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.** Which of the following is NOT a basic requirement for an organism to be suitable for genetic studies? (A) A well-established genetic background. (B) Relatively short life cycle. (C) Relatively large number of offspring from a mating. (D) Genetic variations. (E) Evolutionary conserved.
 **Feedback**	A. Incorrect. A well-established genetic background enables the study in that organism to be more effective.
	B. Incorrect! A short life cycle means more generations are easily obtained and observed.
	C. Incorrect! Genetics data is quantitative, and it requires a relatively large number for statistic analysis.
	D. Incorrect! Genetic variation is critical for genetic study because, if all genes are identical, all the offspring will be identical; therefore, there would be nothing to observe.
	E. Correct! Evolutionary conservation is not a requirement for genetic studies, but it can help to understand the biological pathways among different organisms.
 **Solution**	Genetic study is about correlating a gene with a phenotype (or vice versa); all this is done in model organisms. These listed requirements are basics for model organisms. **(E) Evolutionary conserved.**

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. A reverse genetics approach is ___.

(A) The study of gene function from its mutant phenotype.
(B) To deduce the amino acid sequence of the protein based on its DNA sequence.
(C) The study of gene function with a known DNA sequence of that gene and a knockout strategy for phenotype observation.
(D) To deduce phenotype of the mutant based on the DNA sequence of the gene.
(E) To study the protein function, based on the phenotype.

Feedback

A. Incorrect.
Studying of gene function from its mutant phenotype is called forward genetics.

B. Incorrect!
This is part of molecular genetics.

C. Correct!
This is the definition of reverse genetics.

D. Incorrect!
If the mutant phenotype is known for a homologue of the gene, it is possible to make a guess on the phenotype of the mutant. However, by itself it is not a reverse genetics approach.

E. Incorrect!
Phenotype is more likely to provide information on gene function and less likely to provide information on protein function.

Solution

There are two basic approaches to study genetics: from gene to phenotype is reverse genetics; and from phenotype to gene cloning is forward genetics.

(C) The study of gene function with a known DNA sequence of that gene and a knockout strategy for phenotype observation.

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. In order to study a single nucleotide polymorphism (SNP) in a disease-related gene, a scientist collected 500 people's DNA samples from Europe, middle east and Asia. He found that one particular SNP allele had a higher frequency in Europeans and much lower frequency in Asians. This type of study is called _____.

(A) Classical Genetics
(B) Molecular Genetics
(C) Forward Genetics
(D) Reverse Genetics
(E) Population genetics

Feedback

A. Incorrect!
Classical genetics studies how genes are transmitted from generation to generation.

B. Incorrect!
SNP studies involve molecular genetics, but the focus of this study is not SNP itself; it uses SNP as a marker of a certain allele to study the allele's distribution.

C. Incorrect!
Forward genetics is an approach to isolate the gene from the known phenotype.

D. Incorrect!
Reverse genetics is the approach to identify a gene's function when its DNA sequence is known.

E. Correct!
Population genetics studies allele distribution and drifting.

Solution

There are three major branches of genetics: classical genetics, molecular genetics and population genetics, each of which has overlapping but distinct research areas.

(E) Population genetics

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 genetic material exists in cells as _____.

(A) DNA
(B) Protein
(C) Nucleus
(D) A Chromosome
(E) None of the above

Feedback

A. Incorrect!
DNA itself is genetic material, but it does not exist in cells as pure DNA.

B. Incorrect!
Protein is not genetic material.

C. Incorrect!
The nucleus is where DNA is located, but the nucleus is a large complex organelle, including a matrix and chromosomes.

D. Correct!
DNA exists in cells in the format of chromosomes, which includes DNA and associated proteins.

E. Incorrect!
There is one correct answer above.

Solution

Genetic material is DNA, and DNA exists in both prokaryotes and eukaryotes as chromosomes, even though in a slightly different format. Associated with the DNA are proteins that help maintain its configuration and regulate processes, such as replication.

