NAME_____ **DATE**_____

AP BIO EQUATIONS AND FORMULAS REVIEW SHEET #1

Formulas:

Mode = value that occurs most frequently in a data set

Median = middle value that separates the greater and lesser halves of a data set

Mean = sum of all data points divided by the number of data points

Range = value obtained by subtracting the smallest observation (sample minimum) from the greatest (sample maximum)

Standard Deviation = $\sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}}$ where $\bar{x}$ = mean and n = size of the sample

Example problem:

One of the lab groups collected the following data for the heights (in cm) of their Wisconsin Fast Plants:

5.4 7.2 4.9 9.3 7.2 8.1 8.5 5.4 7.8 10.2

Find the mode, median, mean, and range. Show your work where necessary.

Mode:_____

Median:_____

Mean:_____

Range:_____

Find the standard deviation by filling in the following table.

Heights (x)	Mean ($\bar{x}$)	$x - \bar{x}$	$(x - \bar{x})^2$
5.4			
7.2			
4.9			
9.3			
7.2			
8.1			
8.5			
5.4			
7.8			
10.2			
			← $\Sigma(x - \bar{x})^2$

Standard deviation:

Interpret the standard deviation in the context of the problem.

AP BIO EQUATIONS AND FORMULAS REVIEW SHEET #2

Formulas: (Hardy-Weinberg)

$p^2 + 2pq + q^2 = 1$ p = frequency of the dominant allele in a population

$p + q = 1$ q = frequency of the recessive allele in a population

A little rusty? That's ok. Check out these 2 videos to refresh your memory.

http://www.bozemanscience.com/hardy-weinberg-punnett-square

http://www.bozemanscience.com/solving-hardy-weinberg-problems

Example problem:

For people, being right handed (R) is the dominant trait over being left handed (r). Suppose there is a sample of 20 people that reveals the following genotypes:

(RR) (Rr) (RR) (Rr) (rr) (Rr) (RR) (RR) (Rr) (RR)

(Rr) (rr) (Rr) (Rr) (RR) (RR) (Rr) (RR) (rr) (Rr)

a. What percentage of the people are right handed? Left handed?

b. Find p and q and interpret each in the context of the problem.

Now suppose that we took another sample of 10 people. This time we only know their phenotypes.

(Right) (Left) (Right) (Right) (Right)
(Right) (Right) (Right) (Left) (Right)

c. What percentage of the people are right handed? Left handed?

c. Can you find p and q exactly? Why?

AP BIO EQUATIONS AND FORMULAS REVIEW SHEET #3

pH Reminder: pH = -log (H^+)

Which is more acidic? (H^+) of 1.0×10^{-8} or 1.0×10^{-12}

Which is more basic? (H^+) of 1.0×10^{-6} or 1.0×10^{-3}

Stomach acid has a pH of about 1-2. What would the H^+ concentration be around?

$[H_3O^+]$ or $[H^+]$	scientific notation	pH
0.1		
0.01		
0.001		
0.0001		
0.00001		
0.000001		
0.0000001		
0.00000001		
0.0000000001		
0.00000000001		

As **$[H^+]$** gets smaller, scientific notation exponents get _____, and pH goes _____

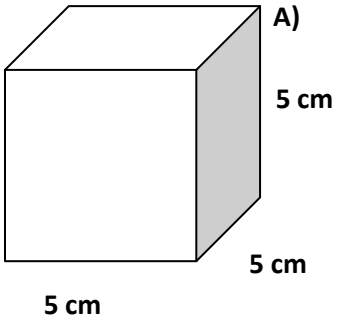
As **$[H^+]$** gets larger, scientific notation exponents get _____, and pH goes_____

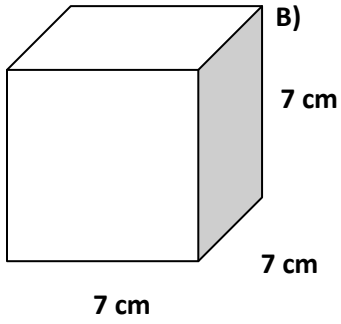
AP BIO EQUATIONS AND FORMULAS REVIEW SHEET #4

Surface area to Volume

1) Cells throughout the world have variable shapes and sizes. Because of this, and because structure is designed around function, certain shapes are optimal for certain processes.

Analyze the following cells (units not to scale), and determine the following…





_____ _: _____ _____ :_____

A) What is the surface area to volume ratio of both cells?

How to calculate Surface Area?	Surface area	How to calculate Volume?	Volume	Surface area to Volume Ratio
Cell 1 =				
Cell 2 =				

B) Conclusion: Compare the ratios and explain why one cell would be more efficient than another.

C) Are you made of lots of large cells or lots of small cells? Why? How do you actually grow in height?

AP BIO EQUATIONS AND FORMULAS REVIEW SHEET #5

Gibbs Free Energy

$\Delta G = \Delta H - T\,\Delta S$

A little rusty? That's ok. Check out this helpful video.
https://paul-andersen.squarespace.com/gibbs-free-energy)

What is Entropy? = a measurement of

When **Δ**S is positive this means there is

When **Δ**S is negative this means there is

What is **Δ**H? = a measurement of

When **Δ**H is positive this means the reaction is

When **Δ**H is negative this means the reaction is

What is Gibbs Free energy? = a measurement of

When **Δ**G is positive this means the reaction will happen

When **Δ**G is negative this means the reaction will happen

ΔG (Joules)	ΔH (Joules)	T (Kelvin)	ΔS (J/K)
	1000	300	5
	1100	300	5
	1200	300	5
	1300	300	5
	1400	300	5
	1500	300	5
	1600	300	5
	1700	300	5
	1800	300	5
	1900	300	5

What happens to ΔG when ΔH goes up ? WHY?

What happens to ΔG when ΔH goes down ? WHY?

ΔG	ΔH	T	ΔS
	1700	300	5
	1700	310	5
	1700	320	5
	1700	330	5
	1700	340	5
	1700	350	5
	1700	360	5
	1700	370	5
	1700	380	5
	1700	390	5

What happens to ΔG when T goes up ? WHY?

What happens to ΔG when T goes down ? WHY?

ΔG	ΔH	T	ΔS
	7500	300	5
	7500	300	10
	7500	300	15
	7500	300	20
	7500	300	25
	7500	300	30
	7500	300	35
	7500	300	40
	7500	300	45
	7500	300	50

What happens to ΔG when ΔS goes up ? WHY?

What happens to ΔG when ΔS goes down ? WHY?