

Name:
Date:
Period:

FRQ practice

The unit of genetic organization in all living organisms is the chromosome.

- (a) **Describe** the structure and function of the parts of a eukaryotic chromosome. You may wish to include a diagram as part of your description.
- (b) **Describe** the adaptive (evolutionary) significance of organizing genes into chromosomes.
- (c) How does the function and structure of the chromosome differ in prokaryotes?

2005 Genetic Essay Question Rubric

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- How does the function and structure of the chromosome differ in prokaryotes?

Part A: 5 Points Maximum

- _____ Chromatid structure: 2/ sister/ pair/ identical DNA/ genetic information
- _____ Chromatid function: distribution of one copy to each new cell
- _____ Centromere structure: noncoding/ uncoiled/ narrow/ constricted/ region/ determines arm ratio
- _____ Centromere function: joins/ holds/ attaches chromatids together
- _____ Nucleosome Concept Structure: Histones, DNA wrapped around special proteins
- _____ Nucleosome Concept Function: Packaging/ compacting
- _____ Chromatin Form (heterochromatin/ euchromatin) structure: condensed supercoiled vs. loosely coiled.
- _____ Chromatin Form (heterochromatin/ euchromatin) function: proper distribution in cell division (not during replication)/ gene expression during interphase/ replication occurs when loosely packed
- _____ Kinetochores structure: disc-shaped proteins
- _____ Kinetochores function: spindle attachment/ alignment
- _____ Genes or DNA structure: brief DNA description
- _____ Genes or DNA function: codes for proteins or for RNA
- _____ Telomeres structure: Tips, ends, noncoding repetitive sequences
- _____ Telomeres function: protection against degradation/ aging, limits number of cell division

NOTE: No points for just naming the component, for stating that chromosomes are made of genes and a diagram alone will not suffice but can be used for clarification.

Part B: 4 Points Maximum, 2 Points Per Theme

- Allows for **Genetic Variation**
 - _____ through independent assortment (brief description)
 - _____ through crossing over (brief description)
 - _____ leads to variation in gametes
- Allows for **Genetic Stability**
 - _____ efficiency of transfer of genetic information
 - _____ prevents loss of genetic information
 - _____ offspring get same number of chromosomes
 - _____ maintains integrity of chromosomes
 - _____ linked genes tend to be inherited together
- Allows for **Gene Regulation**
 - _____ increased complex structure
 - _____ histone acetylating
 - _____ methylation
- Allows for **Complexity**
 - _____ allows for more genes
 - _____ evolution of new genes can occur/transposons
 - _____ intron/ exon allows for alternate splicing

- Allows for **Diploid/Polyploid**

_____ genetic fitness

_____ minimizes the effect of harmful alleles/ backup copy

_____ extra set(s) of alleles

_____ heterozygosity

Part C: 4 Points Maximum

_____ shape (circular/ nonlinear/loop)

_____ less complex (no histones/less elaborate structure/folding)

_____ size (smaller size/less genetic information/fewer genes)

_____ replication method (single origin of replication/ theta replication)

_____ transcription/translation may be coupled

_____ generally few or no introns (noncoding)

_____ majority of genome expressed

_____ operons – gene regulation

NOTE: No points for plasmids – more common but not unique to prokaryotes/ not part of prokaryote chromosome.