

# Stem Cell Research Controversy

"It is embryonic stem cells that cause controversy. Removing the stem cells requires the destruction of the embryo, which some people liken to destruction of a human being. The issue comes down to the question of when life begins: Those who believe that life starts at the moment of conception think that harvesting embryonic stem cells is akin to murder. Some critics of this viewpoint have argued that these embryos were marked for destruction and then donated by their owners, meaning that these embryos would never have come to term anyway, but others predict that this excuse might lead to more ethically questionable actions in the future, such as harvesting embryos specifically for research.

In recent years, researchers have tried to find ways to obtain embryonic stem cells without destroying the embryos. One method of deriving stem cells from mice embryos has proven successful. Researchers are also experimenting with reprogramming adult stem cells to act more like embryonic stem cells. These cells, known as **induced pluripotent stem cells**, hold promise, but scientists would still like the opportunity to pursue work with the embryonic stem cells." (SOURCE: <http://science.howstuffworks.com/life/genetic/ethical-to-use-stem-cells.htm>)

## PRACTICE QUESTIONS

FOR MORE FUN EXCITING QUESTIONS, CHECK OUT THE NY STATE REGENTS WEBSITE: <http://www.nysedregents.org/LivingEnvironment/>

Exam writers LOVE to use this site for question ideas! How do I know? I used to write them! FUN!!! #ownthatstruggle

The presence of DNA is important for cellular metabolic activities because DNA

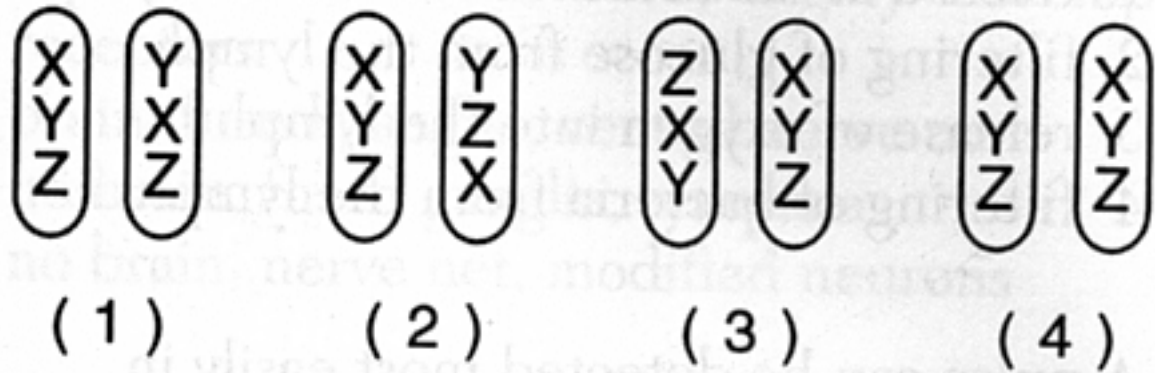
1. directs the production of enzymes
2. is a structural component of cell walls
3. directly increases the solubility of nutrients
4. is the major component of cytoplasm

A molecule of DNA is a polymer composed of

1. glucose
2. amino acids
3. fatty acids
4. nucleotides

"The race is not always to the swift nor the strong, but to he or she who endures to the end." 22  
-Anonymous

Which chromosome pair below best illustrates the gene-chromosome theory?



1. 1
2. 2
3. 3
4. 4

Which nitrogenous bases make up DNA nucleotides?

1. adenine, thymine, guanine, and cytosine
2. adenine, uracil, guanine and cytosine
3. adenine, thymine, uracil, and cytosine
4. adenine, thymine, guanine, and uracil

