1. .001 km = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ meters.
2. 1 meter = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ millimeters
3. 1 mm = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ micrometers
4. DNA is approximately 2 nm in width. How many DNA strands side by side would it take to equal 1 mm? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (use scientific notation).
5. A box is 20 cm on each side. What is its volume in cubic meters? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(use scientific notation).
6. 100 cc of water has a volume of \_\_\_\_\_\_\_\_\_\_\_\_ ml and a mass of \_\_\_\_\_\_\_\_\_\_\_\_ grams.
7. A beetle is 2.5 x 10 -3 meters long. How long is it in cm? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Use the data in the following table to calculate mean, median, mode, standard deviation, and standard error.

**Table 1.** Leaf length and leaf width of 20 randomly selected leaves from mature *Digitaria sanguinalis*.

**Leaf Length**

Mean:

Median:

Mode:

SD:

SE:

**Leaf Width**

Mean:

Median:

Mode:

SD:

SE:

|  |  |  |
| --- | --- | --- |
| Leaf number | Leaf length (cm) | Leaf width (cm) |
| 1 | 2 | .2 |
| 2 | 8 | .6 |
| 3 | 6 | .4 |
| 4 | 10 | .8 |
| 5 | 3 | .2 |
| 6 | 5 | .3 |
| 7 | 6 | .4 |
| 8 | 7 | .5 |
| 9 | 10 | .9 |
| 10 | 9 | .7 |
| 11 | 7 | .5 |
| 12 | 8 | .6 |
| 13 | 4 | .3 |
| 14 | 6 | .4 |
| 15 | 3 | .2 |
| 16 | 7 | .6 |
| 17 | 9 | .7 |
| 18 | 5 | .4 |
| 19 | 4 | .3 |
| 20 | 7 | .5 |

1. The small cell has a diameter of 2 um and the larger cell has a diameter of 4 um. Calculate the surface area: volume ratio for each cell. Which cell is most efficient?
2. In a population at equilibrium, 5 out of 500 individuals are albino. What is the frequency of the recessive allele? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ How many individuals are homozygous dominant? \_\_\_\_\_\_\_\_\_, heterozygous? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ homozygous recessive? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The frequency for the recessive blue color allele is .3. How many individuals in the population at equilibrium are heterozygous?
4. Mendel crossed F1 peas that were heterozygous for smooth, green seeds. From the data below, calculate the X2 value and the probability that these two genes are independently assorting.

|  |  |  |  |
| --- | --- | --- | --- |
| **F2 Phenotypes** | **Observed** | **Expected** |  |
| Smooth Green | 912 |  |  |
| Smooth Yellow |  295 |  |  |
| Wrinkled Green | 310 |  |  |
| Wrinkled Yellow |  99 |  |  |

 X2= \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 P= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. A single 6-sided die is rolled. What is the probability of rolling a 2 or a 5? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which probability rule did you use?

1. A coin is tossed and a single 6-sided die is rolled. Find the probability of landing on the head side of the coin and rolling a 3 on the die. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which probability rule did you use?

1. How many mL of a 2.50 M NaOH solution are required to make 525 mL of a 0.150 M NaOH solution? Show work.
2. In a spontaneous reaction, the change in free energy (ΔG) is always \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (negative/positive).
3. If room temperature is 220C, what is T (in 0K?) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Which of the following processes is spontaneous?

**A**= ΔH°sys **B**=TΔS sys

1. b. c. d.

1. A cell is in equilibrium with its surroundings. The molarity of the surrounding solution is 0.5M. The solution is at 20**°** C. (Assume an ionization constant of 1.)
* Calculate the solute potential of the surrounding solution. (show work)
* Find the water potential of the surrounding solution.
* What is the water potential of the cytoplasm of the cell?
* If the cell is flaccid, then the cell’s molar concentration is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (equal/greater/lesser) to the molar concentration of the surrounding solution.
* If the cell is turgid, the molarity inside the cell is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (equal/greater/lesser) than that of the outside.
1. [H+] = 1.0 x 10-9 M 20. [H+] = 2.0 x 10-7 M

pH = pH =

21. [H+] = 22. [H+] =

pH = 7.0 pH = 6.3010

23. Q10 is a measure of how sensitive to temperature a metabolic reaction is. Look at the graph. A reaction will double if the Q10 value is \_\_\_\_\_\_\_\_\_\_\_. Normal Q10 values fall between 2 and 3. Who do you think shows a higher Q10, an endotherm or an ectotherm and why?