STUDY GUIDE: EXAM TWO

Cellular Division: Mitosis and Meiosis: (Chapter 17)

1. A. In your own words, define cellular division.  B. What is the purpose of cellular division in single celled organisms?  C. in higher animals?  D. what two types of cell division have we learned about?

2. A. Define in your own words the following terms (use drawings to help explain): chromatin, chromosome, sister chromatid, centromere, homologous chromosomes (or homologues)  B. Do sister chromatids carry identical genetic information?  C. Do homologous chromosomes?

3. A. Describe the relationship between autosomes (somatic chromosomes), sex chromosomes, somatic cells and sex cells (you can use a drawing to help illustrate your point.)  B. Describe the terms diploid (2N) and haploid (N) in relation to the types of cells above.

4. A. What is the cell cycle all about or what does it show? (briefly) B. Draw a simplified illustration of the cell cycle using only the words interphase, and mitosis.  C. What is the longest phase of the cell cycle?  D. This phase is divided up into three distinct stages.  What are they and describe briefly what happens in each.  E. Why must DNA replicate prior to mitosis and exactly when does this occur?  F. What is cytokinesis and when does it occur?

5. A. What is the purpose of mitosis?  B. Mitosis has four distinct stages.  What are they and describe in detail what happens in each stage.

6. A. If a cell has 13 chromosomes as a haploid cell, how many chromosomes are found in the diploid cell of the same organism?  B. If a somatic cell has 30 chromosomes, how many are in the gametes?  C. A gamete has 8 chromosomes, is this the N or 2N number? and, how many chromosomes then, are in the somatic cells?  D. If a somatic cell has 24 chromosomes, how many homologues are there?  E. What is the haploid and diploid number of chromosomes in humans?

7. A. What is the purpose of meiosis in higher animal such as humans?  B. Why is this also called reduction division?  C. Does the DNA replicate during the S stage of interphase prior to meiosis just like it does in mitosis forming sister chromatids?

8. A. Meiosis is broken into two large divisions: meiosis I and meiosis II.  Name the stages within each of those large divisions.  B. what is crossing over?  C. when does it occur in meiosis?  D. what is the significance of crossing over?  E. Describe how the separation of chromosomes is different in Anaphase I and Anaphase II.
9. A. How is the outcome of mitosis different from meiosis in cell number and chromosome number? B. If a cell has 32 chromosomes and undergoes meiosis, how many chromosomes would be found in each daughter cell? C. what if the original cell undergoes mitosis?

Molecular Biology: (Chapter 17)

1. A. What is the monomer unit of DNA and what are its three parts? B. Draw a DNA nucleotide. C. What is the shape of a DNA molecule? What makes up the sides of the "ladder"? What makes up the steps of the "ladder"? D. Where in the cell is DNA found? E. Diagram a short section of DNA with six bases on one side. (use each possible base at least once)

2. A. What is the monomer unit of RNA and what are its three parts? B. What is the shape of an RNA molecule C. Where in the cell can RNA found? D. What are the three different types of RNA studied? E. Diagram a short section of RNA with six bases. (use each possible base at least once)

3. Name five differences (physical and/or functional) between DNA and RNA.

4. A. What is the overall purpose of DNA replication? B. During which stage (specifically) of the cell cycle does DNA replication occur?

5. A. In your own words, what are the basic steps in DNA replication. B. where in the cell does DNA replication occur? C. describe what is meant by “semi-conservative” replication. D. How could semi-conservative replication provide an advantage the cell?

6. A. What does the term protein synthesis mean? B. What are the two major steps involved in protein synthesis? C. Must DNA replication occur in order for an individual cell to make proteins?

7. A. In your own words, give a simplified description of what happens during transcription. B. briefly outline the steps of transcription. C. what happens after transcription, before the mRNA strand is ready to begin translation? (Hint: use the terms intron, exon, cap, tail)

8. A. Why is mRNA called a template? B. Where does transcription occur? why does it have to occur there? C. Where does the mRNA molecule move after transcription is complete?

9. A. In your own words, describe what happens during translation. B. briefly outline the steps of translation: include at least the terms: mRNA, codon, ribosome, tRNA charged w/ amino acid, anticodon, polypeptide. C. where in the cell does translation occur? why does it have to occur there?

