Pearson Test Prep Sample

Name_____

I. Using Statistics and Graphical Analysis of Data

The following data were obtained in an artificial selection experiment with Fast Plants. This is what is done in AP Investigation 1, where students select a trait that can be observed and measured in one generation of plants, harvest and plant seeds from the selected plants, and then measure the trait in the next generation. Below you see data for 2 generations , where height is measured at the time the plant displays its first flower.

Height (in cm) at First Flower Generation 1	**Height (in cm) at First Flower Generation 2**
8.2	9.6
7.3	9.3
9.2	8.8
8.1	6.4
8.0	8.9
7.8	8.8
7.9	8.2
9.1	7.9
6.2	8.7
8.9	8.8

1. What is the mean height of the plants in the first generation to the nearest tenth?

2. What is the mode of plant height in the second generation to the nearest tenth?

3. To the nearest tenth, what is the percentage increase in mean height of plants between the first and second generation?

4. What procedure would be the most useful to test the effect of selection for height at first flowering on the mean height of the plants?

   (A) Select plants for breeding that are closest to the average height of the population.
   (B) Use the entire population for breeding, but increase the amount of fertilizer and light.
   (C) Select seeds from only those plants whose height exceeds the mean for the generation.
   (D) Randomly select five plants for breeding.

5. A researcher wanted to evaluate three plant populations based on their mean heights. The chart below summarizes the data. It will be used to determine if there is a significant difference between the size of the plants in the three populations.

	Population I	Population II	Population III
Mean height of plants in cm	6.5	8.9	7.8
Standard error of the mean (SEM)	.3	.2	1.1

A) Prepare a graph of the data including error bars to indicate +/- 2 SEM.

B) Which of these populations are most likely to show a statistically significant difference in their mean height to within 95 % confidence? (i.e., sample mean +/- 2 SEM. Explain your selection using **Claim/Evidence/Reasoning.**

II. Using Traits to Construct a Cladogram

Problem 1: The table below shows three key events in the evolution of plants: the development of vascular tissue, flowers, and seeds. If the group has this character, it is indicated by a +, and absence of the character by a 0.

Plant Group	Vascular Tissue	Flowers	Seeds
Mosses	0	0	0
Gymnosperms	+	0	+
Angiosperms	+	+	+
Ferns	+	0	0

1. Construct a cladogram to show the correct relationship between these plant groups.

2. What character is seen in the common ancestor of both ferns and angiosperms?

3. What character is seen only in the common ancestor of gymnosperms and angiosperms?

4. Use a small dark circle labeled "a" to indicate the location of the common ancestor of mosses and ferns, and a small dark circle labeled "b" to indicate the location of the common ancestor of ferns, angiosperms and gymnosperms.

Problem 2: Did you ever wonder if the fish you ordered in a restaurant or bought in a market was really the fish you thought it was? Substitution of one fish species for another in stores or restaurants is called "market substitution." To determine the degree of market substitution, a gene comparison study was initiated that compared DNA sequences in muscle cells between all species. Then samples of fish being sold as Pacific salmon were taken from restaurants in Tacoma Washington for comparison.

Pacific salmon include five closely related species within the genus *Oncorhynchus*: chinook (*O. tshawytscha*), chum (*O. keta*), coho (*O. kisutch*), pink (*O. gorbuscha*), and sockeye (*O. nerka*). The DNA sequencing and phylogenetic analysis of salmon served at the restaurants revealed that about 24% of the salmon sold as Pacific salmon was actually Atlantic salmon (*Salmo salar*) and another 14% of the salmon sold was a different species of Pacific salmon than the one listed on the menu.

	S. salar	*O. gorbuscha*	*O. keta*	*O. kisutch*	*O. nerka*	*O. tshawytscha*	Test sample
S. salar	self	16%	15%	14%	14%	14%	1%
O. gorbuscha		self	5%	10%	9%	10%	16%
O. keta			self	10%	9%	10%	15%
O. kisutch				self	9%	4%	15%
O. nerka					self	10%	14%
O. tshawytscha						self	15%
Test sample							self

Within the matrix, the intersection of a given row and column contains the percent difference between the row species and the column species. (Some of the cells are gray because they would duplicate comparisons made elsewhere in the matrix.) You can use the pattern of differences to infer the relationships amongst each of the samples or standards.

