Exam 4 in Biol 101 will be on Wednesday, October 29, 2008.
Biol 101 Fall 2008 Exam 4 Study Guide: Cell Reproduction & Patterns of Inheritance
The first set of questions in this study guide is related to Cell Reproduction, emphasizing mitosis and meiosis.
The second set of questions deals with Patterns of Inheritance.
Use this study guide together with the Powerpoint uploads, your class notes and your text to prepare for the exam.

Sample questions related to binary fission, cell cycle and mitosis and meiosis.

1) Creation of offspring carrying genetic information from just a single parent is called
   A) a life cycle.
   B) asexual reproduction.
   C) sexual reproduction.
   D) regeneration.
   E) None of the choices are correct.

2) Which one of the following is a difference between sexual and asexual reproduction?
   A) Only offspring from asexual reproduction inherit traits from two parents.
   B) Sexual reproduction typically includes the development of unfertilized eggs.
   C) Sexual reproduction is more likely to increase genetic variation than is asexual reproduction.
   D) Only asexual reproduction results from the union of a sperm and an egg.
   E) Cell division only occurs after sexual reproduction.

3) Strictly speaking, the phrase "like begets like" refers to
   A) all forms of reproduction.
   B) sexual reproduction only.
   C) production of gametes from a premeiotic cell.
   D) asexual reproduction only.
   E) None of the choices are correct.

4) With the exception of identical twins, siblings who have the same two biological parents are likely to look similar, but not identical, to each other because they have
   A) the same combination of traits but different genes.
   B) only a 20% chance of sharing the same combination of genes.
   C) a similar but not identical combination of genes.
   D) identical genes but different chromosomes.
   E) identical chromosomes but not identical genes.

5) Which one of the following is false? Cell division
   A) is necessary for development to occur.
   B) is common in eukaryotes but rare in prokaryotes.
   C) is the basis of both sexual and asexual reproduction.
   D) can reproduce an entire organism.
   E) ensures the continuity of life from generation to generation.

6) Which one of the following is false?
   A) In prokaryotes, most genes are carried on a circular DNA molecule.
   B) Prokaryotic cells are generally smaller and simpler than eukaryotic cells.
   C) Most prokaryotes reproduce by binary fission.
   D) Prokaryotic chromosomes are more complex than those of eukaryotes.
E) Daughter prokaryotic chromosomes are separated by some sort of active movement away from each other and the growth of new plasma membrane between them.

7) Sister chromatids are
A) made only of DNA.
B) found right after a cell divides.
C) tightly linked together at a centromere.
D) formed when chromatids separate during cell division.
E) unique to prokaryotes.

8) Compared to prokaryotic chromosomes, eukaryotic chromosomes
A) include fewer proteins.
B) are simpler.
C) are circular in structure.
D) are housed in a membrane-enclosed nucleus.
E) are copied immediately after cell division.

9) Prior to mitosis, each chromosome of a eukaryotic cell consists of a pair of identical structures called
A) sister chromosomes.
B) chromatin.
C) nucleoli.
D) DNA transcripts.
E) sister chromatids.

10) Which of the following help maintain the structure of chromosomes and control the activity of genes?
A) proteins
B) ribosomes
C) the nuclear membrane
D) lipids
E) centromeres

11) Eukaryotic cells spend most of their cell cycle in which phase?
A) metaphase
B) anaphase
C) prophase
D) interphase
E) telophase

12) The process by which the cytoplasm of a eukaryotic cell divides to produce two cells is called
A) telophase.
B) mitosis.
C) spindle formation.
D) cytokinesis.
E) binary fission.

13) If the S phase was eliminated from the cell cycle, the daughter cells would
A) be genetically identical.
B) synthesize the missing genetic material on their own.
C) be genetically identical to the parental cell.
D) have half the genetic material found in the parental cell.
E) None of the choices are correct.

14) Which of the following occurs during interphase?
A) duplication of the chromosomes
B) cytokinesis
C) a reduction in the size of the nuclear membrane
D) cell growth and duplication of the chromosomes
E) None of the choices are correct.

