

Workbook



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Cell Biology and Genetics

Cell Reproduction

Questions

- 1) A diploid cell has ___ the number of chromosomes as a haploid cell.
 - a. one-fourth
 - b. half
 - c. twice
 - d. four times

- 2) An organism's traits are determined by the specific combination of inherited.
 - a. cells
 - b. genes
 - c. proteins
 - d. chromatids

- 3) The first level of DNA organization in a eukaryotic cell is maintained by which molecule?
 - a. cohesin
 - b. condensin
 - c. chromatin
 - d. histone

- 4) Identical copies of chromatin held together by cohesin at the centromere are called.
 - a. histones
 - b. nucleosomes
 - c. chromatin
 - d. sister chromatids

- 5) Chromosomes are duplicated during what stage of the cell cycle?
 - a. G1 phase
 - b. S phase
 - c. prophase
 - d. prometaphase

Introduction to Biology

- 6) Which of the following events does not occur during some stages of interphase?
- DNA duplication
 - organelle duplication
 - increase in cell size
 - separation of sister chromatids
- 7) The mitotic spindles arise from which cell structure?
- centromere
 - centrosome
 - kinetochore
 - cleavage furrow
- 8) Attachment of the mitotic spindle fibers to the kinetochores is a characteristic of which stage of mitosis?
- prophase
 - prometaphase
 - metaphase
 - anaphase
- 9) Unpacking of chromosomes and the formation of a new nuclear envelope is a characteristic of which stage of mitosis?
- prometaphase
 - metaphase
 - anaphase
 - telophase
- 10) Separation of the sister chromatids is a characteristic of which stage of mitosis?
- prometaphase
 - metaphase
 - anaphase
 - telophase
- 11) The fusing of Golgi vesicles at the metaphase plate of dividing plant cells forms what structure?
- cell plate
 - actin ring
 - cleavage furrow
 - mitotic spindle

Introduction to Biology

- 12)** At which of the cell-cycle checkpoints do external forces have the greatest influence?
- G₁ checkpoint
 - G₂ checkpoint
 - M checkpoint
 - G₀ checkpoint
- 13)** What is the main prerequisite for clearance at the G₂ checkpoint?
- cell has reached a sufficient size
 - an adequate stockpile of nucleotides
 - accurate and complete DNA replication
 - proper attachment of mitotic spindle fibers to kinetochores
- 14)** If the M checkpoint is not cleared, what stage of mitosis will be blocked?
- prophase
 - prometaphase
 - metaphase
 - anaphase
- 15)** Which protein is a positive regulator that phosphorylates other proteins when activated?
- p53
 - retinoblastoma protein (Rb)
 - cyclin
 - cyclin-dependent kinase (Cdk)
- 16)** Many of the negative regulator proteins of the cell cycle were discovered in what type of cells?
- gametes
 - cells in G₀
 - cancer cells
 - stem cells
- 17)** ___ are changes to the order of nucleotides in a segment of DNA that codes for a protein.
- Proto-oncogenes
 - Tumor suppressor genes
 - Gene mutations
 - Negative regulators

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- 18)** A gene that codes for a positive cell-cycle regulator is called a(n).
- kinase inhibitor
 - tumor suppressor gene
 - proto-oncogene
 - oncogene
- 19)** A mutated gene that codes for an altered version of Cdk that is active in the absence of cyclin is a(n)
- kinase inhibitor
 - tumor suppressor gene
 - proto-oncogene
 - oncogene
- 20)** Which molecule is a Cdk inhibitor that is controlled by p53?
- cyclin
 - anti-kinase
 - Rb
 - p21
- 21)** Which eukaryotic cell-cycle event is missing in binary fission?
- cell growth
 - DNA duplication
 - karyokinesis
 - cytokinesis
- 22)** FtsZ proteins direct the formation of a ___ that will eventually form the new cell walls of the daughter cells.
- contractile ring
 - cell plate
 - cytoskeleton
 - septum

Answer Key

- 1) c
- 2) b
- 3) d
- 4) d
- 5) c
- 6) d
- 7) a
- 8) b
- 9) d
- 10) c
- 11) a
- 12) a
- 13) c
- 14) d
- 15) d
- 16) c
- 17) c
- 18) c
- 19) d
- 20) d
- 21) c
- 22) b

