**Long Answer Practice Questions – Answer Key**

|  |  |  |
| --- | --- | --- |
|  | B | b |
| b | **Bb** | **bb** |
| b | **Bb** | **bb** |

The man’s genotype is Bb. The children’s genotypes are Bb and bb. The children’s phenotypes are 50% brown eyes, 50% blue eyes.

|  |  |  |
| --- | --- | --- |
|  | Xr | Xr |
| XR | **XRXr** | **XRXr** |
| Y | **XrY** | **XrY** |

Both girls have red eyes, both boys have white eyes.

1. XRXRll x XrYLL

FI Generation

|  |  |  |
| --- | --- | --- |
|  | XR | XR |
| Xr | **XRXr** | **XRXr** |
| Y | **XRY** | **XRY** |

|  |  |  |
| --- | --- | --- |
|  | l | l |
| L | **Ll** | **Ll** |
| L | **Ll** | **Ll** |

 F2 Generation

|  |  |  |
| --- | --- | --- |
|   | XR | Xr |
| XR | **XRXR** | **XRXr** |
| Y | **XRY** | **XrY** |

|  |  |  |
| --- | --- | --- |
|  | L | l |
| L | **LL** | **Ll** |
| l | **Ll** | **ll** |

¾ x ¾ = 9/16 red eyed, long winged

¾ x ¼ = 3/16 red eyed, short winged

¼ x ¾ = 3/16 white eyed, long winged

¼ x ¼ = 1/16 white eyed, short winged

1. **DNA MUTATIONS**

**Deletion mutation** – one nucleotide is removed from each strand of DNA.

**Insertion mutation** – one nucleotide is added to each strand of DNA.

**Frameshift mutation** – either an insertion or a deletion, all the nucleotides from insertion or deletion point are shifted either down or up.

**Point mutation or substitution** **mutation** – one nucleotide pair is substituted for another.

**CHROMOSOME MUTATIONS**

**Inversion mutation** - A section of a chromosome breaks away and then flips over or inverts before it reattaches.

**Translocation mutation** - A section of a chromosome breaks away and then reattaches to another chromosome.

**Dihybrid cross** – two traits are crossed

**Independent assortment** - separate genes for separate traits are passed independently of one another from parents to offspring.

**Co-dominance** - Both alleles are clearly expressed in the phenotype. The “co” in co-dominance means “together”. Both alleles are equally dominant.

**Incomplete dominance** - F1 hybrids have an appearance that is blended between the phenotypes of the parental varieties. Neither allele is dominant.

**Polygenic inheritance** - An additive effect of two or more genes on a single phenotypic character. E.g. skin pigment in humans.

**Epistasis** - One locus alters the phenotypic expression at a second locus.

**Replication** - Replication is the process where DNA makes a copy of itself.

**Transcription** - DNA producing RNA in the cell’s nucleus.

**Translation** – protein synthesis. It occurs at the ribosome in the cytoplasm.

**DNA (Deoxyribonucleic acid)** - DNA is a molecule of repeating nucleotides in the shape of a double helix. It controls the production of proteins within the cell.

**RNA (Ribonucleic acid)** – Is a single stranded molecule of repeating nucleotides. There are 3 types: mRNA (messenger), tRNA (transfer), rRNA (ribosomal).

**mRNA** – It is transcribed from DNA in the nucleus and carries the message to the ribosomes in the cytoplasm.

**tRNA** – It transfers a specific amino acid to the growing polypeptide chain at the ribosome. It attaches via its anticodon to the codon on the mRNA.

**Nucleotides** – are made of a sugar, phosphate and nitrogen base. The nucleotides found in DNA are adenine, guanine, cytosine and thymine. The nucleotides found in RNA are adenine, guanine, cytosine and uracil.

|  |
| --- |
| 1. This is an autosomal dominant pedigree.
 |



aa

Aa

aa

Aa

1. Sex Linked Recessive Pedigree

XAXa

XAY



XAX?

XAY

XAY

XAXa

|  |  |  |  |
| --- | --- | --- | --- |
|  | **DNA** | **mRNA** | **tRNA** |
| **Where is it found?** | Nucleus | Nucleus and cytoplasm | Cytoplasm |
| **What does it do?** | Carries the code/instructions for the creation of proteins. | Carries the message from the DNA to the ribosome. | Transfers a specific amino acid to a growing polypeptide chain. |
| **What is its shape** | Double helix | Single stranded. Every 3 nucleotides is a codon. | T-shaped. 3 nucleotides at the bottom are the anticodon. The amino acid is at the top. |
| **What nucleotides are found in each?** | Adenine, guanine, cytosine, thymine | Adenine, guanine, cytosine, uracil | Adenine, guanine, cytosine, uracil |