15) Looking into your microscope, you spot an unusual cell. Instead of the typical rounded cell shape, the cell has a very narrow middle separating two bulging ends. It sort of looks like the number 8! Then you realize, this is a cell
A) in the S phase of interphase.
B) that is about to undergo mitosis.
C) in the G2 phase of interphase.
D) undergoing cytokinesis.
E) in the G1 phase of interphase.

16) The phase of mitosis during which the nuclear envelope fragments and the nucleoli disappear is called
A) anaphase.
B) telophase.
C) prophase.
D) metaphase.
E) interphase.

17) During which phase of mitosis do the chromosomes line up on a plane located equidistant from the two spindle poles?
A) telophase
B) metaphase
C) anaphase
D) prophase
E) interphase

18) Which one of the following does not occur during mitotic anaphase?
A) The chromatid DNA replicates.
B) Sister chromatids separate.
C) The centromeres of each chromosome divide.
D) Daughter chromosomes begin to move toward opposite poles of the cell.
E) All of the choices occur during mitotic anaphase.

19) During which phase of mitosis does the nuclear envelope re-form and the nucleoli reappear?
A) interphase
B) telophase
C) anaphase
D) metaphase
E) prophase

20) Which of the following is a feature of plant cell division that distinguishes it from animal cell division?
A) A cell plate forms.
B) Four new cells (rather than two) are produced per mitotic division.
C) Cytokinesis does not occur.
D) The nucleolus disappears and then reappears.
E) A cleavage furrow forms.

21) Which of the following is likely to account for the difference between plant and animal cell cytokinesis?
A) Animal cells lack chloroplasts.
B) Plant cell division must maintain the integrity of the cell wall.
C) Plant and animal cells do not have a common ancestor.
D) Plant cells have two sets of chromosomes; animal cells have one set of chromosomes.
E) Plant cells lack the microfilaments required for forming a cleavage furrow.

22) When animal cells are grown in a petri dish, they typically stop dividing once they have formed a single, unbroken layer on the bottom of the dish. This arrest of division is an example of
A) density-dependent inhibition.
B) cell division repression.
C) cell constraint.
D) cancer.
E) growth factor desensitization.

23) As a patch of scraped skin heals, the cells fill in the injured area but do not grow beyond that. This is an example of
A) density-dependent inhibition.
B) anchorage-dependent inhibition.
C) density-independent inhibition.
D) anchorage independence.
E) growth factor inhibition.

24) The cell-cycle control system
A) triggers and controls major events in the cell cycle.
B) is influenced by growth factors that bind to cell receptors.
C) includes three key checkpoints to complete a cell cycle.
D) receives messages from outside of the cell that influence cell division.
E) All of the choices are correct.

25) You are asked to culture an unidentified sample of animal tissue. You notice that the cells seem not to exhibit density-dependent inhibition. Which of the following choices would be the most likely source for this tissue sample?
A) a scar
B) the fetal liver
C) the skin
D) a cancer
E) the sperm-producing tissue of the testis

26) A benign tumor differs from a malignant tumor in that a benign tumor
A) spreads from the original site.
B) can only arise in the brain, whereas a malignant tumor can arise anywhere in the body.
C) never causes health problems.
D) does not metastasize.
E) is cancerous.
27) You are the director of research for a drug company. A list of candidate drugs is brought to you. Which of the following shows the greatest promise as a cancer chemotherapy agent? A drug that
A) causes cells to divide at a right angle from their usual orientation.
B) prevents sister chromatids from separating at anaphase.
C) prevents tetrad formation.
D) interferes with cellular respiration.
E) prevents crossing over.

28) Which one of the following is a function of mitosis? Mitosis helps organisms
A) repair tissues.
B) grow.
C) replace worn cells.
D) reproduce asexually.
E) All of the choices are correct.

29) Two chromosomes in a nucleus that carry loci for the same traits in the same positions on the chromosome but specify different versions of some traits constitute a pair of
A) polyploid chromosomes.
B) heterologous chromosomes.
C) homologous chromosomes.
D) complementary chromosomes.
E) None of the choices are correct.