Meiosis and Sexual Reproduction

Questions

- 1) Meiosis usually produces cells.
 - a. two haploid
 - b. two diploid
 - c. four haploid
 - d. four diploid

- 2) What structure is most important in forming the tetrads?
 - a. centromere
 - b. synaptonemal complex
 - c. chiasma
 - d. kinetochore

- 3) At which stage of meiosis are sister chromatids separated from each other?
 - a. prophase I
 - b. prophase II
 - c. anaphase I
 - d. anaphase II

- 4) At metaphase I, homologous chromosomes are connected only at what structures?
 - a. chiasmata
 - b. recombination nodules
 - c. microtubules
 - d. kinetochores

- 5) Which of the following is not true in regard to crossover?
 - a. Spindle microtubules guide the transfer of DNA across the synaptonemal complex.
 - b. Nonsister chromatids exchange genetic material.
 - c. Chiasmata are formed.
 - d. Recombination nodules mark the crossover point.

- 6) What phase of mitotic interphase is missing from meiotic interkinesis?
 - a. G₀ phase
 - b. G₁ phase
 - c. S phase
 - d. G₂ phase

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- 7) The part of meiosis that is similar to mitosis is?
- meiosis I
 - anaphase I
 - meiosis II
 - interkinesis
- 8) If a muscle cell of a typical organism has 32 chromosomes, how many chromosomes will be in a gamete of that same organism?
- 8
 - 16
 - 32
 - 64
- 9) The pea plants used in Mendel's genetic inheritance studies were diploid, with 14 chromosomes in somatic cells. Assuming no crossing over events occur, how many unique gametes could one pea plant produce?
- 28
 - 128
 - 196
 - 16,384
- 10) How do telophase I and telophase II differ during meiosis in animal cells?
- Cells remain diploid at the end of telophase I, but are haploid at the end of telophase II.
 - Daughter cells form a cell plate to divide during telophase I, but divide by cytokinesis during telophase II.
 - Cells enter interphase after telophase I, but not after telophase II.
 - Chromosomes can remain condensed at the end of telophase I, but decondense after telophase II.
- 11) What is a likely evolutionary advantage of sexual reproduction over asexual reproduction?
- Sexual reproduction involves fewer steps.
 - There is a lower chance of using up the resources in a given environment.
 - Sexual reproduction results in variation in the offspring.
 - Sexual reproduction is more cost-effective.

Introduction to Biology

- 12)** Which type of life cycle has both a haploid and diploid multicellular stage?
- asexual life cycles
 - most animal life cycles
 - most fungal life cycles
 - alternation of generations
- 13)** A diploid, multicellular life-cycle stage that gives rise to haploid cells by meiosis is called?
- sporophyte
 - gametophyte
 - spore
 - gamete
- 14)** Many farmers are worried about the decreasing genetic diversity of plants associated with generations of artificial selection and inbreeding. Why is limiting random sexual reproduction of food crops concerning?
- Mutations during asexual reproduction decrease plant fitness.
 - Consumers do not trust identical-appearing produce.
 - Larger portions of the plant populations are susceptible to the same diseases.
 - Spores are not viable in an agricultural setting.

Answer Key

- 1) c
- 2) b
- 3) d
- 4) a
- 5) c
- 6) c
- 7) c
- 8) b
- 9) d
- 10) d
- 11) c
- 12) d
- 13) a
- 14) c

Menel's Experiments and Heredity

Questions

- 1) Mendel performed hybridizations by transferring pollen from the ___ of the male plant to the female ova.
 - a. anther
 - b. pistil
 - c. stigma
 - d. seed

- 2) Which is one of the seven characteristics that Mendel observed in pea plants?
 - a. flower size
 - b. seed texture
 - c. leaf shape
 - d. stem color

- 3) Imagine you are performing a cross involving seed color in garden pea plants. What F1 offspring would you expect if you cross true-breeding parents with green seeds and yellow seeds? Yellow seed color is dominant over green.
 - a. 100 percent yellow-green seeds
 - b. 100 percent yellow seeds
 - c. 50 percent yellow, 50 percent green seeds
 - d. 25 percent green, 75 percent yellow seeds

- 4) Consider a cross to investigate the pea pod texture trait, involving constricted or inflated pods. Mendel found that the traits behave according to a dominant/ recessive pattern in which inflated pods were dominant. If you performed this cross and obtained 650 inflated-pod plants in the F2 generation, approximately how many constricted-pod plants would you expect to have?
 - a. 600
 - b. 165
 - c. 217
 - d. 468

