

1. Which is associated with the inability to produce factor VIII in the blood?

Select one:

- a. hemophilia
- b. color-blindness
- c. Duchenne muscular dystrophy
- d. Williams syndrome
- e. trisomy 21

- 2. Hemophilia is due to a sex-linked recessive gene (X^h : recessive gene, X^H : normal and dominant gene). A hemophiliac man marries a woman who is not a hemophiliac. But, their first son has hemophilia.
- 3. a) Indicate the genotypes of the parents
- 4. b) What are the chances that their daughter, if they had one, will be hemophilic?
- 5. Use Punnet square to show your work.

3. What blood types might possibly result in children of a family whose mother has B blood and whose father has AB blood?

a) Show all the possibility of parents' genotypes.

b) Show all the possible genotypes of F_1 in a Punnett square

4. Which refers to the loss of a portion of a chromosome?

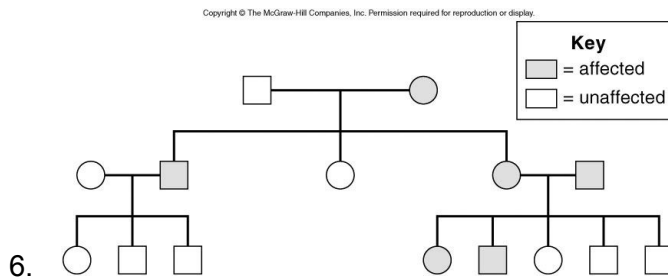
Select one:

- a. translocation
- b. deletion
- c. inversion
- d. monosomy
- e. duplication

5. Women with X-linked disorders always pass the genes for the disorder to _____, while men with X-linked disorders always pass the genes for the disorder to _____.

Select one:

- a. their sons, their daughters
- b. both their daughters and sons; only their sons
- c. only their daughters; only their daughters
- d. both their daughters and sons; only their daughters
- e. both their daughters and sons; their daughters and sons



According to the pedigree diagrammed above the original parents of this family tree had

Select one:

- a. 2 daughters and 3 sons
- b. 2 daughters and 1 son
- c. 3 daughters and 2 sons
- d. None of these is correct
- e. 1 daughter and 2 sons

7. Armadillos give birth to four genetically identical babies, derived from a single egg. Suppose we weigh four newborn siblings and find their weights to be nearly identical, but when captured and weighed one year later they differ substantially. What is this variation due to?

Select one:

- a. Environmental effects have introduced nongenetic variation during growth.
- b. We are seeing the effects of epistasis and pleiotropy.
- c. A large number of multiple alleles at a single locus influences weight.

d. Differing alleles at a number of gene loci affect the final weight.

8. A sperm cell carries two alleles for each gene.

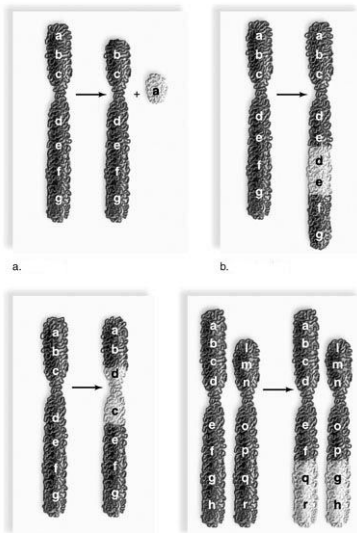
Select one:

True

False

9. Which of the abnormalities can lead to Down's syndrome?

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Select one:

a. a.

b. c.

c. d.

d. b.

10. A father of type B and a mother of type O have a child of type O. What are the chances that their next child will be:

- Type O?
- Type B?
- Type A?
- Type AB?

Use a Punnett Square to explain your work.

11. Consider the case of a lethal recessive gene located on the nonhomologous part of the human X-chromosome; it is therefore sex-linked. Its effect is to prevent the full development of the embryo, which is therefore reabsorbed at an early stage. Beginning with a female who carries this gene in a heterozygous state, what proportion of the offspring will be female?