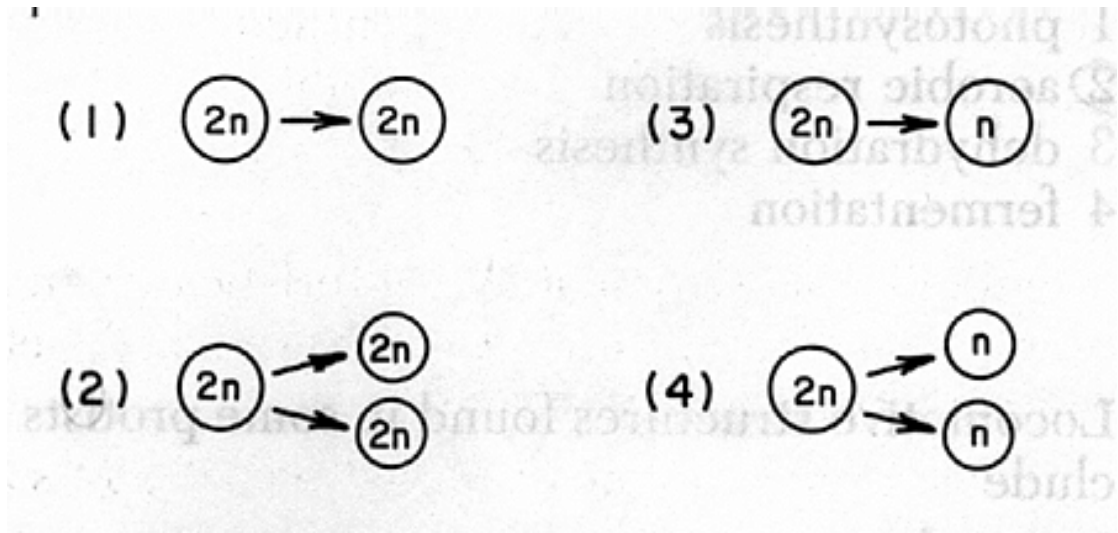
In squirrels, the gene for gray fur (G) is dominant over the gene for black fur (g). If 50% of a large litter of squirrels are gray, the parental cross that produced this litter was most likely

1. GG x Gg
2. GG x GG
3. Gg x gg
4. gg x gg

Which cross could produce a child with type O blood?

1. AO x BB
2. AA x BO
3. AB x OO
4. AO x BO

Which diagram most correctly represents the process of mitosis?



1. 1
2. 2
3. 3
4. 4

What percentages can be expected in the offspring of cross between a female carrier for color blindness and a male with normal color vision?

1. 25% normal male, 25% colorblind males, 25% normal females, 25% carrier females
2. 25% normal males, 25% colorblind males, 25% carrier females, 25% colorblind females
3. 75% normal males, 25% carrier females
4. 50% colorblind males, 50% colorblind females

Geneticists have observed that fruit flies that commonly inherit vestigial wings also inherit lobed eyes. Observations such as this have helped to develop the genetic concept known as

1. segregation
2. dominance
3. gene linkage
4. crossing-over

"The race is not always to the swift nor the strong, but to he or she who endures to the end." 24  
-Anonymous

By which process are two daughter nuclei formed that are identical to each other and to the original nucleus?

1. meiosis
2. synapsis
3. fertilization
4. mitosis

Because the gene for hemophilia is located on the X-chromosome, it is normally impossible for a

1. carrier mother to pass the gene to her son
2. hemophiliac father to pass the gene on to his son
3. hemophiliac father to pass the gene to his daughter
4. carrier mother to pass the gene to her daughter

A man with a blood genotype AO marries a woman with a blood genotype of AO. What blood types could be expected in their children?

1. type A, only
2. type O, only
3. both type A and type O
4. neither type A nor type O

A hybrid black-coated guinea pig produces two million sperm cells. Approximately what number of its sperm cells contain the recessive gene for white coat color?

1. 1 million
2. 2 million
3. 0
4. 0.5 million

Some individuals with blood group A may inherit the genes for blond hair, while other individuals with blood group A may inherit the genes for brown hair. This can be explained by the principle of

1. dominance
2. multiple alleles
3. independent assortment
4. incomplete dominance

"The race is not always to the swift nor the strong, but to he or she who endures to the end." 25  
-Anonymous

The outward appearance (gene expression) of a particular trait in an organism is referred to as

1. a genotype
2. a phenotype
3. an allele
4. a chromosome

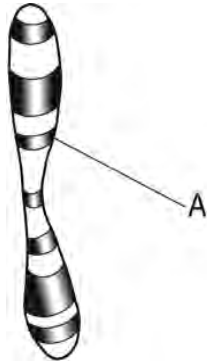
A child is born with an extra chromosome in each of its cells. This condition is usually the result of

1. nondisjunction
2. crossing-over
3. segregation
4. hybridization

Mutations can be considered as one of the raw materials of evolution because they

1. contribute to new variations in organisms
2. are usually related to the environment in which they appear
3. are usually beneficial to the organism in which they appear
4. usually cause species of organisms to become extinct