- 5) The observable traits expressed by an organism are described as its ____ .
 - a. Phenotype
 - b. genotype
 - c. alleles
 - d. zygote

Introduction to Biology

- 6) A recessive trait will be observed in individuals that are ____ for that trait.
- heterozygous
 - homozygous or heterozygous
 - homozygous
 - diploid
- 7) If black and white true-breeding mice are mated and the result is all gray offspring, what inheritance pattern would this be indicative of?
- dominance
 - codominance
 - multiple alleles
 - incomplete dominance
- 8) The ABO blood groups in humans are expressed as the I^A , I^B , and i alleles. The I^A allele encodes the A blood group antigen, I^B encodes B, and i encodes O. Both A and B are dominant to O. If a heterozygous blood type A parent ($I^A i$) and a heterozygous blood type B parent ($I^B i$) mate, one quarter of their offspring will have AB blood type ($I^A I^B$) in which both antigens are expressed equally. Therefore, ABO blood groups are an example of:
- multiple alleles and incomplete dominance
 - codominance and incomplete dominance
 - incomplete dominance only
 - multiple alleles and codominance
- 9) In a mating between two individuals that are heterozygous for a recessive lethal allele that is expressed in utero, what genotypic ratio (homozygous dominant:heterozygous:homozygous recessive) would you expect to observe in the offspring?
- a. 1:2:1
 - b. 3:1:1
 - c. 1:2:0
 - d. 0:2:1
- 10) Assuming no gene linkage, in a dihybrid cross of $AABB \times aabb$ with $AaBb$ F1 heterozygotes, what is the ratio of the F1 gametes (AB , aB , Ab , ab) that will give rise to the F2 offspring?
- a. 1:1:1:1
 - b. 1:3:3:1
 - c. 1:2:2:1
 - d. 4:3:2:1

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- 11) The forked line and probability methods make use of what probability rule?
- test cross
 - product rule
 - monohybrid rule
 - sum rule
- 12) How many different offspring genotypes are expected in a trihybrid cross between parents heterozygous for all three traits when the traits behave in a dominant and recessive pattern? How many phenotypes?
- 64 genotypes; 16 phenotypes
 - 16 genotypes; 64 phenotypes
 - 8 genotypes; 27 phenotypes
 - 27 genotypes; 8 phenotypes
- 13) A scientist pollinates a true-breeding pea plant with violet, terminal flowers with pollen from a true-breeding pea plant with white, axial flowers. Which of the following observations would most accurately describe the F₂ generation?
- 75% violet flowers; 75% terminal flowers
 - 75% white flowers in a terminal position
 - 75% violet flowers; 75% axial flowers
 - 75% violet flowers in an axial position
- 14) Labrador retriever's fur color is controlled by two alleles E and B. Any dog with the ee__ genotype develops into a yellow lab, while B_E_ dogs become black labs and bbE_ dogs become chocolate labs. This is an example of .
- epistasis
 - codominance
 - incomplete dominance
 - linkage
- 15) Which of the following situations does not follow the Law of Independent Assortment?
- A blond man and a brunette woman produce three offspring over time, all of who have blond hair.
 - A white cow crossed with a brown bull produces roan cattle.
 - Mating a hog with a sow produces six female piglets.
 - Men are more likely to experience hemophilia than women.

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- 16)** If the allele encoding polydactyly (six fingers) is dominant why do most people have five fingers?
- Genetic elements suppress the polydactyl gene.
 - Polydactyly is embryonic lethal.
 - The sixth finger is removed at birth.
 - The polydactyl allele is very rare in the human population.
- 17)** A farmer raises black and white chickens. To his surprise, when the first generation of eggs hatch all the chickens are black with white speckles throughout their feathers. What should the farmer expect when the eggs laid after interbreeding the speckled chickens hatch?
- All the offspring will be speckled.
 - 75% of the offspring will be speckled, and 25% will be black.
 - 50% of the offspring will be speckled, 25% will be black, and 25% will be white.
 - 50% of the offspring will be black and 50% of the offspring will be white.