Select one:

- a. No offspring will be produced at all.
- b. two-thirds
- c. one-half
- d. three-fourths
- e. all, because the lethal recessive gene will express itself in the absence of any genes on the short Y-arm for the XY male embryos

12. If two genes assort independently at meiosis, then they must be on separate chromosomes.

Select one:

True

False

13. A man with a blood type A marries to a woman with a blood type O. Then, they have five children with a blood type A.

- a) What is the most probable genotype of the man?
- b) What is the most probable genotype of the woman?

c) What are the most probable genotypes of the children?

Show your work.

14.X-linkage was discovered for the first time in

Select one:

- a. ants
- b. fruit flies
- c. humans
- d. mice
- e. chickens

15.An individual with blood type A marries an individual with blood type B. What blood types could their offspring exhibit?

Select one:

- a. all of these are possible
- b. O
- c. A
- d. B
- e. AB

16 If a woman is a carrier for the color-blind recessive allele and her husband is normal, what are their chances that a son will be color-blind?
Select one:

- a. None since the father is normal.

b. 50% since the mother is the only carrier.

c. 25% because the mother is a hybrid.

d. 100% because the mother has the gene.

e. None since he will also be just a carrier.

17. Assume each of a married couple is heterozygous for Tay-Sachs disease, a lethal recessive disorder. If they have four children, we know that only one will develop the disease.

Select one:

True

False

18. Which type of inheritance results in continuous variation often a bell-shaped curve—because genes at many loci are involved?

Select one:

a. polygenic

b. X-linked

c. autosomal dominant

d. autosomal recessive

e. sex-influenced

19. The water buttercup produces thin leaves underwater, but those same tissues will produce broad leaves above the water. Individuals in the 1800's (when hunger and childhood diseases were common) averaged slightly over five feet tall, but their offspring in the 1900's were substantially taller on the average. This reflects the influence of

Select one:

- a. gene linkage.
- b. environmental factors on the ability of genes to express themselves.
- c. polygenic inheritance.
- d. genotype having no relationship to phenotype.
- e. epistasis.

20. Boys get their Y chromosomes only from their fathers, and girls get their X chromosomes only from their mother.

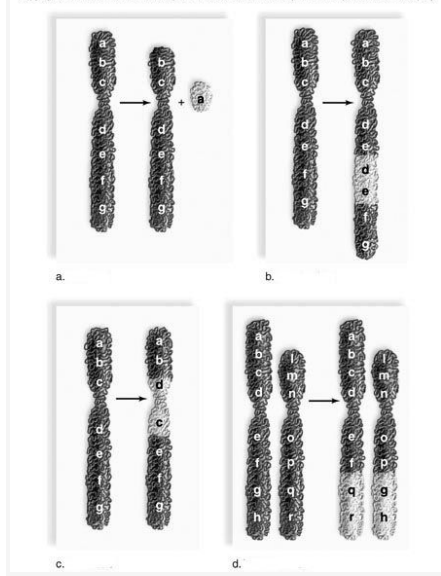
Select one:

True

False

21. Which of the diagrams illustrates what happens during an inversion?

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Select one:

a. b.

b. c.

c. d.

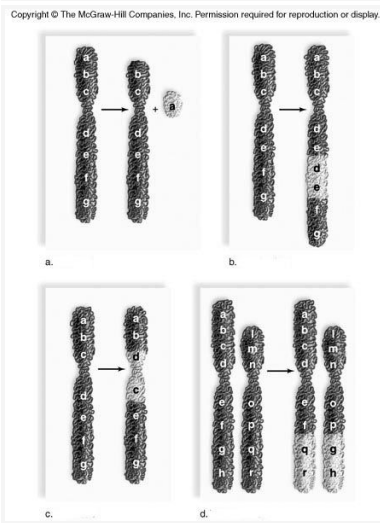
d. a.

22. Assume your parents have blood types A and B respectively, but you do not know if they are homozygous or heterozygous. At the next family reunion, you get out a notepad and draw a pedigree chart. Whose blood types would provide possible clues to your parents' genotypes?

