

| Question Number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| <b>1(a)</b>     | 1. idea that DNA (molecule){ unwinds / unzips / uncoils / eq} (DNA) strands separate ;<br><br>2. (RNA mono) nucleotides {line up against / attach to} {one strand / template / antisense strand / eq} / eq ;<br><br>3. ref to complementary base pairing (between DNA and mononucleotides) ;<br><br>4. ref to formation of phosphodiester bonds ;<br><br>5. ref to condensation reaction ;<br><br>6. correct name of enzyme involved ;<br><br>7. idea that mRNA detaches from the DNA; | 1. AL W description e.g. breaking of hydrogen bonds<br><br>2. N DNA strands, DNA nucleotides<br><br>3. AL W description of complementary base pairing<br><br>6. ( A) helicase, RNA polymerase, DNA ligase NOT DNA polymerase, polymerase<br><br>7. N leaves nucleus alone / eq | <b>(4)</b> |

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| <b>1(b)(i)</b>  | B ;    | <b>(1)</b> |

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| <b>1(b)(ii)</b> | B ;    | <b>(1)</b> |

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| <b>1(b)(iii)</b> | D ;    | <b>(1)</b> |

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| <b>1(c)</b>     | <ol style="list-style-type: none"> <li>1. tRNA is folded (and mRNA is {straight / unfolded}) / eq ;</li> <li>2. tRNA has hydrogen bonds (holding the structure together) (but the mRNA does not / eq) ;</li> <li>3. tRNA is a fixed {size / length} (but mRNA {is not / length depends on size of gene}) / eq ;</li> <li>4. tRNA has an anticodon (but mRNA has codons) ;</li> <li>5. tRNA has an amino acid binding site ;</li> </ol> | <ol style="list-style-type: none"> <li>1. IG RE double stranded / branched<br/>ALLOW tRNA clover shaped / looped</li> <li>2. ALLO tRNA has complementary base pairing / double stranded sections<br/>NOT (all) double stranded</li> <li>4. N is an anticodon</li> </ol> | <b>(2)</b> |

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| <b>2(a)</b>     | B ;    | <b>(1)</b> |

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| <b>2(b)</b>     | C ;    | <b>(1)</b> |

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| <b>2(c)</b>     | D ;    | <b>(1)</b> |

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| <b>2(d)</b>     | B ;    | <b>(1)</b> |

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| <b>2(e)</b>     | B ;    | <b>(1)</b> |

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| <b>2(f)</b>     | C ;    | <b>(1)</b> |

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| <b>2(g)</b>     | <p><b>mRNA</b></p> <ol style="list-style-type: none"> <li>1. idea of mRNA being a copy of the { antisense DNA strand / template DNA strand / coding DNA strand / gene / allele / part of DNA / eq } ;</li> <li>2. idea that mRNA { made up of codons / codes for specific amino acids / code for amino acid sequence / eq } ;</li> <li>3. idea of mRNA being taken { into the cytoplasm / to the ribosomes / out of the nucleus / eq } ;</li> <li>4. used in translation ;</li> <li>5. binds to ribosome ;</li> </ol> <p><b>tRNA</b></p> <ol style="list-style-type: none"> <li>6. (tRNA) { attaches to / transports / eq } (specific) amino acid / eq ;</li> <li>7. idea that tRNA binds to mRNA / reference to anticodon codon interaction ;</li> <li>8. idea that two tRNA bring amino acids together (for peptide bonds to be formed) ;</li> </ol> | <b>(4)</b> |

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| <b>3(a)</b>     | <ol style="list-style-type: none"> <li>1. (Double-stranded because made of) two strands ;</li> <li>2. (strands joined) by hydrogen bonds (between bases ) ;</li> <li>3. (polynucleotide) of {many / eq} nucleotides ;</li> <li>4. (nucleotides) linked by phospho(di)ester bonds / eq ;</li> </ol> | <b>(3)</b> |

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| <b>*3(b)<br/>QWC</b> | <p><b>Take into account quality of written communication when awarding the following points.</b></p> <ol style="list-style-type: none"> <li>1. idea of sequence of bases {forming the genetic code / determines the amino acid sequence} ;</li> <li>2. idea that one triplet codes for an amino acid;</li> <li>3. ref to (DNA) acting as a template ;</li> <li>4. reference to transcription OR detail of transcription e.g. DNA unzips, mRNA synthesis ;</li> <li>5. idea that mRNA moves from nucleus to cytoplasm / eq ;</li> <li>6. reference to translation OR detail of translation e.g. role of ribosome, codon-anticodon interaction ;</li> <li>7. idea that tRNA carries an amino acid ;</li> <li>8. ref to formation of peptide bonds between amino acids ;</li> <li>9. idea that primary structure is the {sequence /order / eq} of amino acids ;</li> <li>10. comment on post-transcriptional modification of mRNA (between transcription and translation)e.g. removal of introns, splicing ;</li> </ol> | <b>(5)</b> |

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|-----------------|---|------|
| 4(a)            | (DNA) { polymerase / helicase / ligase} ; | (1)  |

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| 4(b)            | <p><b>Stage 1</b></p> <p>1. only one bond drawn in lower half of tube ;</p> <p><b>Stage 2</b></p> <p>2. one only bond drawn (higher than the one drawn in stage 1) ;</p> <p><b>Stage 3</b></p> <p><b>Diagram</b></p> <p>3. {1 / 2} molecules shown with one light and one heavy strand ;</p> <p>4. {1 / 2} molecules shown with two light strands;</p> <p><b>Test tube</b></p> <p>5. 2 bands shown in roughly correct position (middle to upper half of test tube) ;</p> <p>6. bands should be of (roughly) equal width ;</p> <p>[consequential error from stage 2 should apply for both marking points 5 and 6]</p> | (6)  |

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| 5(a)            | <ol style="list-style-type: none"> <li>1. presence of amine group /eq ;</li> <li>2. presence of carboxyl group / eq ;</li> <li>3. reference to R group ;</li> <li>4. reference to central carbon atom ;</li> </ol> <p>[award marks on correctly drawn diagram]</p> | (2)  |

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| 5(b)            | <ol style="list-style-type: none"> <li>1. correct reference to transcription ;</li> <li>2. DNA {unwinds / strands separate / eq} ;</li> <li>3. (RNA) (mono)nucleotides {line up against / attach / eq} to one (DNA) { strand / template / eq} ;</li> <li>4. reference to <u>complementary</u> base pairing (between DNA and (mono)nucleotides) ;</li> <li>5. reference to {(mono)nucleotides joining together / formation of phosphodiester bonds} ;</li> <li>6. correct reference to condensation reaction ;</li> <li>7. correct reference to named enzymes involved / eq ;</li> <li>8. mRNA detaches (from DNA) / eq ;</li> </ol> | (4)  |

| Question Number | Answer                                   | Mark       |
|-----------------|--|------------|
| <b>5(c)(i)</b>  | <b>DISCOUNTED QUESTION / DO NOT MARK</b> | <b>(0)</b> |

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|-----------------|--------|------------|
| <b>5(c)(ii)</b> | B ;    | <b>(1)</b> |

| Question Number  | Answer | Mark       |
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| <b>5(c)(iii)</b> | D ;    | <b>(1)</b> |