Answer Key

- 1) a
- 2) b
- 3) b
- 4) c
- 5) a
- 6) c
- 7) d
- 8) d
- 9) c
- 10) a
- 11) b
- 12) d
- 13) c
- 14) a
- 15) d
- 16) d
- 17) c

Modern Understandings of Inheritance

Questions

- 1) X-linked recessive traits in humans (or in *Drosophila*) are observed...
 - a. in more males than females
 - b. in more females than males
 - c. in males and females equally
 - d. in different distributions depending on the trait

- 2) The first suggestion that chromosomes may physically exchange segments came from the microscopic identification of?
 - a. synapsis
 - b. sister chromatids
 - c. chiasmata
 - d. alleles

- 3) Which recombination frequency corresponds to independent assortment and the absence of linkage?
 - a. 0
 - b. 0.25
 - c. 0.50
 - d. 0.75

- 4) Which recombination frequency corresponds to perfect linkage and violates the law of independent assortment?
 - a. 0
 - b. 0.25
 - c. 0.50
 - d. 0.75

- 5) Which of the following codes describes position 12 on the long arm of chromosome 13?
 - a. 13p12
 - b. 13q12
 - c. 12p13
 - d. 12q13

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- 6) In agriculture, polyploid crops (like coffee, strawberries, or bananas) tend to produce ____
- more uniformity
 - more variety
 - larger yields
 - smaller yields
- 7) Abnormalities in the number of X chromosomes tends to have milder phenotypic effects than the same abnormalities in autosomes because of ____
- deletions
 - nonhomologous recombination
 - synapsis
 - X inactivation
- 8) Assume a pericentric inversion occurred in one of two homologs prior to meiosis. The other homolog remains normal. During meiosis, what structure—if any—would these homologs assume in order to pair accurately along their lengths?
- V formation
 - cruciform
 - loop
 - pairing would not be possible
- 9) The genotype XXY corresponds to
- Klinefelter syndrome
 - Turner syndrome
 - Triplo-X
 - Jacob syndrome
- 10) By definition, a pericentric inversion includes the _____
- centromere
 - chiasma
 - telomere
 - synapse

Answer Key

- 1) a
- 2) c
- 3) c
- 4) a
- 5) b
- 6) c
- 7) d
- 8) c
- 9) a
- 10) a

DNA Structure And Function

Questions

- 1) If DNA of a species was analyzed and it was found that it contains 27 percent A, what would be the percentage of C?
 - a. 27 %
 - b. 30 %
 - c. 23 %
 - d. 54 %

- 2) The experiments by Hershey and Chase helped confirm that DNA was the hereditary material based on the finding that:
 - a. radioactive phage were found in the pellet
 - b. radioactive cells were found in the supernatant
 - c. radioactive sulfur was found inside the cell
 - d. radioactive phosphorus was found in the cell

- 3) Bacterial transformation is a major concern in many medical settings. Why might health care providers be concerned?
 - a. Pathogenic bacteria could introduce disease-causing genes in non-pathogenic bacteria.
 - b. Antibiotic resistance genes could be introduced to new bacteria to create "superbugs."
 - c. Bacteriophages could spread DNA encoding toxins to new bacteria.
 - d. All of the above.

- 4) DNA double helix does not have which of the following?
 - a. antiparallel configuration
 - b. complementary base pairing
 - c. major and minor grooves
 - d. uracil

- 5) In eukaryotes, what is the DNA wrapped around?
 - a. single-stranded binding proteins
 - b. sliding clamp
 - c. polymerase
 - d. histones

Introduction to Biology

- 6) Meselson and Stahl's experiments proved that DNA replicates by which mode?
- conservative
 - semi-conservative
 - dispersive
 - none of the above
- 7) If the sequence of the 5'-3' strand is AATGCTAC, then the complementary sequence has the following sequence:
- 3'-AATGCTAC-5'
 - 3'-CATCGTAA-5'
 - 3'-TTACGATG-5'
 - 3'-GTAGCATT-5'
- 8) How did Meselson and Stahl support Watson and Crick's double-helix model?
- They demonstrated that each strand serves as a template for synthesizing a new strand of DNA.
 - They showed that the DNA strands break and recombine without losing genetic material.
 - They proved that DNA maintains a double-helix structure while undergoing semi-conservative replication.
 - They demonstrated that conservative replication maintains the complementary base pairing of each DNA helix.
- 9) Which of the following components is not involved during the formation of the replication fork?
- single-strand binding proteins
 - helicase
 - origin of replication
 - ligase
- 10) Which of the following does the enzyme primase synthesize?
- DNA primer
 - RNA primer
 - Okazaki fragments
 - phosphodiester linkage
- 11) In which direction does DNA replication take place?
- a. 5'-3'
 - b. 3'-5'
 - c. 5'
 - d. 3'

