Gene Regulation Video Worksheet

**Gene Regulation and the Order of the Operon**

<https://www.youtube.com/watch?v=h_1QLdtF8d0>

1. DNA is used to give \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during the process of protein synthesis.

2. Gene regulation will determine which genes to turn on and when, for example –

Regulatory Proteins for:

a) positive transcription to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the rate of transcription

b) negative transcription to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the rate of transcription

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are molecules that build up, break down and speed of chemical reactions.

4. There are four key players in “Operon” gene regulation.

|  |  |
| --- | --- |
|  | It’s a builder enzyme & starts transcription |
|  | Section of DNA that binds to RNA polymerase |
| Operator | Section of DNA that contains the \_\_\_\_\_\_\_\_\_\_\_\_\_ to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  | Can bind to the operator and stop RNA polymerase |

**Regulation of Gene Expression**

<https://www.youtube.com/watch?v=J9jhg90A7Lw>

1. Transcription and translation serve as a code for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of everything

within that organism

2. Some polypeptides will undergo folding in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ and sometimes

modification will occur in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ where special groups

like sugars, lipids and phosphates are attached.

3. Complete the “Central Dogma of Molecular Biology” below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Every somatic cell in your body contains the exact copy all of your genetic information, but

different cells in your body serve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ purposes and need to

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ different genes.

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mechanisms result in selective gene expression that should reflect the

immediate chemical surroundings

6. If a substance surrounding a cell is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell will \_\_\_\_\_\_\_\_\_\_\_\_ producing

that substances, if it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell will kick \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the production to

survive (feedback inhibition)

7. The operator (which is like an \_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_ switch) is a small section of DNA that controls

whether RNA polymerase has access to transcribe or not.

8. Most genes are typically \_\_\_\_\_\_\_\_\_ unless repressed, however some genes are \_\_\_\_\_\_\_\_\_\_\_ unless activated.

9. Explain two examples of negative gene expression:

1. A molecule \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ repression of a gene
2. A molecule \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ repression

10. Explain positive gene regulation:

1. a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule generates a complex that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with DNA

11. Genes bound to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cannot be expressed because RNA polymerase

cannot access them

12. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ box (a transcription factor) is a region of DNA that is easy to pry apart and

can easily initiate transcription.

13. Certain signaling molecules may only be present during \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

in the life cycle, like during puberty.

Production of Proteins Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Video Reflection

**What is a Gene?**

<https://www.youtube.com/watch?v=5MQdXjRPHmQ&t=183s>

1. Each one of our cells contains \_\_\_**46**\_\_\_ strands of DNA. A single strand is made of millions of

particles called \_\_\_\_**NUCLEOTIDES**\_\_\_\_\_\_.

2. A \_\_\_\_\_**GENE**\_\_\_\_\_ is a special stretch of DNA, a \_\_\_**SEQUENCE**\_\_\_\_\_\_ of A’s, T’s, C’s

and G’s that codes for something.

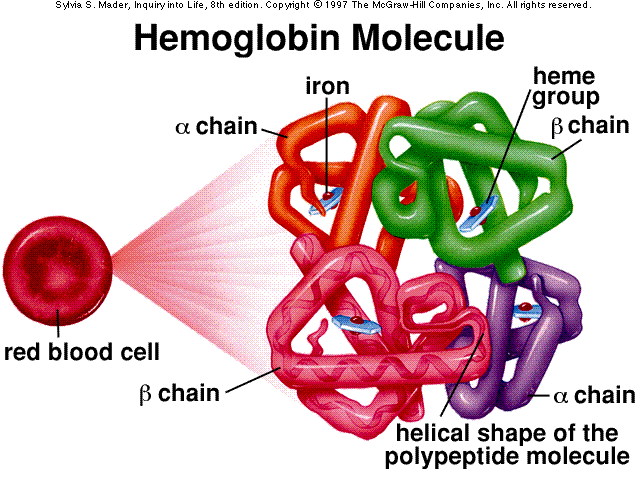
3. Genes make \_\_\_\_**PROTEINS**\_\_\_\_\_, that interact with each other proteins.

4. A single strand of DNA contains thousands of genes or unique protein \_\_\_\_**RECIPES**\_\_\_\_.

5. Human have approximately \_\_**20,000**\_\_\_ genes all together.

6. The size and shape of the gene will determine the \_\_\_**SIZE**\_\_\_\_ and \_\_**SHAPE**\_\_\_\_\_

of the protein which will determine the function of that protein in the body.

7. Draw a picture and explain the function of the hemoglobin protein.

**Hemoglobin is a red blood cell protein**

**That can carry 4 oxygen molecules**

8. What happens when a gene from bacteria is placed in a plant or an animal?

**The plant or the animal will begin making the bacterial protein**

9. Explain some interesting examples of how scientists have manipulated genetics.

**corn that is toxic to insects, tomatoes that stay fresh longer**

**Bacteria that makes insulin**

**Protein Synthesis**

<https://www.youtube.com/watch?v=oefAI2x2CQM>

1. Proteins serve several different important roles or functions. Identify at least 4.

1 **Transport** 2 **Structure**

3 **Enzymes** 4 **Protecting the Body**

2. \_\_\_\_**TRANSCRIPTION**\_\_\_ and \_\_\_**TRANSLATION**\_\_\_\_ are the two major steps in

protein synthesis.

3. Transcription occurs in the \_\_\_**NUCLEUS**\_\_\_\_\_ where RNA polymerase will connect

complimentary RNA \_\_**BASES**\_\_\_\_ to the DNA to make single stranded \_\_**mRNA**\_\_\_ or

messenger RNA.