30) Which one of the following statements is false?
A) A typical body cell is called a somatic cell.
B) A zygote is a fertilized egg.
C) Gametes are made by mitosis.
D) Gametes are haploid cells.
E) Somatic cells are diploid.

31) Which of the following statements is false?
A) All sexual life cycles involve an alternation of diploid and haploid stages.
B) A haploid cell has half the chromosomes of a diploid cell.
C) A normal human zygote has 46 chromosomes.
D) Mitosis produces daughter cells with half the number of chromosomes as the parent cell.
E) Meiosis only occurs in the ovaries and testes.

32) During which stage of meiosis do synapsis and the formation of tetrads occur?
A) prophase II
B) interphase I
C) prophase I
D) interphase II
E) None of the choices are correct.

33) Which one of the following choices best describes the behavior of a tetrad during anaphase I of meiosis?
A) It splits into two pairs of sister chromatids, and one pair goes to each pole of the dividing cell.
B) It splits into four chromosomes, which distribute in random pairs to the two poles of the dividing cell.
C) It goes intact to one pole of the dividing cell.
D) It splits into four chromosomes, which distribute in sister-chromosome pairs to the two poles of the dividing cell.
E) It splits into two pairs of homologous, nonsister chromatids, and one pair goes to each pole of the dividing cell.

34) Which of the following is a difference between mitosis and meiosis?
   A) In meiosis four daughter cells are produced, whereas in mitosis two daughter cells are produced.
   B) Cells produced by mitosis are diploid; cells produced by meiosis are haploid.
   C) In mitosis cytokinesis occurs once, whereas in meiosis cytokinesis occurs twice.
   D) Mitosis but not meiosis occurs in somatic cells.
   E) All of the choices are correct.

35) Which one of the following statements is false?
   A) Meiosis provides for asexual reproduction.
   B) In mitosis, the chromosomes replicate only once in the preceding interphase.
   C) In meiosis, the chromosomes replicate only once in the preceding interphase.
   D) Mitosis provides for growth and tissue repair.
   E) All the events unique to meiosis occur during meiosis I.

36) Independent orientation of chromosomes at metaphase I results in an increase in the number of
   A) points of crossing over.
   B) possible combinations of characteristics.
   C) homologous chromosomes.
   D) sex chromosomes.
   E) gametes.

37) Karyotyping
   A) can reveal alterations in chromosome number.
   B) shows chromosomes as they appear in metaphase of meiosis II.
   C) examines points of crossing over.
   D) reveals the presence of cancerous genes.
   E) reveals the results of independent orientation of chromosomes during meiosis I.

38) Which one of the following is false?
   A) Down syndrome is the most common serious birth defect in the United States.
   B) Women with Down syndrome cannot reproduce.
   C) A human embryo with an abnormal number of chromosomes is usually spontaneously aborted.
   D) Trisomy 21 usually leads to Down syndrome.
   E) People with Down syndrome usually have a life span much shorter than normal.

39) Nondisjunction occurs when
   A) members of a chromosome pair fail to separate.
   B) an entire pair of chromosomes is lost during meiosis I.
   C) a portion of a chromosome breaks off and is lost.
   D) two chromosomes fuse into one.
   E) chromosomes replicate too many times.

40) Which one of the following is false?
   A) The absence of a Y chromosome results in "femaleness."
   B) In general, a single Y chromosome is enough to produce "maleness."
C) Women with a single X chromosome have Turner syndrome and are sterile.
D) In mammals, extra copies of the Y chromosome are typically inactivated.
E) Nondisjunction in meiosis can affect autosomes and sex chromosomes.

41) If a chromosome fragment breaks off and then reattaches to the original chromosome but in the reverse direction, the resulting chromosomal abnormality is called a(n)
A) deletion.
B) reciprocal translocation.
C) nondisjunction.
D) inversion.
E) translocation.

42) Examine the following sentence. "Where is the cat?" Which one of the following variations of this sentence is most like a chromosomal deletion?
A) Where is cat?
B) Where is the the cat?
C) Where is cat the the cat?
D) Where is is is is the cat?
E) Where the is cat?

