

## Mark schemes

**Q1.**

(a) Nucleus;

1

- (b) 1. Loops (of DNA) contain introns;  
*Accept 'non-coding' for introns, but only for mark point 1.*
2. DNA forming hybrid (molecule) contain exons;
3. Complementary base pairing occurs between DNA and mRNA

**OR**

Hydrogen bonding occurs between DNA and mRNA;

4. Introns removed during splicing

**OR**

Introns removed to produce mRNA;

5. (The) mRNA is shorter (than original DNA/premRNA strand) due to splicing;

3 max

- (c) 1. No loops (of DNA);
2. (Because) no introns (in prokaryotic DNA);

2

- (d) Change in base sequence (of exons) occurs

**OR**

Deletion/addition of bases occurs

**OR**

Deletion of exons;

*Accept description of exons.**Accept nucleotide/s for base/s.**Ignore references to DNA or RNA.*

1

**[7]**

**Q2.**

- (a)
1. (Hb) loads/associates/binds oxygen in the lungs;
  2. At high partial pressure of oxygen;
  3. Binding of an oxygen (molecule to Hb) makes binding of another oxygen (molecule) easier;
  4. (Oxygen transported as) oxyhaemoglobin in red blood cells;
  5. (Hb) unloads/dissociates oxygen in the (respiring) cells/tissues;
  6. At low partial pressure of oxygen

**OR**

At high partial pressure of carbon dioxide;

*Accept  $pO_2$  for partial pressure of oxygen.*

*Accept  $pCO_2$  for partial pressure of carbon dioxide.*

**5 max**

- (b)
1. (mRNA attaches) to ribosomes

**OR**

(mRNA attaches) to rough endoplasmic reticulum;

*Full name required for RER.*

2. (tRNA) anticodons (bind to) complementary (mRNA) codons;
3. tRNA brings a specific amino acid;  
*Accept amino acid joined to tRNA using ATP.*
4. Amino acids join by peptide bonds;
5. (Amino acids join together) with the use of ATP;
6. tRNA released (after amino acid joined to polypeptide);
7. The ribosome moves along the mRNA to form the polypeptide;

**5 max****[10]**

**Q3.**

(a)

mRNA	tRNA
1. (Has) codon(s)	(Has) anticodon;
2. No hydrogen/H bonds/base pairs	Has hydrogen/H bonds/base pairs;
3. No amino acid binding site	Has amino acid binding site;
4. Linear/straight/not folded	'Clover (leaf' shape)/folded;
5. Long/many nucleotides/bases	Short/few nucleotides/bases;

*Must be comparisons**Accept description of binding site, eg amino acid only bound to tRNA**Accept mRNA cannot carry an amino acid, tRNA can***3 max**

(b) Phe, Arg, Ala;

*Reject if order is different***1**

(c) (Name of mutation)

1. (Single base) substitution;

(Change in DNA)

2. Guanine to thymine

**OR**

G to T

**OR**

GCC to TCC;

*Marks can be achieved in any section**Reject thiamine*

(Explanation)

3. (So) Arg (still) present

**OR**

No change in amino acid;

*Reject amino acids are formed*

4. (So) no change in primary structure

**OR**

(So) no change in tertiary structure

**OR**

(So) no change in active site (shape);

**Q4.**

(a) (Volume)

Correct answer of  $57.9 \mu\text{m}^3$  = **2 marks**;;**OR**If volume incorrect, evidence of 2.35-2.45 (as radius) = **1 mark**

(Times larger)

8 (times larger) (or ECF) = **1 mark**;*58 = 2 marks**57.91 = 2 marks**Accept 54.3/54 = 2 marks**Accept 61.6/62 = 2 marks**Allow 7.5 – 8.52**ECF Allow any alternative for 8 which shows  $463 \div$  their volume*

3

(b) 1. Nuclear membrane /nucleolus /vesicles/  
lysosomes/ribosomes distinct/visible;*Accept invaginations of membrane distinct/visible**Reject nucleus**Reject mitochondrion*

2. EM has greater resolution;

*assume 'it' refers to electron microscope*

2

(c) Stimulating cytotoxic T cells

**OR**

Stimulating B cells

**OR**

Stimulating phagocytes;

*Accept 'activate' for stimulating*

1

(d) 1. Anticodon (on tRNA) binds to (complementary) codon (on mRNA);

2. (tRNA) brings/carries specific amino acid (to ribosome);

2

**[8]**

**Q5.**

- (a) Site of translation, catalyse the joining of amino acids by condensation reactions;

1

- (b) Any **two** from:

rRNA;

(Pre) mRNA;

tRNA;

*Ignore capitalization of r, m and t*

1 max

- (c) 1. Less phospholipids in rough

**OR**

More protein/glycoprotein in rough

**OR**

Presence of ribosomes in rough;

*Accept references to percentages from Table 1.*

2. (More protein/glycoprotein/ribosomes)  
Rough – production/transport of proteins;  
*Accept modifies/packages proteins*

3. (More phospholipid) Smooth –  
production/modification/packaging/transport  
of lipids;  
*Accept storage/synthesis of carbohydrates*  
*Accept storage of lipids*

3

**[5]**

**Q6.**

(a) 1. RNA/rRNA;

2. Protein;

*Reject tRNA and mRNA*

*Ignore amino acids*

2

(b) 1. DNA has deoxyribose, mRNA has ribose;

2. DNA has thymine, mRNA has uracil;

3. DNA long, mRNA short;

4. DNA is double stranded, mRNA is single stranded

*Accept 'double helix' for 'double stranded' and  
'single helix' for 'single stranded'*

5. DNA has hydrogen bonds, mRNA has no hydrogen bonds

**OR**

DNA has (complementary) base pairing, mRNA does not;

4 max

*Must be comparisons*

*Ignore splicing/introns*

**[6]**

**Q7.**

- (a) A sequence of DNA (nucleotides) bases that codes for a polypeptide;

*Ignore codes for a protein.*

*Accept 'codes for a functional RNA' or 'codes for rRNA/tRNAs' or 'codes for a sequence of amino acids/primary structure'*

1

- (b) 1. Pre-mRNA (only) produced in eukaryote (cell);  
2. Splicing only occurs in eukaryote (cell);  
3. Introns removed in eukaryote (cell)

**OR**

Introns not present in prokaryote (cell);

2 max

- (c) 1. PNA is complementary to DNA

**OR**

PNA forms base pairs with DNA;

2. Preventing/reducing RNA polymerase activity/binding

**OR**

Prevents RNA nucleotides binding

**OR**

Reducing/stopping transcription;

2

- (d) 1. Releases/provides energy;  
*Reject 'produce energy'*  
2. (So) peptide bonds form between amino acids

**OR**

(So) amino acid joins to tRNA;

2

[7]