10. A. What is an anti-codon and on what molecule is it located? B. By what process are the amino acids joined together? C. Once a polypeptide chain is formed (primary structure) what has to happen before it can become a functional protein? Where does this occur?
11. In review, briefly explain how the master "code" for a particular protein found in the DNA, is ultimately expressed by the production of that same protein in the cytoplasm. (brief overview of protein synthesis)

12. A. In your own words, what is a gene mutation?  B. What do we call things that can cause mutations in DNA?  C. What are the two main types of DNA mutations?  D. Which type is likely to be more damaging to the protein?

Biotechnology: (Ch. 20)

1. A. What is meant by “recombinant DNA"  B. What are restriction enzymes” and how are restrictions enzymes used in making recombinant DNA?  C. How is it possible the same restriction enzyme can cut DNA from two different people into different lengths of DNA segments?  D. what are these lengths of DNA called?

2. A Describe the process of making recombinant DNA as outlined in class.  B. What are some uses for this technology?

3. A. What is meant by a DNA "fingerprint"?  B. Explain how/why electrophoresis can separate DNA fragments (RFLP's) from each other.  C. In a few sentences explain how DNA fingerprinting could allow you to help solve a murder mystery.

4. Give some example of the following and how they might benefit humans:  A. Transgenic bacteria  B. Transgenic plants  C. Transgenic animals.  D. Briefly discuss the controvers?

Heredity: (Ch. 19)

1. Define the following terms, give examples to help explain your answer:  a. gene,  b. allele,  c. dominant allele,  d. recessive allele,  e. genotype,  f. homozygous dominant,  g. homozygous recessive,  h. heterozygous/hybrid  i. phenotype

2. a. Who was Gregor Mendel?  b. What organism did he use in his study?  c. What is meant by Mendelian Inheritance?

3. a. When doing a punnett square, what do the letters outside of the box represent and where do they come from (be specific)?  b. If a parent is homozygous dominant for a trait, how many different kinds of gametes can (s)he make? Give an example  c. If the parent is homozygous recessive …? Example?  d. If the parent is heterozygous …? Example?  e. What do the letters inside the box represent (be specific)?

4. Show a monohybrid cross using the following information:  L = long wings,  l = short wings  Show the punnett square and give the genotypic and phenotypic outcomes of the offspring.
5. Explain Mendel’s principle of segregation: to help illustrate your point give an example.

6. Show a dihybrid cross using the following information:
L = long wings, l = short wings and N = notched wings, n = smooth wings Show the
punnett square and give the genotypic and phenotypic outcomes of the offspring.

7. Explain Mendel’s principle of independent assortment: to help illustrate your point, give an example.

8. a. Distinguish between complete dominance, co-dominance and incomplete dominance.
   b. Human blood groups have which two types of dominance? Explain/show how this works.

9. a. What is meant by multiple alleles? b. give an example c. If a man of blood type B and
   a woman of blood type A have children, show (by punnett square) how they could have
   children of all blood phenotypes (A, B, AB and O)

10. a. What is meant by Polygenic Inheritance? b. Give an example of a human trait that is
    governed by polygenic inheritance.

11. a. what are sex-linked traits? b. What are X-linked traits? Give some examples. c. which
    sex is generally affected in a greater percentage? d. If a colorblind male marries a carrier female,
    what are the chances that their children will be color-blind? e. Cross: X^{H}X^{h} and X^{H}Y What
    % of offspring are normal? f. what are sex influenced traits? Give an example

12.a. For what scientific purpose are pedigrees used? b. draw and label the pedigree symbols
    used in class. c. be able to fill out an autosomal dominant or recessive pedigree and an X-linked
    dominant or recessive pedigree (study class notes)

13. Chromosomal abnormalities: a. What is meant by "non-disjunction"? b. What is trisomy?
    Give an example c. what is monosomy? Give an example

14. Describe the following: a. amniocentesis, b. karyotype, C. chorionic villus sample

15. a. What is meant by an "autosomal recessive trait"? b. give some examples of autosomal
    recessive diseases. c. What is meant by an "autosomal dominant trait"? d. give some
    examples of autosomal dominant diseases.