Question No. 1 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

1. Both bacterial and eukaryotic chromosomes are packed into nucleosomes and then further packed into _____.

(A) The cell
(B) Genes
(C) Chromosomes
(D) DNA
(E) None of the above

Feedback

A. Incorrect!
Bacterial chromosomes are composed of naked DNA, no histones and, therefore, no nucleosomes; only eukaryotic cells have nucleosome structure and have highly packed chromosome structure.

B. Incorrect!
Bacterial chromosomes are composed of naked DNA, no histones and, therefore, no nucleosomes; only eukaryotic cells have nucleosome structure and have highly packed chromosome structure.

C. Correct!
Bacterial chromosomes are composed of naked DNA, no histones and, therefore, no nucleosomes; only eukaryotic cells have nucleosome structure and have highly packed chromosome structure.

D. Incorrect!
Bacterial chromosomes are composed of naked DNA, no histones and, therefore, no nucleosomes; only eukaryotic cells have nucleosome structure and have highly packed chromosome structure.

E. Incorrect!
There is one correct answer above.

Solution

The major difference between a prokaryotic chromosome and a eukaryotic chromosome is that prokaryotic chromosomes do not have histone proteins and do not have diploid genome, as the eukaryotic chromosomes do.

(C) Chromosomes

Question No. 2 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
 **Question**	**2.** The proteins which complex with DNA, producing the "beads on a string" or nucleosomes are called _____. (A) Proteases (B) Spindle fibers (C) Histones (D) Hemoglobins (E) Nucleases
 **Feedback**	A. Incorrect! Proteases are a class of enzymes that degrade proteins.
	B. Incorrect! Spindle fibers are the microtubules that are used in mitosis to separate chromosomes, pulling them into the new daughter cells.
	C. Correct! Histones are proteins that form complex with DNA to form nucleosomes.
	D. Incorrect! Hemoglobins are proteins in blood cells to uptake and load oxygen molecules.
	E. Incorrect! Nucleases are enzymes that are capable of cleaving and separating nucleic acids.
 **Solution**	Histone proteins form complexes with DNA and are critical in regulating transcription. By this mechanism, histones have been shown to play a critical role in regulating DNA activities, i.e. gene function. **(C) Histones**

Question No. 3 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

3. The non-coding DNA sequences that are dispersed alternatively among the coding sequence of a gene are called _____.

(A) Repetitive DNA
(B) Exons
(C) Introns
(D) Heterochromatin
(E) Euchromatin

Feedback

A. Incorrect!
Repetitive DNA is the DNA sequence that repeats more than 10 times (up to 1 million times) in the genome. They are non-coding, but they normally are located in a specific region of a chromosome, not between the coding sequences of a gene.

B. Incorrect!
Exons are the DNA sequence that encodes the proteins.

C. Correct!
Introns are dispersed alternatively among exons; they are non-coding sequences.

D. Incorrect!
Heterochromatins are usually non-coding, but it refers to a region of chromatin, instead of DNA sequence.

E. Incorrect!
Euchromatin is when the DNA is loosely packed for transcription.

Solution

A gene is composed of regulatory elements, exons and introns. Introns are dispersed between coding regions of a given gene and are excised prior to pre-mRNA becoming a mature mRNA. In some genes, introns offer alternative splicing options to allow multiple proteins to be coded for by a given length of DNA.

(C) Introns

Question No. 4 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

4. The genome with the greatest diversity, in terms of the number of types of organisms it's capable of producing, is?

(A) Human
(B) Bacterial
(C) Viral
(D) Plant
(E) None of the above

Feedback

A. Incorrect!
The human genome is very complex, but it is a typical eukaryotic genome, made up of 46 chromosomes, all linear DNA, complex with histones.

B. Incorrect!
Bacterial chromosomes are simple and not very diversified; they all have circular DNA molecules and are not complex with histones.

C. Correct!
The viral genome is most diversified because it can be made up of single or multiple molecules of either DNA or RNA, either circular or linear molecules.

D. Incorrect!
Plant genomes are like the human genome, very complex but not with much diversity. Some plants may have very small genome and some may have large.

