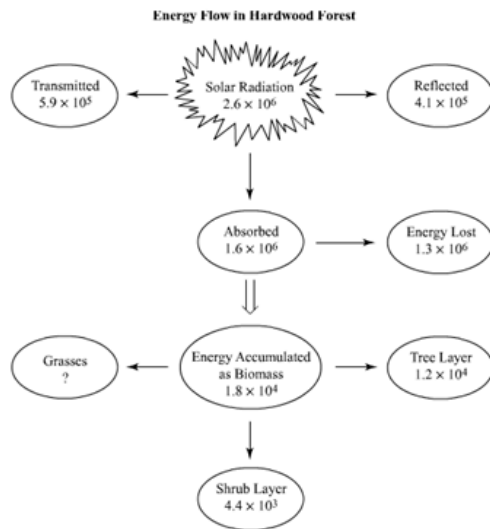


AP Biology - Math Review

Basics: There are many basic math skills that you must be able to do to work the more complex math problems in AP Biology. It will be sad if our students know how to do the hard things, and mess up on the basics (which my students do). They don't see that the question is asking for % or they calculate chi square based on the incorrect expected phenotypic ratio. They tell me I should highlight these things or call their attention to them – I wish I could, but they have to be able to see these things for themselves. The first several pages of this review are based on common mistakes that my students have made.

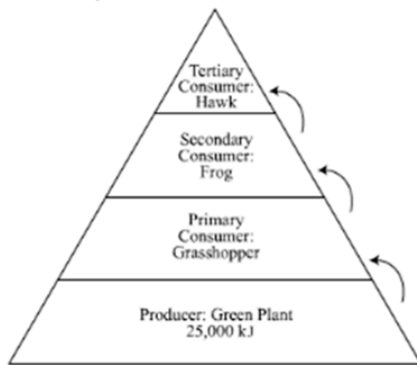
Energy Flow in a Hardwood Forest

What percentage of the biomass in the forest community represented is tied up in the grass layer which has a question mark? Give your answer to the nearest whole number.



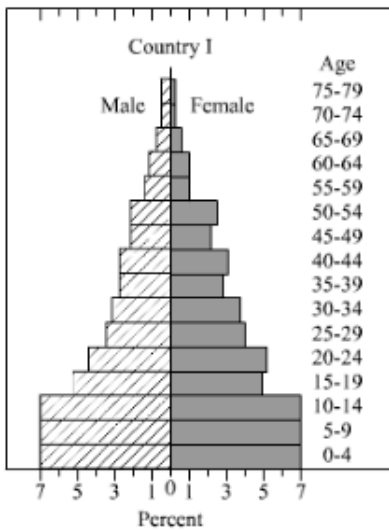
What percentage of the biomass in the forest community is tied up in the grass layer? **Give your answer to the nearest whole number.**

Here is a food pyramid that begins with producers and ends with tertiary consumers. If the producer level contains 25,000 kJ of energy and this pyramid follows the 10% rule, then how much energy gets transmitted to the tertiary consumers?



How much energy gets transmitted to the tertiary consumers?

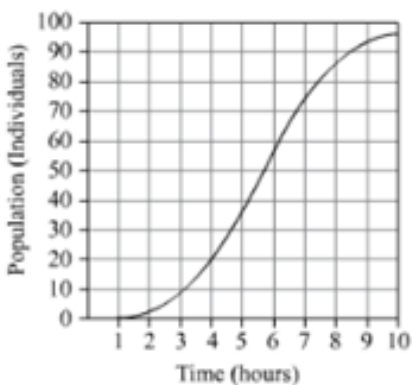
Study this age structure diagram that shows the human population for India. What percent of the population is under 20?



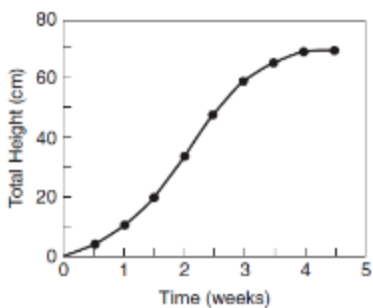
Calculating Rate of Change (Slope)

Population Growth

Use the graph below to calculate the mean rate of population growth (individuals per hour) between hours 6 and 9. Give your answer to the nearest whole number.



