AQA, OCR, Edexcel

A Level

A Level Biology

Mutations and Cancer Questions

Name:

M M E

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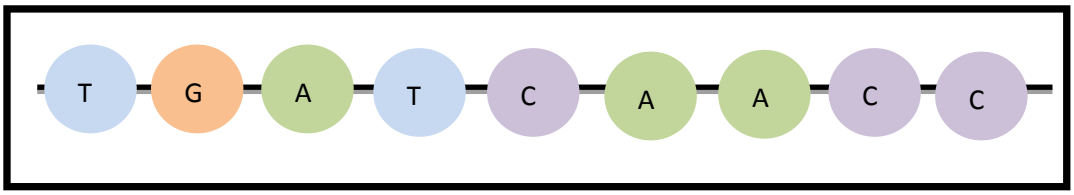
Total Marks: /42

Mutations and Cancer

The cell cycle is occurring across all cells within organisms all the time. Replication is the part of the cell cycle where the DNA is copied. Sometimes during this phase, errors occur; these errors are called mutations.

1. a) The sequence of nucleotide bases below shows a portion of DNA with no mutations.



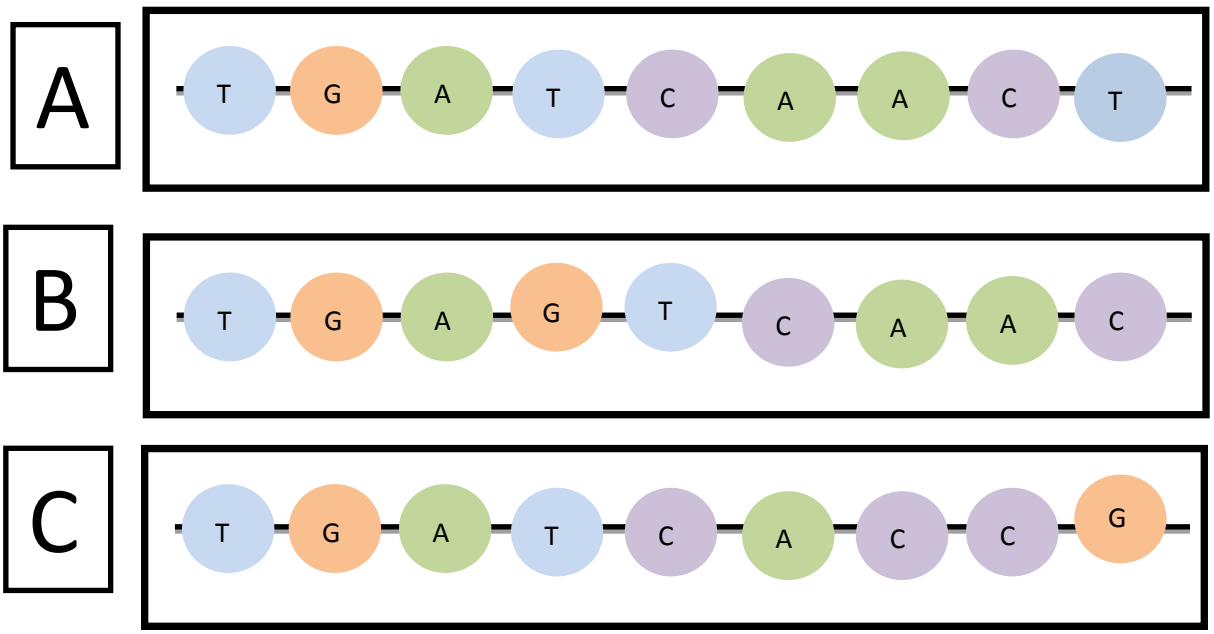
i) From the table below, identify which amino acids are coded for by the DNA bases above (2 marks)

Second letter

First letter	U	C	A	G	Third letter
U	UUU Phe, UUC Phe	UCU Ser, UCC Ser, UCA Ser, UCG Ser	UAU Tyr, UAC Tyr	UGU Cys, UGC Cys	U C A G
	UUA Leu, UUG Leu		UAA Stop, UAG Stop	UGA Stop, UGG Trp	
C	CUU Leu, CUC Leu, CUA Leu, CUG Leu	CCU Pro, CCC Pro, CCA Pro, CCG Pro	CAU His, CAC His	CGU Arg, CGC Arg, CGA Arg, CGG Arg	U C A G
			CAA Gln, CAG Gln		
A	AUU Ile, AUC Ile, AUA Ile	ACU Thr, ACC Thr, ACA Thr, ACG Thr	AAU Asn, AAC Asn	AGU Ser, AGC Ser	U C A G
	AUG Met		AAA Lys, AAG Lys	AGA Arg, AGG Arg	
G	GUU Val, GUC Val, GUA Val, GUG Val	GCU Ala, GCC Ala, GCA Ala, GCG Ala	GAU Asp, GAC Asp	GGU Gly, GGC Gly, GGA Gly, GGG Gly	U C A G
			GAA Glu, GAG Glu		

ii) The three sections of DNA below (A-C) are the original strand, shown above, each with a different mutation. For each strand:

- define the type of mutation
- explain the effect of the mutation on the DNA strand
- Identify the new amino acid chain that is coded for (9 marks)



iii) Why is the degenerate nature of the genetic code advantageous? (2 marks)

iv) Evaluate the claim that 'the mutation in strand A is more detrimental than the mutations in strand B and C.' (3 marks)

2. Chromosome mutations are caused by errors in cell division.

a)
i) Explain the causes of Down's Syndrome with regards to chromosome mutations. (3 marks)

b) Mutations are continually occurring in DNA, though most errors are corrected before the DNA is replicated. However there are many factors that can increase the mutation rate; one of these factors is genetics.

i) Identify two examples of mutagenic agents. (2 marks)

ii) What is the difference between acquired mutations and hereditary mutations? (2 marks)

3)

a) The latest statistics about cancer in the UK suggest that 340, 000 people are diagnosed with cancer every year, a figure that is increasing by 3.2% annually.

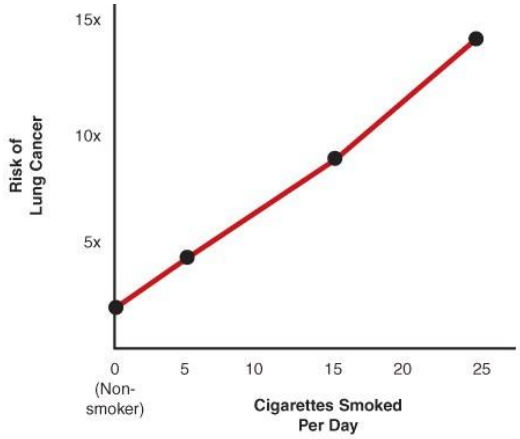
i) What is cancer? (2 marks)

ii) Explain how a mutation can cause cancer. (6 marks)

iii) How might the prevention and diagnosis of cancer caused by hereditary mutations be different from cancer caused by acquired mutations. (4 marks)

iv) Why is cancer such a complex disease to treat? (2 marks)

b) Cancer is caused by the interaction of many different factors. The graph below shows the relationship between the risk of developing cancer and the number of cigarettes a group of individuals smoked per day.



i) Describe the relationship shown in the graph above. (1 mark)

ii) Evaluate the claim that 'exposure to cigarettes causes cancer'(4 marks)