Pioneer® brand corn hybrid ratings

			CHARACTERISTICS RATINGS																		DISEASE AND PEST RESISTANCE RATINGS						
	SPECIALTY SEGMENT[1]	BASE GENETICS[2]	CHM[3]	SILK CHM	PHYSIOLOGICAL CHM[4]	GRAIN TO SILK	GRAIN TO PHYSIOLOGICAL MATURITY[5]	YIELD FOR MATURITY[6]	ADAPTABILITY TO HIGH POPULATION[7]	ADAPTABILITY TO LOW POPULATION[8]	GRAIN DRYDOWN[9]	STALK STRENGTH	ROOT STRENGTH	STAYGREEN	DROUGHT TOLERANCE	TEST WEIGHT[10]	EARLY GROWTH[11]	PLANT HEIGHT[12]	EAR HEIGHT[13]	EAR RETENTION	MID-SEASON BRITTLE STALK[14]		GRAY LEAF SPOT[15]	NORTHERN LEAF BLIGHT[16]	HEAD SMUT	GOSS'S WILT[17]	EYESPOT[18]	ECB, 1ST BROOD[19]	ECB, 2ND BROOD[20]
39K72			75	77	76	970	1760	8	7	8	6	5	6	4	6	7	7	5	5	5	7	39K72		2	7	6		5	4
3979			76	76	75	950	1740	7	8	7	6	5	4	5	7	4	5	6	6	5	6	3979		4	7	6	6	7	4
39K73*	Bt	39K72	77	77	76	970	1760	9	9	9	6	7	6	5	6	7	7	5	4	6	7	39K73*			7	6		9	9
39J69*	Bt	3970	79	80	79	1000	1840	9	9	9	5	6	5	5	4	6	4	6	6	6	7	39J69*			8		6	9	9
3963			79	80	82	1000	1920	7	7	6	7	5	6	4	5	4	5	5	4	6	7	3963		2	7	5		4	5
39A26*			80	82	81	1030	1900	9	9	9	7	7	5	6	5	6	4	6	8	5	6	39A26*		7	7	5		3	
39Y85*			82	78	81	980	1900	7			8	7	6	8		5	6	5	5	6	6	39Y85*			7	7	3		
3941			82	81	83	1020	1950	8	8	8	6	7	4	8	5	5	4	5	5	6	6	3941		5	7	5	6	3	6
39D81*			85	87	82	1090	1920	9	9	9	6	5	7	5	7	5	6	5	5	5	5	39D81*		6	4	4	4	3	
3914			86	87	86	1090	2030	7	7	7	6	5	6	6	7	5	4	6	6	6	7	3914	2	3	8	5	4	3	5
39F06*	Bt	3905	88	88	88	1100	2080	9	9	9	6	8	6	8	7	5	7	5	8	6	5	39F06*		6	7	4	5	9	9
3893			89	90	90	1130	2130	8	9	8	6	4	6	5	7	5	7	5	6	6	5	3893		5	6	5	4	3	4
3878			89	93	92	1160	2180	7	7	7	6	5	6	4	6	5	3	7	6	5	7	3878		4	9	5	3	4	5
3845			91	94	93	1180	2210	7	7	7	8	5	6	7	5	5	9	8	7	4	6	3845		6	9	5	7	5	6
38R21			92	91	91	1140	2160	7	7	7	6	5	3	3	8	5	8	6	8	6	6	38R21		5	8	6	4	3	5
38K06*			92	93	94	1160	2240	9			6	5	5	6	7	4	7	5	8	6	5	38K06*		7	8	4	6	3	
38W36	Bt	3893	93	92	91	1150	2160	9	9	8	6	6	5	6	7	5	7	6	7	7	5	38W36		5	6	5	5	9	9
38P05			94	94	94	1180	2240	9	9	9	6	5	5	6	7	6	5	5	5	5	6	38P05		7	8	5	5	4	5
38P06*	Bt	38P05	95	96	94	1200	2240	9	9	9	6	6	5	7	7	6	5	5	5	6	6	38P06*		7	8	5	4	9	9
37J99	CL	37M81	97	98	99	1230	2370	9	9	8	7	4	4	6	7	4	6	6	6	5	4	37J99	4	5	7	5	5	4	3