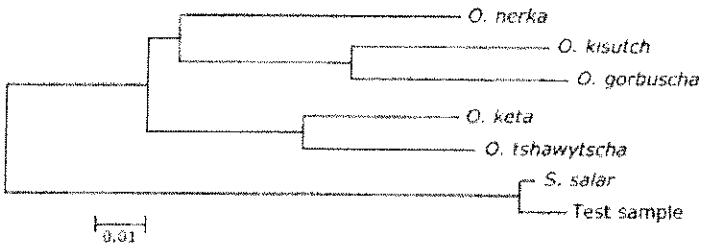
1. Which of the following is most likely the species of the test sample fish?
   (A) *O. tshawytscha*
   (B) *O. nerka*
   (C) *O. gorbuscha*
   (D) *S. salar*

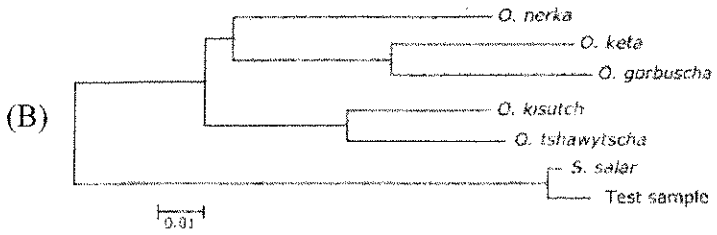
2. When a phylogenetic tree is formed using the data in the chart, *O. kisutch* is closely related to another species of salmon. Which is the closely related species?

   (A) *O. tshawytscha*
   (B) *O. nerka*
   (C) *O. gorbuscha*
   (D) *O. nerka*

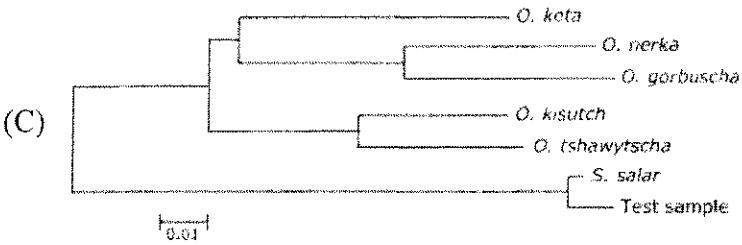
3. Which of the following trees is the best match for the relationships shown in the chart?

(A)

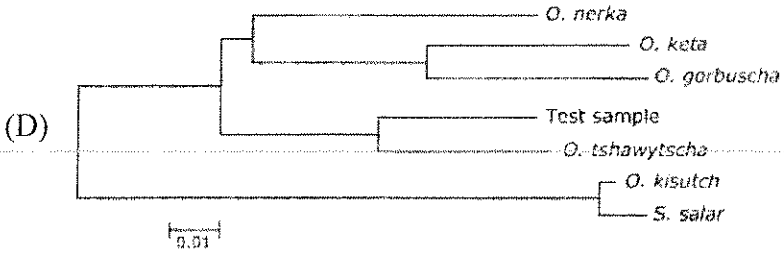




(B)



(C)



(D)

III. Analysis of Data Including Rate Calculation

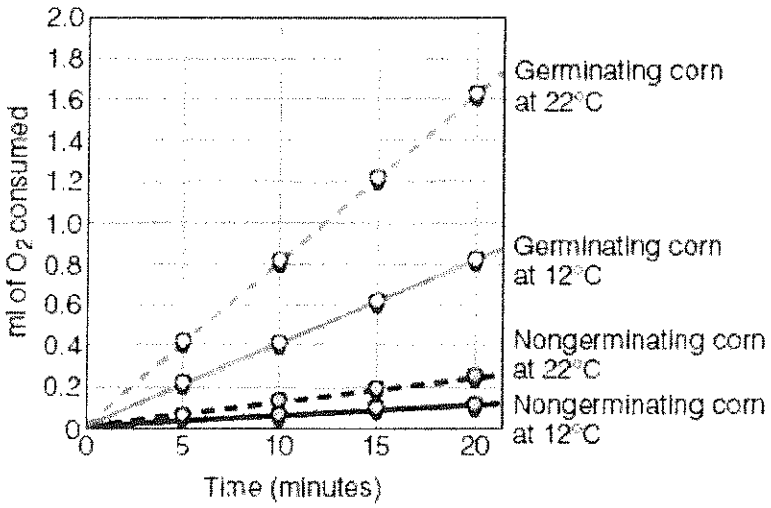


Figure 6.2 Effect of temperature on respiration rate

1. What is the question being tested in Figure 6.2?

2. What is a valid conclusion supported by the data?

3. What is the rate of oxygen consumption in germinating corn at 22°C?

Chi-Square Analysis of Data

Use the following data chart and reading to answer these questions. The cells in the control group were grown in water, and the cells in the experimental were grown with a solution known to affect the rate of cell division.

Table 7.1: Onion Root Tip Cell Phase Data

	Cells in Interphase	Cells in Mitosis	Total # Cells

Control Group	202	48	250
Experimental Group	186	64	250

1. From the data, what effect does the chemical in the experimental group seem to have on the rate of cell division? Use **Claim/Evidence/Reasoning** to frame your answer.