2 Human genetic material is represented in the diagram below.



The region labeled A is made up of a section of

- (1) a protein that becomes an enzyme
- (2) DNA that may direct protein synthesis
- (3) a carbohydrate made from amino acids
- (4) glucose that may be copied to make DNA

3 Brothers and sisters often have similar facial characteristics, such as nose shape or eye color, because they

- (1) are raised in similar environments
- (2) eat similar types of foods
- (3) have similar types of proteins
- (4) use similar types of facial care products

4 Compared to a normal body cell, a normal egg cell contains

- (1) the same number of chromosomes
- (2) half the number of chromosomes
- (3) twice the number of chromosomes
- (4) four times the number of chromosomes

Which factor would cause two specialized tissues that contain identical chromosomes to function differently?

- (1) Specific sections of DNA molecules in the chromosomes are activated.
- (2) All of the sections of DNA molecules in the chromosomes are activated.
- (3) Specific sections of the amino acid molecules in the cytoplasm are activated.
- (4) All of the amino acid molecules in the cytoplasm are activated.

Some variation must be present in a population in order for natural selection to take place. These variations arise from mutations in the DNA and

- (1) sorting of chromosomes during sexual reproduction
- (2) combining of chromosomes during organ development
- (3) changing of chromosomes during cloning
- (4) removal of chromosomes during selective breeding

The diagram below represents a segment of a gene on two chromosomes.

Normal gene 

A	T	A	C	C	T
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Mutated gene 

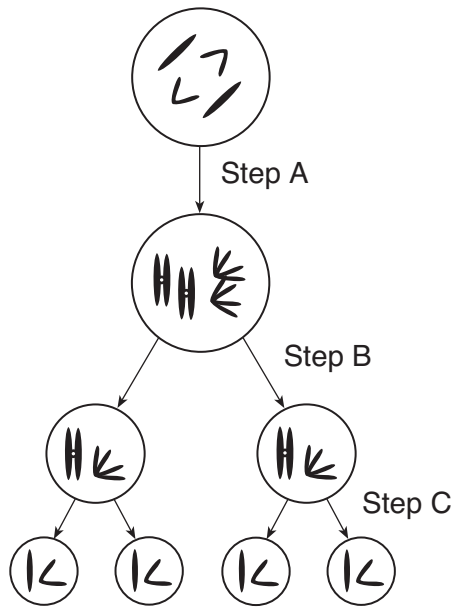
A	T	G	C	C	T
---	---	---	---	---	---

The change in the gene sequence is an example of

- (1) an insertion
- (2) a deletion
- (3) a substitution
- (4) a replication

*point mutation*

Part of a process necessary for reproduction in complex organisms is represented below.



Step C results in the production of

- (1) four zygotes that will develop into embryos
- (2) embryonic cells that could unite and develop into an organism
- (3) four cells that will recombine to form two offspring
- (4) gametes that could be involved in the formation of a zygote

Which two cell structures work together in the process of protein synthesis?

- (1) nucleus and chloroplast
- (2) ribosome and vacuole
- (3) nucleus and ribosome
- (4) mitochondrion and cell membrane

Base your answers to questions 77 and 78 on the Universal Genetic Code Chart below and on your knowledge of biology.

**Universal Genetic Code Chart  
Messenger RNA Codons and the Amino Acids for Which They Code**

		SECOND BASE				
		U	C	A	G	
FIRST BASE	U	UUU } PHE UUC } UUA } LEU UUG }	UCU } UCC } SER UCA } UCG }	UAU } TYR UAC } UAA } STOP UAG }	UGU } CYS UGC } UGA } STOP UGG } TRP	U C A G
	C	CUU } LEU CUC } CUA } CUG }	CCU } CCC } PRO CCA } CCG }	CAU } HIS CAC } CAA } GLN CAG }	CGU } CGC } ARG CGA } CGG }	U C A G
	A	AUU } AUC } ILE AUA } AUG } MET or START	ACU } ACC } THR ACA } ACG }	AAU } ASN AAC } AAA } LYS AAG }	AGU } SER AGC } AGA } ARG AGG }	U C A G
	G	GUU } GUC } VAL GUA } GUG }	GCU } GCC } ALA GCA } GCG }	GAU } ASP GAC } GAA } GLU GAG }	GGU } GGC } GLY GGA } GGG }	U C A G