3751			97	98	98	1230	2340	8	8	8	7	4	4	5	7	4	4	5	4	5	6	3751	3	5	8	5	7	5	3
37R71	Bt	37M81	98	97	98	1210	2340	9	9	8	7	6	5	7	7	4	5	6	6	7	4	37R71	4	5	7	5	6	9	9
3730			99	99	99	1240	2370	9	9	7	6	6	5	5	7	5	8	6	4	6	4	3730	3	5	8	5	6	5	4
36F30	Bt	3751	99	100	100	1250	2390	9	8	9	7	6	4	6	7	4	4	6	6	5	6	36F30	3	5	8	5	7	9	9
36H36			100	99	101	1240	2420	9	9	9	6	6	6	7	7	5	7	5	5	6	5	36H36	4	6	9	5			4
36R10*			101	100	100	1250	2390	9			6	6	5	7	7	5	4	6	5	5	6	36R10*	5	6	9	7		6	3
36R11*†	Bt	36R10	101	101	101	1260	2420	9				7	5	7	7	5	4	6	4	6	6	36R11*†	5	6	9	7		9	9
36B08*			102	100	100	1250	2390	9			5	6	7	7	7	6	7	4	4	5	5	36B08*	5	7	9	6		6	5
36Y96*	Bt, YFC	36Y95	103	101	103	1260	2470	9	9	8	6	7	4	7	6	7	5	4	5	5	6	36Y96*	3	6	8	4		9	9
36D14*	CL		103	102	103	1270	2470	9			6	6	4	6	6	4	5	5	5	4	6	36D14*	5	6				5	3
3563			103	105	105	1310	2530	8	8	8	7	6	7	6	7	8	4	7	4	7	4	3563	3	5	8	5	6	4	5
35P12*			104	103	105	1290	2530	9			7	5	6	7	7	4	7	5	5	6	6	35P12*	4	5	9	6		5	5
35R57			104	104	105	1300	2530	9	9	8	7	7	5	5	8	6	4	5	4	5	4	35R57	3	6	7	4	5	4	4
35R58*	Bt	35R57	105	105	106	1310	2550	9	9	8	7	7	5	5	8	6	4	6	5	5	4	35R58*	3	6	6	4	5	9	9
3522			105	103	104	1290	2500	8	8	8	6	7	4	5	7	5	5	4	6	5	4	3522	3	6	6	5	6	3	5
35N05	Bt	3563	105	107	107	1340	2580	9	9	9	8	6	7	7	7	7	5	7	5	7	4	35N05	4	5	7	5		9	9
34G81			106	106	106	1320	2550	9	9	8	8	7	3	6	8	6	5	5	5	5	5	34G81	4	7	9	4	6	4	4
34G82*	Bt	34G81	106	107	107	1340	2580	9	9	8	8	7	4	7	8	6	5	5	5	6	5	34G82*	4	7	9	4	6	9	9
34R07*	Bt	3489	110	110	109	1370	2630	9	9	9	7	5	6	7	8	6	4	6	5	6	3	34R07*	4	4	8	5	6	9	9
High Oil Products																						**High Oil Products**							
38F48*	HOSX, Bt		95	95	93	1190	2210	7	8	6	6	5	6	5	7	5	6	4	4	6	7	38F48*	3	5	3	4	6	9	9
37H97	HOTC	37M81	98	97	98	1210	2340	8	8	7	7	4	4	6	6	4	6	6	7	5	4	37H97	4	5	8	5	5	3	3
Waxy Hybrids																						**Waxy Hybrids**							
37B04*	WX	3752	99	96	97	1200	2320	8	8	8	6	4	4	5	7	7	4	5	4		7	37B04*			9	6	4		
35G41*	WX	3522	106	104	103	1300	2470	8	8	8	5	7	3	5	7	5	5	4	6	5	4	35G41*	3	6		5		4	4
34H98	WX	34K77	108	108	110	1350	2660	8	8	8	7	5	5	7	7	6	6	5	6	5	6	34H98	4	5	8	6		4	3