43) Cancer is not usually inherited because
A) people with cancer usually die before reproducing.
B) cancer typically causes disruptions of meiosis.
C) the causes of cancer are not usually genetic.
D) the cancerous cells usually interfere with the ability to produce gametes.
E) the chromosomal changes in cancer are usually confined to somatic cells.

44) The genetic material is duplicated during
A) the mitotic phase.
B) mitosis.
C) G with subscript((2) ) .
D) G with subscript((1) ) .
E) the S phase.

45) Both mitosis and meiosis are preceded by
A) anaphase.
B) interphase.
C) telophase.
D) prometaphase.
E) prophase.
The next set of questions is related to Patterns of Inheritance.

1. A diploid organism that has two identical alleles for the same trait is called _______ for that particular trait.
   A) homozygous
   B) heterozygous
   C) dominant
   D) recessive
   E) codominant

2. A gene for a particular trait that is only expressed in the presence of another gene of the same kind is called a(n)
   A) dominant gene
   B) codominant gene
   C) incompletely dominant gene
   D) recessive gene
   E) multiple allele

3. A set of red blood cell surface antigens that are responsible for serious interactions between a mother and her developing fetus are called the
   A) ABO antibody factors
   B) Barr body factors
   C) sex-linked antigens
   D) Rh factors
   E) X-factors

4. One of the general principles of biology that was accepted before much was known about genetics was that “like begets like” or
   A) heredity occurs within species, and species “breed true”
   B) hybrids can form occasionally from any two parents
   C) mythical monsters can no longer be found on earth
   D) traits are transmitted directly
   E) traits of both parents are blended in the offspring

5. Mendel chose the garden pea for his work on inheritance for all of the following reasons except
   A) The monastery of which he was a monk ordered him to use it.
   B) Earlier investigators had shown segregation among the offspring.
   C) A large number of true breeding varieties were already available.
   D) The generation time was short; many offspring can be grown easily.
   E) He could choose to self- or cross-pollinate.

6. Mendel referred to the trait that was expressed in the hybrid, F₁ or first filial generation as
   A) recessive
   B) dominant
   C) codominant
   D) independent
7. In a typical Mendel experiment on pea-seed color, if the dominant yellow seed-bearing plant was crossed with the recessive green seed-bearing plant, the F2 generation will show what ratio of each kind?
A) 1 yellow : 3 green
B) 1 yellow 1 green
C) 3 yellow 1 green
D) seeds with patches of green and yellow color
E) tall plants with yellow seeds and short plants with green seeds

8. Mendel's understanding of the inheritance of traits in peas, expressed in modern language, included all of the following except
A) Parents transmit information encoded in genes.
B) Each individual contains two genes for each trait.
C) Not all genes are identical; alternative forms (alleles) exist.
D) Each of the alleles present in an individual is discrete.
E) If a given allele is present, its effects will be seen in the individual.

9. Individuals carrying two “factors” for most traits are
A) haploid
B) diploid
C) eukaryotic
D) homozygous
E) heterozygous

10. When the two haploid gametes contain two different alleles of a given gene, the resulting offspring is called
A) discrete
B) a haploid
C) heterozygous
D) homozygous
E) a fused allele

11. In a heterozygous individual the allele being expressed is
A) recessive
B) masked
C) redundant
D) dominant
E) epistatic

12. An allele that is present but unexpressed is
A) redundant
B) dominant
C) functional
D) epistatic
13. The allelic make up of an individual is referred to as its
A) blueprint
B) genotype
C) phenotype
D) genetic pattern
E) allelotype

14. The observable outward manifestation of the genes of an individual is referred to as its
A) blueprint
B) genotype
C) phenotype
D) genetic map
E) allelotype

15. What is the name of the cross that involves the mating of a hybrid F1 plant with a homozygous recessive plant for the same trait?
A) monohybrid cross
B) dihybrid cross
C) reciprocal cross
D) test cross
E) back cross

16. Yellow-seeded plants might be homozygous or heterozygous. We could find out which by crossing these plants with
A) true breeding yellow-seeded plants
B) true breeding green-seeded plants
C) heterozygous yellow-seeded plants
D) true breeding white-flowered plants
E) true breeding purple-flowered plants