Claim:

Evidence:

Reasoning:

2. Using the data from Table 7.1 do a Chi-square analysis to complete the following table. State the null hypothesis being tested.

Null Hypothesis:			
	Observed (o)	Expected (e)	$(o-e)^2 / e$
Interphase cells			
Mitosis cells			
Total			
		$X^2 =$	
Degrees of Freedom =	p value =	critical value =	
Accept or reject the null hypothesis? Explanation:			

Analysis of a Restriction Digest

Here is a plasmid with restriction sites for *Bam*HI and *Eco*RI. Several restriction digests were done using these two enzymes either alone or in combination. Use Figure 9.2 to answer questions 3 and 4. **Hint:** Begin by determining the number and size of the fragments produced with each enzyme; "kb" stands for kilobases, or thousands of base pairs.

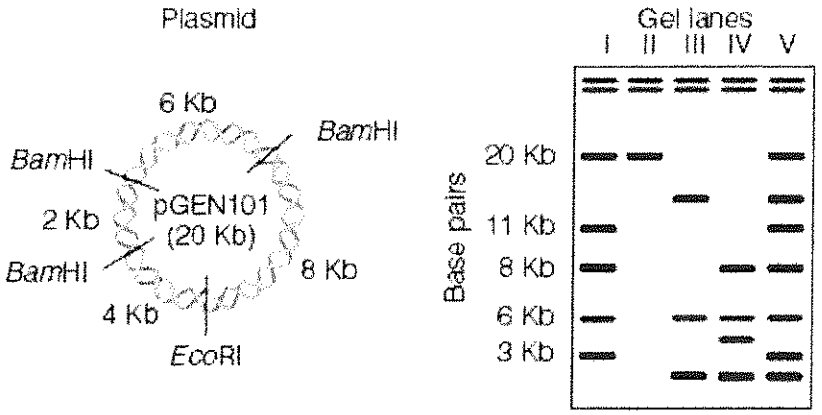


Figure 9.2 Plasmid with restriction sites for *Bam*HI and *Eco*RI

1. Which lane shows a digest with *Bam*HI only?
   A) I
   (B) II
   (C) III
   (D) IV

2. Which lane shows a digest with both *Bam*HI and *Eco*RI?
   (A) II
   (B) III
   (C) IV
   (D) V

Species — **Alignment of Amino Acid Sequences of β-globin**

```
Human      1 VHLTPEEKSA VTALWGKVNV DEVGGEALGR LLVVYPWTQR FFESFGDLST PDAVMGNPKV
Monkey     1 VHLTPEEKNA VTTLWGKVNV DEVGGEALGR LLLVYPWTQR FFESFGDLSS PDAVMGNPKV
Gibbon     1 VHLTPEEKSA VTALWGKVNV DEVGGEALGR LLVVYPWTQR FFESFGDLST PDAVMGNPKV

Human     61 KAHGKKVLGA FSDGLAHLDN LKGTFATLSE LHCDKLHVDP ENFRLLGNVL VCVLAHHFGK
Monkey    61 KAHGKKVLGA FSDGLNHLDN LKGTFAQLSE LHCDKLHVDP ENFKLLGNVL VCVLAHHFGK
Gibbon    61 KAHGKKVLGA FSDGLAHLDN LKGTFAQLSE LHCDKLHVDP ENFRLLGNVL VCVLAHHFGK

Human    121 EFTPPVQAAY QKVVAGVANA LAHKYH
Monkey   121 EFTPQVQAAY QKVVAGVANA LAHKYH
Gibbon   121 EFTPQVQAAY QKVVAGVANA LAHKYH
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Data from http://www.ncbi.nlm.nih.gov/protein/AAA21111.1 (human);
http://www.ncbi.nlm.nih.gov/protein/122634 (rhesus monkey);
http://www.ncbi.nlm.nih.gov/protein/122616 (gibbon)

Analyzing Polypeptide Sequence Data

DNA and polypeptide sequences from closely related species are more similar to each other than sequences from more distantly related species. In the alignment shown here, the letters give the sequences of the 146 amino acids in β-globin from humans, rhesus monkeys, and gibbons. Because a complete sequence would not fit on one line, the sequences are broken into segments. The sequences for the three different species are aligned for ease of comparison. For example, you can see that, for all three species, the first amino acid is "V" (valine) and the 146th amino acid is "H" (histidine).

Scan along the aligned sequences, letter by letter, noting any positions where the amino acids in the monkey or gibbon sequences do not match the human sequence.

1. How many amino acids differ between the monkey and the human sequences?

(A) 2

(B) 6

(C) 8

(D) 10

2. What percent of monkey β-globin amino acids are *identical* to the human sequence? (This is called the percent identity between the monkey and human β-globin sequences.)

(A) 5.48%

(B) 94.5%

(C) 95.9%

(D) 98.6%

3. Using the same procedure, humans and gibbons differ in amino acids at two locations. What percent of gibbon β-globin amino acids are *identical* to the human sequence? (This is called the percent identity between the gibbon and human β-globin sequences.)

(A) 1.37%

(B) 94.5%

(C) 95.9%

(D) 98.6%

4. Based on the β-globin alignment, identify the best hypothesis about how humans are related to monkeys and gibbor

(A) Gibbons are more closely related to humans than monkeys are because the gibbon β-globin sequence is a close match with the human sequence.

