



Topic covered:

- Principles of Inheritance and Variation (Session 1) - NEET

Worksheet

1. In racoons, a dark face is dominant over a bleached face. Several crosses were made between racoons that were heterozygous for a dark face and that were homozygous for a bleached face. What percentage of the offspring would be expected to have a dark face?
 - a. 0%
 - b. 50%
 - c. 75%
 - d. 100%
2. An allele is said to be dominant when
 - a. it is able to express itself when in a homozygous condition only
 - b. it is able to express itself in both heterozygous and homozygous conditions
 - c. it is able to express itself in a heterozygous condition only
 - d. it is never expressed at all
3. Given below are assertions and reason. Point out if both are true with reason being the correct explanation (A), both true but reason not correct explanation (B), assertion true but reason is wrong (C) or and both are wrong (D).

Assertion : We study two characters in monohybrid cross.

Reason : In a monohybrid cross, the alleles are not in a dominant-recessive relationship.

 - a. A
 - b. B
 - c. C
 - d. D
4. Mendel's law of segregation can be explained with the help of:
 - a. Mitosis
 - b. Cloning
 - c. Meiosis
 - d. All of the above
5. When both the alleles for a gene are identical in an organism, it is said to be
 - a. dominant
 - b. homozygous
 - c. heterozygous
 - d. recessive



6. Which among the following statements are not an outcome of the Mendel's laws of inheritance?
- The unit controlling a particular character is called a factor
 - Out of one pair of factors, one is dominant and the other is recessive
 - Alleles do not show any blending and both the characters are recovered in the F₂ generation
 - Crossing of tall plant and dwarf plant gave medium height plant
7. The F₂ genotypic ratio of monohybrid cross is
- 3:1
 - 1:1
 - 1:2:1
 - 9:3:3:1
8. What test does one need to perform to know the genotype of an unknown phenotype?
- Back cross
 - Reciprocal cross
 - Test cross
 - None of the above
9. Assertion: Mendel published his results in "The proceedings of the Brunn Natural History Society".
Reason: Mendel was an Austrian monk who proposed the three laws of inheritance.
- Both assertion and reason are true with reason being the correct explanation
 - Both assertion and reason true but reason not correct explanation
 - Assertion true but reason is wrong
 - Both are wrong
10. The process of removing stamens from floral buds during hybridization experiments is called:
- Emasculation
 - Selfing
 - Bagging
 - Crossing
11. Yellow color is dominant over green color. If a generation has 50% yellow and 50% green individuals, then, which of the following statements is true about the genotype of the parents.
- Both homozygous
 - Both heterozygous
 - One of them is heterozygous
 - None of the above



12. The genes controlling seven traits in pea studied by Mendel were located on
- a. 7 chromosomes
 - b. 6 chromosomes
 - c. 4 chromosomes
 - d. 5 chromosomes
13. Recombinations and variations in all eukaryotic organisms are because of
- a. mitosis and meiosis
 - b. fertilization and mitosis
 - c. meiosis and fertilization
 - d. meiosis and amitosis
14. Who is regarded as the “Father of Genetics”
- a. Sutton
 - b. Dixon
 - c. Linnaeus
 - d. Gregor Mendel
15. Mendel was a native of
- a. Brunn
 - b. Australia
 - c. Maravia
 - d. Austria
16. One of the recessive traits in *Pisum sativum* is
- a. wrinkled seeds
 - b. tall stem
 - c. round seeds
 - d. yellow seed coat
17. The statement “like begets like” stands for
- a. dominance
 - b. inheritance
 - c. recessiveness
 - d. random fertilization
18. Which among the following is correct about the traits chosen by Mendel?
- a. Terminal pod is dominant
 - b. Constricted pod is recessive
 - c. Green colored pod is recessive
 - d. Tall plants are recessive



19. Match the columns and choose the correct combination:

Column I	Column II
A. Monohybrid cross	I. T and t
B. Test cross	II. TT
C. alleles	III. Tt x Tt
D. Homozygous tall	IV. tt
	V. Tt x tt

a. A-III, B-V, C-IV, D-II

c. A-III, B-V, C-I, D-II

b. A-V, B-III, C-II, D-IV

d. A-III, B-I, C-V, D-II

20. Reappearance of recessive trait in F₂ generation is due to

a. law of independent assortment

c. law of codominance

b. law of dominance

d. law of purity of gametes



ANSWER KEY

Question Number	1	2	3	4	5	6	7
Correct Answer	(b)	(b)	(d)	(c)	(b)	(d)	(c)

Question Number	8	9	10	11	12	13	14
Correct Answer	(c)	(b)	(a)	(c)	(c)	(c)	(d)

Question Number	15	16	17	18	19	20
Correct Answer	(d)	(a)	(b)	(b)	(c)	(d)



Solutions

1. (b)

A dominant trait is expressed in either homozygous or heterozygous condition. In this case, since dark face (DD) is expressed in heterozygous condition also, it is the dominant trait. Bleached face (dd) is the recessive trait.