17. Mendel's first law states that
A) alternative forms of trait are encoded by alternative alleles
B) alternative alleles segregate in gametes
C) either allele has equal probability to be passed on into the gamete
D) all genes found in an individual are not separable into gametes
E) only a, b, and c are correct

18. An individual possessing both kinds of alleles of two different traits is called
A) homozygote
B) monohybrid
C) dihybrid
D) true breed
E) diallelic
19. Let \( P = \) purple flowers and \( p = \) white, and \( T = \) tall plants and \( t = \) dwarf. What would be the appearance of a plant with the genotype \( PpTt \)?
A) purple flowers, tall
B) purple flowers, dwarf
C) white flowers, tall
D) white flowers, dwarf
E) pale purple flowers, intermediate height

20. Let \( P = \) purple flowers and \( p = \) white, and \( T = \) tall plants and \( t = \) dwarf. What combinations of gametes could be produced by a heterozygote for both the traits?
A) \( PpTt \) only
B) \( Pp, Tt \)
C) \( P, p, T, t \)
D) \( PT, Pt, pT, pt \)
E) infertile, no gametes produced

21. Let \( P = \) purple flowers and \( p = \) white, and \( T = \) tall plants and \( t = \) dwarf. Of the 16 possible gamete combinations in the dihybrid cross, how many would be the phenotype \textit{white, tall}?
A) none
B) 1
C) 3
D) 9
E) 16

22. Mendel's observations that different pairs of genes assort independently of each other is known as Mendel's
A) First Law of Heredity
B) Pea Manifesto
C) Statement of Assortment Principle
D) Second Law of Heredity
E) Theory of Genetic Independence

23. One of the main reasons genes assort independent of one another is that
A) they produce unrelated traits
B) they produce related traits
C) they are on the same chromosome
D) they are different alleles
E) they are on different chromosomes

24. A single gene has 3 or more alternative forms. These are called
A) heterozygotes
B) multiple alleles
C) epistatic
D) homozygotes
E) multiple zygotes
25. Sometimes one gene pair will interact so as to control the expression of a second gene pair in an interaction called
A) dominance
B) gene regulation
C) recessiveness
D) pleiotropy
E) epistasis

26. ABO blood group expression is an example of
A) epistasis
B) dominance
C) recessiveness
D) multiple alleles
E) pleiotropy

27. Occasionally, chromosomes fail to separate during meiosis, leading to a condition in which the diploid number is not normal. This phenomenon is called
A) epistasis
B) nondisjunction
C) disjunction
D) pleiotropy
E) autosomy

28. Humans who have lost even one copy of an autosome are called
A) tetrasomics
B) trisomics
C) bisomics
D) monosomics
E) nullisomics

29. The most common condition of trisomy, in which three copies of a chromosome are present instead of the normal two, is of chromosome
A) X
B) 13
C) 15
D) 18
E) 21

30. If a human female has two Barr bodies, it is almost certain that
A) her father had at least one Barr body
B) her mother also had two Barr bodies
C) she developed from a fertilized egg with 3 X chromosomes
D) she is actually a male with female characteristics
E) she is genetically a normal fertile female
31. A person with type A blood might be either heterozygous or homozygous. One way to find out is to
A) count the type A red blood cells
B) test for type A sugars on red blood cells
C) test the offspring after the person mates with a B type
D) test the offspring after the person mates with an O type
E) test the offspring after the person mates with a homozygous type A

32. The most common fatal genetic disorder of Caucasians is
A) cholera
B) cystic fibrosis
C) hemophilia
D) sickle cell anemia
E) muscular dystrophy

33. Hemophilia is a
A) recessive condition
B) dominant condition
C) epistatic condition
D) codominant condition
E) condition that occurs with equal frequency in both sexes

34. A human hereditary disease that is caused by a dominant allele but does not show up in affected individuals until they are in their thirties is
A) cystic fibrosis
B) sickle cell anemia
C) Tay-Sachs disease
D) Huntington's disease
E) hemophilia

