

SMART EXAM RESOURCES

TOPIC QUESTIONS: NUCLEIC ACID AND PROTEIN SYNTHESIS

SUB-TOPIC: COMPARING TERMS AND PROCESSES SET-1-QP-MS

- 1** Complete the table to show **three** ways in which the **structure** of DNA differs from RNA.

	DNA	RNA
1		
2		
3		

[3]

MARK SCHEME:

(a) one mark per complete correct row

DNA	RNA
two, polynucleotides / chains / strands A double	single, polynucleotide / strand / chain ;
(double) helix	not a helix / straight chain ;
deoxyribose	ribose <i>differences between pentoses / sugar may be described in terms of OH on C₂</i>
<u>thymine</u> / no uracil	uracil / no <u>thymine</u>
hydrogen bonding (between all bases)	hydrogen bonds between some bases A no hydrogen bonds
ratio of A+G to C+T = 1 / AW	ratio of A+G to C+T varies ;
longer	shorter ;
one type	more than one type / three types / mRNA + tRNA + rRNA ;

[max 3]

2

DNA is a very stable molecule. This means that it is not broken down either chemically or by enzymes during the normal life of the cell.

In contrast, mRNA is described as being highly labile. This means that most mRNA molecules are broken down in the cytoplasm within a few hours of their release from the nucleus.

Suggest the significance of:

- (i) DNA being very stable

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..... [2]

- (ii) mRNA being highly labile.

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..... [2]

MARK SCHEME:

- (i) sequence will not (spontaneously) change / AW ; **A** decreases chance of mutation
(so) gene products / proteins, produced will always be functional ;
maintains all, genetic information / AW, throughout life of cell ;
same, genetic information / AW, passed on to, daughter cells / offspring ;
AVP ; e.g. maintains size so still enclosed within nucleus [max 2]
- (ii) translation / protein synthesis, will stop when mRNA breaks down ;
allows re-use of nucleotides (for other mRNA) ;
ref. to control of gene expression ; **A** prevents too much product forming
ref. to control of cell activity / fast response to changing requirements ;
ref. to efficiency in energy use ; [max 2]

MARK SCHEME:

<i>mRNA</i>	max 4
1 single-stranded ;	
2 no hydrogen bonding / only DNA has hydrogen bonding ;	
3 no base pairs / only DNA has base pairs ;	
4 uracil and not thymine / DNA has thymine instead of uracil ; <i>treat as neutral T and U, look for complete term</i>	
5 ribose not deoxyribose ;	
6 detail, e.g. -H and not -OH on C2 ;	
7 short(er) / DNA is longer ; A smaller / bigger	
8 not a helix ;	

4

More mRNA molecules than tRNA molecules are synthesised in cells.

Suggest a reason for this.

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..... [1]

MARK SCHEME:

mRNA, less stable / broken down sooner / used only for a short time / does not last long / is temporary / has short (half-) life ; I 'used up'
tRNA is re-used (for a longer time); no ora
unless correct ref. to mRNA 'shelf life'

[max1]