Genetics

A. The Vocabulary of Genetics

1. – bar-like structures of tightly coiled chromatin, visible

during cellular division.

2. chromosomes – chromosomes that carry the same genes and

determine the same traits. In a human, there are homologous chromosome pairs for

a total of chromosomes.

A) – of the 23 pairs of chromosomes present in human cells,

pairs of them have nothing to do with the sex of the individual.

B) chromosomes – of the 23 pairs of chromosomes present in human cells,

pair determines the sex of the individual.

3. – one of the biological units of heredity that determines the traits of an

individual.

4. – different versions or alternate forms of a gene (example: blue eyes,

brown eyes, green eyes, etc). Alleles are often designated as being

A) Dominant alleles can of other alleles (ex: widow’s

peak).

Theses alleles are always designated with a capital letter such as “A”.

B) Recessive alleles are by the effects of other alleles

(ex: straight hairline).

These alleles are always designated with a lower case letter such as “a”.

5. – a person’s combination of alleles.

A) – the person possesses two dominant

alleles (AA).

B) – the person possesses one dominant allele and one

recessive allele (Aa).

C) – the person possesses two recessive

alleles (aa).

6. – a person’s physical expression of their genetic make-up

(genotype).

A) A homozygous dominant person shows the trait on the

outside.

B) A homozygous recessive person shows the trait on the

outside.

C) A heterozygous person often shows only the trait on the

outside because the dominant allele masks the presence of the recessive.

B. Types of Inheritance

1. Dominant-Recessive Inheritance

A) This type of inheritance is common with traits like hitchhiker thumb, rolling the

tongue, hairline, PTC tasting, etc.

B) In every case, the

C) Punnett Squares are useful tools for determining genetic inheritance of

dominant/recessive traits.

1) However, Punnett Squares only predict the probability that offspring will have a

particular genotype or phenotype.

2) The larger the number of offspring, the more likely that the ratios will conform

to the predictions.

2. Incomplete Dominant Inheritance

A) Recessive traits are not masked in the heterozygous form. Instead, a third

phenotype (different from either the dominant or recessive one) is produced.

B) Ex: A + B = C (Red flowers + White flowers = Pink flowers)

D) Sickle cell anemia is a human condition associated with this type of inheritance

where the intermediate form has sickle cell trait but not full blown sickle cell

disease.

3. Codominant Inheritance and Multiple Alleles

A) There are some traits that demonstrate more than two dominant alleles.

B) is a common multiple allele pattern of inheritance.

C) Because two alleles are “dominant” neither has the ability to mask the other;

instead they are codominant and mixture of the two alleles shows up in the

phenotype of the offspring.

1) Ex: A + B = AB (Red flower + White flower = Red flower with white spots)

4. Sex-linked Inheritance

A) All of the patterns of inheritance mentioned above are demonstrations of

genes carried on autosomal chromosomes and an individual has equal chances of

getting the gene whether that person is male or female.

B) Sex-linked inheritance however, demonstrates traits that are carried on the sex

chromosomes and an individual’s chance of getting the trait varies with the sex of

the individual.

C) Most sex-linked traits are carried on the chromosome while very few are carried

on the chromosome.

D) X-linked traits affect both males and females because both sexes will receive at

least one X in their genotype

1) Ex:

E) Y-linked traits only affect because females do not receive a Y chromosome.

1) Ex.

5. Polygenic Inheritance

A) Polygenic inheritance is the result from several different gene pairs at different

locations within the genetic makeup work together to produce a particular

phenotype.

B) Ex. over 150 different genes influence

C) Different combinations produce variations in skin color from dark skin to light

skin.

6. However, environment can affect the expression of genes.

A) Maternal drug use can alter normal gene expression during embryonic

development.

B) Nutrition and diet

C) Hormonal deficits and excesses

C. Sources of Genetic Variation

1. Mendel’s Law of

A) Each organism contains two factors (alleles) for each trait and these randomly align

along the metaphase plate.

B) The factors then segregate during the formation of gametes so that each gamete

contains only one factor for each trait.

C) This reshuffling of the factors helps explain how variations come about and why

offspring differ from their parents.

2. Law of

A) Members of one pair of factors separate independently of members of another pair

of factors.

B) Therefore, all possible combinations of factors can occur in the gametes.

3. Crossing over of homologous gene

A) During two of the four chromatids (one maternal

& the other paternal) may cross over at one or more points and exchange

corresponding gene segments.

B) The recombinant chromosomes contain new gene combinations, adding to the

variability arising from independent assortment.

4.

A) The third source of genetic variation is random fertilization of eggs by sperm.

B) When just considering independent assortment, crossing over and random

fertilization, any resulting offspring represents one out of the close to 72 TRILLION

zygotes possible.