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- 12)** A scientist randomly mutates the DNA of a bacterium. She then sequences the bacterium's daughter cells, and finds that the daughters have many errors in their replicated DNA. The parent bacterium likely acquired a mutation in which enzyme?
- DNA ligase
 - DNA pol II
 - Primase
 - DNA pol I
- 13)** The ends of the linear chromosomes are maintained by
- helicase
 - primase
 - DNA pol
 - Telomerase
- 14)** Which of the following is not a true statement comparing prokaryotic and eukaryotic DNA replication? (c)
- Both eukaryotic and prokaryotic DNA polymerases build off RNA primers made by primase.
 - Eukaryotic DNA replication requires multiple replication forks, while prokaryotic replication uses a single origin to rapidly replicate the entire genome.
 - DNA replication always occurs in the nucleus.
 - Eukaryotic DNA replication involves more polymerases than prokaryotic replication.
- 15)** During proofreading, which of the following enzymes reads the DNA?
- primase
 - topoisomerase
 - DNA pol
 - Helicase
- 16)** The initial mechanism for repairing nucleotide errors in DNA is
- mismatch repair
 - DNA polymerase proofreading
 - nucleotide excision repair
 - thymine dimers

- 17) A scientist creates fruit fly larvae with a mutation that eliminates the exonuclease function of DNA pol III. Which prediction about the mutational load in the adult fruit flies is most likely to be correct?
- The adults with the DNA pol III mutation will have significantly more mutations than average.
 - The adults with the DNA pol III mutation will have slightly more mutations than average.
 - The adults with the DNA pol III mutation will have the same number of mutations as average.
 - The adults with the DNA pol III mutation will have fewer mutations than average.

Answer Key

- 1) c
- 2) d
- 3) d
- 4) d
- 5) d
- 6) b
- 7) a
- 8) c
- 9) d
- 10) b
- 11) a
- 12) d
- 13) d
- 14) c
- 15) c
- 16) b
- 17) c

Genes and Proteins

Questions

- 1) The AUC and AUA codons in mRNA both specify isoleucine.
What feature of the genetic code explains this?
 - a. complementarity
 - b. nonsense codons
 - c. universality
 - d. degeneracy

- 2) How many nucleotides are in 12 mRNA codons?
 - a. 12
 - b. 24
 - c. 36
 - d. 48

- 3) Which event contradicts the central dogma of molecular biology?
 - a. Poly-A polymerase enzymes process mRNA in the nucleus.
 - b. Endonuclease enzymes splice out and repair damaged DNA.
 - c. Scientists use reverse transcriptase enzymes to make DNA from RNA.
 - d. Codons specifying amino acids are degenerate and universal.

- 4) Which subunit of the *E. coli* polymerase confers specificity to transcription?
 - a. α
 - b. β
 - c. β'
 - d. σ

- 5) The -10 and -35 regions of prokaryotic promoters are called consensus sequences because .
 - a. they are identical in all bacterial species_____
 - b. they are similar in all bacterial species
 - c. they exist in all organisms
 - d. they have the same function in all organisms

Introduction to Biology

- 6) Three different bacteria species have the following consensus sequences upstream of a conserved gene.

	Species A	Species B	Species C
-10	TAATAAT	TTTAAT	TATATT
-35	TTGACA	TTGGCC	TTGAAA

Order the bacteria from most to least efficient initiation of gene transcription.

- A > B > C
 - B > C > A
 - C > B > A
 - A > C > B
- 7) Which feature of promoters can be found in both prokaryotes and eukaryotes?
- GC box
 - TATA box
 - octamer box
 - 10 and -35 sequences
- 8) What transcripts will be most affected by low levels of α -amanitin?
- 18S and 28S rRNAs
 - pre-mRNAs
 - 5S rRNAs and tRNAs
 - other small nuclear RNAs
- 9) How do enhancers and promoters differ?
- Enhancers bind transcription factors to silence gene expression, while promoters activate transcription.
 - Enhancers increase the efficiency of gene expression, but are not essential for transcription. Promoter recognition is essential to transcription initiation.
 - Promoters bind transcription factors to increase the efficiency of transcription. Enhancers bind RNA polymerases to initiate transcription.
 - There is no difference. Both are transcription factor-binding sequences in DNA.
- 10) Which pre-mRNA processing step is important for initiating translation?
- poly-A tail
 - RNA editing
 - splicing
 - 7-methylguanosine cap

Introduction to Biology

- 11) What processing step enhances the stability of pre-tRNAs and pre-rRNAs?
- methylation
 - nucleotide modification
 - cleavage
 - splicing

- 12) A scientist identifies a pre-mRNA with the following structure.