On crossing a heterozygous dark faced raccoon with bleached raccoon,

$Dd \times dd$

	D	d
d	Dd	dd
d	Dd	dd

So, $Dd : dd = 1:1$

So, 50% of the offspring would be dark faced and 50% bleached.

2. (b)

A gene is said to be dominant when it is able to express itself in both heterozygous and homozygous conditions. A dominant gene will always express itself over a recessive allele. For a recessive allele to express itself, it should be homozygous.

3. (d)

A monohybrid cross is a cross between two individuals differing in one character. One of the characters will almost all the time express itself and that is called the dominant trait.



4. (c)

Heredity is the inheritance of genes from the parents and how they are passed on from generation to generation.

Since all genes are part of the chromosomes and the chromosomes are passed into the gametes, we can, with the help of meiosis, understand how the genetic recombination takes place and how the characteristics of the offspring depends on the random fertilization of the gametes. As chromosomes segregate (law of segregation) into different gametes during meiosis, the two different alleles for a particular gene also segregate so that each gamete acquires one of the two alleles.

5. (b)

Homozygous is when both alleles for a character are similar, eg. TT, tt.

Heterozygous is when both the alleles for a character are dissimilar, e.g. Tt.

The gene that is able to express itself in the presence or absence of its allele is called the dominant allele and that character is said to be dominant. The allele that is recessive is able to express itself only in the absence of its allele and the character is said to be recessive.

6. (d)

The law of dominance states that for a particular character, there are two alleles controlling the expression of the character. The gene that is able to express itself in the presence or absence of its allele is called the dominant allele and that character is said to be dominant. The allele that is recessive is able to express itself only in the absence of its allele and the character is said to be recessive. Crossing of tall plant and dwarf plant gave tall plant and not medium height plant because the characters considered by Mendel had only two contrasting traits and no blending of inheritance was seen.



7. (c)

1:2:1 is the genotypic ratio in a monohybrid cross, whereas the phenotypic ratio for a monohybrid cross is 3 (dominant) : 1 (recessive) for the character.

The test cross ratio for a monohybrid cross is 1 : 1 with both the heterozygous dominant and recessive being equally present in the generation.

9:3:3:1 is the phenotypic ratio of a dihybrid cross.

8. (c)

A backcross is a cross of the offspring with one of its parents. If it is done with the recessive parent, it is called a test cross. Test cross is performed to know the genotype of an unknown phenotype.

A reciprocal cross is a pair of crosses between a male of one strain or character and a female of another, and vice versa.

9. (b)

Mendel published his results and hypothesis in 1866 in a journal The proceedings of the Brunn Natural History Society. But this wasn't because he was a monk who extensively studied the pea plants and proposed the three laws of inheritance. Hence, both assertion and reason true but reason not correct explanation.

10. (a)

Emasculation is the removal of the anther (stamen) of a bisexual flower without affecting the pistil. It is done to prevent self pollination and to obtain the desired variety of a plant by allowing cross fertilisation.

Selfing is self fertilization.

Bagging is the method by which the emasculated flower is enclosed in a bag to avoid pollination by any unwanted pollen.

Crossing is mating between two individuals.

11. (c)

We know that yellow colour (YY) is dominant over green colour (yy). So, we know that the genotype of the green individual is yy.

The genotype of the yellow individual may be YY or Yy.

On crossing YY with yy, all progeny (100%) would be yellow. So, this cannot be the genotype in the case.

On crossing Yy with yy,



	Y	y
y	Yy	yy
y	Yy	yy

Here 50% progeny is yellow (Yy) and 50% of the progeny is green (yy). Hence one of the parents has to be heterozygous to get this result.

12. (c)

Pisum sativum has 14 chromosomes out of which the contrasting characters that Mendel selected are on 4 chromosomes - Chromosomes 1, chromosome 4, chromosome 5 and chromosome 7.

13. (c)

Crossing over takes place during the pachytene stage of meiosis I. This is the mutual exchange of the genetic material between homologous chromosomes. This exchange of genetic material is what leads to variation. After this the homologous chromosomes segregate and enter into different gametes. Fertilization is when the male and the female gametes fuse to give rise to a diploid cell. And the newly formed zygote is a combination of the characteristics of both the parents. This leads to diversity after fertilization.

