2. 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?

3. Angiosperms (flowering plants) have wide distribution in the biosphere and the largest number of species in the plant kingdom.

   (a) **Discuss** the function of FOUR structures for reproduction found in angiosperms <u>and</u> the adaptive (evolutionary) significance of each.

   (b) Mosses (bryophytes) have not achieved the widespread terrestrial success of angiosperms. **Discuss** how the anatomy and reproductive strategies of mosses limit their distribution.

   (c) **Explain** alternation of generations in either angiosperms <u>or</u> mosses.

4. An important defense against diseases in vertebrate animals is the ability to eliminate, inactivate, or destroy foreign substances and organisms. **Explain** how the immune system achieves THREE of the following:

   - Provides an immediate nonspecific immune response

   - Activates T and B cells in response to an infection

   - Responds to a later exposure to the same infectious agent

   - Distinguishes self from nonself

END OF EXAM

Part A (5 points maximum)		
Component	**Structure: 1 point/component**	**Function: 1 point/component**
Chromatids	2/sister/pair/identical DNA/genetic information	Distribution of one copy to each new cell
Centromere	Noncoding/uncoiled/narrow/constricted region/determines arm ratio	Joins/holds/attaches chromatids together
Nucleosome concept	Histones, DNA wrapped around special proteins	Packaging compacting
Chromatin form (heterochromatin/ euchromatin)	Condensed/supercoiled → Loosely coiled →	Proper distribution in cell division (not during replication) Gene expression during interphase/replication occurs when loosely packed
Kinetochores	Disc-shaped proteins	Spindle attachment/alignment
Genes or DNA	Brief DNA description	Codes for proteins or for RNA
Telomeres	Tips, ends, noncoding repetitive sequences	Protection against degradation/ aging, limits number of cell divisions

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

Part B (4 points maximum, 2 points per theme)	**Part C** (4 points maximum)
- allows for **<u>genetic variation</u>** - through independent assortment (brief description) - through crossing over (brief description) - leads to variation in gametes - allows for **<u>genetic stability</u>** - 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 **<u>gene regulation</u>** - increased complex structure - histone acetylating - methylation - allows for **<u>complexity</u>** - allows for more genes - evolution of new genes can occur/transposons - intron/exon allows for alternate splicing - allows for **<u>diploid/polyploid</u>** - genetic fitness - minimizes the effect of harmful alleles/backup copy - extra set(s) of alleles - heterozygosity	**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 *No points for plasmids—more common but not unique to prokaryotes/not part of prokaryote chromosome.*