(D)A Chromosome

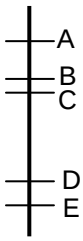
Question No. 5 of 10

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. From this genetic map (see below), the genetic distance between which two neighboring genes are the shortest?

(A) A and B
(B) B and C
(C) C and D
(D) A and C
(E) None of the above



Feedback

A. Incorrect!
The genetic distance is proportional to the physical distance on a map; however, the distance between A and C does not equal the added value of AB and BC. The distance between A and B here is not the shortest.

B. Correct!
BC distance looks like the shortest.

C. Incorrect!
CD distance looks like the longest among the neighboring genes.

D. Incorrect!
A and C are not neighboring genes.

E. Incorrect!
There is one correct answer above.

Solution

Genetic distance is defined by crossover frequency, which ranges from 0 to 1, which is correlated with the physical distance between genes on chromosomes in most cases.

(B) B and C

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 the history of genetics is true?

(A) In 1980, Tomas Morgan discovered that chromosomes carry genes.
(B) In 1910, Tomas Morgan discovered that chromosomes carry genes.
(C) In 1896, investigators at the Roslin Institute reported successfully cloning a sheep named Dolly.
(D) In 2005, investigators at the Roslin Institute reported successfully cloning a sheep named Dolly.
(E) In 1953, Watson and Morgan discover the double helix structure of DNA.

Feedback

A. Incorrect!
In 1910, Tomas Morgan discovered that chromosomes carry genes.

B. Correct!
In 1910, Tomas Morgan discovered that chromosomes carry genes.

C. Incorrect!
In 1996, investigators at the Roslin Institute reported successfully cloning a sheep named Dolly.

D. Incorrect!
In 1996, investigators at the Roslin Institute reported successfully cloning a sheep named Dolly.

E. Incorrect!
In 1953, Watson and Crick discovered the double helix structure of DNA.

Solution

Some key events in the history of the field of genetics include: Gregor Mendel, 1865, Experiment on Plant Heredity; Thomas Morgan, 1910, Chromosomes carry genes; Tatum & Beadle, 1941, Gene encode proteins; Watson & Crick, 1953, DNA double helix structure; Nirenberg, 1961, Discovery of Genetic Code; Meselson & Yuan, 1968, Restriction Enzyme Discovery; Roslin Institute, 1996, Cloned Sheep; NGO & Celera Genomics, 2005, Completion of human genome.

(B) In 1910, Tomas Morgan discovered that chromosomes carry genes.

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. Which of the following statements about the use of humans as subjects for genetic studies is true?

(A) Obtaining approval for any type of human genetic studies is impossible.
(B) It is difficult to impossible to control human mating behaviour, and there are not that many offspring.
(C) It is easy to control human mating behaviour, but there are not that many offspring produced.
(D) To date, there has been little gained in any human genetic study or genetic sequencing.
(E) The human genome is equally complex to that of a mouse and it is difficult to obtain genetic disease information.

Feedback

A. Incorrect!
While obtaining approval for any kind of human study can be difficult, it is not impossible in all cases.

B. Correct!
It is difficult to impossible to control human mating behavior, and there are not that many offspring.

C. Incorrect!
It is difficult to impossible to control human mating behavior, and there are not that many offspring.

D. Incorrect!
Although hypothesis testing is difficult with human subjects, there has been a vast amount of information gained from sequencing the human genome.

E. Incorrect!
The human genome is more complex than that of the mouse and it is difficult to obtain genetic disease information.

Solution

Understanding human genetics is the ultimate goal, but humans are not easy subjects for genetic studies. Humans are hard to control in terms of cross-mating, have a long life span and limited number of offspring. The human genome is more complex than that of the mouse and it is difficult to obtain genetic disease information. Hypothesis testing is difficult, but the sequencing of the human genome has provided an excellent reference and information database.

(B**) It is difficult to impossible to control human mating behaviour, and there are not that mayn offspring.**

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 genetic disease prevention is true?