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores based on period-of-years testing through 1998 harvest and were the latest available at time of printing. Some ratings may change after 1999 harvest. Contact your Pioneer sales professional before planting for the latest trait rating information.

*NEW for 2000

† This information reflects preliminary ratings and positioning. Contact your Pioneer sales professional to confirm ratings prior to planting. Many ratings based upon the non-converted version of this hybrid.

For Pioneer® hybrids 36R11, 35R58, 34G82 and 37H97: Many ratings are based on the base genetics of these hybrids. For HOTC products, ratings are for the female grain parent only.

RATINGS: 9 = Outstanding; 1 = Poor; **Blank** = Insufficient Data.

IMPORTANT: Ratings based on comparison with other Pioneer hybrids, not competitive hybrids. Ratings are assigned from research and data over a wide range of both climate and soil types, based on average performance across area of adaptation under normal conditions. Extreme conditions may adversely affect performance. Consult your local Pioneer sales professional for specific product information in your area.

SPECIALTY CORN RATINGS: Based on comparison with other Pioneer hybrids, not competitive hybrids. Yield and other trait ratings for white and waxy hybrids reflect comparison with non-modified yellow hybrids of a similar maturity. Specialty ratings based on average performance across area of adaptation under normal conditions. Extreme conditions may adversely affect performance.

1 **SPECIALTY SEGMENT: Bt** – The YieldGard[a] gene offers a high level of resistance to European corn borer, southwestern corn borer and southern cornstalk borer. The gene also offers a moderate level of resistance to corn earworm and common stalk borer; strong resistance to Fall armyworm. **CL**[b] (formerly IMI T) – Contains gene for imidazolinone herbicide resistance. (No protection from sulfonylurea [SU] herbicide carryover or from SU herbicide-insecticide interactions.) **WX** – Waxy. **YPC** – Suitable also for yellow food corn use. **HOSX** – High oil single-cross. **HOTC** – High oil TC Blend®.

a Registered trademark of, and used under license from, Monsanto Company.
b Trademark of American Cyanamid Company.
c Registered trademark of Optimum Quality Grains, L.L.C.

2 **BASE GENETICS:** Identifies the non-converted hybrid which is modified to include new technologies. Manages similarly to the base genetic hybrid.

3 **CRM (COMPARATIVE RELATIVE MATURITY):** With no industry standard for maturity ratings, comparing hybrid maturity and harvest moisture ratings between companies is usually difficult. Use the CRM rating to compare Pioneer hybrids with competitive hybrids of a similar maturity and harvest moisture. Individual company ratings may show variation from this average comparative rating. CRM ratings for relative harvest moisture of ECB-resistant hybrids are calculated across all levels of corn borer infestation. Under heavy corn borer pressure, the relative harvest CRM between ECB-resistant hybrids and similar CRM non-ECB resistant hybrids may differ by as many as 2-3 CRM units.

4 **PHYSIOLOGICAL CRM:** Physiological maturity/zero milk line. To help decide if a new hybrid fits your area's growing season, compare its physiological maturity to a hybrid that you plant or one that is successfully used in your area.

5 **GDUS TO PHYSIOLOGICAL MATURITY:** Physiological maturity/zero milk line. To help decide if a new hybrid fits your area's growing season, compare its physiological maturity to a hybrid that you plant or one that is successfully used in your area.

6 **YIELD FOR MATURITY** ratings for ECB-resistant hybrids are scored relative to only other ECB-resistant hybrids. Yield for maturity ratings for non-ECB resistant hybrids are scored relative to only other non-ECB resistant hybrids.

7 **ADAPTABILITY TO HIGH POPULATION:** Reflects adaptability to yield at high plant density and maintain harvest dependability.

8 **ADAPTABILITY TO LOW POPULATION:** Reflects adaptability to yield at low plant density; ability to yield at reduced stands.

9 **GRAIN DRYDOWN:** Compares hybrids of similar maturity for rate of moisture loss during grain drydown. A higher score indicates faster drydown. A lower score indicates slower drydown, or a wider opportunity for silage and high-moisture corn harvest.

10 **TEST WEIGHT:** Higher score indicates heavier test weight.

11 **EARLY GROWTH:** Ratings taken when two leaf collars are visible.

12 **PLANT HEIGHT:** 9 = Very Tall; 1 = Short.

13 **EAR HEIGHT:** 9 = High; 1 = Low.

14 **MID-SEASON BRITTLE STALK:** Ratings determined by frequency and severity of stalk breakage at lower to middle stalk internodes from conditions usually favored by rapid or optimum growth. Relative response of hybrids can be affected by planting date, stage of growth, rate of growth, wind severity and other variables. Scores derived from both natural observations and artificial push test evaluation just prior to tasseling.

NOTE: Scores do not reflect breakage enhanced by or due to herbicide interaction. The use of growth regulator herbicides such as 2,4-D and dicamba can increase the brittle stalk potential of corn hybrids. Hybrids with lower brittle stalk ratings will require more caution and have a higher risk associated with the use of growth regulator herbicides. Early application, proper rates and application methods, along with both hybrid and herbicide selection can help reduce this risk.