(B) Monkeys are more closely related to humans than gibbons are because monkeys' β-globin sequence has the lower percent identity with humans.

(C) Both monkeys and gibbons are equally unrelated to humans because neither monkeys nor gibbons have the exact same β-globin sequence as humans.

(D) Both monkeys and gibbons are equally related to humans because they both have less than a 10% difference in β-globin sequence with humans.

5. What other evidence could you use to analyze evolutionary relatedness among gibbons, monkeys, and humans?

(A) the amino acid sequences of other proteins from gibbons, monkeys, and humans

(B) the β-globin amino acid sequence from gorillas

(C) the frequency of albinism (mutants that lack hair and skin pigment) in populations of gibbons, monkeys, and humans

(D) the amount of habitat overlap among gibbons, monkeys, and humans

Hardy-Weinberg

1. In a certain group of rabbits, the presence of yellow fur is the result of a homozygous recessive condition in the biochemical pathway producing hair pigment. If the frequency of the allele for this condition is 0.09, which of the following is closest to the frequency of the dominant allele in this population? (Assume that the population is in Hardy-Weinberg equilibrium and only two alleles are present for this gene.)

2. Mice that are homozygous for a lethal recessive allele die shortly after birth. In a large breeding colony of mice, you find that a surprising 5% of all newborns die from this trait. In checking lab records, you discover that the same proportion of offspring have been dying from this trait in this colony for the past three years. (Mice breed several times a year and have large litters.) Calculate the frequency of the recessive allele. How might you explain the persistence of this lethal allele at such a high frequency?

3. In a population of king snakes the banded pattern (*B*) is dominant to no banding (*b*). If 12% of the population shows no banding, what percentage of the population, to the nearest tenth, is heterozygous for banding?

Use the following table to answer questions 4-8.

Number of Seedlings				
Time (days)	Green (C^GC^G)	Green-yellow (C^GC^Y)	Yellow (C^YC^Y)	Total
7	49	111	56	216
21	47	106	20	173

One way to test whether evolution is occurring in a population is to compare the observed genotype frequencies at a locus with those expected for a nonevolving population based on the Hardy-Weinberg equation. Students planted soybean seeds and then counted the number of seedlings of each genotype at day 7 and again at day 21. Seedlings of each genotype could be distinguished visually because the C^G and C^Y alleles show incomplete dominance: C^GC^G seedlings have green leaves, C^GC^Y seedlings have green-yellow leaves, and C^YC^Y seedlings have yellow leaves. The two alleles, C^G and C^Y affect chlorophyll production and hence leaf color, which impacts photosynthesis and therefore the viability of the plant.

4. The first step in testing whether a population is in Hardy-Weinberg equilibrium is to calculate the allele frequencies in the population. Remember that the frequency of an allele in a gene pool is the number of copies of that allele divided by the total number of copies of all alleles at that locus. Using the day 7 data, what is the frequency of the C^G allele (p)?

(A) 0.113

(B) 0.484

(C) 0.613

(D) 0.968

5. Using the day 7 data, what is the frequency of the C^Y allele (q)?

(A) 0.234

(B) 0.484

(C) 0.516

(D) 1.484

