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**Introduction**

The questions in this document are from the Biology 30 June 2008 Diploma Examination. This material, along with the Biology 30 Program of Studies, *Biology 30 Information Bulletin*, student-based performance standards, and school authority or school reports, can provide insight for teachers to assist them with instructional programming.

**Additional Documents and Online Resources**

Provincial Assessment supports the instruction of Biology 30 with the following documents and online resources.

These documents contain information about administrations of the diploma examinations for the upcoming school year, sample questions, and assessment samples for classroom use.

- *Biology 30 Information Bulletin*
- *Biology 30 Archived Information Bulletin*
- *Biology 30 Assessment Exemplars*
- *Biology 30 Student-based Performance Standards*

The *Biology 30 Practice Tests* contains previous diploma examinations and some practice questions that have been released.
Information on Released Items

The table below shows the results for each of the 16 released items and includes the question’s difficulty; the keyed response; and the outcomes for knowledge (k), skills (s), and science, technology, and society (sts). The percentage reported in the Diff. % column indicates the proportion of students who got the question correct.

**Key:** MC—Multiple Choice; NR—Numerical Response

<table>
<thead>
<tr>
<th>Question</th>
<th>Difficulty (%)</th>
<th>Key</th>
<th>Outcome</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC 1</td>
<td>64.9</td>
<td>A</td>
<td>A1.2k</td>
<td>June 2008 – MC 5</td>
</tr>
<tr>
<td>MC 2</td>
<td>70.4</td>
<td>D</td>
<td>A1.5k</td>
<td>June 2008 – MC 7</td>
</tr>
<tr>
<td>MC 3</td>
<td>68.0</td>
<td>A</td>
<td>A1.1k</td>
<td>June 2008 – MC 8</td>
</tr>
<tr>
<td>MC 4</td>
<td>51.5</td>
<td>C</td>
<td>A2.2k</td>
<td>June 2008 – MC 12</td>
</tr>
<tr>
<td>MC 5</td>
<td>80.0</td>
<td>B</td>
<td>B1.2k, B1.1sts, B1.2s</td>
<td>June 2008 – MC 13</td>
</tr>
<tr>
<td>MC 6</td>
<td>44.3</td>
<td>B</td>
<td>B1.1k, B1.2k, B1.1sts, B1.2s</td>
<td>June 2008 – MC 14</td>
</tr>
<tr>
<td>MC 7</td>
<td>71.7</td>
<td>A</td>
<td>C1.4k, C1.7k, C1.2s</td>
<td>June 2008 – MC 25</td>
</tr>
<tr>
<td>MC 8</td>
<td>70.9</td>
<td>C</td>
<td>C1.1k, C1.7k, C1.2s</td>
<td>June 2008 – MC 26</td>
</tr>
<tr>
<td>NR 1</td>
<td>65.6</td>
<td>0.25</td>
<td>C2.2k, C2.3s</td>
<td>June 2008 – NR 5</td>
</tr>
<tr>
<td>MC 9</td>
<td>70.6</td>
<td>B</td>
<td>C2.2k, C2.3s</td>
<td>June 2008 – MC 34</td>
</tr>
<tr>
<td>MC 10</td>
<td>77.9</td>
<td>C</td>
<td>C3.3k, C3.2s</td>
<td>June 2008 – MC 37</td>
</tr>
<tr>
<td>NR 2</td>
<td>84.1</td>
<td>7741</td>
<td>C3.3k, C3.2s</td>
<td>June 2008 – NR7</td>
</tr>
<tr>
<td>MC 11</td>
<td>49.1</td>
<td>C</td>
<td>C3.7k, C1.3k</td>
<td>June 2008 – MC 38</td>
</tr>
<tr>
<td>MC 12</td>
<td>67.7</td>
<td>D</td>
<td>D3.3k, D3.4k</td>
<td>June 2008 – MC 47</td>
</tr>
<tr>
<td>MC 13</td>
<td>53.9</td>
<td>C</td>
<td>D3.2k</td>
<td>June 2008 – MC 48</td>
</tr>
<tr>
<td>NR 3</td>
<td>69.3</td>
<td>2413</td>
<td>D2.1k</td>
<td>June 2008 – NR 8</td>
</tr>
</tbody>
</table>
1. The brain stem is the region of the brain that is composed of the midbrain, pons, and medulla oblongata. Functions of the brain stem include the