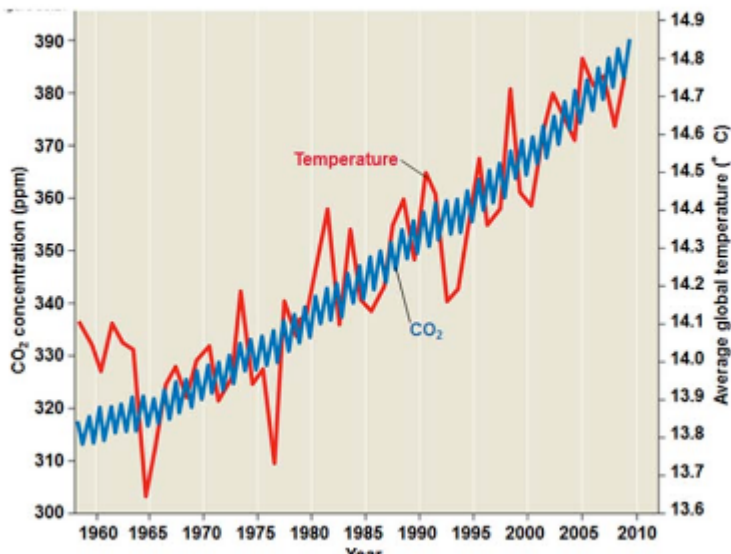
What is the rate of change (individuals per hour)?



The graph shows the growth in cm of a pea plant over a period of 5 weeks. What was the mean growth rate per day between week 1 and week 3?

Give your answer to the nearest tenth.

Increase in Atmospheric Carbon Dioxide Concentration at Mauna Loa, Hawaii and Average Global Temperatures



Examine the data.

- Calculate the rate of increase in CO₂ production from 1974
- What will be the approximate CO₂ concentration in 2100

Chi Square

Water Potential

1. What is the water potential of a cell with a solute potential of -0.67 MPa and a pressure potential of 0.43 MPa?
2. You measure the total water potential of a cell and find it to be -0.24 MPa. If the pressure potential of the same cell is 0.46 MPa, what is the solute potential of that cell?
3. Calculate the water potential of a 0.15 M sucrose solution. Assume a temperature of 27°C .
4. Cell A has a solute potential of -2.0 MPa and a pressure potential of 0.5 MPa. Cell B has a solute potential of -4.0 MPa and a pressure potential of 0.9 MPa.

Which way will water flow when the two cells are placed against each other?

5. A wind borne pollen grain with a solute potential of -3.0 MPa has dried out somewhat after being blown about; this has caused its turgor pressure (pressure potential) to go to 0 . It lands on a flower stigma that whose cells have a solute potential of 3.0 MPa and a pressure potential of 1 MPa. Which way will water flow? From the pollen grain to the stigma, or the stigma to the pollen grain? Show how you deduced your answer

Surface Area

In the Diffusion Lab, agar cubes are used to illustrate the relationship of surface area/volume/diffusion rate. Fill in the values missing in the table

Block	cm x cm	Surface Area cm	Volume ml	Surface Area:Volume Ratio
A	2 x 2			
B	3 x 3			
C	4 x 4			

You use this data to answer questions like this-

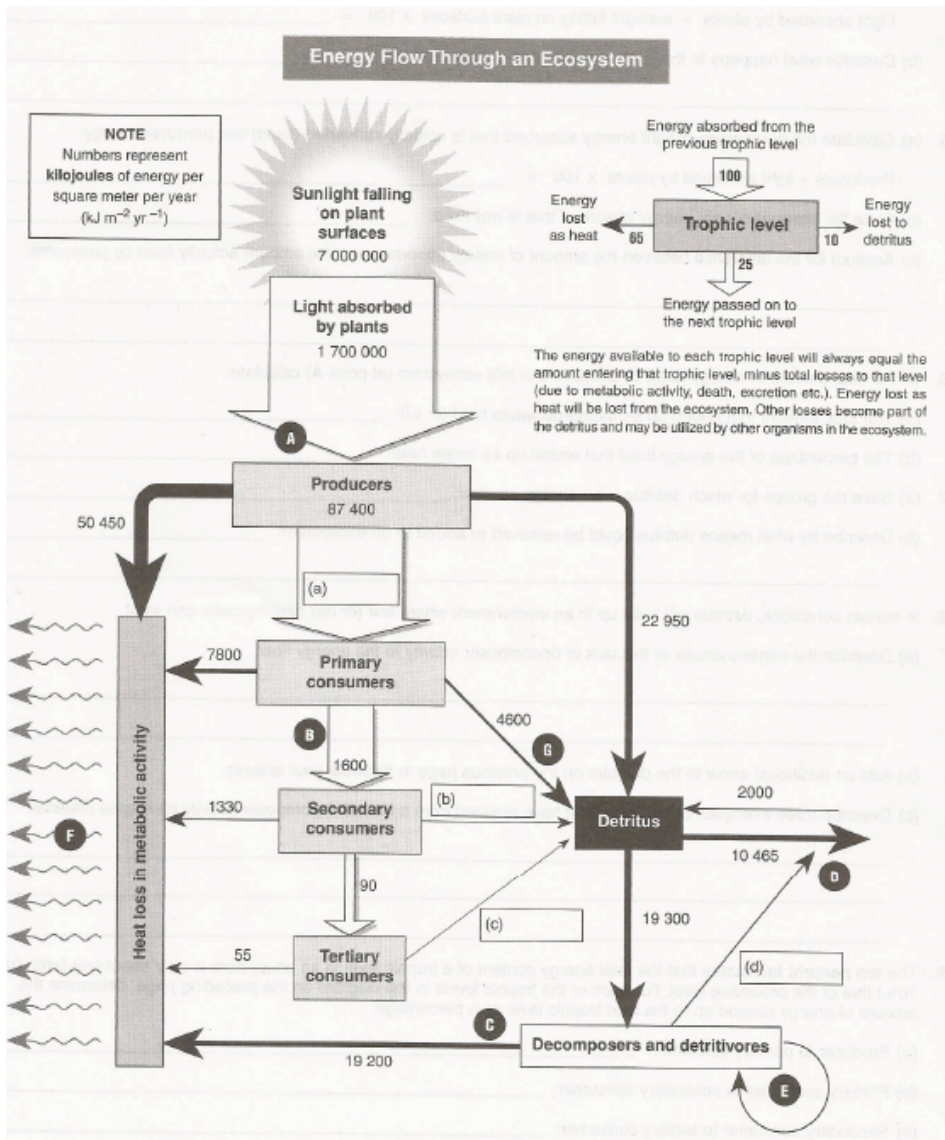
Predict- If you put each of the blocks into a solution, into which block would that solution diffuse throughout the entire block fastest? Greatest distance? How do you explain the difference?

