Unit 1 Assignment: Molecular basis for inheritance

1) Explain how Frederick Griffith’s experiment demonstrated that heritable material can be transferred between bacteria

2) The probable candidates for the heritable material were protein and DNA. How did Hershey and Chase’s experiment show that the heritable material was in fact DNA?

3) *Chargaff’s Rule* states:

* The base composition of DNA varies between species
* For each species the percentages of A and T bases are roughly equal. G and C are roughly equal

Using what you know of *Chargaff’s Rule*, complete the following table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DNA Source | Adenine | Guanine | Cytosine | Thymine |
| Sea Urchin | 32.8% | 17.7% | 17.3% | 32.1% |
| Salmon | 29.7% | 20.8% | 20.4% | 29.1% |
| Wheat | 28.1% | 21.8% | 22.7% |  |
| *E. coli* | 24.7% | 26.0% |  |  |
| Human | 30.4% |  |  | 30.1% |
| Ox | 29.0% |  |  |  |

4) How does Watson and Crick’s discovery of the double helix model explain the similar ratios of A/T and G/C?

5) Draw and explain the steps of DNA replication. Be sure to mention all enzymes/ proteins. Label each end of the DNA with either 5’ or 3’ to show the directions of replication

6) What causes our somatic cell DNA to break down? How does that impact future cell division?

7) How do germ cells prevent the degradation of genes?

8) Explain how the biochemical pathway for creating arginine was used to demonstrate the “one gene-one polypeptide (enzyme)” theory

9) What is the purpose for creating mRNA? Ie. Why doesn’t DNA just bring its own message?

10) Draw and explain how RNA polymerase is used to transcribe DNA into RNA. Be sure to use all the terminology needed to describe initiation, elongation, and termination

11) Explain the steps in RNA processing and also explain why each step is important

12) Alternative RNA splicing is when one gene is able to produce multiple different polypeptides. How is this concept linked to intron and exons?

13) Explain how the structure of tRNA allows for it to carry out its function. Be sure to explain its function

14) Explain the function of a ribosome (ie. How is it used in translation?). How are the EPA sites involved in translation?

15) Once tRNA drops off its amino acid, explain how it is able to attach to another

16) Explain how the creation of a polypeptide is initiated, elongated, and then terminated

17) What is the difference between nucleotide-pair substitution and nucleotide-pair insertion/deletion is terms of the number of amino acids it will affect

18) Explain the difference between nonsense, missense, neutral, and silent mutations

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