1. a. UCG AUG AUC UUU GCG

b. ACG UAC UAG AAA CGC

c. SER-MET-ILE-PHE-ALA

1. DNA is unwound by the enzyme helicase in the nucleus. RNA polymerase brings in complementary RNA nucleotides to connect with one of the DNA strands (the template strand). The mRNA then leaves the nucleus and enters the cytoplasm. It is carrying the message from the DNA to the ribosome. At the ribosome the tRNA attaches to the mRNA codon via its anticodon and brings with it a specific amino acid. This amino acid connects to the previous via a peptide bond and forms a polypeptide chain which eventually becomes a protein.
2. **AN EXAMPLE I MADE UP**
3. Long tubelike fish ………………………………………………….……………….. go to statement 2

Non-tubelike fish ……………………………………………………………………. go to statement 3

1. Has a sharp point at its tail ………………………………………….………….. arrowhead fish

Does not have a sharp point at its tail …………………………………..... eel

1. Is shaped like a kite ……………………………………………………………….… kite fish

Oval shaped ……………………………………………………………………………. Go to statement 4

1. Has a forked tongue ………………………………………………………….…….. fork fish

Does not have a forked tongue ……………………………………….………. go to statement 5

1. Has a fin along the entire length of top and bottom ……………….. bubble fish

Does not have a fin along its entire length ………………………………. Go to statement 6

1. Tail fin is connected …………………………………………………………………. Cute fish

Tail fin is not connected …………………………………………………………… go to statement 7

1. Has stripes ……………………………………………………………………………….. stripy fish

Has wide front and no stripes …………………………………………………… bulge fish

 **THE ACTUAL DICHOTOMOUS KEY**

|  |  |
| --- | --- |
| **Step 1**If fish shape is long and skinny then go to step 2 If fish shape is not long and skinny, then go to step 3  | **Step 5**If fish has spots, then go to step 6If fish does not have spots, then go to step 7  |
| **Step 2**If fish has pointed fins, it is a trumpet fishIf fish has smooth fins, it is a spotted moray eel  | **Step 6**If fish has chin "whiskers," it is a spotted goat fishIf fish does not have chin "whiskers," it is a band-tail puffer  |
| **Step 3**If fish has both eyes on top of the head, then go to step 4If fish has one eye on each side of the head, then go to step 5  | **Step 7**If fish has stripes, then go to step 8If fish does not have stripes, it is a glassy sweeper  |
| **Step 4**If fish has long whip-like tail, it is a spotted eagle rayIf fish has short, blunt tail, it is a peacock flounder  | **Step 8**If fish has a v-shaped tail, it is a squirrel fishIf fish has a blunt tail, it is a glass-eye snapper |

1. Natural Selection is the mechanism for change in a population. It occurs when organisms with favourable traits survive, reproduce and pass on their variations to the next generation.
2. **Embryology** is a [science](http://en.wikipedia.org/wiki/Science) which is about the development of an [embryo](http://en.wikipedia.org/wiki/Embryo) from the [fertilization](http://en.wikipedia.org/wiki/Fertilization) of the [ovum](http://en.wikipedia.org/wiki/Ovum) to the [fetus](http://en.wikipedia.org/wiki/Fetus) stage. Darwin extrapolates this to larger groups: For example, the forelimbs might be legs in an ancestral species, but would be modified as flippers, arms, wings, etc. at a late stage in development; but the pattern in the embryonic stage would remain similar if not unchanged.

**Amino acid comparison/DNA sequencing** includes several methods and technologies that are used for determining the order of the nucleotide bases or amino acids. The theory is the more similar the genome is the closer the groups are on the evolutionary tree.

**Vestigial organs** describes [homologous](http://en.wikipedia.org/wiki/Homology_%28biology%29) [characters](http://en.wikipedia.org/wiki/Character_%28biology%29) of [organisms](http://en.wikipedia.org/wiki/Organism) that have seemingly lost all or most of their original [function](http://en.wikipedia.org/wiki/Function_%28biology%29) in a species through [evolution](http://en.wikipedia.org/wiki/Evolution). As groups evolved and adapted to their environment some organs were no longer needed.

1. **No mutation** occurs so that the gene pool does not change.

**Emigration and immigration do not** occur as they would alter the gene pool.

The **population must be large** so that changes do not happen by chance alone.

All **mating** must be totally **random** so that one form of the allele is not favoured over another.

All forms of the allele must be expressed equally so that there is **no natural selection**.

1. q2 = 0.40

q = 0.632 p = 1-0.632 = 0.368

* 1. 2pq = 2(0.368)(0.632) = 0.465 🡪 46.5%
	2. P2 = 0.3682 = 0.135