35. Amniocentesis is a procedure that is normally used
A) to reduce the risk of genetic disease
B) for gene therapy
C) to change the sex of the fetus
D) for diagnosis of genetic disorders
E) for nourishing the fetus

36. When Mendel crossed dark purple-flowered pea plants with white-flowered pea plants, he never got any pea plants with light purple flowers. This was counter to the
A) idea of acquired characteristic inheritance
B) theory of blending inheritance
C) the assumption of direct transmission of traits
D) the law of dominance
E) the laws of probability
37. When Mendel crossed two purple-flowered pea plants with each other, he obtained a phenotypic ratio of 3:1 (purple-flowered pea plants to white-flowered pea plants). His results are consistent with which of the following sets of parents?
A) homozygous dominant purple pea plant and homozygous recessive white pea plant
B) homozygous dominant purple pea plant and heterozygous white pea plant
C) heterozygous purple pea plant and homozygous recessive white pea plant
D) heterozygous purple pea plant and homozygous dominant purple pea plant
E) heterozygous purple pea plant and heterozygous purple pea plant

38. Height and eye colors are two examples of continuous variation in humans. Whereas in pea plants the tall allele is dominant over the short allele, there are no intermediate heights in peas. Which of the following is the best explanation for the differences described above?
A) Humans are more advanced than pea plants; thus, the genetics of peas is much simpler than humans.
B) The intermediate size pea plant seeds are aborted within the seedpod and thus will never develop.
C) The intermediate size pea plant seeds have deleterious alleles that prevents them from germinating.
D) Many genes, rather than one gene for a characteristic, control some variations in species.
E) These variations in humans are affected by lack of dominance in the alleles that control these traits.

39. Huntington's disease is caused by an autosomal dominant allele. It is a lethal disease, but it persists in the human population. Which of the following statements best describes why?
A) Huntington's disease is sex-linked and every human has at least one X chromosome; thus, the chances are extremely high for this allele to be maintained in the human population.
B) Huntington's disease presents symptoms that resemble cases reflecting a lack of dominance in some individuals; in those cases, the allele is passed on to the offspring.
C) While lethal to a parent, Huntington's disease will not be lethal to the offspring since it can skip a generation.
D) Huntington's disease presents symptoms in humans after many have already reproduced; therefore, they are unaware that they passed on Huntington's disease.
E) Huntington's disease can be treated in humans that are heterozygous for the condition, but individuals who are homozygous cannot receive treatments; thus, they pass on the alleles to their offspring.

40. Irene and William are having their first child. Irene knows her blood type is A, but William does not know his blood type. However, William knows that his mother and father were B. Their first child is a boy named Gregory. Gregory has type O blood. Of course, Irene and William do not understand how this happened. You could explain this to them using which of the following choices?
A) Irene's genotype is AA, and William's genotype is OO; thus, Gregory expresses the phenotype of O.
B) Irene's genotype is AO, and William's genotype is OO; thus, Gregory expresses the phenotype of O.
C) Because his parents were both type B, William could not be the father of Gregory.
D) Gregory's blood type will need to be checked after his first month of life if the parents want to know his blood type. It takes about a month for the blood type to develop in a newborn child.

E) Since Irene is type A, there had to be a mix-up in the lab report. Gregory should have been type A.

41. Select the genotype that a person whose phenotype was A positive would not have.

42. A person who has lost a large amount of blood but is still alive is found in a wrecked automobile under a highway bridge. Several people are helping the paramedics load the victim into the ambulance. After the ambulance has departed for the hospital, you overhear the following conversation from the persons who helped the paramedics. “I am certain that when that guy gets to the hospital, they will transfuse him with any blood that they have in the blood bank since he has lost so much blood.” The other person says, “Yeah, I bet you're right!” Having had a biology course, you know which blood could be safely given to anyone. Select it below.
A) A positive  B)A negative  C)O positive  D)O negative  E)AB negative

43. Sickle cell anemia is caused by a defect in the
A) oxygen carrying pigment hemoglobin
B) protein makeup in the liver
C) sticky sides of the red blood cells
D) allele for the production of mucus in the lungs
E) vector for the transfer of the correct amino acid for the hemoglobin molecule