6. Use the values for p and q from day 7 and the Hardy-Weinberg equation ($p^2 + 2pq + q^2 = 1$) to calculate the expected percentage of genotype C^GC^Y (green-yellow plants) for a population in Hardy-Weinberg equilibrium.

(A) 23%

(B) 27%

(C) 46%

(D) 50%

7. The expected genotypic percentage of yellow plants (C^YC^Y) at Hardy-Weinberg equilibrium is 26.6%. However, in the 21 day readings the observed genotypic ratio is 11.6% Which of the following statements is best supported by the data?

(A) The population is evolving, and there appears to be selection against genotype C^GC^Y.

(B) The population is in Hardy-Weinberg equilibrium.

(C) The population is evolving, and there appears to be selection against genotype C^YC^Y.

(D) The population is evolving, and there appears to be selection against genotype C^GC^G.

8. Based on the data presented, predict the frequencies of the C^G and C^Y alleles after 6 more generations.

(A) The frequency of the C^Y allele will decrease, and the frequency of the C^G allele will increase.

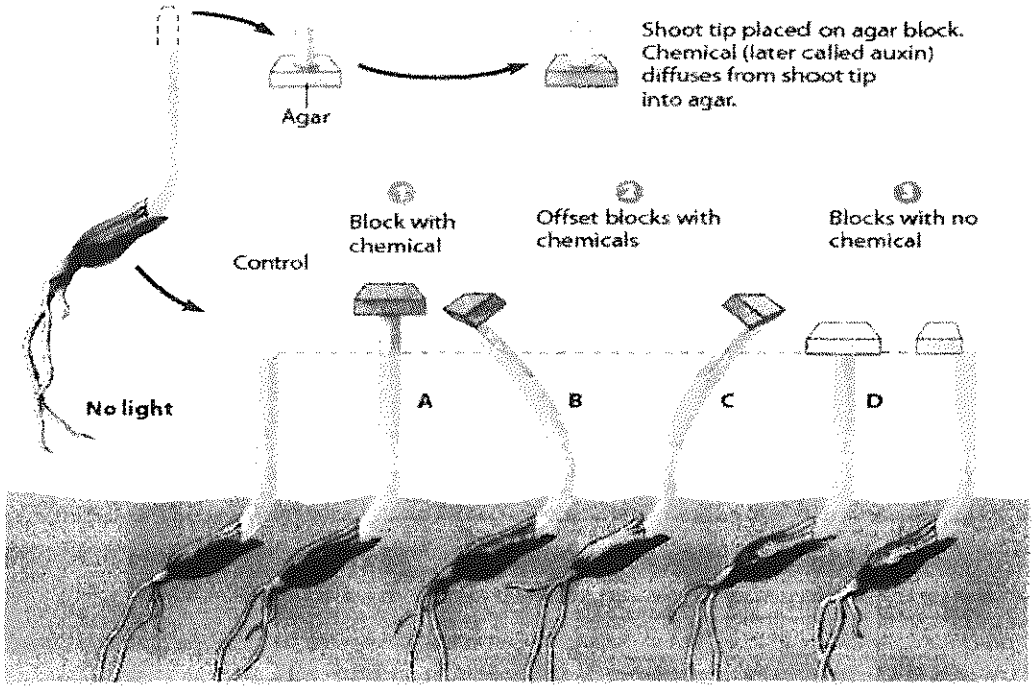
(B) The frequencies of the C^Y and C^G alleles will stay the same.

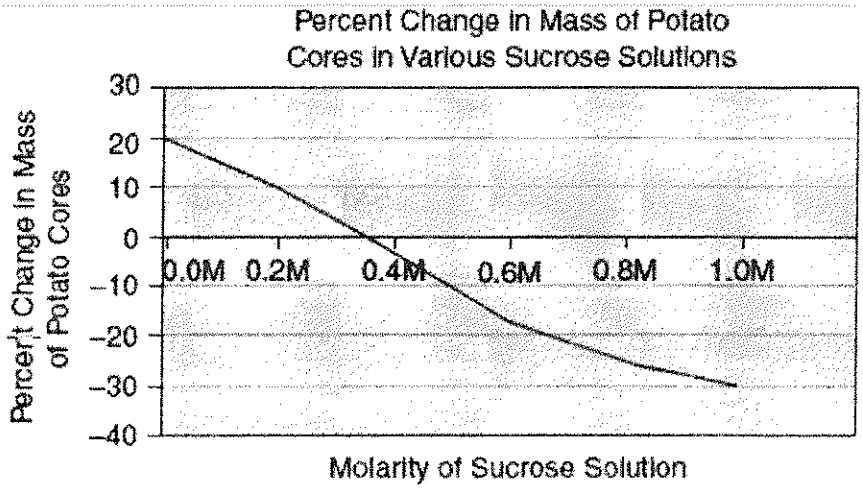
(C) The frequency of the C^Y allele will increase, and the frequency of the C^G allele will decrease.

(D) The frequency of the C^Y allele will decrease, and the frequency of the C^G allele will stay the same.

Solving Water Potential Problems

A group of students placed potato cores in various sucrose solutions to determine the molarity of the cores. The mass of the potato cores was taken before and after immersion in the various sucrose solutions. The following results were obtained.





1. Calculate the solute potential of the potato cores if the temperature in the beaker is 25^0 C.
   (Hint: On the exam you will find the formula for water potential, pressure potential and solute potential. Anytime you have a numerical question and the formula is not given, check the Equations and Formulas sheet that accompanies the exam.)

Interpreting Experimental Results : Phototropism

In 1926 Frits Went experimented with how seedlings grow towards the light. He placed seedlings in the dark and removed their tips, putting some tips on agar cubes, that he predicted would absorb the growth-promoting chemical. The figure shows key elements of Went's experiment.

1. Which plant shows auxin stimulating elongation in the left side of the plant only?
   (A)plant A
   (B) plant B
   (C) plant C
   (D) plant D

2. What prior knowledge must Went have had to design this experiment as shown?
   (A)Plants respond to gravity as well as light.
   (B) Compounds produced in the shoot tip have an effect on phototropism.
   (C) Placing an agar block on a seedling will stimulate its growth.
   (D) Photosynthesis is concentrated in cells of the shoot tip.

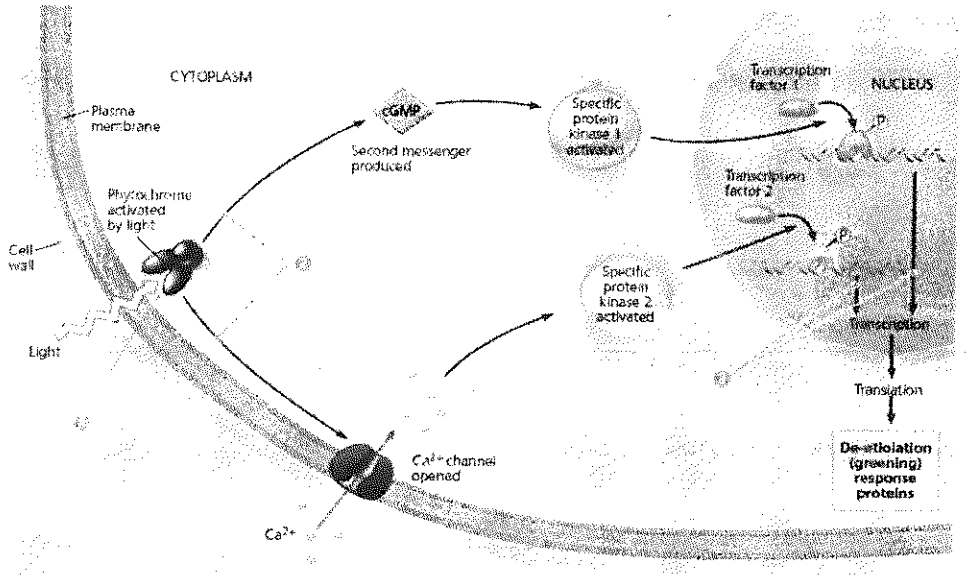
3. In Went's experiment, observe what happens to both plants with treatment D, agar blocks with no chemicals. What *conclusion* can be drawn from this?
   (A) These plants serve as the control because they have no chemical.
   (B) It is necessary to add chemical to the block to get bending.
   (C) The addition of the chemical causes elongation of cells.
   (D) The mechanical irritation of the agar block is responsible for the bending.

4. You are given the task of preventing grass seedlings from rotating toward the light. Using your knowledge of phototropism, which of the following experimental procedures would you use to complete the task?
   A) Cover the growing tip of the grass seedling with black paper.
   B) Cover only the base of the grass seedling with black paper.