Select one:

- a. those aunts and uncles that are your parents siblings, especially if your grandparents are not alive
- b. you
- c. all of the choices are correct
- d. your brothers and sisters
- e. your grandparents

23. Which of the abnormalities is the cause of Williams or Cri du chat syndrome?



Select one:

- a. b.
- b. d.
- c. a.
- d. c.

24. Which refers to the movement of a piece of one chromosome to another nonhomologous chromosome?

Select one:

a. inversion

b. deletion

c. monosomy

d. duplication

e. translocation

25. A male has B type blood. He knows his mother has O type blood.

a) Identify all the possible blood genotype he might have.

b) Identify all the possible blood genotype his father might have.

ASSIGNMENT 9

1. The message for producing protein is found in the ribosomes.

Select one:

True

False

2. DNA is found in ribosomes.

Select one:

True

False

3. Complementary base pairing is the result of:

(must pick two answers to get full marks)

Select one or more:

- a. hydrogen bonding
- b. the fact that strands of DNA are unwound around each other in a double helix
- c. ionic bonding
- d. the fact that complementary bases fit together physically
- e. covalent bonding

4. A three-point test cross is performed to identify the locus of each of three alleles in relation to each other. The results were as follows:

AB recombinations = 225

BC recombinations = 165

AC recombinations = 60

Parental linkages = 550

Total offspring = 1000

Calculate the map units, then draw the chromosome. Show the position and map distance apart for each allele (A, B, and C) on a chromosome.

This question gives you three options to submit your answer. Use one of the following:

- Text: type it in the answer box
- Text and using 'Draw a picture' from the toolbar (pencil icon), and insert it as a picture.
- Send in as an attachment

Show all the calculations.

5. The parts of genes that are transcribed into mRNA but are later removed are called:

Select one:

- a. exons
- b. spliceosomes
- c. introns
- d. mutations
- e. peptides

6. Which of the following statements concerning Griffith's work with *Streptococcus pneumonia* is incorrect?

Select one:

- a. The S-form bacteria are enveloped with a capsule of polysaccharide
- b. Injected heat-killed S-form bacteria allowed mice to survive
- c. Injected R-form bacteria killed mice
- d. Injected heat-killed S-form bacteria together with live R-form bacteria killed mice
- e. Injected S-form bacteria killed mice

7. DNA replication

Select one:

- a. may be conservative or semi-conservative at different points in an organism's life cycle
- b. is only semi-conservative in eukaryotes, not prokaryotes
- c. is the first step of protein synthesis
- d. occurs in the G₂ phase of the cell cycle
- e. helps to ensure genetic information is passed to future generations

8. The number of nitrogenous bases coded by 9 amino acids would be

Select one:

- a. 3
- b. Too little information provided
- c. 9
- d. 27
- e. 18

9. The codons that code for phenylalanine are UUU and UUC. What characteristic of the genetic code explains this fact?

Select one:

- a. The genetic code has 64 different codons.
- b. The genetic code is continuous.
- c. The genetic code is redundant.
- d. The genetic code is universal.

e. The genetic code has 20 different amino acids.

10. An anticodon is made up of three nucleotides and is found on the tRNA.

Select one:

True

False

11. Normal body cells usually have paired chromosome strands.

Select one:

True

False

12. If a free phosphate is found at the 5' end of a DNA strand, what is found at the other end of the same strand?

Select one:

a. A hydroxyl group on the 3' carbon of a deoxyribose sugar.

b. A base attached to the 3' carbon of a deoxyribose sugar.

c. A phosphate group on the 5' carbon of a deoxyribose sugar.

d. A hydroxyl group on the 5' carbon of a deoxyribose sugar.

e. A phosphate group on the 3' carbon of a deoxyribose sugar.

13. Which of the following enzymes would be considered an exonuclease, an enzyme with the ability to remove incorrectly matched nucleotides?