14. (d)

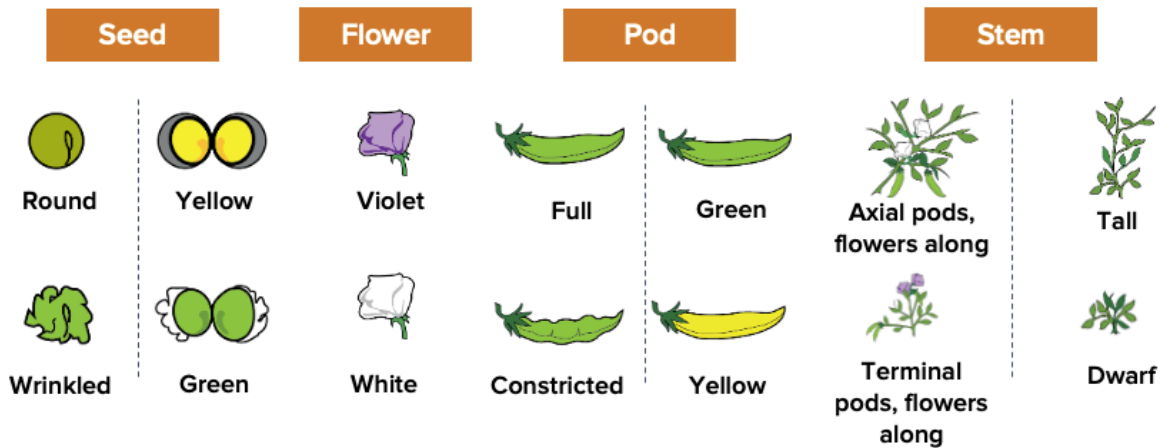
Gregor Mendel put forth the laws of inheritance based on his experimental works on the common garden Pea plant. His laws formed the basis for all the work done in the field of genetics.

15. (d)

Mendel was an Austrian monk. He was born in a German-speaking family in the Silesian part of the Austrian Empire (today's Czech Republic) and gained recognition as the founder of the modern science of genetics.

16. (a)

Mendel selected 7 contrasting characters with each of them having one dominant allele and one recessive allele.

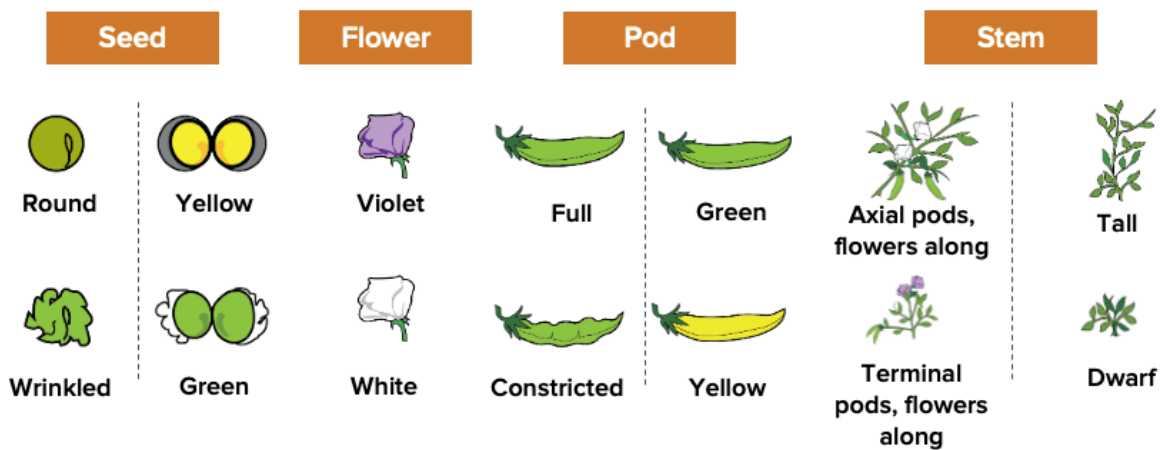


17. (b)

“Like begets like” simply means that there is a strong similarity between the offspring and their parents. It stands for inheritance. Inheritance is the passing of genes from one generation to another. The study of heredity and inheritance is what constitutes genetics.

18. (b)

The following are the traits chosen by Mendel:





19. (c)

A monohybrid cross is when the cross is between two individuals differing in one character ($Tt \times Tt$).

A test cross is conducted to determine the unknown zygosity of the offspring of the F1 generation. This is done by crossing the offspring with the recessive parent ($Tt \times tt$).

An allele is an alternate form of a gene. Eg. if T is the gene for tall then for dwarf it is t. Homozygous condition is when the gene and its allele is the same for a particular character. Eg. TT for tall.

20. (d)

Reappearance of recessive trait in F2 generation is due to law of purity of gametes. Mendel proposed the law of segregation which is also called the law of purity of gametes. This law states that the gametes carry either dominant or recessive characters but not both in the F1 generation.