### Genetic diversity and adaptation

**Answers to practice questions**

<table>
<thead>
<tr>
<th>Question number</th>
<th>Answer</th>
<th>Marks</th>
<th>Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a) (i)</td>
<td>4;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1 (a) (ii)</td>
<td>1. Change in amino acid/(sequence of) amino acids/primary structure;</td>
<td>3</td>
<td>1. Reject = different amino acids are ‘formed’</td>
</tr>
<tr>
<td></td>
<td>2. Change in hydrogen/ionic/disulphide bonds;</td>
<td></td>
<td>3. Alters 3D structure on its own is not enough for this marking point.</td>
</tr>
<tr>
<td></td>
<td>3. Alters tertiary structure/active site (of enzyme);</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Substrate not complementary/cannot bind (to enzyme/active site) /</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>no enzyme-substrate complexes form;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (b)</td>
<td>1. Lack of skin pigment / pale/light skin / albino;</td>
<td>2 max</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Lack of coordination / muscles action affected;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (c)</td>
<td>Founder effect / colonies split off / migration / interbreeding;</td>
<td>1</td>
<td>Allow description of interbreeding e.g. reproduction between individuals from different</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>populations</td>
</tr>
<tr>
<td>2 (a)</td>
<td>(Different) form/type/version of a gene / different base sequence of a gene;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2 (b)</td>
<td>Two/sister chromatids; Due to DNA replication;</td>
<td>2 max</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Joined by a centromere;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (c) (i)</td>
<td>Crossing over; Exchange (of alleles) between chromatids/chromosomes;</td>
<td>2</td>
<td>2 Negate first marking point for answers which refer to independent segregation. Chiasma/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>chiasmata = first marking point</td>
</tr>
<tr>
<td>2 (c) (ii)</td>
<td>Is infrequent/rare;</td>
<td>1</td>
<td>References to it being ‘random’, ‘occurs by chance’ or ‘doesn’t always occur’ should not be</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>credited without a clear idea that it is rare or infrequent.</td>
</tr>
<tr>
<td>2 (d) (i)</td>
<td>Three chromosomes shown; One from each homologous pair;</td>
<td>2</td>
<td>For first mark point allow drawings showing three chromosomes as single or double structures.</td>
</tr>
<tr>
<td>2 (d) (ii)</td>
<td>8;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2 (e) (i)</td>
<td>$2^{12} = 4,096$</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2 (e) (ii)</td>
<td>$4,096 \times 4,096 = 16,777,216$</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3 (a)</td>
<td>Difference in DNA/base sequence / difference in alleles/genes/gene pool;</td>
<td>1</td>
<td>Neutral: ‘fewer alleles’ unless qualified e.g. fewer different alleles.</td>
</tr>
<tr>
<td>3 (b)</td>
<td>Environmental;</td>
<td>1</td>
<td>Accept: Environment</td>
</tr>
<tr>
<td>3 (c)</td>
<td>Reduced (genetic diversity); As fewer different/varied alleles/genes / reduced gene pool; (Genetic) bottleneck;</td>
<td>2 max</td>
<td>Neutral: ‘fewer alleles’ unless qualified e.g. fewer different alleles.</td>
</tr>
<tr>
<td>4 (a) (i)</td>
<td>22;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4 (a) (ii)</td>
<td>1. Odd number of chromosomes/33 chromosomes (in leaf cell);</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Chromosomes cannot pair/cannot undergo</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 9 Genetic diversity and adaptation

#### Answers to practice questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 (b) (i)</td>
<td>Fast growth/produces crop fast/produces large crop;</td>
<td>1</td>
</tr>
<tr>
<td>4 (b) (ii)</td>
<td>Leaves less likely to break/higher breaking strength;</td>
<td>1</td>
</tr>
<tr>
<td>4 (c)</td>
<td>Low genetic diversity because they are produced by mitosis; Will all have the same DNA GENES/alleles/ will be genetically identical/will be clones; OR Low genetic diversity because they are not produced by meiosis; No crossing over/independent segregation/will not be genetically different;</td>
<td>2</td>
</tr>
</tbody>
</table>