BRITTLE STALK PRECAUTION: In areas with higher potential for brittle stalk breakage, growers must balance the risk of planting hybrids with brittle stalk ratings of 1 to 4 against the overall performance of more resistant hybrids with higher ratings. All hybrids have a period of susceptibility to brittle stalk. Hybrids with low ratings may have a longer period of susceptibility, or they may experience more severe breakage relative to hybrids with higher scores in their period of susceptibility.

DISEASE PRECAUTION: Grower should balance hybrid yield potential, hybrid maturity and cultural practices selection against their anticipated risk of a specific disease and need for resistance. In high disease risk conditions, consider planting hybrids with at least moderate resistance ratings of 4 or higher to help reduce risk. When susceptible hybrids with disease ratings of 1 to 3 are planted in conditions of high disease pressure, the grower assumes a higher level of risk. If conditions are severe, even hybrids rated as resistant can be adversely affected. Independent of yield reduction, diseases can predispose plants to secondary diseases such as stalk rots. This requires individual field and hybrid monitoring for stalk stability and timely harvest when warranted.

DISEASE AND PEST RATINGS: **8-9** = Highly Resistant; **6-7** = Resistant; **4-5** = Moderately Resistant; **1-3** = Susceptible; **Blank** = Insufficient Data.

15 **GRAY LEAF SPOT PRECAUTION:** Avoid planting hybrids with a lower gray leaf spot (GLS) rating in continuous corn fields that have a history of GLS infection unless tillage operations that bury significant amounts of corn residue and inoculum are practiced.

16 **NORTHERN LEAF BLIGHT CAUTION:** In conditions where northern leaf blight (NLB) risk is high, growers should consider planting only hybrids with at least moderate NLB resistance ratings of 4 or higher.

17 **GIBBERELLA EAR MOLD CAUTION:** Growing hybrids with a score of 6 or less north of a line formed by the Nebraska/South Dakota border, to the Illinois/Wisconsin border, curving south of the Great Lakes to the Pennsylvania/New York border, may increase the risk of Gibberella ear mold infection and the associated mycotoxins, including deoxynivalenol (DON or vomitoxin) and zearalenone.

18 **EYESPOT:** Degree of resistance to the disease under natural infestation. Data is limited by the number of observations, but it should give a general ranking of resistance.

19 **ECB, 1ST BROOD:** European corn borer – 1st Brood leaf feeding visual score; not based on yield reduction data.

20 **ECB, 2ND BROOD:** European corn borer – 2nd Brood pest tassel visual score; not based on yield reduction data.

	HERBICIDE FAMILIES			
	Amide[1]	Growth Regulator[2]	Pigment Inhibitor[3]	SU[4]
39K72				
3979				
39K73*				
39J69*				
3963				
39A26*				
39Y85*				
3941				
39D81*				
3914				
39F06*				
3893				
3878				
3845				
38R21				
38K06*				
38W36				
38P05				
38P06*				
37J99				
3751				
37R71				
3730				
36F30				
36H36				
36R10*				
36R11*†				
36B08*				
36Y96*				
36D14*				
3563				
35P12*				
35R57				
35R58*				
3522				
35N05				
34G81				
34G82*				
34R07*				
High Oil Products				
38F48*				
37H97				
Waxy Hybrids				
37B04*				
35G41*				
34H98				

Under certain environmental conditions any hybrid can be injured by any herbicide. This guide can assist in selecting and managing herbicide programs. It is based on replicated research trials and field observations. See your Pioneer® herbicide representative regarding herbicide-hybrid combinations that require careful management.

ADEQUATE TOLERANCE: This herbicide-hybrid combination has acceptable tolerance. Available research and field observations suggest injury is unlikely to occur in normal growing conditions when label recommendations are followed.

REQUIRES CAREFUL MANAGEMENT: This herbicide-hybrid combination may require careful management in challenging environments such as sandy soils, soils low in organic matter, high pH soils, cool wet conditions, or hot and humid growing conditions. For growth regulator herbicides, these hybrids may exhibit greater early season stalk breakage when applied prior to a significant windstorm.

NOT RECOMMENDED: Based on field observations and research results, this herbicide-hybrid combination should not be used.

INSUFFICIENT DATA: Additional testing is needed to evaluate crop response and grain yield.

1 **Amide** (chloroacetamide) tested was Harness. This family includes Axiom, Dual, Dual II, Frontier, Harness, Lasso, Surpass, Topnotch, and others in pre-packaged mixes.

2 **Growth Regulator** tested was Banvel. This family includes 2,4-D, Banvel, Clarity, Stinger, in pre-packaged mixes. Hybrids may exhibit greater early season stalk breakage when growth regulator herbicides are applied prior to a significant windstorm.

