Quite well-answered

Some did not state that **same** restriction enzyme should be used in cutting the DNA fragment and the plasmid

Some wrote “DNA polymerase” instead of “DNA ligase”
(ii)(1) Because not all plasmids have taken up the desired DNA fragment since the ligation is a random process. Because the plasmid may rejoin because the sticky end of the plasmid are complementary to each other. Hence, not all Agrobacteria contain the plasmid with the DNA fragment and hence, not all treated crop cells have.
Some only recited what they memorized from their textbooks, without realizing that the cells that should be screened should be crop cells instead of bacteria.

Some wrongly stated that chemical X can be used for screening, without realizing that these crop cells are grown in culture medium and need not undergo photosynthesis.
Many only copied the question “chemical X inhibits enzyme Y in photosynthesis and kills all plants”, without further elaboration on it

These plants do not have the gene coding for the mutant form of enzyme Y

Some only stated that GM plants would have less competition, without specifically stating what resources could they get more
Some thought that chemical X may be an inhibitor of enzyme Y, a pesticide or a fertilizer.

Some only stated that GM plants would have less competition, without specifically stating what resources could they get more.
Paper 2 Section D
Part (a)(iii)

Level 2

(iii) This is because the apply of chemical X
in the field can kill all the other microorganisms
which compete the nutrient with the crop.
As the chemical X can only inhibit the
enzyme Y in photosynthesis of the other type
of plant and microorganisms, thus the genetically
modified so crop can be absorb more nutrients.
Well answered

Some just wrote “cloning is not accepted by the world nowadays” without further elaboration
Many could give correct answer
Some wrote “umbilical cord blood” or “embryonic cell” without quoting that they should be taken long time ago
Some wrote “脊髓”
Some wrote “backbone” or “vertebral column”
Many missed out one or two points of the answer

- Stem cells should be cultured to give rise to more cells first
- They were then induced to proliferate into specialized cells, which are then introduced into Keith’s body

Some only recited what they memorized from textbook: “Stem cells can differentiate into different kinds of cells in the body”
Some confused between “limitations” and “disadvantages”, and gave answers like “rejection of tissue” or “very high cost”

Some could only write “it is difficult for stem cells to differentiate into the nerve cells”, without explaining why it is difficult
Paper 2 Section B & D
General comments

» Some candidates did not read through the question carefully and answer a lot of irrelevant information

» Some did not respond to all the requirements of the questions

» Do not just copy the question as part of the answer; try to elaborate from it

» Avoid using vague terms

Elaboration on the answer is required
The meanings of their answers are not accurate, e.g.:

- Some *Agrobacterium* may fail to incorporate with the crop’s genome
- Repulsion of tissue may occur
- Tissue to be transplanted is limited
- Time for transplantation is very long
- During cloning, many living cells are killed
Can do better in describing the general trend and patterns of given data
  e.g. describe the change under a certain range of time

Understand and apply what they learnt from the teachers and textbooks, do not just memorize and recite the words from textbooks, notes and suggested answers
Thank you!