4. mRNA will leave the nucleus and enter the cytoplasm to attach to a \_\_\_**RIBOSOME**\_\_\_\_\_\_\_

to make proteins during translation.

5. \_\_\_**tRNA**\_\_\_ (transfer RNA) carry an \_\_\_**AMINO**\_\_\_ \_\_**ACID**\_\_\_ on them with the monomer

for a protein or a building block for \_\_\_**PROTEIN**\_\_\_\_\_.

6. mRNA \_\_\_\_**CODON**\_\_\_\_\_ and tRNA \_\_\_\_**ANITCODON**\_\_\_\_\_\_ come in 3-base complimentary

pairs. Each codon will correspond to a unique or specific amino acid. For example, AUG or

methionine is a \_\_\_\_**START**\_\_\_\_\_\_ codon.

**Why RNA Is Just As Cool as DNA**

<https://www.youtube.com/watch?v=0Elo-zX1k8M>

1. Without \_\_\_**RNA**\_\_\_\_ you wouldn’t be able to get genetic message out to cells to

produce \_\_\_\_**PROTEINS**\_\_\_\_\_.

2. DNA and RNA are both \_\_\_\_\_**NUCLEIC**\_\_\_\_\_\_ acids

3. Compare and Contrast DNA and RNA.

|  |  |
| --- | --- |
| DNA | RNA |
| \_\_\_\_**DEOXYRIBOSE**\_\_\_\_ sugar | \_\_\_**RIBOSE**\_\_\_\_ sugar |
| \_\_\_\_\_\_**DOUBLE**\_\_\_\_ stranded | \_\_**SINGLE**\_\_\_\_\_ stranded |
| Adenine, Guanine, Cytosine & \_\_**THYMINE**\_\_\_ | Adenine, Guanine, Cytosine, \_\_**URACIL**\_\_\_\_ |
| Found in the \_\_\_**NUCLEUS**\_\_\_\_\_ | In the \_**NUCLEUS**\_\_\_\_ & the \_\_**CYTOPLASM**\_\_\_\_\_ |
|  | 3 types of RNA: mRNA, tRNA, rRNA |

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Regulatory Proteins for:

a) positive transcription to \_\_\_**INCREASE**\_\_\_\_\_\_ the rate of transcription

b) negative transcription to \_\_\_**DECREASE**\_\_\_\_\_ the rate of transcription

3. \_\_\_\_**ENZYMES**\_\_\_\_\_ are molecules that build up, break down and speed of chemical reactions.

4. There are four key players in “Operon” gene regulation.

|  |  |
| --- | --- |
| **RNA polymerase** | It’s a builder enzyme & starts transcription |
| **Promoter** | Section of DNA that binds to RNA polymerase |
| Operator | Section of DNA that contains the \_\_\_\_\_\_\_\_\_\_\_\_\_ to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Repressor** | Can bind to the operator and stop RNA polymerase |

**Regulation of Gene Expression**

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1. Transcription and translation serve as a code for the \_\_**MANUFACTURE**\_\_\_\_\_\_ of everything

within that organism

2. Some polypeptides will undergo folding in the \_\_\_\_**ROUGH**\_\_\_\_\_ \_\_\_**ER**\_\_\_ and sometimes

modification will occur in the \_\_\_\_**GOLGI**\_\_\_\_\_ \_\_**APPARATUS**\_\_\_\_\_ where special groups

like sugars, lipids and phosphates are attached.

3. Complete the “Central Dogma of Molecular Biology” below:

\_\_\_**DNA**\_\_\_ → \_\_\_**RNA**\_\_\_\_ → \_\_\_\_**PROTEINS**\_\_\_\_

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different cells in your body serve \_\_\_\_**DIFFERENT**\_\_\_\_\_\_ purposes and need to

\_\_\_**EXPRESS**\_\_\_\_ different genes.

5. \_\_\_\_**REGULATORY**\_\_\_\_ mechanisms result in selective gene expression that should reflect the

immediate chemical surroundings

6. If a substance surrounding a cell is \_\_\_\_**PLENTIFUL**\_\_\_\_\_ the cell will \_\_**STOP**\_\_\_ producing

that substances, if it is \_\_\_**SPARCE**\_\_\_\_\_\_ the cell will kick \_\_\_**START**\_\_\_\_ the production to

survive (feedback inhibition)

7. The operator (which is like an \_\_**ON**\_\_\_/\_\_**OFF**\_\_\_ switch) is a small section of DNA that controls

whether RNA polymerase has access to transcribe or not.

8. Most genes are typically \_\_**ON**\_\_ unless repressed, however some genes are \_\_**OFF**\_\_ unless activated.

9. Explain two examples of negative gene expression:

1. A molecule \_\_**ACTIVATES**\_\_\_\_ repression of a gene
2. A molecule \_\_**DEACTIVATES**\_\_\_\_ repression

10. Explain positive gene regulation:

1. a \_\_\_\_SIGNALING\_\_\_\_ molecule generates a complex that \_\_\_**INTERACTS**\_\_\_ with DNA

11. Genes bound to \_\_\_\_**HISTONES**\_\_\_\_ cannot be expressed because RNA polymerase

cannot access them

12. A \_\_\_**TATA**\_\_\_ box (a transcription factor) is a region of DNA that is easy to pry apart and

can easily initiate transcription.

13. Certain signaling molecules may only be present during \_\_**SPECIFIC**\_\_\_ \_\_\_**TIMES**\_\_\_

in the life cycle, like during puberty.