Genetics Summative Assessment
Teacher Rubrics

1. Demetrius looks very similar to his father. Did he receive more genetic information from his father than from his mother? Support your decision.

This item measures the student's understanding that sexually reproduced offspring get one half of their genetic information from one parent and one half from the other and that patterns of inheritance follow rules and are therefore predictable.

Criteria for a complete response:

1. Student states or implies that Demetrius does not receive more genetic information from either his mother or his father.
2. Student states that Demetrius gets one half of his genetic information from each parent.

Note: In 7th grade, students are not held responsible for knowing the exact number of chromosomes.

Code	Response
	Correct Response
10	Meets criteria above.
11	Meets criteria but suggests that Demetrius inherited more dominant genes from his father.
12	Meets criteria but suggests that the sperm donates one half the chromosomes and the egg donates one half the chromosomes.
19	Any other completely correct response.
	Incorrect Response
70	Student states that Demetrius received more genetic information from his father.
71	States that Demetrius receives one half genetic information from mother and one half from father but shows confusion about pairing of genes for ALL traits. Example: "Demetrius got more genes for hair color and eye color from his Dad," or "No, Demetrius just got more "look" genes from his father and more of the other genes from his mother."
72	States that Demetrius looks more like his father because he is a boy. If this were a girl, she would look more like her mother.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

2.a. Use the genes/alleles from the mother and father below to determine a possible genetic make-up of one offspring. Fill in the blank chromosomes for the genetic make-up of one offspring.

This item measures the student's understanding of chromosomal/gene pairing in sexual reproduction.

Criterion for a complete response:

1. Student fills in the blank chromosome with appropriate alleles for a single offspring.

Code	Response
	Correct Response
10	Meets criteria above.
19	Any other completely correct response.
	Incorrect Response
70	Does not pair matching alleles. Alleles are randomly paired.
71	Directly copies genes from mother or father (i.e., makes offspring identical to a parent).
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

2.b. List a complete description of your offspring's phenotype in the table below.

This item measures the student's understanding of phenotypic expression.

Criteria for a correct response:

1. Genotypes match those shown on the chromosome created by the student.
2. Phenotypes correctly describe the genotype for each trait.

Code	Response
	Correct Response
20	Meets criteria above.
29	Any other completely correct response.
	Partially Correct Response
10	Student does everything correctly except for sex determination or sex determination is not included in answer.
19	Any other partially correct response.
	Incorrect Response
70	Genes are not the same as those shown on the student work for the offspring.
71	Confuses genotype and phenotype.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

3. A male and female human with 46 chromosomes each had 4 children (ages 1, 3, 6, and 12). Are any of their offspring identical? Explain your answer.

This item measures the student's understanding of genetic variability.

Criterion for a complete response:

1. Student states that none of the offspring will be identical because of genetic variability.

Code	Response
	Correct Response
10	Meets criteria above.
19	Any other completely correct response.
	Incorrect Response
70	Student indicates that none of the offspring will be identical but does not provide an explanation.
71	Student indicates that some children may be identical without acknowledging the improbability of such an occurrence.
72	Student indicates that the offspring would not be identical because, if part of the chromosomes were already given to one child, then there would not be any of them left to give to other siblings (i.e., the chromosomes are used up to make each offspring).
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

4. The shapes below represent two different species, A and B. Both species live in the same small puddle and compete for the same food source.
   a. Which species, A or B, reproduces asexually? What observations(s) support your answer?

This item measures the student's understanding of the differences between asexual and sexual reproduction. Asexually reproducing species have little variation within a population.

Criterion for a complete response:

1. Student states that species A reproduces asexually as shown by the lack of variation in the population.

Code	Response
	Correct Response
20	Meets criterion above.
21	States that species A reproduces asexually. The observation cited indicates that species B has more variation than species A.
22	States that species A reproduces asexually. The observation cited indicates that all of species A looks the same (clones).
29	Any other completely correct response.
	Partially Correct Response
10	States that species A reproduces asexually but uses population size alone as the explanation.
11	Student does not identify species A as reproducing asexually. Student does indicate that species B does not reproduce asexually and provides an accurate observation.
19	Any other partially complete response.
	Incorrect Response
70	States that species B reproduces asexually.
71	Indicates that species A reproduces asexually without explanation or with incorrect explanation.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible or impossible to interpret.
99	Blank.

4. The shapes below represent two different species, A and B. Both species live in the same small puddle and compete for the same food source.
   b. The puddle floods and the food source washes away to another part of the puddle. Describe one advantage ***EACH*** species has in this environment to allow survival and reproduction for several generations?

This item measures the student's understanding that there are advantages to sexual and asexual reproduction that allow some individuals with certain traits to survive and produce greater numbers of offspring. Sexual reproduction provides an additional advantage for survival when there is a change in the environment.