   C) Illuminate the seedlings with a high wattage bulb at a 45^{O} angle.
   D) Supply the seedling with nutrient-rich fertilizer solution.

5. In plants the movement of sugars, hormones and other organic molecules takes place in the phloem. Which of the following mechanisms would best explain this movement?
   (A)A difference in water potential between a sugar source and a sugar sink.
   (B) The evaporation of water through the stomata.
   (C) The cohesion of water molecules to each other and adhesion to the transport tubes.
   (D) The release of auxins in response to a loss of water in the xylem.

Analyzing Graphical Information: Cell Signaling

When a seed germinates and the growing plant shoot reaches light, the plant undergoes profound changes known as de-etiolation or greening. Stem elongation slows, leaves expand, roots elongate, and the shoot produces chlorophyll. You can see this pathway in the accompanying figure.



1. Which step in this pathway begins the amplification of the signal resulting in numerous active molecules?
   (A) Step 1
   (B) Step 2

(C) Step 3
(D) Both Steps 1 and 3

2. Which of the following describes a significant difference between the phytochrome and the calcium channel protein in the figure?
   (A)When activated, phytochromes allow the plant to skip the transduction stage and go directly to cellular responses.
   (B)Phytochrome molecules do not require an environmental stimulus to be activated.
   (C)Phytochrome molecules are intracellular rather than membrane-bound and do not respond to a molecular stimulus.
   (D)Phytochrome activation causes the transduction and cellular response sequences to occur in the nucleus.

Mathematics Applied to Ecology

1. If r_{max}= 1.0 and carrying capacity (K) = 1500, calculate the population growth rate (logistic growth) where population size (N) = 1600. Explain what is happening to the population in this case.

2. Calculate the population growth rate where the population size (N) = 1200. Explain what is happening to the population in this case.

3. If r_{max} is doubled, predict how the population growth rate will change. Now calculate the population growth rate for problem 2 above when r_{max} is doubled.

4. What would the value of the expression (K-N)/K be if K=N and what growth would you predict for the population?

Use the reading and data table to answer questions 5-9.

In a classic experiment, John Teal studied the flow of energy through the producers, consumers, and detritivores in a salt marsh. Teal measured the amount of solar radiation entering a salt marsh in Georgia over a year. He also measured the aboveground biomass of the dominant primary producers, which were grasses, as well as the biomass of the dominant consumers, including insects, spiders, and crabs, and of the detritus that flowed out of the marsh to the surrounding coastal waters. To determine the amount of energy in each unit of biomass, he dried the biomass, burned it in a calorimeter, and measured the amount of heat produced. His data is summarized in the chart that follows.

Form of Energy	**kcal/(m^2 • yr)**
Solar radiation	600,000
Gross grass production	34,580
Net grass production	6,585
Gross insect production	305
Net insect production	81
Detritus leaving marsh	3,671

Data from J. M. Teal, Energy flow in the salt marsh ecosystem of Georgia, *Ecology* 43:614-624 (1962).

5. What percentage of the solar energy that reaches the marsh is incorporated into gross primary production?
   (A) 1.1% (B) 5.8% (C) 10.3%(D) 17.4%