Gibbs Free Energy $\Delta G = \Delta H - T\Delta S$
 G = Free Energy H = Enthalpy S = Entropy

T = Temperature in Kelvin Δ represents change in value over time

An experiment determined that when a protein unfolds to its denatured (D) state from the original folded (F) state, the change in **Enthalpy** is $\Delta H = H(D) - H(F) = 46,000$ joules/mol. Also the change in **Entropy** is $\Delta S = S(D) - S(F) = 178$ joules/mol. At a temperature of 20°C, calculate the change in Free Energy ΔG , in j/mol, when the protein unfolds from its folded state.

“Miscellaneous Math”

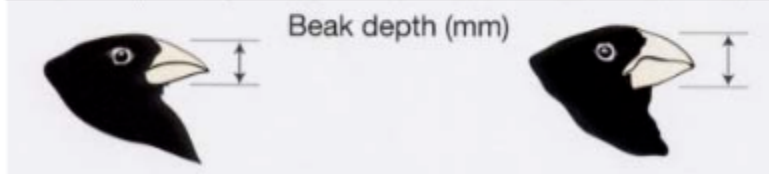


Calculate the amount of energy remaining at

(a)
(b)

(c)
(d)

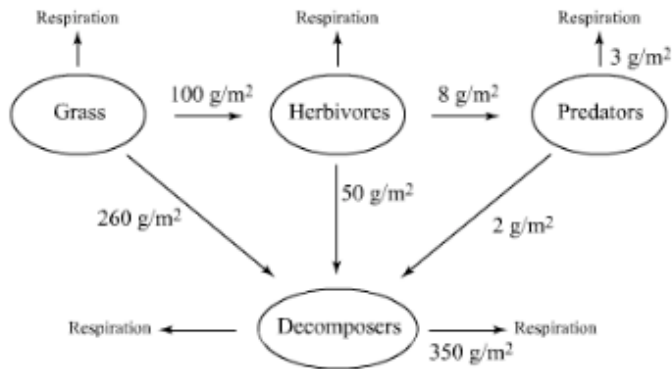
Bird ID Tag Number	Wet Year Beak Depth (mm)	Bird ID Tag Number	Dry Year Beak Depth (mm)
1A	10.81	1B	11.02
2A	8.74	2B	9.65
3A	10.04	3B	11.75
4A	9.75	4B	10.22
5A	9.76	5B	9.86



Use the data above to determine the increase in the mean of the depth of the beak between the wet and dry years. Give your answer to the nearest hundredth of a millimeter.

Carbon Flow in a Grassland Ecosystem

How much carbon (g/m^2) is released into the atmosphere as a result of the metabolic activity of herbivores? Give your answer to the nearest whole number.



The mark and recapture method of estimating population size is used in the study of animal populations where individuals are highly mobile. It is of no value where animals do not move or move very little. The number of animals caught in each sample must be large enough to be valid.

1. In the first capture, each animal that is captured is marked in a distinctive way.
2. The marked animals are released into the natural habitat and left for a period of time.
3. A second capture is done. Only a portion of the second capture sample will have marked animals.

$$\frac{\text{Number of animals in first sample (all marked)} \times \text{Total number of animals in 2}^{\text{nd}} \text{ sample}}{\text{Number of marked animals in the second sample (recaptured)}}$$

Total population =

30 turtles are captured in 1 km^2 , they are marked and released back into the wild. Two weeks later 30 more turtles are caught. 6 had the marking of the original population. Based on this information, what is the best estimation of the turtle population in the area?