E. Incorrect!
There is one correct answer above.

Solution

The viral genome is most diversified because it can be made up of single molecule or multiple molecules, of either DNA or RNA, either circular or linear molecules.

(C) Viral

Question No. 5 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

5. Which of the following techniques is NOT used in genetic counseling?

(A) Pedigree analysis
(B) Chromosome banding
(C) Enzymatic analysis
(D) Bacteria phage
(E) Karyotyping

Feedback

A. Incorrect!
Pedigree analysis is a common method for genetic counseling.

B. Incorrect!
Chromosome banding is usually used together with karyotyping to identify individual chromosomes and, therefore, to examine whether there is abnormality in the chromosome.

C. Incorrect!
For certain genetic diseases, enzymatic analysis is a simple and easy test to identify the infected individuals.

D. Correct!
Bacteria phages are viruses that infect only bacteria and are not used for generating information for the purpose of genetic analysis.

E. Incorrect!
Karyotyping is commonly used to identify certain genetic mutations involving chromosome loss or amplification.

Solution

Genetic counseling is a complex procedure and many techniques can be used to identify certain defects.

(D) Bacteria phage

Question No. 6 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
 **Question**	**6.** Which of the following statements about mitochondrial DNA is true? (A) Mitochondria have their own DNA and genome. (B) Mitochondria contain DNA that produces proteins other than mitochondrial proteins, such as secreted hormones. (C) The human mitochondrial genome is the same size as that of plant cells, 16.6kb. (D) Mitochondrial DNA is only inherited from the father. (E) Mitochondrial DNA is inherited from the mother and father.
 **Feedback**	A. Correct! Mitochondria have their own DNA and genome.
	B. Incorrect! Mitochondria have their own DNA and genome.
	C. Incorrect! The mitochondrial genome varies in size – human 16.6 kb, plants >100 kb.
	D. Incorrect! Mitochondrial DNA is only inherited from the mother.
	E. Incorrect! Mitochondrial DNA is only inherited from the mother.
 **Solution**	Mitochondria have DNA and genomes, which code only for mitochondrial proteins. The genome size varies: humans 16.6 kb, plants>100 kb. Mitochondrial DNA is only inherited from the mother. **(A) Mitochondria have their own DNA and genome.**

Question No. 7 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

7. There are two main forms of chromatin in cells, which statement about them is correct?

(A) Euchromatin is chromatin that is lightly packed and stains heavily with typical microscopic techniques.
(B) Euchromatin is chromatin that is lightly packed and exists only in the mitochondria.
(C) Both euchromatin and heterochromatin are fully available for transcription.
(D) Only euchromatin is fully available for transcription, heterochromatin is less available for transcription and is tightly packed.
(E) Staining procedures used to reveal chromatin in cells stain euchromatin and heterochromatin equally.

Feedback

A. Incorrect!
Euchromatin is lightly packed, available for transcription, stains lightly, and is located in the nucleus of cells.

B. Incorrect!
Euchromatin is lightly packed, available for transcription, stains lightly, and is located in the nucleus of cells.

C. Incorrect!
Only euchromatin is fully available for transcription; heterochromatin is less available for transcription and is tightly packed.

D. Correct!
Only euchromatin is fully available for transcription; heterochromatin is less available for transcription and is tightly packed.

E. Incorrect!
The typical staining procedure for visualizing chromatin in cells stains euchromatin lightly and heterochromatin heavily.

Solution

Euchromatin:

1. Lightly packed.
2. Available for transcription.
3. Stains lightly.

Heterochromatin:

1. Tightly packed (condensed) interphase DNA.
2. Less available for transcription.
3. Stains heavily.

(D)Only euchromatin is fully available for transcription, heterochromatin is less available for transcription and is tightly packed.

