CELL BIOLOGY

Name: **KEY**

Date: _____

Chapter 14 Review Guide

Define the following:

1. Karyotype - **Chart showing all chromosomes**
2. Autosome - **non-sex chromosomes**
3. Pedigree Chart - **show genetics of a trait in generations**
4. Polygenic - **many genes control trait**
5. p **dominant allele**
6. q **recessive allele**
7. p^2 **homozygous dominant**
8. q^2 **homozygous recessive**
9. 2pq **heterozygous**
10. $p^2 + 2pq$ **Look dominant**

Answer the following

11. What sex chromosomes do males have? **XY** females? **XX**
12. What chromosome carries sex-linked traits? **X - chromosome**
13. How many autosomes do humans have? **44**
14. Tigers have a total of 38 chromosomes. How many autosomes do they have? **36**
15. How many sex chromosomes do tigers have? **2**
16. Genetically, what is the cause of cystic fibrosis (be specific) _____
    Chromosome #7 3 bases deleted

17. As a result of the genetic defect, how is a person's body different who has cystic
    fibrosis? **protein doesn't fold properly and is destroyed**

18. Genetically, what is the cause of sickle cell anemia (be specific) _____
    one base pair missing Chrom #11

HW

19. As a result of the genetic defect, how is a person's body different who has sickle

cell anemia? _____hemoglobin protein in blood_____
_____affected_____

20. Determine whether the following are dominant or recessive genetic disorders:

    a. Albinism _____recessive_____

    b. Dwarfism (achondroplasia) _____dominant_____

    c. Cystic fibrosis _____recessive_____

    d. Huntington's disease _____dominant_____

    e. Galactosema _____recessive_____

    f. PKU _____recessive_____

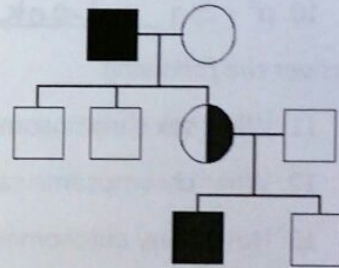   g. Hypercholesterolemia _____dominant_____

21. How many bytes (in computer language) of information does human DNA hold?

_____3 Gb_____ How many bibles would that be? _____600 Bibles_____

22. Given the pedigree chart for a recessive **sex linked**

trait(black color), in a dragon family on the right,

    a. How many dragons express the trait? _2_

    b. Write the punnet square for the p1 parents

	X^b	$\ast Y$
X^B	$X^B X^b$	$X^B Y$
X^B	$X^B X^b$	$X^B Y$

    % chance of females being normal: _____100%_____
    % chance of females being recessive: _____0%_____
    % chance of males being normal: _____100%_____
    % chance of males being color-blind: _____0%_____

    c. How many carriers were are in the family? _____1_____

    d. The p1 dad had the recessive trait. Why didn't any of his sons have the

        trait? _____only passed on his X-chromosome_____

    e. Is it possible for a male dragon to be a carrier? _NO_ Why? _____only_____
        _____has 1 x-chromosome_____

    f. Is it possible for the F2 recessive son to pass on the recessive trait to his

        daughters? Explain. _____no → but they will be carriers_____

$$p2 + 2pq + q2 = 1 \qquad \text{and} \qquad p + q = 1$$

23. A population of squirrels are either black or red (red is recessive). If 45% of the population is black, calculate the allelic and genotypic frequencies for the population. $55\% = \underline{red}$ (recessive) $q^2 = .55$

$q = \sqrt{.55} = .74$ $\boxed{74\% \text{ red allele}}$
$P = 1 - .74 = .26$ $\boxed{26\% \text{ black allele}}$
$p^2 = (.26)^2 \quad = .07$ $\boxed{7\% \text{ homozygous black}}$
$2pq = 2(.74)(.26) = .39$ $\boxed{39\% \text{ heterozygous black}}$
$q^2 = (.74)^2 = .55$ $\boxed{55\% \text{ homozygous red}}$

24. A population in a particular European country, the chances of having cystic fibrosis

$.00022$ is 1 in 4500. Calculate the allelic and genotypic frequencies for the population.

$q^2 = .00022 \rightarrow q = \sqrt{.00022} = .0149$ $\boxed{1.49\% \text{ R allele}}$
$P = 1 - .0149 =$ $\boxed{98.51\% \text{ D allele}}$

$P^2 = (.9851)^2 \quad = .97$ $\boxed{99\% \text{ homozygous dominant}}$
$2pq = 2(.0149)(.9851) = .0294$ $\boxed{2.9\% \text{ heterozygous}}$
$q^2 = .00022 = \boxed{.022\% \text{ recessive}}$

25. In a particular population of lemurs, there are either red-eyed lemurs or yellow-eyed lemurs. If this is a trait controlled by only one gene and if 53% of the population has the dominant red-eyed genotype of (RR, calculate the following:

$p^2 + 2pq$ a. __93__ % lemurs that have red-eyes
q^2 b. __7.4__ % lemurs that have yellow-eyes
$2pq$ c. __40__ % lemurs that have dominant RG genotype
R   d. __72.8__ % frequency of red-eye allele
r   e. __27.2__ % frequency of yellow-eye allele

$2pq = .53$
$P^2 = .53$
$p = \sqrt{.53} = .728$

$q = 1 - .728 = .272$
$q^2 = (.272)^2 = .0740$
$1 - .0740 = p^2 + 2pq = .93$
$2(.728)(.272) = .396$

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