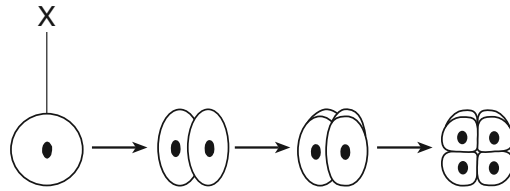
77 The table below shows the DNA, mRNA, and amino acid sequences from two similar plant species. Using the information given, fill in the missing mRNA base sequences for species A on the table below. [1]

78 Using the Universal Genetic Code Chart, fill in the missing amino acids for species B on the table below. [1]

Species A	DNA base sequence	CCG	TGC	ATA	CAG	GTA
	mRNA base sequence	_____	_____	UAU	_____	_____
	amino acid sequence	GLY	THR	TYR	VAL	HIS
Species B	DNA base sequence	CCG	TGC	ATA	CAG	GTT
	mRNA base sequence	GGC	ACG	UAU	GUC	CAA
	amino acid sequence	GLY	_____	_____	VAL	_____



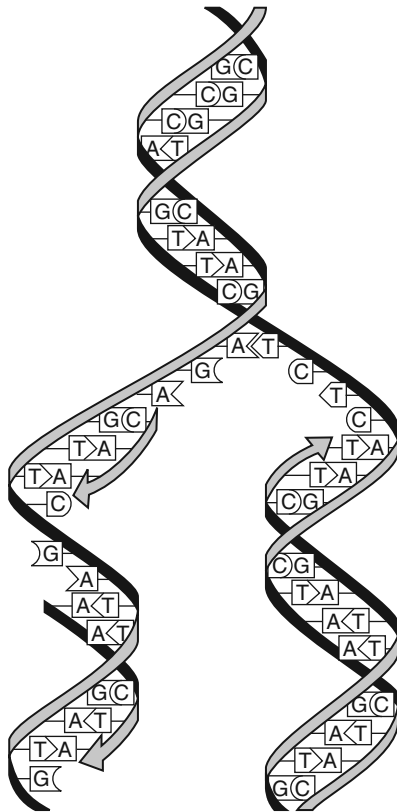
The diagram below represents some stages that occur in the formation of an embryo.



Which statement best describes stage X?

- (1) Stage X is a zygote and contains half the number of chromosomes as the body cells of the parents.
- (2) Stage X is formed by the process of meiosis and is known as a gamete.
- (3) Stage X is a zygote and is formed as a result of the process of fertilization.
- (4) Stage X is formed by mitosis and is known as an egg cell.

8 The process represented in the diagram below occurs in many cells.



The main function of this process is to

- (1) provide an exact copy of the genetic code
- (2) ensure genetic variation in a species
- (3) synthesize cellular proteins
- (4) produce antibodies to combat disease

Which process allows a mammal to continue to grow in size?

- (1) mitosis of sex cells
- (2) mitosis of body cells
- (3) meiosis of sex cells
- (4) meiosis of body cells

2 Which factor has the greatest influence on the development of new, inheritable characteristics?

- (1) combinations of genes resulting from mitosis
- (2) mutations of genes in reproductive cells
- (3) sorting of genes during asexual reproduction
- (4) recombining of genes during differentiation

Base your answers to questions 83 through 85 on the chart below and on your knowledge of biology. The DNA Sequences chart shows a portion of the code for insulin in humans and cows. These DNA sequences are repeated in the Human Insulin and Cow Insulin charts.

83 In the DNA Sequences chart, circle the number over each three-letter portion of the DNA that is different in humans and cows. [1]

DNA Sequences								
	1	2	3	4	5	6	7	8
<b>Human Insulin</b>	CCA	TAG	CAC	CTT	GTT	ACA	ACG	TGA
<b>Cow Insulin</b>	CCG	TAG	CAT	CTT	GTT	ACA	ACG	CGA

84 For each number circled for the DNA sequences above, write the complementary mRNA base sequence in the Human Insulin and Cow Insulin charts that each of these circled portions would produce. Be sure to complete *only* the circled portions. [1]

Human Insulin								
	1	2	3	4	5	6	7	8
<b>DNA Sequence</b>	CCA	TAG	CAC	CTT	GTT	ACA	ACG	TGA
<b>mRNA Sequence</b>								
<b>Amino Acid</b>								

Cow Insulin								
	1	2	3	4	5	6	7	8
<b>DNA Sequence</b>	CCG	TAG	CAT	CTT	GTT	ACA	ACG	CGA
<b>mRNA Sequence</b>								
<b>Amino Acid</b>								