Select one:

a. DNA polymerase

b. DNA helicase

c. RNA polymerase

d. peptidyl transferase

e. DNA ligase

14. When amino acids join they form peptide bonds and eventually proteins.

Select one:

True

False

15. A molecule of adenine matches with a molecule of cytosine.

Select one:

True

False

16. What bases are found in DNA?

Select one:

a. adenine, uracil, thymine and guanine

b. adenine, thymine, cytosine and guanine

c. adenine, uracil, thymine and cytosine

d. adenine, uracil, cytosine and guanine

17. A protein is a specific sequence of:

Select one:

a. amino acids

b. codons

c. nucleotides

d. tRNAs

e. anticodons

18. DNA is the biochemical molecule that makes up the chromosome.

Select one:

True

False

19. There are only 20 different amino acids that combine to make a protein.

Select one:

True

False

20. A nucleotide is made up of a base, a sugar and a phosphate.

Select one:

True

False

21. In chromosome mapping, one map unit represents

Select one:

a. 1% crossing over between two sites on a chromosome.

- b. 10% of the length of the chromosome.
- c. the distance between one gene and the next on a chromosome.
- d. 10% crossing over between two sites on a chromosome.
- e. 1% of the length of the chromosome.

22. Transfer RNA has a specific anticodon for a specific amino acid that it carries.

Select one:

True

False

23. Cytosine is an example of a base found on either DNA or mRNA.

Select one:

True

False

24. The main idea behind polymerase chain reaction (PCR) is:

Select one:

- a. the combination of two different organism's DNA
- b. the cloning of one's entire DNA sequence to create genetically similar organisms
- c. the amplification of a specific region of the DNA for further study
- d. the extraction of DNA from a cell
- e. to genetically sequence an organism's DNA

25. Briefly describe three basic types of gene therapy

26. What is the corresponding anticodon for the codon CGG?

Select one:

- a. AUU
- b. CCG
- c. GGG
- d. UUU
- e. GCC

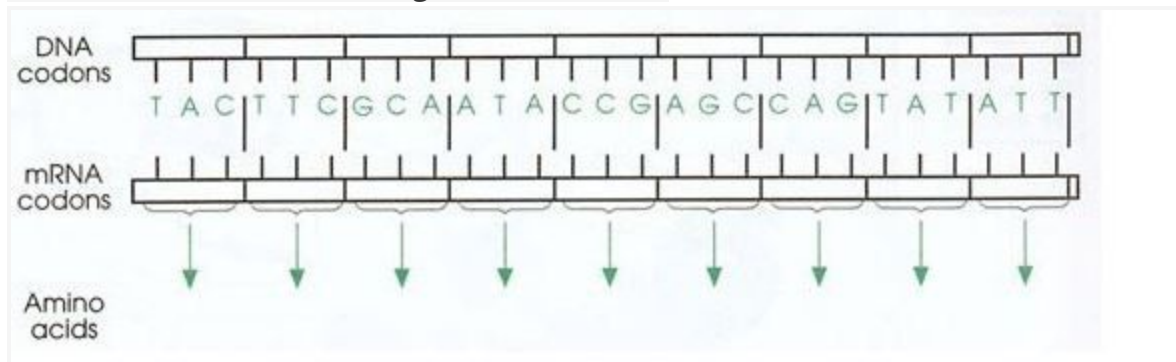
27. Mutations occur when the base sequences are copied with DNA incorrectly.

Select one:

True

False

28. Use the base pairing rules and the Table 18.3 on page 637 in the textbook to answer the question. Starting from left to right, complete the following simulation by filling in the mRNA codons and naming each amino acid.



29. Messenger RNA is found in the mitochondria.

Select one:

True

False

30. Ribose is an example of a nucleotide.

Select one:

True

False

**31. The percentage composition of a nucleic acid found in a bacteriophage is
32.3% Adenine**

28.7% Thymine

23.6% Cytosine

15.4% Guanine

The molecule is most likely:

Select one:

a. double-stranded RNA

b. single-stranded DNA

c. double-stranded DNA

d. messenger RNA

e. mitochondrial DNA

ASSIGNMENT 10

The ability to taste phenylthiocarbamide (PTC) is a trait controlled by 2 alleles (PTC taster and PTC non-taster). Suppose 36% of a remote mountain village cannot taste PTC and must, therefore, be homozygous recessive (aa) for the PTC non-taster allele. If this population conforms to Hardy-Weinberg expectations for this gene, what percentage of the population must be homozygous (AA) for the PTC taster allele?