6. What percentage of the solar energy that reaches the marsh is incorporated into net primary production?
   (A) 0.01%
   (B) 0.2%
   (C) 1.1%
   (D) 12.3%
7. How much energy is lost by primary producers as respiration in this ecosystem?
   (A) 3,921 kcal/(m2 • yr)
   (B) 6,585 kcal/(m2 • yr)
   (C) 13,735 kcal/(m2 • yr)
   (D) 27,995 kcal/(m2 • yr)

8. If all of the detritus leaving the marsh is plant material, what percentage of all net primary production leaves the marsh as detritus each year?
   (A) 8%
   (B) 20%
   (C) 43%
   (D) 56%

9. The data from the energy flow in a saltwater ecosystem supports which of the following statements?
   (A) The progressive loss of energy along the food web explains why most food webs include only 4 or 5 trophic levels.
   (B) The movement of energy through the food web explains why most food webs contain more top level carnivores than primary consumers.
   (C) The efficient cycling of energy through a food web explains the abundance of species on Earth.
   (D) The high level of energy transfer between all trophic levels in a food web accounts for the large biomass of the saltwater ecosystem.

10. A population of 20 bobcats was introduced to a barrier island to help control the large rodent population. The bobcat population's birth rate is 0.48 bobcats/year per capita, and the death rate is 0.21 bobcats/year per capita. Given the initial bobcat population, predict the population size after 2 years on the island. (Round to the nearest whole number.)

TIP FROM THE READERS

Explain is an important term that has very specific requirements! Here are the components of a scientific explanation:

1. Make a *claim* (an assertion or conclusion)
2. Provide *evidence* (data that support the claim)
3. Give *reasoning* the scientific basis the evidence is linked to the claim)

Here is an example of a question and how you might answer it:

Explain when chromosome number is reduced in meiosis.

Chromosome number is reduced in the first meiotic division **(CLAIM)** because at that time homologous pairs are separated. **(EVIDENCE).** At this point there is only one chromosome of each pair of parental chromosomes, although they are replicated sister chromatids.. **(REASONING).**

Water Potential Problem Name_____

Please show your work.

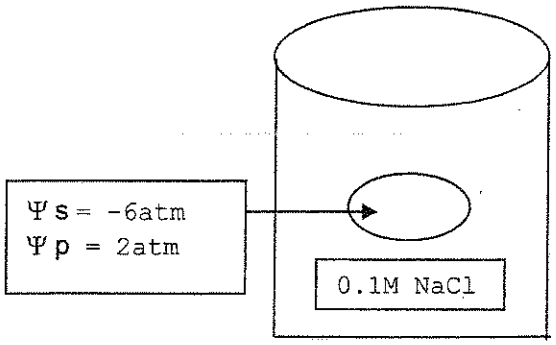
a). Write the formula for water potential.

b). Calculate the osmotic potential of the diagrammed beaker contents.

c). What is the water potential of the cell?

d). What is the water potential of the beaker contents?

e). Which way will water go? _____



Osmotic Potential =iCRT
i = ionization constant
C = molar concentration
R = 0.0831
T = temp in K (°C +273)

2. We consider Mendel's Pea Experiment in which he crossed two heterozygote parents ***YyRr*** × ***YyRr*** with each other. In this experiment, the ***Y*** and ***y*** genes determine whether a pea is yellow (yellow is dominant, ***Y***) or green (only ***yy*** genotypes are green). The ***R*** and ***r*** genes are those that make a pea smooth (smooth is dominant, ***R***) or wrinkled (since wrinkled is recessive, just like before, only ***rr*** genotypes are wrinkled). The Punnett Square for this crossing is shown below:

YyRr X YyRr	***YR***	***Yr***	***yR***	***yr***
YR	YYRR	YYRr	YyRR	YyRr
Yr	YYRr	YYrr	YyRr	Yyrr
yR	YyRR	YyRr	yyRR	yyRr
yr	YyRr	Yyrr	yyRr	yyrr

In his experiment, Mendel observed the following number of offspring of each phenotype:

Yellow & Smooth	***Green & Smooth***	***Yellow & Wrinkled***	***Green & Wrinkled***
315	108	101	32

Again, we can use a χ^2 test to help us decide if this is in line with what we expect.

