SUBJECT: Biology YEAR: 13 MTP TITLE: The control of gene expression HALF TERM: 4-5 NO. OF LESSONS (approx): 25

Deliberate retrieval of expected prior knowledge

- Basic Genetics: Understanding of DNA, genes, and chromosomes.
- Protein Synthesis: Basic knowledge of transcription and translation processes.
- Cell Structure: Familiarity with the structure and function of the nucleus, ribosomes, and mitochondria.
- Enzymes: Role of enzymes as biological catalysts.

Academic transformation

- Gene Mutations: Types of mutations (addition, deletion, substitution, inversion, duplication, translocation) and their effects on protein structure.
- Gene Expression Regulation: Mechanisms controlling gene expression, including transcription factors and epigenetic modifications.
- Transcription Factors: Proteins that bind to specific DNA sequences to regulate gene transcription.
- Epigenetics: Heritable changes in gene function without altering the DNA sequence, influenced by environmental factors.
- RNA Interference: Mechanisms like siRNA and miRNA that regulate gene expression post-transcriptionally.
- Stem Cells: Role of stem cells in gene expression and their potential in medical applications.

Personal transformation

- Gene Therapy: Techniques for correcting defective genes responsible for disease development.
- Personalized Medicine: Tailoring medical treatment to individual genetic profiles.
- Ethical Implications: Debates surrounding gene editing technologies like CRISPR.
- Environmental Impact: How environmental factors influence gene expression and health.

Can I Learning Questions

- ***Can I explain how transcription and translation is regulated?***
- ***Can I explain how tumours are formed?***
- ***Can I describe how information gained from the genome project is useful today?***
- ***Can I describe how we transfer fragments of DNA from one organism to another?***
- ***Can I describe how we screen for heritable conditions?***
- ***Can I explain how genetic fingerprinting is used in forensic science, medical diagnosis and animal and plant breeding?***

Literacy / Oracy

Key vocabulary

Inversion, translocation, frame shift, totipotent, pluripotent, unipotent, cardiomocytes, induced pluripotent, transcription factors, epigenetic control, methylation, acetylation, RNA interference, tumour suppressor genes, oncogenes, genome, proteome, genetic code, complementary DNA, reverse transcriptase, gene machine, in vitro, in vivo, polymerase chain reaction, terminator region, restriction endonucleases, ligase, gene markers, DNA hybridisation, genetic counselling, variable number tandem repeats, genetic fingerprinting

Disciplinary reading

- Biofact sheets
- https://studywise.co.uk/a-level-revision/biology/
- https://www.s-cool.co.uk/a-level/biology
- AQA A Level Biology Revision Notes 2017 | Save My Exams
- https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF

Misconceptions

Gene Mutations: Belief that all mutations result in harmful effects.
Transcription Factors: Misunderstanding their role in gene activation and repression.
Epigenetics: Confusing epigenetic changes with genetic mutations.
RNA Interference: Not recognizing its role in regulating gene expression post-transcriptionally.
Stem Cells: Overlooking the potential of stem cells in regenerative medicine.
Gene Expression Regulation: Assuming gene expression is a static process without regulation.