Select one:

- a. 48%
- b. 16%
- c. 40%
- d. 60%
- e. 32%

Which is an accurate statement regarding allele frequencies?

Select one:

- a. The values of allele frequencies are always between 0 and 1.
- b. Allele frequencies are the same as genotypic proportions.
- c. In considering evolution, allele frequencies do not change.
- d. Allele frequencies are always values greater than 1.

Some scientists before Darwin, such as Lamarck, believed that one species could give rise to another.

Select one:

- True
- False

Starting from a single wild canine species, humans have developed hundreds of breeds of domestic dogs. Which of the following statements is supported by this observation?

Select one:

- a. There was enough heritable variation in the wild canine species to create a variety of features.
- b. Most of the variation in domestic dog species is a result of variation in nutrition and training.
- c. Heritable variation is low; otherwise there would be more wild dog species.
- d. Natural selection had not occurred very frequently in the wild dog populations.

If the frequencies of the A allele is p and the frequency of the a allele is q , then the Hardy-Weinberg frequency of Aa heterozygotes will be $2pq$.

Select one:

True

False

Which of the following is NOT a source of variation in a population?

Select one:

- a. None of the choices.
- b. Differences due to age.
- c. Differences due to accident.
- d. Differences due to health.
- e. Inherited genetic differences.

Identify the two types of mutations that can occur in an individual.

What is the relationship between mutations and natural selection?

Explain what heterozygote advantage is. Give 2 examples.

Explain why speciation and the concept of Darwinian natural selection are not always closely linked.

According to Hardy-Weinberg equilibrium $1 = p^2 + 2pq + q^2$.

Select one:

True

False

In which of the following ways is natural selection not analogous to artificial selection?

Select one:

a. None of the above.

b. Natural selection depends upon the presence of variation, artificial selection does not.

c. Natural selection occurs within populations, artificial selection does not.

d. With natural selection "picking" is due to the fit of an organism with its environment; whereas in artificial selection, the breeder "picks" which organisms will breed.

e. There is a limit to how much change can be brought about by natural selection, no such limit exists for artificial selection.

If a population is not in genetic equilibrium, what must be occurring in the population?

The variation natural selection operates on is due to random mutations. What does this imply about natural selection?

Select one:

- a. None of the options.
- b. Natural selection is also a random process.
- c. A, B and C.
- d. Natural selection is nevertheless a directed process- the likelihood one variant will be favored in a given environment over another is predictable, even if the origin is not.
- e. There is no possibility God could be involved in this process.

Which of the following statements is consistent with Darwin's idea of natural selection?

Select one:

- a. Individuals with variation tend to survive longer.
- b. Individuals better adapted to the environment tend to leave more offspring.
- c. Organisms placed into a cold environment will have an increased rate of mutation in cold adapted alleles.
- d. Larger individuals tend to have more offspring.
- e. Survival of individuals is more important in natural selection than in reproduction.

Traditionally, human males with the genetic disease hemophilia often died before they reached reproductive age. If modern medical treatment allows most hemophiliacs to lead long and fruitful lives, what will happen to the frequency of the allele responsible for hemophilia?

Select one:

- a. It should increase in frequency.
- b. Change in frequency will be unpredictable due to random events.
- c. It should decrease in frequency.
- d. It should not change in frequency.

The genetic differences between individuals in populations result

Select one:

- a. from repeated use of a structure increasing the rate of mutation
- b. only from recombination shuffling existing alleles during sexual reproduction
- c. only from mutations giving rise to different alleles for genetic loci
- d. from the action of natural selection
- e. from mutations producing novel alleles and from recombination producing new combinations of traits

Which of the following is not an assumption of the Hardy-Weinberg principle?

Select one:

- a. there must be no mutation.
- b. no selection can be operating on the population.
- c. populations must be large.

d. the gene pool must have balanced polymorphism.

e. mating must be random.

In humans, there is a blood system known as the MN system. It is different from the commonly known ABO systems that are important for blood transfusions. MN blood antigens will not cause agglutination if mixed as the ABO antigens could. The observed allele frequencies in the population are M = 60% and N = 40%.