3 **Isoxazole (pigment inhibitor)** tested was Balance. The herbicide prevents the biosynthesis of a photosynthetic pigment (carotenoid). The carotenoid pigment prevents the degradation of chlorophyll. Susceptible plant will turn white and chlorotic.

4 **SU** (sulfonylurea) tested were Accent, Basis and Basis Gold. This family also includes Accent, Accent Gold, Basis, Basis Gold, Beacon, Permit, Elite, Ultim, Exceed and others in pre-package mixes. A similar family called Sulfonamides includes Python, Broadstrike + Dual, and Hornet.

CAUTION: Some sulfonylurea products have label restrictions on hybrids with maturity shorter than 88 CRM. Review the herbicide label before applying any sulfonylurea product to hybrids less than 88 CRM.

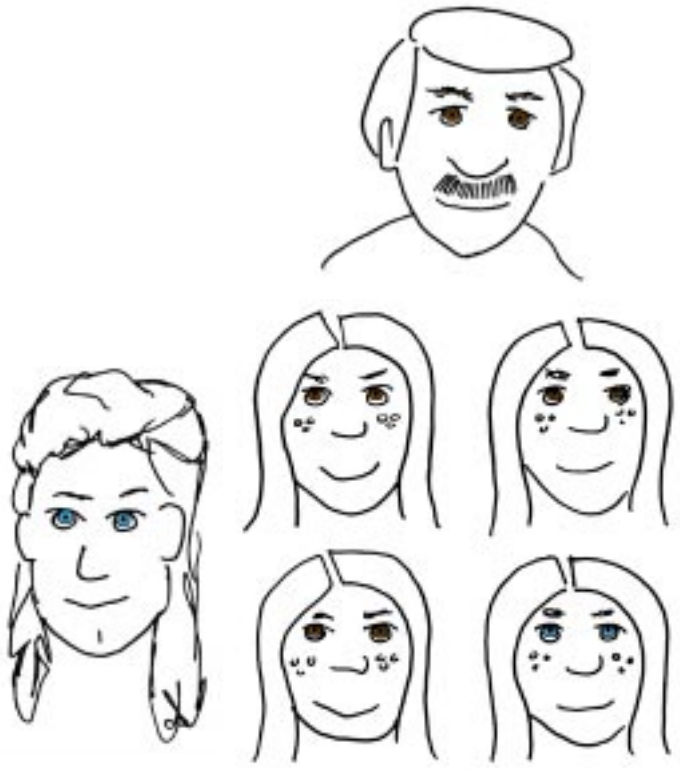
All herbicides are trademarks of their manufacturers.

Inherited Traits

Free ear lobe

Attached ear lobe

Ability to roll the tongue



	B (BROWN)	b (blue)
B (BROWN)	BB (BROWN)	Bb (BROWN)
b (blue)	Bb (BROWN)	bb (blue)

GENES-R-US ACTIVITY WORKSHEET

1. Discuss how parents and children are alike. Why are they alike? *(because of genes*)

2. Explain that cells contain information that determines how children look, and that genes are the messengers that carry the information, just as a child would carry a note to a teacher. Stress that we can't see genes with our eyes—they are very, very small.

3. Poll how many participants have blue eyes, brown eyes, how many have attached ear lobes, how many can roll their tongues. (Show them the drawings of earlobes and rolled tongues! - Example 1) Ask them to count the number of girls and boys in their family.

4. Explain that the information for some traits is dominant over that of others.

   Ask, can two brown eyed parents have a blue eyed child? The answer (yes, if both have a recessive blue-eyed gene) can be demonstrated by placing four brown pipe cleaners, two short and two long, into a bag. This would be represented by the following punnet square, and drawing:

	B (BROWN)	b (blue)
B (BROWN)	BB (BROWN)	Bb (BROWN)
b (blue)	Bb (BROWN)	bb (blue)

   The odds of having a blue-eyed child (rr) are one in four. But will this probability match what actually happens?

   Take turns drawing two pipe cleaners at a time from the bag (replace after each turn). Tally the number of blue and brown eyed people made. Does it work out to the 3:1 ratio predicted by the punnet square?