The RNA components of ribosomes are synthesized in the_____

- cytoplasm
 - nucleus
 - nucleolus
 - endoplasmic reticulum
- 13) In any given species, there are at least how many types of aminoacyl tRNA synthetases?
- 20
 - 40
 - 100
 - 200
- 14) A scientist introduces a mutation that makes the 60S ribosomal subunit nonfunctional in a human cell line. What would be the predicted effect on translation?
- Translation stalls after the initiation AUG codon is identified.
 - The ribosome cannot catalyze the formation of peptide bonds between the tRNAs in the A and P sites.
 - The ribosome cannot interact with mRNAs.
 - tRNAs cannot exit the E site of the ribosome.

Answer Key

- 1) d
- 2) c
- 3) c
- 4) d
- 5) b
- 6) d
- 7) b
- 8) b
- 9) b
- 10) d
- 11) a
- 12) c
- 13) a
- 14) a

Gene Expression

Questions

- 1) Control of gene expression in eukaryotic cells occurs at which level(s)?
 - a. only the transcriptional level
 - b. epigenetic and transcriptional levels
 - c. epigenetic, transcriptional, and translational levels
 - d. epigenetic, transcriptional, post-transcriptional, translational, and post-translational levels

- 2) Post-translational control refers to:
 - a. regulation of gene expression after transcription
 - b. regulation of gene expression after translation
 - c. control of epigenetic activation
 - d. period between transcription and translation

- 3) If glucose is absent, but so is lactose, the lac operon will be _____.
 - a. activated
 - b. repressed
 - c. activated, but only partially
 - d. mutated

- 4) Prokaryotic cells lack a nucleus. Therefore, the genes in prokaryotic cells are:
 - a. all expressed, all of the time
 - b. transcribed and translated almost simultaneously
 - c. transcriptionally controlled because translation begins before transcription ends
 - d. b and c are both true

- 5) What are epigenetic modifications?
 - a. the addition of reversible changes to histone proteins and DNA
 - b. the removal of nucleosomes from the DNA
 - c. the addition of more nucleosomes to the DNA
 - d. mutation of the DNA sequence

- 6) Which of the following are true of epigenetic changes?
 - a. allow DNA to be transcribed
 - b. move histones to open or close a chromosomal region
 - c. are temporary
 - d. all of the above

Introduction to Biology

- 7) The binding of _____ is required for transcription to start.
- a protein
 - DNA polymerase
 - RNA polymerase
 - a transcription factor
- 8) What will result from the binding of a transcription factor to an enhancer region?
- decreased transcription of an adjacent gene
 - increased transcription of a distant gene
 - alteration of the translation of an adjacent gene
 - initiation of the recruitment of RNA polymerase
- 9) Which of the following are involved in posttranscriptional control?
- control of RNA splicing
 - control of RNA shuttling
 - control of RNA stability
 - all of the above
- 10) Binding of an RNA binding protein will _____ the stability of the RNA molecule.
- increase
 - decrease
 - neither increase nor decrease
 - either increase or decrease
- 11) Post-translational modifications of proteins can affect _____ .
- protein function
 - transcriptional regulation
 - chromatin modification
 - all of the above
- 12) Cancer causing genes are called _____ .
- transformation genes
 - tumor suppressor genes
 - oncogenes
 - mutated genes

- 13)** Targeted therapies are used in patients with a set gene expression pattern.
A targeted therapy that prevents the activation of the estrogen receptor in breast cancer would be beneficial to which type of patient?
- patients who express the EGFR receptor in normal cells
 - patients with a mutation that inactivates the estrogen receptor
 - patients with lots of the estrogen receptor expressed in their tumor
 - patients that have no estrogen receptor expressed in their tumor

Answer Key

- 1) d
- 2) b
- 3) b
- 4) d
- 5) a
- 6) b
- 7) c
- 8) b
- 9) d
- 10) d
- 11) a
- 12) c
- 13) c