A. control of breathing and heart rate  
B. control of body temperature and blood pressure  
C. interpretation of auditory and visual information  
D. relay of information between the cerebral hemispheres

Use the following information to answer questions 2 and 3.

Meniere syndrome is a debilitating disorder characterized by periods of vertigo (dizziness), tinnitus (ringing in the ear), a sensation of pressure in the ear, and progressive hearing loss. In most people affected with Meniere syndrome, the nerve associated with balance has reduced responsiveness to stimulation.

2. The structure of the ear that is associated with vertigo is the

A. cochlea  
B. auditory canal  
C. Eustachian tube  
D. semicircular canal

3. Reduced responsiveness of the nerve associated with balance could indicate

A. an increased threshold level  
B. an increased action potential  
C. increased myelination of the nerve  
D. increased repolarization of the nerve
Chorionic gonadotropin is similar to thyroid-stimulating hormone (TSH) and can bind to TSH receptors in the thyroid gland, thereby stimulating the thyroid gland. Some women develop temporary hyperthyroidism during pregnancy when chorionic gonadotropin levels are at their highest.

4. Which of the following rows indicates the effect of a high level of chorionic gonadotropin on thyroxine secretion and on TSH secretion?

<table>
<thead>
<tr>
<th>Row</th>
<th>Thyroxine Secretion</th>
<th>TSH Secretion</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>B.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>C.</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>D.</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
One cause of male infertility is congenital absence of the vas deferens (CAVD). In CAVD, a portion or all of the epididymis, vas deferens, and seminal vesicle is missing. This disorder results in the obstruction of the passage of sperm from the testes. Microsurgical epididymal sperm aspiration (MESA) has been used to enable some men affected with CAVD to father children. This procedure is used to obtain sperm that can be used for in vitro fertilization.

5. In the diagram above, the reproductive structures that are associated with CAVD are numbered
   A. 1, 2, and 5
   B. 1, 4, and 5
   C. 3, 4, and 6
   D. 4, 5, and 6

6. The structure from which sperm are aspirated using the MESA procedure and the structure into which an embryo is inserted following in vitro fertilization are numbered, respectively,
   A. 5 and 7
   B. 5 and 8
   C. 6 and 7
   D. 6 and 8
Use the following information to answer questions 7 and 8.

*Toxoplasma gondii* is a parasite that can infect many different mammals, but it reproduces sexually only in cats.

**Life Cycle of Toxoplasma gondii**

7. Which of the following rows identifies process 1 and process 3 in the life cycle shown above?

<table>
<thead>
<tr>
<th>Row</th>
<th>Process 1</th>
<th>Process 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Meiosis</td>
<td>Mitosis</td>
</tr>
<tr>
<td>B.</td>
<td>Mitosis</td>
<td>Mitosis</td>
</tr>
<tr>
<td>C.</td>
<td>Mitosis</td>
<td>Meiosis</td>
</tr>
<tr>
<td>D.</td>
<td>Meiosis</td>
<td>Meiosis</td>
</tr>
</tbody>
</table>
8. The haploid structure in the life cycle of *Toxoplasma gondii* is the
   A. zygote
   B. oocyst
   C. gamete
   D. sporozoite

---

*Use the following information to answer numerical-response question 1.*

Hypophosphatemic rickets is an X-linked dominant disorder that is characterized by abnormal growth and bone formation.

**Numerical Response**

1. If a man who is affected with hypophosphatemic rickets and a woman who is heterozygous for the disorder have a child, what is the probability that the child will be a daughter who is heterozygous for the disorder?