Criterion for a complete response:

1. Student describes at least one advantage for each species.
   Some examples of correct responses may include:
   - Species A can reproduce more rapidly.
   - Species A does not have to find a mate to reproduce.
   - Some individuals (those with longer tails/flagella) in species B will be able to quickly swim to the relocated food source.
   - Any reference to a specific variation in species B that allows survival.

Code	Response
	Correct Response
20	Meets criterion above.
29	Any other completely correct response.
	Partially Correct Response
10	Student describes one correct advantage for one species without mention of the other species.
11	Student describes a correct advantage for one species with an incorrect advantage for the other species.
19	Any other partially complete response.
	Incorrect Response
70	Student reverses advantages for each of the species.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

5. This pedigree shows a family of fictional organisms that have either plain or spotted noses. Glory, Belle, and Spot have spotted noses. Use this pedigree to answer the following questions.
   a. Are spotted noses the result of a dominant or recessive gene? Genetically, how do you know?

This item measures the student's ability to interpret a pedigree.

Criteria for complete response:
1. States that spotted noses are the result of a recessive gene.
2. States that parents Lady and Spike do not express the trait.

Code	Response
	Correct Response
10	Meets criteria above.
11	Student states that spotted nose is the result of a recessive trait and gives a valid explanation without specifically referencing Lady or Spike.
19	Any other completely correct response.
	Incorrect Response
70	Indicates that the spotted nose trait is recessive because it appears less often in the chart.
71	Indicates that the spotted nose is the result of a dominant gene.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

NOTE: See code 70. Students often think that the most commonly expressed traits are dominant and that less commonly expressed traits are recessive. This misconception is directly addressed with this question.

5. This pedigree shows a family of fictional organisms that have either plain or spotted noses. Glory, Belle, and Spot have spotted noses. Use this pedigree to answer the following question.
   b. What are the genotypes of individuals Lady and Spike? (Hint: You may want to use a Punnett Square.)

This item measures the student's understanding that sexually reproduced offspring get one half of their genetic information from one parent and one half from the other.

Criterion for a complete response:

1. Student indicates that both parents, Lady and Spike, are heterozygous for the spotted nose trait. Student may indicate this using letters (Nn, Bb, etc.) or by stating that Lady and Spike are heterozygous.

Code	Response
	Correct Response
10	Meets criteria above.
19	Any other completely correct response.
	Incorrect Response
70	Confuses genotype with phenotype.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

NOTE: The use of letters that are easily distinguishable between capital and lower case are recommended.

5. This pedigree shows a family of fictional organisms that have either plain or spotted noses. Glory, Belle and Spot have spotted noses. Use this pedigree to answer the following questions.
   c. If Jake's father has a spotted nose, what is the chance that Lassie has a spotted nose? Use a Punnett Square to help answer your question.

This item measures the student's understanding that sexually reproduced offspring get one half of their genetic information from one parent and one half from the other and that patterns of inheritance follow rules and are therefore predictable.

Criteria for a complete response:

1. States that Lassie has a 50% chance (or equal representation) of getting a spotted nose.
2. Shows a correctly completed Punnett Square including a correct genotype for Jake.

Example:

	N	**n**
n	**Nn**	**nn**
n	**Nn**	**nn**

or

	n	**n**
N	**Nn**	**Nn**
n	**nn**	**nn**

Code	Response
	Correct Response
20	Meets criteria above.
29	Any other completely correct response.
	Partially Correct Response
10	Meets criteria above, but Punnett Square is interpreted incorrectly in explanation (i.e., Punnett Square shows a 50% chance, but student states a different percentage).
11	Accurate Punnett Square is shown but no explanation or statement of chance is given.
19	Any other partially complete response.
	Incorrect Response
70	Punnett Square is wrong but explanation or percentage that is given is correct anyway. Clear disconnect between tool and explanation.
71	Explanation given with no Punnett Square.
76	Repeats stem of question.
79	Any other incorrect response.
	Non-Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

5. This pedigree shows a family of fictional organisms that have either plain or spotted noses. Glory, Belle, and Spot have spotted noses. Use this pedigree to answer the following questions.
   d. Individuals Rascal and Belle are expecting a third offspring. What is the chance that the offspring will be male? Support your answer.

This item measures the student's understanding of sex determination.

Criteria for a complete response:
1. There is a 50% chance (or equal representation) that the offspring will be male.
2. Student uses a Punnett Square or other acceptable diagram and/or written explanation including a description of sex chromosomes.

Code	Response
	Correct Response
20	Meets criteria above.
29	Any other completely correct response.
	Partially Correct Response
10	Accurate prediction given but no reference to sex chromosomes in explanation (i.e., "the dad is responsible," or "the father determines sex").
19	Any other partially complete response.
	Incorrect Response
70	Accurate prediction given but no explanation is provided.
71	Prediction is based on the gender of current siblings.
76	Repeats stem of question.
79	Any other incorrect response.
	Non Response
90	Crosses out, erases, illegible, or impossible to interpret.
99	Blank.