5. Write the following on a board: *(Suggestion: Limit this exercise to only two or three traits for younger students.)*
   - Brown = Eye Color (long = dominant = brown) (short = recessive = blue)
   - Red = Tongue Rolling (long = dominant = can roll) (short = recessive = can't roll)
   - Green = Number of Fingers (long = dominant = five fingers) (short = mut
   - White = Earlobe Structure (long = dominant = attached) (short = recessive = not attached)
   - Yellow = Sex (two longs = girl) (one long and one short = boy)
   - Green = Number of Fingers (long = dominant = five fingers) (short = mutant = six)

6. Help the students prepare 10 bags, 5 are "Mom" and 5 and "Dad".
   Bag Mom 1 (Mom's eye color genes): Mom has blue eyes (recessive). Fill bag with 100% short brown pipe cleaners.

- Bag Dad 1 (Dad's eye color genes): Dad has brown eyes because he received a dominant "brown gene" from his mother and a recessive "blue" gene from his father. Fill bag with 50% short brown pipe cleaners and 50% long brown pipe cleaners.
- Bag Mom 2 (Mom's tongue rolling ability gene): Mom can roll her tongue because she received a dominant tongue rolling gene from her mother, while receiving a recessive tongue rolling gene from her father. Fill the bag with 50% long red and 50% short red pipe cleaners.
- Bag Dad 2 (Dad's tongue rolling ability gene): Dad can also roll his tongue because he received a dominant tongue rolling gene from his mother, while receiving a recessive tongue rolling gene from his father. Fill the bag with 50% long red and 50% short red pipe cleaners.
- Bag Mom 3 (Mom's earlobe attachment genes): Mom has attached earlobes and received dominant genes from both of her parents. Fill bag with 100% long white pipe cleaners.
- Bag Dad 3 (Dad's earlobe attachment genes): Dad also has attached earlobes and also received dominant genes from both of his parents. Fill bag with 100% long white pipe cleaners.
- Bag Mom 4 (Mom's gender genes): All females have 2 "X" chromosomes. Fill the bag with 100% short yellow pipe cleaners.
- Bag Dad 4 (Dad's gender genes): All males have 1 "X" and one "Y" chromosome. Fill the bag with 50% short and 50% long yellow pipe cleaners.
- Bag Mom 5 (Mom's finger genes): Mom has five fingers and no mutant finger genes. Fill the bag with 100% long green pipe cleaners.
- Bag Dad 5 (Dad's finger genes): Dad has six fingers due to his possession of two mutant finger genes inherited from his parents. Fill the bag with 100% short green pipe cleaners.

7. Line the 10 bags up on a table, appropriately labeled "Mom eye genes, Dad's eye genes, Mom's tongue rolling genes, etc.) Split students into teams of two, then have each student pick one pipe cleaner from each bag.

8. After all are finished, ask each team to decide, and then describe or draw, what their "person" will look like (male or female, blue eyes or brown, tongue rolling ability or not, five or six fingers, attached earlobes or not). Share these results with the classroom.

- Eyes: Offspring of these two parents should be 50% blue eyed and 50% brown eyed. Mom always contributes a recessive blue gene, while dad contributes a blue gene half the time and brown gene the other half.
- Tongue rolling ability: Offspring should be 75% tongue rollers and 25% non-tongue rollers. This result can be predicted from the punnet square given the genes of the parents. In reverse, the genetics of the parents could have been deciphered from the ratio of tongue rollers to non-tongue rollers among the offspring.
- Earlobes: 100% of the offspring have attached earlobes, since both parents possessed only dominant genes for this trait.
- Gender: Just like real life, 50% of the offspring will be females, and 50% will be males. Females always have two X chromosomes and males always have one X and one Y chromosome.

- Fingers: All offspring have 5 fingers. This is an opportunity to point out how dominant normal genes can cover up a "defect" caused by recessive genes. The offspring, while having five fingers (normal), are "carriers" of the "recessive-mutant" gene.

Biotech Quiz

1. Biotechnology (say bye'-o-tek-nawl'-o-jee) is (circle one):

   a.) using nuclear power to make life from nonliving things such as rocks and soil
   b.) using microorganisms, plant cells, or other living things to make things
   c.) a rare species of owl
   d.) a technique that uses lightning bolts to create new life

2. Circle all the things below made using biotechnology:

   a.) bread
   b.) cheese
   c.) penicillin
   d.) delayed-ripening tomatoes

3. Genetic engineering is (circle all that apply):

   a.) changing living things by changing their genes
   b.) the deliberate transfer of genes between and among species by humans.
   c.) changing stones into living things
   d.) dependent on finding and moving DNA