Question No. 8 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
 **Question**	**8.** Which of the following statements about the difference between a telomere and a centromere is true? (A) A telomere is a sequence at the end of a eukaryotic chromosome and a centromere is located near the center of the chromosome. (B) A telomere is located within a eukaryotic chromosome and a centromere is located near the center of the chromosome. (C) The centromere consists of simple repeated sequences of DNA. (D) The telomere functions in chromatid segregation and the centromere functions during replication of DNA. (E) The telomere is important during chromatid segregation during metaphase.
 **Feedback**	A. Correct! A telomere is a sequence at the end of a eukaryotic chromosome and a centromere is located near the center of the chromosome.
	B. Incorrect! A telomere is a sequence at the end of a eukaryotic chromosome and a centromere is located near the center of the chromosome.
	C. Incorrect! The centromere consists of specific DNA sequences.
	D. Incorrect! The telomere functions during replication of DNA, and the centromere functions in chromotid segregation.
	E. Incorrect! The telomere functions during replication of DNA, and the centromere functions in chromotid segregation.
 **Solution**	The ends of the chromosome are called telomeres and the constricted mid-section (although not exactly in the middle) is the centromere. Telomere Structure and Function: 1. The sequence at the ends of the eukaryotic chromosome. 2. The telomere consists of simple, repeated sequences of DNA. 3. They are important in replication of the ends of linear DNA molecules. Centromere Structure and Function: 1. Consist of specific DNA sequences. 2. Ensure precise segregation of the duplicated chromatids. **(A) A telomere is a sequence at the end of a eukaryotic chromosome and a centromere is located near the center of the chromosome.**

Question No. 9 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

9. Chloroplast DNA _____.

(A) Is contained in the chloroplast of cells, which are responsible for gamete production.
(B) Is contained in the chloroplast of cells, which are responsible for photosynthesis and energy production.
(C) Is double-stranded and exists as linear chromosomes.
(D) Is single-stranded and exists as linear chromosomes.
(E) Along with mitochondrial DNA, code for chloroplast proteins.

Feedback

A. Incorrect!
Chloroplast DNA is contained in the chloroplast of cells, which are responsible for photosynthesis and energy production.

B. Correct!
Chloroplast DNA is contained in the chloroplast of cells, which are responsible for photosynthesis and energy production.

C. Incorrect!
Chloroplast DNA is double-stranded and exists as circular molecules.

D. Incorrect!
Chloroplast DNA is double-stranded and exists as circular molecules.

E. Incorrect!
Chloroplast DNA encodes for chloroplast proteins, whereas mitochondrial DNA encodes for mitochondrial proteins.

Solution

Chloroplasts are the site of photosynthesis and energy production. Chloroplasts have a circular genome coding for chloroplast proteins. The size of chloroplasts varies among species. One or many DNA copies are in each chloroplast.

(B) Is contained in the chloroplast of cells, which are responsible for photosynthesis and energy production.

Question No. 10 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.	
 **Question**	**10.** Which of the following statements about genetic techniques used to visualize chromosomes is true? (A) A karyotype is the complete set of mitosis chromosomes in a cell. (B) Chromosomes contain natural banding patterns that do not require any treatments or staining. (C) Chromosomes contain natural banding patterns that do not require any treatments or staining but must be collected during interphase. (D) FISH stands for fluorescence in situ hybridization, and this technique can be used to visualize genes or larger portions of a chromosome. (E) FISH stands for fluorescence inside cellular heterochromatin, and it allows the visualization of genes on chromosomes.
 **Feedback**	A. Incorrect! The karyotype is the complete set of metaphase chromosomes in a cell.
	B. Incorrect! Chromosomes contain natural banding patterns that do not require any treatments or staining.
	C. Incorrect! Chromosomes contain natural banding patterns that do not require any treatments or staining.
	D. Correct! FISH stands for fluorescence in situ hybridization, and this technique can be used to visualize genes or larger portions of a chromosome.
	E. Incorrect! FISH stands for fluorescence in situ hybridization, and this technique can be used to visualize genes or larger portions of a chromosome.
 **Solution**	Chromosomes are in the nucleus of each cell. Chromosomes consist of DNA coiled many times around proteins, called histones,that stabilize their structure. The karyotype is the complete set of metaphase chromosomes in a cell. The karyotype is species' specific. Changes in the karyotype can be used for genetic diagnosis. FISH: fluorescence in situ hybridization. DNA that has been tagged with a fluorescent dye is hybridized to a chromosome. It is used to locate or amplify a gene on a chromosome. **(D) FISH stands for fluorescence in situ hybridization, and this technique can be used to visualize genes or larger portions of a chromosome.**