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# BIOLOGY

## ENERGY TRANSFERS IN & BETWEEN ORGANISMS

| | |
|---|---|
| Level & Board | AQA (A-LEVEL) |
| TOPIC: | DNA & PROTEIN SYNTHESIS |
| PAPER TYPE: | QUESTION PAPER - 1 |
| TOTAL QUESTIONS | 5 |
| TOTAL MARKS | 35 |

# DNA and Protein Synthesis - 1

**1.**

**(a)** A tumor may develop as a result of a mutation in a tumour suppressor gene.

Describe how? **(2)**

**(b)** The encoded polypeptide's amino acid sequence is not altered by every mutation.

Describe your reasoning**. (1)**



**2.**

**(a)** A receptor protein that attaches to the hormone growth factor is present in the cell-surface membrane of some cancer cells. This promotes the division of cancer cells.

A monoclonal antibody that blocks this activation has been created by scientists.

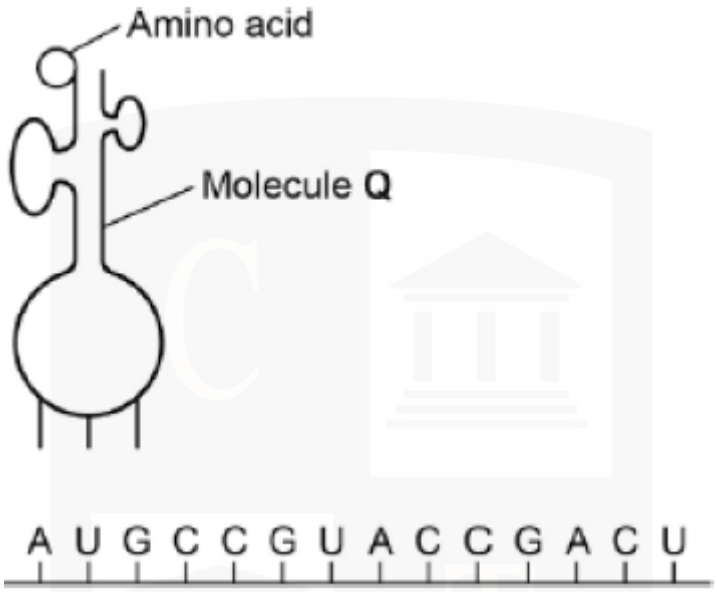
Make a suggestion for how this antibody inhibits the growth of a tumor using your understanding of monoclonal antibodies. **(3)**



**3.**

**(a)** One step in the production of proteins is shown in the diagram below.




**(a)** Give the name of the demonstrated procedure. **(1)**

**(b)** Determine which chemical is designated Q. **(1)**



**(c)** AUG is the first codon in the diagram above. Provide the following basic sequence: **(2)**

the complementary DNA base sequence:

the missing anticodon:

**4.**

**(a)** Polypeptides are formed during translation by the usage of messenger RNA (mRNA).

Explain the process by which mRNA is made in a cell's nucleus. **(6)**



**(b)** Describe the way proteins are put together. **(5)**



**(c)** Explain the process of protein digestion in the human stomach. **(4)**



**5.**

Read the following passage carefully.

It is now recognized that many diseases are caused by various forms of mitochondrial disease (MD). MD frequently weakens muscles by affecting the skeletal system.

Through the fertilized egg cell, our moms give us our mitochondria. Sperm from fathers do not carry mitochondria. Mutations in the genes that code for the mitochondria can result in certain mitochondrial disorders.

Genes involved in mitochondrial function that are mutated in the cell nucleus are the primary cause of the majority of mitochondrial disorders. These nuclear DNA mutations result in recessive alleles.

A mutation in a mitochondrial gene that codes for a tRNA results in one type of mitochondrial illness. In the DNA base sequence, guanine has been substituted for adenine in the mutation. The tRNA's anticodon is altered as a result.

As a result, the mitochondrion produces a protein that is not functional.

The presence of a mitochondrial illness can be determined in a variety of methods. One test measures the amount of lactate that a person's blood contains following physical activity. The concentration is typically far greater than normal in an MD patient. A tiny amount of DNA can be taken out of the mitochondria and subjected to DNA sequencing in order to look for mutations if the lactate test indicates MD.

Answer the following questions using the facts in the passage and your own understanding.

**(a)** Muscle weakness is a common symptom of mitochondrial dysfunction (MD) (lines 1-3). Make suggestions for explanations for this MD impact by drawing on your knowledge of breathing and muscle contraction. **(3)**

One or more of the offspring of spouses A and B suffered from a mitochondrial disease. For every pair, the type of mitochondrial illness was distinct.

Not a single parent displayed any MD symptoms or indicators.

Of the four children of Couple A, all four were impacted by an MD; of the four children of Couple B, only one was impacted by an MD.

**(b)** Make a suggestion for why using the details in lines 5–9 and your understanding of inheritance.

• Every child of spouse A had a medical degree.

• Of the children of couple B, just one had an MD. **(4)**



**(c)** Explain how MD is caused by a mutation in a tRNA's anticodon (lines 10–13). **(3)**



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