4. To make a pea plant that produces more peas, we could (circle all that apply):

   a.) selectively breed pea plants that produce a lot of peas with each other
   b.) use glue to stick many pea pods option a plant
   c.) feed a plant lots of fertilizer and hope it will produce lots of peas
   d.) assuming we could locate and isolate the genes that could make more peas, transfer them to our plant

5. Biotechnology began:

   a.) about five years ago
   b.) about 35 years ago
   c.) about 135 years ago
   d.) more than 10,000 years ago

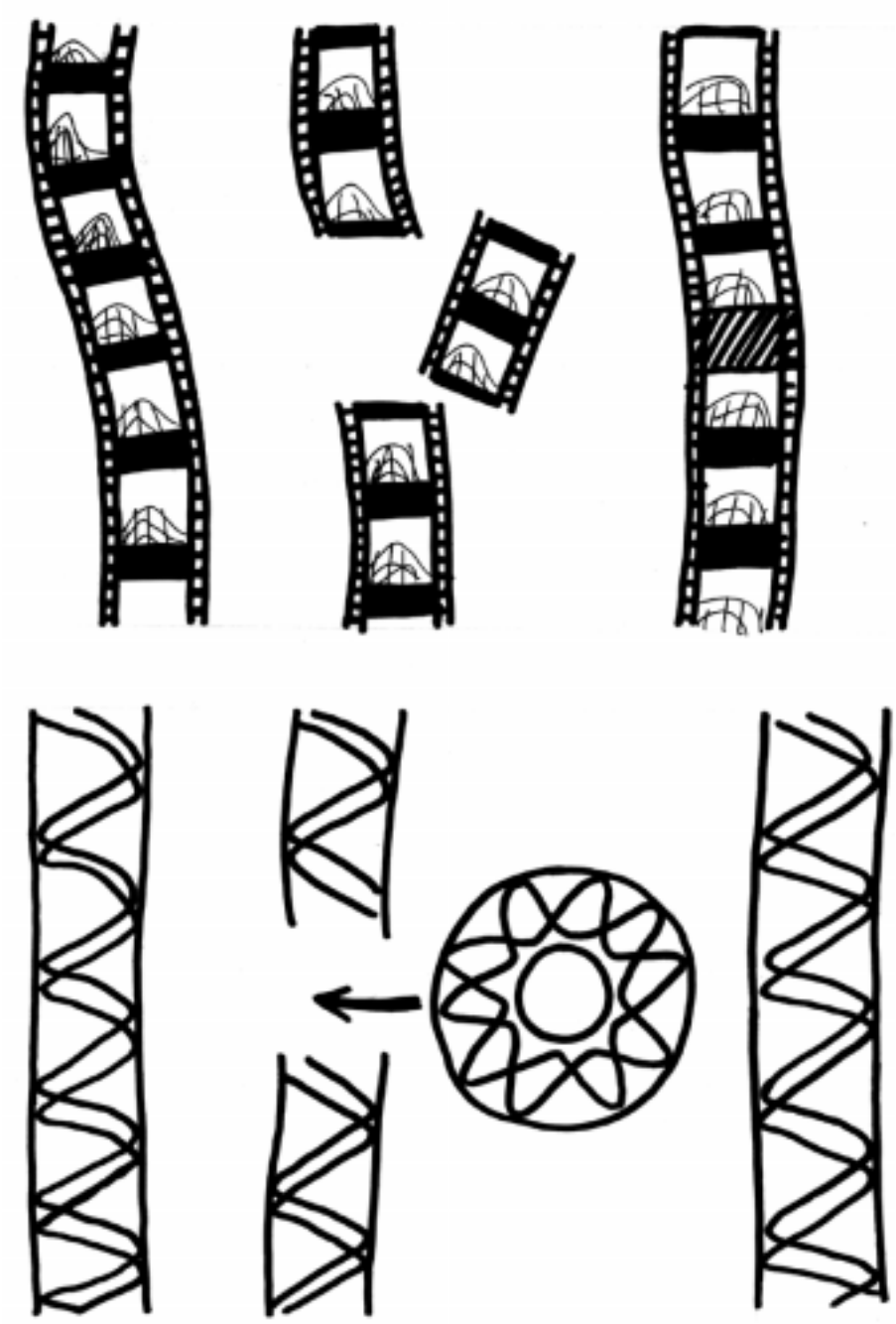
6. Genetic engineering techniques have been used to selectively move genes between living organisms:

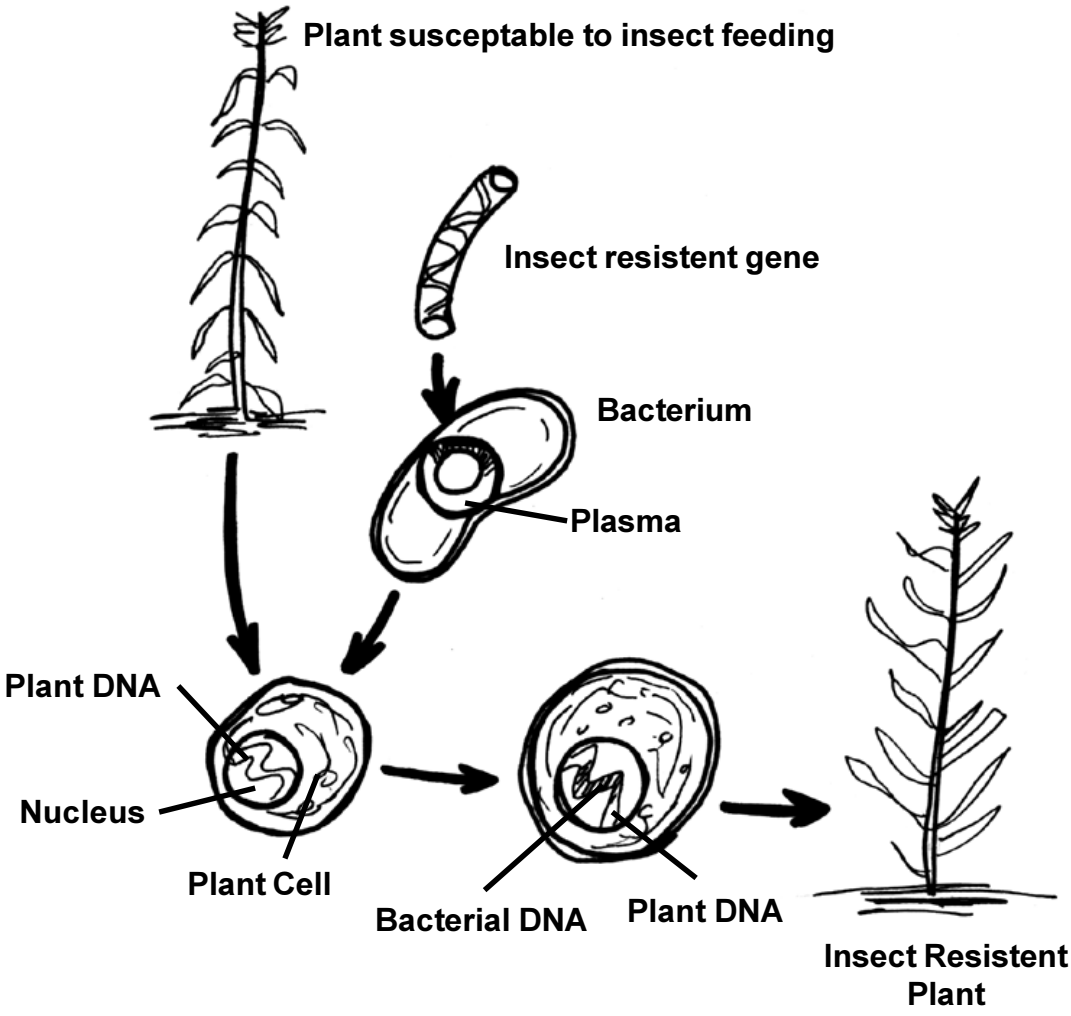
   a.) for about 5,000 years
   b.) for about 100 years
   c.) for about 25 years
   d.) haven't been developed yet

ANSWERS

1.) b
2.) a, b, c and d
3.) a, b, and d
4.) a and d. C might work, but overfertilizing a plant won't always make it produce more fruit. I may just increase the amount of leaves and stems, assuming it isn't killed by too much fertilizer.
5.) d. Biotechnology is old. Our ancestors made wine and bread using yeast thousands of years ago.
6.) c. Modern selective genetic engineering began in 1972, when two researchers chemically cut a fragment from one source and spliced it into another.

Genetic Engineering





8 Steps to Creating New Plants

1. Identify the trait you want.
2. Identify the source of the gene
3. Isolate the gene from that source
4. Adjust the gene to confer the desired trait.
5. Transfer the gene to plant
6. Test to see if the trait you wanted is there.
7. If it is, go to step 8. If it isn't, go back to step 5.
8. Run field trials to:
    a) make sure there are no detrimental effects of the gene
    b) the gene works the way you want it to