(a) How many outcomes are possible in this situation? (As before, the outcomes correspond to the phenotype of the offspring.)

(b) How many degrees of freedom are there in this scenario?

(c) According to Mendel's observations, fill in the following observed values:

$O_{YellowSmooth}$ = _____

$O_{GreenSmooth}$ = _____

$O_{YellowWrinkled}$ = _____

$O_{GreenWrinkled}$ = _____

(d) What is the null hypothesis (the "nothing is out of the ordinary" hypothesis) in this scenario?

(e) Based on the Punnett square, fill in the expected proportions of each phenotype (not the expected number of each phenotype).

Expected Proportion of Yellow & Smooth Peas = _____

Expected Proportion of Green & Smooth Peas = _____

Expected Proportion of Yellow & Wrinkled Peas = _____

Expected Proportion of Green & Wrinkled Peas = _____

(f) Use the proportions you calculated in *(e)* to determine how many plants of each phenotype we expect under Mendel's hypotheses:

$E_{YellowSmooth}$ = _____

$E_{GreenSmooth}$ = _____

$E_{YellowWrinkled}$ = _____

$E_{GreenWrinkled}$ = _____

(g) Use your previous results to complete the following table:

	Yellow & Smooth	***Green & Smooth***	***Yellow & Wrinkled***	***Green & Wrinkled***
$o - e$				
$(o - e)^2$				
$[(o - e)^2]/e$				

(h) What is your χ^2 value?

(i) Based on your χ^2 value do you reject or fail to reject the null hypothesis?

(j) Summarize your χ^2 conclusion about the pea plant offspring. State in terms of your null hypothesis.

(k) **Challenge:** What would your χ^2 value be if Mendel had observed 105 green, wrinkled pea plant offspring with all other counts remaining the same? Would it change whether you accepted or rejected the null hypothesis?

3. As in AP Biology Investigation #12, you and two lab partners are investigating fruit fly behavior. In particular you are considering whether fruit flies have a preference for older fruit juice over fresher. You and your partners provide your fruit flies with a bowl of fresh juice, a bowl of four-day-old juice, and a bowl of seven-day old juice. You count the number of fruit flies that feed in each bowl.

Juice Type	***Fresh***	***4 days old***	***7 days old***
# of Feeding Fruit Flies	88	96	125

Again, we can use a χ^2 test to help us decide if this is in line with what we expect.

(a) What are the possible outcomes in this experiment?

(b) How many degrees of freedom are there in this scenario?

(c) According to your observations (in the table above), fill in the following observed values:

$O_{freshjuice}$ = _____

$O_{4dayoldjuice}$ = _____

$O_{7dayoldjuice}$ = _____

(d) What is the null hypothesis (the "nothing is out of the ordinary" hypothesis) in this scenario?

(e) Based on the null hypothesis, fill in the expected proportions of juice preference among the fruit flies.

Expected Proportion of Fresh Juice Preferers = _____

Expected Proportion of 4-day-old Juice Preferers = _____

Expected Proportion of 7-day-old Juice Preferers = _____

(f) Use the proportions you calculated in *(e)* to determine how many fruit flies we expect to prefer each juice under the null hypothesis:

$E_{freshjuice}$ = _____

$E_{4dayoldjuice}$ = _____

$E_{7dayoldjuice}$ = _____

(g) Use your previous results to complete the following table:

	Fresh Juice	*4-day-old Juice*	*7-day-old Juice*
$o - e$			
$(o-e)^2$			
$[(o-e)^2]/e$			

(h) What is your χ^2 value?

(i) Based on your χ^2 value do you reject or fail to reject the null hypothesis?

(j) Summarize your χ^2 conclusion about the juice preferences of the fruit flies. State in terms of your null hypothesis.