Answer the following three questions below.

1. Use the Hardy-Weinberg principle to determine the genotypic proportions of the M and N antigens in the population and assume genetic equilibrium applies.

Use the following letter assignments

$p = M$

$q = N$

$pq = MN$ (heterozygous genotype)

$p^2 = MM$ (homozygous dominant genotype)

$q^2 = NN$ (homozygous recessive genotype)

2. Using the information you found out in question 1 regarding allele frequencies in the entire human population, you can determine if, for some reason or another, a selected population is undergoing change by studying the frequency of its genotype.

In a small Alberta town of 200 people, the following numbers were noted:

$MM = 52$ people

$MN = 96$ people

NN = 52 people

Compare the frequency of the genotypes in this population to the frequencies in the normal population from question 1.

Is the small Alberta town following Hardy-Weinberg principles?

Show your work.

Use the following statement to answer the next questions.

If two groups are geographically isolated, there is obviously no way that they can get together for reproduction. Therefore, these two groups are reproductively isolated.

1. Hypothesize how geographic isolation could occur in a species of mice living in a farmer's field and explain how two distinct species might develop.
2. If the physical barrier is removed after sufficient time to produce two species, what are the various ways that reproductive isolation might still be in effect?

Which of the following is an example of environmental variation?

Select one:

- a. Homer inherited baldness from his father's side of the family.
- b. Bart is a boy because he has both an X and a Y chromosome.
- c. Marge dyes her hair blue.
- d. Patti and Selma have hanging ear lobes.

e. Apu is a tongue roller, but his brother Sanjay is not.

What is the only source for brand new genetic information?

Select one:

- a. independent assortment of chromosomes**
- b. mutation**
- c. sexual reproduction**
- d. crossing over during meiosis**

In Kettlewell's mark-recapture experiment with peppered moths, the agent of selection that has been shown to alter the frequency of peppered moth morphs is

Select one:

- a. soot from factories**
- b. lichens growing on trees**
- c. birds that eat moths**

What's the difference between natural selection and sexual selection?

Select one:

- a. Sexual selection occurs during sex.**
- b. Natural selection is a type of sexual selection.**
- c. Sexual selection is a type of natural selection.**
- d. Sexual selection occurs within demes, natural selection does not.**
- e. None of the above.**

Evolution is not always the result of natural selection.

Select one:

True

False

Assuming that a population is mating randomly, and no mutation or gene flow is occurring, calculate the frequencies of the two alleles for the five generations shown in the table below.

You can complete this question either using the toolbar to insert a table to complete the blanks with (?), or submit your answer as an attachment.

The Initial (P1) generation is done for you as an example.

Generation n	Number of AA	Number of Aa	Number of aa	p	q
P1	42	46	12	0.65	0.35
F1	40	45	15	?	?
F2	38	49	13	?	?
F3	45	40	15	?	?
F4	46	48	6	?	?
F5	44	40	16	?	?

Which of the following supports the statement that *H. sapiens* evolved independently in different regions from distinctive populations of early humans?

Select one:

- a. multiregional hypothesis**
- b. natural selection**
- c. mosaic evolution**
- d. Out of Africa hypothesis**

Explain how genetic variation within a gene pool might be increased.

Which term best describes large-scale evolutionary change over long periods of time?

Select one:

- a. macroevolution**
- b. molecular clock**
- c. adaptation**
- d. microevolution**

Elephant seals were common in the early 19th century but were hunted almost to extinction. Today their numbers have increased again, but the species has little genetic variation. We can say the species has experienced

Select one:

- a. mutation pressure
- b. natural selection
- c. founder effect
- d. a bottleneck

Explain speciation by polyploidy.

Genetic drift is most likely to be an important evolutionary force in

Select one:

- a. natural populations
- b. very small populations
- c. artificial populations
- d. very large populations

Which of the following statements explains why animals are less likely than plants to speciate by polyploidy?