   **Answer:** __________

   (Record your answer as a value between 0 and 1 rounded to two decimal places in the numerical-response section on the answer sheet.)

---

*Use the following information to answer question 9.*

Blood is typed on the basis of various factors found both in the plasma and on the red blood cells. A single pair of codominant alleles determines the M, N, and MN blood groups. ABO blood type is determined by three alleles: the *I*<sup>A</sup> and *I*<sup>B</sup> alleles, which are codominant, and the *i* allele, which is recessive. There are four distinct ABO blood types: A, B, AB, and O.

9. A man has type MN and type O blood, and a woman has type N and type AB blood. What is the probability that their child has type N and type B blood?

   A. 0.00
   B. 0.25
   C. 0.50
   D. 0.75
Breast cancer is normally suppressed by the **BRCA1** gene. If this gene is damaged by a mutation, breast cancer will result. The nucleotide sequence for a segment of the **BRCA1** gene is GCT CTT CGC GTT.

10. The sequence of the messenger RNA transcribed from this segment of the **BRCA1** gene is

   A. CGU GUU GCG CUU
   B. GCU CUU CGC GUU
   C. CGA GAA GCG CAA
   D. CGA GAA CGC GAA

Cystic fibrosis is caused by a mutation in the **CFTR** gene. A short section of the mutated **CFTR** gene is TAG TAA CCA CAA.

**Some Amino Acids**

1. Valine  
2. Lysine  
3. Proline  
5. Glycine  
6. Glutamate  
7. Isoleucine  
8. Phenylalanine

**Numerical Response**

2. The sequence of the amino acids coded by the section of the mutated **CFTR** gene above is _____, _____, _____, and _____.

   (Record all **four digits** of your answer in the numerical-response section on the answer sheet.)
Use the following information to answer question 11.

Male mussels of the genus *Mytilus* inherit their mitochondrial DNA (mtDNA) from both their mother and father.

11. The inheritance of mtDNA in humans differs from that in male *Mytilus* mussels because human mtDNA is

A. identical to the mother’s nuclear DNA  
B. transmitted from the father to all offspring  
C. transmitted from the mother to all offspring  
D. a mixture of the father’s mtDNA and nuclear DNA

Use the following information to answer questions 12 and 13 and numerical-response question 3.

Wood bison are the largest land animals in North America. They were a major food source for people of the First Nations. In the 1650s, an estimated 168 000 bison roamed northern Alberta, northeastern British Columbia, and the Northwest Territories. By 1891, only 250 bison were left in these regions.

—based on http://issues.albertawilderness.ca, 2006


12. Prior to the 1650s, the wood bison population in North America remained close to the carrying capacity of its habitat. The generalized growth curve and the reproductive strategy of the wood bison were, respectively,

A. a J-curve and *r* selection  
B. a J-curve and *K* selection  
C. an S-curve and *r* selection  
D. an S-curve and *K* selection

13. Hunting of the bison for meat and hides by First Nations people helped maintain the bison population near the carrying capacity of its habitat by increasing the

A. natality of the bison  
B. intraspecific competition  
C. environmental resistance  
D. biotic potential of the bison
Some Relationships Between Wood Bison and Other Species

1. Elk and deer compete with wood bison for food and living space.
2. Many wood bison are infected with tuberculosis or brucellosis bacteria.
3. Smaller wood bison compete with larger wood bison for food and living space.
4. Grazing by wood bison provides more suitable digging conditions for prairie dogs.

Numerical Response

3. Match each of the relationships numbered above with its classification, as given below.

<table>
<thead>
<tr>
<th>Relationship:</th>
<th>Classification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parasitism</td>
</tr>
<tr>
<td>2</td>
<td>Commensalism</td>
</tr>
<tr>
<td>3</td>
<td>Interspecific competition</td>
</tr>
<tr>
<td>4</td>
<td>Intraspecific competition</td>
</tr>
</tbody>
</table>

(Record all four digits of your answer in the numerical-response section on the answer sheet.)