EOC Genetics Review - Key

1. What role does DNA play in the transmission of genetic information?

***DNA stores genetic information and contains the instructions for building proteins.***

1. What roles does RNA play in the transmission of genetic information?  
   ***RNA carries the genetic message from the nucleus and is used for building proteins.***
2. Compare and contrast the structures of DNA and RNA. You must list at least 3 factors for each and 2 factors shared.

**DNA**

***Genetic molecule***

***Used for building proteins***

***Single Stranded***

***Ribose Sugar***

***Uracil***

***Can leave nucleus***

***Double Stranded***

***Deoxyribose Sugar***

***Thymine***

***“Stuck” in nucleus***

**RNA**

1. Describe the semiconservative model of DNA replication

***The original strand of the DNA molecule is used as a template for the new strand. Following replication, each molecule of DNA is half original, half newly constructed.***

1. Describe the overall purpose and process of DNA replication. Where in the cell does this take place?

***The purpose of replication is to make more, identical copies of DNA. This takes place in the nucleus. DNA Helicase (enzyme) unwinds and unzips DNA and then DNA Polymerase (enzyme) puts together the new, complementary nucleotides.***

1. Determine the complementary **DNA** sequence following ***DNA replication***: A T G C G A T C G A A G

***T A C G T A G C T T C***

1. Describe the overall purpose and process of transcription. Where in the cell does this take place?  
     
   ***The purpose of transcription is to create a molecule of messenger RNA (mRNA) using a molecule of DNA so that the DNA “instructions” can leave the nucleus. This process takes place in the nucleus. DNA Helicase (enzyme) unwinds and unzips DNA, RNA Polymerase (enzyme) puts together the complementary RNA molecules, building a single stranded molecule of RNA that can leave the nucleus.***
2. Determine the complementary **mRNA** sequence following ***transcription***: A T G C G A T C G A A G  
   ***U A C G U A G C U U C***
3. Describe the overall purpose and process of translation. Where in the cell does this take place?  
     
   ***The purpose of translation is to build a protein molecule at the ribosome by “reading” the mRNA codons and bringing the proper/signaled amino acids. This takes place at the ribosome.***
4. Use the coding chart to determine the amino acid sequence for the mRNA codons: A G C U U C G A A

***Ser – Phe - Glu***

1. In terms of meiosis, how are traits passed down from parents to offspring?  
     
   ***Alleles separate during the process of meiosis and gametes (sex cells) are produced. Sex cells combine during fertilization and the alleles of the parents are passed on to future generations.***
2. Who was Gregor Mendel?

***The father of genetics – studied pea plants and created the laws of inheritance.***

1. Describe the law of segregation.

***Alleles for the same gene separate during the creation of gametes during the process of meiosis.***

1. Describe the law of independent assortment.  
     
   ***Alleles/genes are independent of one another, which allows us to study more than one trait at a time (dihybrid cross)***

1. Define each of the following terms:
   1. Dominant : ***“Stronger” trait expressed in the f1 generation***
   2. Recessive: ***“Weaker” trait masked in the f1 generation***
   3. Genotype : ***Genetic makeup***
   4. Phenotype : ***Physical trait expressed (seen)***
   5. Homozygous : ***Two of the same alleles (ex: BB , bb )***
   6. Heterozygous. : ***Two different alleles (ex: Bb )***
   7. Incomplete Dominance : ***Neither trait is dominant, resulting in a BLEND***
   8. Codominance : ***Both traits are equally dominant, resulting in the expression of BOTH traits***
2. Identify examples of incomplete dominance and codominance in organisms.

***Incomplete Dominance – Red x White = Pink Codominance – Black x White= Black AND white spots***

1. Define the following terms:
   1. Point Mutation ***: A change in a genetic sequence involving one single nitrogen base***
   2. Frameshift Mutation :***a change in a genetic sequence that affects the following amino acid signals***
2. Which type of mutation will have a greater effect on an organism point or frameshift?  
   ***Frameshift***
3. Identify situations which result in genetic disorders.   
   ***Point mutations, frameshift mutations***

***Errors in meiosis - deletion of entire chromosomes, extra chromosomes***

1. Compare and contrast sexual and asexual reproductive outcomes. You must list three differences for each and two similarities

**Sexual**

**Asexual**

***Produces offspring***

***Both have pros/cons***

***One parent***

***Offspring genetically identical***

***Fast reproduction***

***Two parent***

***Offspring genetically different***

***Slower reproduction***

1. How is DNA biotechnology used in today’s society?

***Various answers possible – discussion should include DNA fingerprinting, cloning, genetic engineering, etc.***

n

N

|  |  |
| --- | --- |
| NN | Nn |
| Nn | nn |

1. ***In humans the allele for albinism is recessive to the allele for normal skin pigmentation.*** If two heterozygous parents have children, what is the chance that a child will have normal skin pigment? What is the chance that a child will have albinism?

N

Normal pigment? \_\_\_\_\_\_***75***\_\_\_\_\_\_ %

Albinism? \_\_\_\_***25***\_\_\_\_\_\_\_\_ %

n

|  |  |
| --- | --- |
| RW | RW |
| WW | WW |

1. ***Pure-breeding red radishes crossed with pure-breeding white radishes make pink radishes.*** What are the genotypic and phenotypic ratios when you cross pink radish with a white radish?

R

W

W

**This is an example of \_\_\_\_\_*incomplete*\_\_\_\_\_\_ inheritance.**

Genotype Ratio?\_\_\_***0 : 2 : 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

Phenotype Ratio?\_\_\_***0 : 2 : 2***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

W

|  |  |
| --- | --- |
| RB | RB |
| BB | BB |

1. ***In certain fish, red and blue fish when mated create offspring with a patchwork of blue AND red scales.*** What would be the genotypic and phenotypic probabilities for a cross between a blue fish and a fish with patchwork red/blue scales?

B

B

**This is an example of \_\_\_\_\_*codominance*\_\_\_\_\_\_\_\_\_\_\_\_\_ inheritance.**

R

What percentage of the fish will be red?\_\_\_\_***0***\_\_\_\_\_ %

What percentage of the fish will be blue?\_\_\_\_***50***\_\_\_\_\_ %

What percentage of the fish will be red and blue?\_\_\_***50***\_\_\_\_\_ %

B

Xr

Xr

|  |  |
| --- | --- |
| XRXr | XRXr |
| XrY | XrY |

XR

1. ***In fruit flies, the gene for white eyes is sex-linked recessive on the X chromosome. Red eyes are dominant.*** Cross a white-eyed female with a normal red-eyed male.

Y

What percent of offspring will be males with red eyes? White eyes?

***Males with red eyes – 0% , Males with white eyes – 50%***

What percentage of the offspring will be females will have red eyes? White eyes?

***Females with red eyes – 50% , Females with white eyes – 0%***