Select one:

- a. Animal movement patterns insure gene flow.
- b. Animals have behavioral rituals that result in mate recognition.

c. Animals chromosomes are less likely to replicate incorrectly than plants.

d. Animals rarely self-fertilize, so diploid gametes are much less likely to fuse.

Evolution that results from changes at the genetic level is called

Select one:

a. macroevolution

b. microevolution

c. species evolution

d. allelic change

The founder effect is when a population has been 1st established by a few individuals with an unusual genetic constitution.

Select one:

True

False

A gene pool is the

Select one:

a. genetic set that identifies a species

b. all alleles of all genes of all individuals in a population

c. accumulation of mutations in small populations

d. early primordial soup

Why is diversity important to the long-term survival of a species?

Isolated Amish populations show high incidence of genetic abnormalities such as polydactyly, Ellis-van Creveld syndrome and dwarfism. What mechanism of population genetics might explain this?

Select one:

- a. spontaneous mutation**
- b. bottleneck effect**
- c. founder effect**
- d. natural selection**

Distinguish between phyletic gradualism and punctuated equilibrium.

Genetic drift is usually an important factor in populations with a large number of individuals.

Select one:

- True**
- False**

The two key factors responsible for speciation among populations are:

Select one:

- a. mutation and genetic drift**
- b. mutation and heterozygote disadvantage**

- c. reproductive isolation and genetic divergence
- d. postzygotic isolation and morphological change

Which of the following does NOT tend to promote speciation?

Select one:

- a. gene flow
- b. reproductive isolation
- c. natural selection
- d. founder effect

Gradual speciation has many different forms. Define each and explain how they are different.

1. Geographic Speciation Model
2. Gradual Speciation by Habitat Splitting
3. Speciation Without Physical Isolation
4. Gradual Speciation on Islands

ASSIGNMENT 12

1. a) Define what Gause's principle is.
b) How does an intraspecific competition drive natural selection?

2. Label the predominant relationship that exists between the following combinations of species. Detritivory, predation, mutualism, commensalism, parasitism

aphid and ladybug

barnacles and whale

flea and dog

bacteria and sewage

bird and trees

ant and caterpillar

birds and berries

E. coli and large intestine

Grazing predators do not affect population size of the prey.

Select one:

True

False

Which of the following would best be described as a case of speciation in sympatry?

Select one:

- a. Speciation cannot take place in sympatry - only in allopatry, where geography poses a barrier to gene flow.**
- b. A population of lizards is subdivided by a natural barrier and subsequently diverges to form two species that cannot interbreed.**
- c. A new, isolated population of fruit flies is founded by a small group of colonists, which then diverge from the ancestral source population.**
- d. An individual hermaphroditic plant undergoes meiotic failure, producing diploid pollen and ovules; these self-fertilize, germinate, and grow into several fully fertile tetraploid plants.**

Explain how a population can be distributed, and some of the causes behind them.

Which of the following are difficult to explain in terms of natural selection?

Select one:

- a. All of the choices**
- b. Some traits appear to have no adaptive value.**
- c. Male deer evolve antlers that are not used to defend themselves against predators.**
- d. A bird issues a warning cry that puts it at greater risk of being noticed by a predator.**

e. Male peacocks evolve tail feathers that would appear to make them more rather than less vulnerable to predators.

a) The growth curve showing a closed population is characterized by which four distinct phases?

b) What factors must be in place for a country to have zero population growth?

Identify and describe the problem of overpopulation in the developing world.

True predators prefer hunting animals that are not in an established territory.

Select one:

True

False

Create a table to compare the characteristics of populations with typical r-selected and K-selected life strategies. To get a full mark, you will need to create a table to show your work. Click the link if you need help with creating a table

Positive feedback occurs when an increasing population faces decreased resistance.

Select one:

True

False

Animals with bright colours are likely to freeze when attacked.

Select one:

True

False

More food, water, and light in a niche causes decreased resistance to population size.

Select one:

True

False

Predation increases diversity in a community.

Select one:

True

False

Animals that are in a group are more likely to be attacked by a predator.

Select one:

True

False

Two species can live in the exact same niche in complete cooperation.

Select one:

True

False