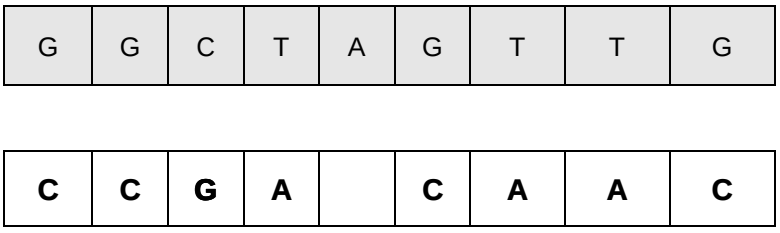
Question Number	Answer	Acceptable answers	Mark
1(a)	A description that includes two of the following • hydrogen bonds (1) • between (complementary) base pairs (1)	H bonds accept singular A and T, G and C but not the wrong pairings	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	• one bar the height of the guanine bar (34%) and one bar the height of the thymine bar (16%) (1) • bars for cytosine and adenine shown the correct way round (1)	+/- 1 square (including sketches)	**(2)**

Question Number	Answer	Mark
1(c)(i)	 [all correct = 2 marks and 1 mistake = 1 mark]	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	three / 3	**Reject** any other numbers given	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(d)	ribosome(s) / polysome(s)	**Ignore** cytoplasm **Reject** any other structure given	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	mitosis	reasonable phonetic spelling provided there is a 't' ignore asexual reproduction	**(1)**

Question Number	Answer	Acceptable answers	Mark
2 (a)(ii)	Any two from the following: • same characteristics in offspring as parent plant /best characteristics inherited / clones produced / identical (1) • easier to generate new plants/propagate (1) • quicker to produce new plants (1) • cheap /idea that the plants will not run out / no need to buy new plants / seeds (1)	Accept same as parent plant	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	<u>Stage 1</u> • to break open cells/release cell contents / release DNA /dissolve proteins (1) <u>Stage 3</u> • to precipitate DNA from the solution/to separate DNA (from other components)/ (1)	Accept break down cell membrane / cell wall Accept to make DNA visible ignore refs to freezing the DNA	**(2)**

Question Number	Answer	Acceptable answers	Mark
2 (c)(i)	**C** 4		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	• location drawn anywhere in cytoplasm (1) • correct name - nucleus (1)	chloroplast / mitochondria NB these are stand alone mark points	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)	A description including the following linked points • ref to a gene (coding for protein)(1) • sequence of bases determines sequence of amino acids (1) • idea of one code / triplet / codon / 3 bases (for one amino acid) (1) • several amino acids make up a protein / (poly)peptide (1) • transcription / detail of transcription (1) • translation / detail of translation (1)	Accept on either DNA or RNA base pairs Accept a chain of amino acids eg mRNA made eg mRNA attached to ribosome	**(4)**

Question Number		Indicative Content	Mark
QWC	***3(b)**	A description including some of the following points in a logical sequence Points relating to DNA structural features: • two strands • double helix • (contains) bases • A, T, C, G • adenine / A paired with thymine / T • guanine / G paired with cytosine / C • hydrogen / H bonds joining bases Contributions from Scientists: • X-ray (crystallography) being used • to show helical structure • to show diameter of molecule • how base pairs are arranged was shown • how strands are arranged was shown • modelling • reference to using other people's ideas	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description that includes either: at least **three** DNA features **OR one** contribution • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description that includes at least **three** features of DNA and at least **one** contribution **OR two** features of DNA and **two** contributions. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of the structure of DNA that includes at least **three** features and **two** contributions. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
3(c)	An explanation to include two of the following points linked together • genes / base sequence (on human chromosome) identified (1) • identification of faulty / mutated genes (1) • people can be tested for a genetic disorder (1) • ref to development of gene therapy (1) • idea that appropriate /early /personalised / genomic medication / counselling can be given (1)	Accept base pair sequence gene map Accept idea that genes can be linked to disease Accept diagnosis of cancer Accept a description of gene therapy	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)	**D** haploid and haploid		**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (b)	A description linking three of the following (DNA is a) double helix (1) the sides of DNA are made from (alternating) sugars and phosphate (molecules) / sugar phosphate backbone (1) {paired / complementary} bases / A (joins to) T and C (joins to) G (1) (bases joined by/strands held together by) hydrogen bonds (1)	 Accept H bonds Ignore h or H_2 bonds	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(c)	A description including four of the following: (the process is) translation (1) (mRNA) leaves the nucleus / enters the cytoplasm (1) (mRNA joins to) ribosomes(1) tRNA carries amino acids (1) tRNA joins to mRNA / bases on tRNA matches bases on mRNA (1) (bases read as) {sets of three / triplets / idea of codons} (1) (ribosome / mRNA holds tRNA so) amino acids are joined together / to make polypeptides (1)		**(4)**

Total for Question 1 = 8 marks