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BIOLOGY

ENERGY TRANSFERS IN & BETWEEN ORGANISMS

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

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DNA and Protein Synthesis - 1

1.

(a) A mutation in the tumor suppressor gene can cause it to deactivate because tumor suppressor genes encode proteins that suppress cell division. The mutation prevents the protein from being produced causing cells to divide uncontrollably forming a tumor.

OR

Tumor suppressor gene inactivated / not able to control / slow down cell division

Rate of cell division too fast / out of control.

(b) Only exons are used during translation and introns are spliced out prior to translation. If a mutation takes place in the DNA that will then be spliced out as an intron, this mutation has no effect on the amino acid sequence of the encoded polypeptide.

OR

Genetic code degenerate

Mutation in intron.

2.

(a) Antibody has specific tertiary structure / binding site

Complementary shape / fit to receptor protein / binds to receptor protein / to GF

Prevents GF binding to receptor

3.

(a) Translation.

(b) Transfer RNA

(c) TAC

UAC

4.

(a) Messenger RNA is produced in the nucleus of a cell by transcription. Firstly, DNA Helicase (1) causes the DNA strands to separate by breaking hydrogen bonds (2). Then free RNA nucleotides are attracted to the exposed non-coding strand (3+4) and line up to it via complementary base pairing (5).

OR

- Helicase
- Breaks hydrogen bonds
- Only one DNA strand acts as template
- RNA nucleotides attracted to exposed bases
- Attraction according to base pairing rule
- RNA polymerase joins RNA nucleotides together
- Pre-mRNA spliced to remove introns.

(b) To reiterate, the primary structure of a protein is defined as the sequence of amino acids linked together to form a polypeptide chain. Each amino acid is linked to the next amino acid through peptide bonds created during the protein biosynthesis process

OR

Polymer of amino acids

Joined by peptide bonds

Formed by condensation

Primary structure is order of amino acids

Secondary structure is folding of polypeptide chain due to hydrogen bonding

Tertiary structure is 3-D folding due to hydrogen bonding and ionic / disulfide bonds

Quaternary structure is two or more polypeptide chains

(c) Once a protein source reaches your stomach, hydrochloric acid and enzymes called proteases break it down into smaller chains of amino acids. Amino acids are joined together by peptides, which are broken by proteases. From your stomach, these smaller chains of amino acids move into your small intestine.

OR

Hydrolysis of peptide bonds

Endopeptidases break polypeptides into smaller peptide chains

Exopeptidases remove terminal amino acids

Dipeptidases hydrolyse / break down dipeptides into amino acids.

5.

(a)

Reduction in ATP production by aerobic respiration;

Less force generated because fewer actin and myosin interactions in muscle

Fatigue caused by lactate from anaerobic respiration.

(b)

Couple A

- Mutation in mitochondrial DNA / DNA of mitochondrion affected
- All children got affected mitochondria from mother
- Probably mutation during formation of mother's ovary / eggs

Couple B

- Mutation in nuclear gene / DNA in nucleus affected
- Parents heterozygous
- Expect 1 in 4 homozygous affected.

(c)

- Change to tRNA leads to wrong amino acid being incorporated into protein
- Tertiary structure of protein changed
- Protein required for oxidative phosphorylation / the Krebs cycle, so less / no ATP made.

I am Sorry !!!!!



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- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
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