M1.(a) (i) Joins nucleotides (to form new strand).

Accept: joins sugar and phosphate / forms sugar-phosphate backbone

Reject: (DNA polymerase) forms base pairs / hydrogen bonds

1

(ii) (Prokaryotic DNA)

1. Circular / non-linear (DNA);

   Accept converse for eukaryotic DNA

   Ignore: references to nucleus, binary fission, strands and plasmids

2. Not (associated) with proteins / histones;

   Accept does not form chromosomes / chromatin

3. No introns / no non-coding DNA.

   Accept only exons

   Q *Neutral: no 'junk' DNA*

2 max

(b) (i) 1. Have different genes;

Reject: different alleles

2. (Sobases / triplets) are in a different sequence / order;

   Accept: base sequence that matters, not percentage

3. (So) different amino acid (sequence / coded for) / different protein / different polypeptide / different enzyme.

   Unqualified 'different amino acids' does not gain a mark

   Reject: references to different amino acids formed

   Ignore: references to mutations / exons / non-coding / introns

2 max

(ii) (Virus DNA)

1. A does not equal T / G does not equal C;

   Accept: similar for equal

   Accept: virus has more C than G / has more A than T

2. (So) <u>no</u> base pairing;

3. (So) DNA is not double stranded / is single stranded.

2 max

[7]

M2.(a) 1. DNA replicated;

Reject: DNA replication in the wrong stage

2. (Involving) specific / accurate / complementary base-pairing;

Accept: semi conservative replication

3. (Ref to) two identical / sister chromatids;

4. Each chromatid / moves / is separated to (opposite) poles / ends of cell.

Reject: meiosis / homologous chromosomes / crossing over

Note: sister chromatids move to opposite poles / ends = 2 marks for mp 3 and mp 4

Reject: events in wrong phase / stage

4

(b) (i) 1. To allow (more) light through;

Accept: transparent

2. A single / few layer(s) of cells to be viewed.

Accept: (thin) for better / easier stain penetration

2

(ii) 1. More / faster mitosis / division near tip / at 0.2 mm;

Neutral: references to largest mitotic index

2. (Almost) no mitosis / division at / after 1.6 mm from tip;

Accept: cell division for mitosis

Penalise once for references to meiosis

3. (So) roots grow by mitosis / adding new cells to the tip.

Accept: growth occurs at / near / just behind the tip (of the root)

Accept: converse arguments

2 max

[8]

M3.(a) Deoxyribose.

1

(b) 1. Thymine 18 (%);
2. Guanine 32 (%).

2

(c) DNA polymerase.

1

(d) 1. (**Figure 1** shows) DNA has antiparallel strands / described;
2. (**Figure 1** shows) shape of the nucleotides is different / nucleotides aligned differently;
3. Enzymes have active sites with specific shape;
4. Only substrates with complementary shape / only the 3' end can bind with active site of enzyme / active site of DNA polymerase.

4

[8]

M4.(a) 1. Outside of virus has antigens / proteins;
2. With complementary shape to receptor / protein in membrane of cells;
3. (Receptor / protein) found only on membrane of nerve cells.

Accept converse argument

3

(b) 1. No more (nerve) cells infected / no more cold sores form;
2. (Because) virus is not replicating.

2

(c) Prevents replication of virus.

1

(d) MicroRNA binds to cell's mRNA (no mark)
1. (Binds) by specific base pairing;

2. (So) prevents mRNA being read by ribosomes;
3. (So) prevents translation / production of proteins;
4. (Proteins) that cause cell death.

4

[10]

M5.(a) Box around single nucleotide.

1

(b)

DNA strand	Percentage of each base			
	A	**C**	**G**	**T**
Strand **1**	(16)	**34**	**21**	**29**
Strand **2**	**29**	(21)	(34)	**16**

2 rows correct = 2 marks;
1 row correct = 1 mark.

2

(c) 1. Reference to DNA polymerase;
2. (Which is) specific;
3. Only complementary with / binds to 5' end (of strand);

Reject hydrogen bonds / base pairing

4. Shapes of 5' end and 3' end are different / description of how different.

4

[7]

M6.(a) (i) Repeating units / nucleotides / monomer / molecules;

Allow more than one, but reject two

1

(ii) 1. C = hydrogen bonds;

2. D = deoxyribose;
Ignore sugar

3. E = phosphate;
Ignore phosphorus, Ignore molecule

3

(iii)

Name of base	Percentage
Thymine	34
Cytosine / Guanine	16
Adenine	34
Cytosine / Guanine	16

Spelling must be correct to gain MP1
First mark = names correct
Second mark = % correct, with adenine as 34%

2

(b) (i) 153;

1

(ii) Some regions of the gene are non-coding / introns / start / stop code / triplet / there are two DNA strands;
Allow addition mutation
Ignore unqualified reference to mutation
Accept reference to introns and exons if given together
Ignore 'junk' DNA / multiple repeats

1

[8]