(A) All diseases are caused by defects in the DNA.
(B) There are some diseases caused by defects in an individual's DNA.
(C) Genetic testing can't be used until after the individual has reached the age of 16.
(D) Genetic testing can't be used until after the individual has reached the age of 21.
(E) Genetic tests, such as chromosome tests and antenatal tests, are useful but not diagnostic.

Feedback

A. Incorrect!
There are some diseases caused by defects in an individual's DNA.

B. Correct!
There are some diseases caused by defects in an individual's DNA.

C. Incorrect!
Prenatal, newborn and carrier screening can be helpful in addressing possible genetic defects.

D. Incorrect!
Prenatal, newborn and carrier screening can be helpful in addressing possible genetic defects.

E. Incorrect!
Genetic tests, such as chromosome tests and antenatal tests, are useful and are, in some cases, considered diagnostic.

Solution

There are some diseases caused by defects in the genetic information, DNA. Prenatal, newborn and carrier screening can be helpful in addressing possible genetic defects. Genetic tests, chromosome tests and antenatal genetic tests are diagnostics. Early diagnosis can help focus treatment options.

(B)There are some diseases caused by defects in an individual's DNA.

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.** Which statement about the impact of genetic studies is true? (A) The results of genetic studies have improved the ability to make certain pest resistant crops, as well as higher yield crops. (B) The results of genetic studies have improved the ability to make medicine, but has had no impact on agriculture and crop production. (C) The studies that contributed to sequencing of the human genome have created new innovative techniques but have no impact on human health or disease prevention. (D) Genetic information has been useful for vaccine development, but it has not impacted the development of medicines. (E) Genetic information has been useful for the development of new medicines, but it has not had any role in vaccine development.
 **Feedback**	A. Correct! The results of genetic studies have improved the ability to make certain pest-resistant crops, as well as higher yield crops.
	B. Incorrect! The results of genetic studies have improved the ability to make certain pest-resistant crops, as well as higher yield crops.
	C. Incorrect! By understanding the human genome, it is possible to prevent or treat certain genetic diseases.
	D. Incorrect! Genetic information has been important in developing treatments for disease, such as recombinant vaccines and medications.
	E. Incorrect! Genetic information has been important in developing treatments for disease, such as recombinant vaccines and medications.
 **Solution**	The purpose of genetic studies is to improve the quality of life of people. Genetic studies also improve food production by making more robust crops. By understanding the human genome, it is possible to prevent or treat certain genetic diseases. Genetic information has been important in developing treatments for disease, such as recombinant vaccines and medications. **(**A**) The results of genetic studies have improved the ability to make** certain pest resistant **crpos, as well as higher yield crops.**

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.** Why yeasts are (Saccharomyces Cerevisiae) good test subjects for genetic studies? (A) Yeasts are good test subjects for genetic studies because their life cycle is only 1-3 months. (B) Yeasts are good test subjects for genetic studies because their life cycle is only 1 month. (C) Although easy to work with, yeasts have poor homologous recombination. (D) Yeasts have stable diploid forms but are difficult to transform. (E) Yeasts have stable diploid forms and are easy to transform and screen.
 **Feedback**	A. Incorrect! Yeasts are good test subjects for genetic studies because their life cycle is only 90 minutes.
	B. Incorrect! Yeasts are good test subjects for genetic studies because their life cycle is only 90 minutes.
	C. Incorrect! Yeasts have efficient homologous recombination.
	D. Incorrect! Yeasts have stable diploid and haploid forms, and they are easy to transform and screen.
	E. Correct! Yeasts have stable diploid and haploid forms, and they are easy to transform and screen.
 **Solution**	Baker's yeast is a good candidate for genetic research and study because its life cycle is only 90 minutes. They have stable diploid (2N) and haploid (1N) forms. They have efficient homologous recombination and simple transformation and genetic screening. **(E) Yeasts have stable diploid forms and are easy to transform and screen.**