

Practice Challenge - Objective

Subject: Biology

Topic : Heredity and Evolution

Exam Prep Session 01

Class: X

Time: 00:20 hrs

1. Homozygous condition for a particular trait exists when

- ☒ A. 2-alleles for a trait are identical
- ☐ B. 2-alleles for a trait are different
- ☐ C. When X and Y chromosomes pair up
- ☐ D. Genes of all chromosomes are identical

Homozygous condition for a particular trait exists when 2-alleles for a trait are identical. Eg; TT, bb, RR, rr etc

2. In living organisms, expression of traits are controlled by _____.

- ☐ A. chromosomes
- ☐ B. hormones
- ☒ C. genes
- ☐ D. nervous system

Expression of traits in organisms are controlled by genes. Genes code for proteins which could be directly involved in the expression of traits or enzymes controlling the metabolic pathways of molecules related to the expression of traits.

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3. Which of the following are transferred from parents to offspring because of which they look like their parents?

- ☐ A. Ribosomes
- ☐ B. Nucleolus
- ☒ C. Chromosomes
- ☐ D. Mitochondria

Genes are present on chromosomes which are responsible for particular traits. During sexual reproduction, the chromosomes, along with the genes present on them, are transferred to the offsprings. Since both, mother and father contribute a set of chromosomes, the offsprings look like their parents.

4. Monohybrid cross parents should always:

- ☐ A. be hybrid
- ☐ B. have same allelic pair
- ☐ C. be pure line and homozygous
- ☒ D. both B and C

Parents of monohybrid cross should always be a pure line, i.e., they should have same alleles for a particular trait. A pure line organism means homozygous. For example, TT/tt, both are pure lines, i.e., homozygous, of dominant and recessive traits respectively.

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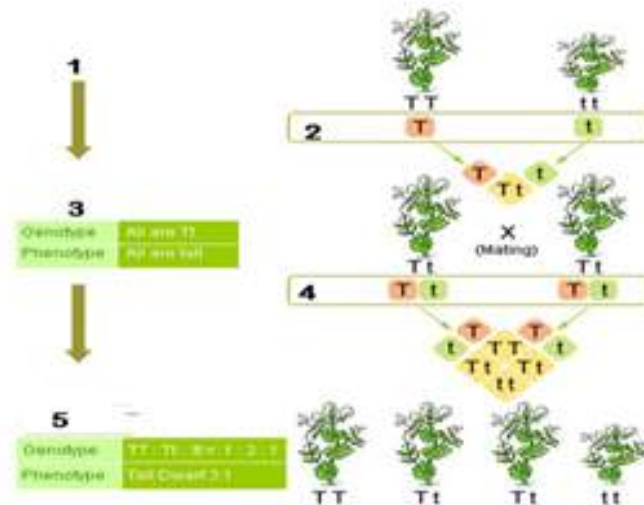
5. Which of the following is the correct explanation of phenotype of an organism?

- ☒ A. Set of observable characters
- ☐ B. Genetic makeup of the organism
- ☐ C. Eating habits of the organism
- ☐ D. Habitat of the organism

A phenotype is an observable characteristic in an organism. It is affected by the genetic makeup and environmental influences. It includes physical appearance and behaviour of an organism.

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6. Label the organism or group of organisms in a typical monohybrid cross.



- ☒ A. 1- Parental generation, 2- gametes, 3- F2 generation, 4- gametes , 5- F1 generation
- ☒ B. 1- F1 generation, 2- gametes, 3- F2 generation, 4- gametes , 5- F3 generation
- ☒ C. 1- Parental generation, 2- F1 generation, 3- gametes, 4- gametes , 5- F2 generation
- ☒ D. 1- Parental generation, 2- gametes, 3- F1 generation, 4- gametes , 5- F2 generation

1- Tall plant with trait combination TT is crossed with a dwarf plant with trait combination tt. This denotes parental generation.

2- T and t are haploid cells. They represent gametes.

3- Fusion of gametes (T and t) gives rise to all tall plants. But they have different trait combination as compared to parents. This denotes F1 generation.

4- During selfing of the F1 generation plants they produce haploid cells each having different trait (T, t, T and t). This represents gametes.

5- New plants are formed in the ratio of 3:1 where 75% are tall and rest 25% are dwarf. This denotes the F2 generation.

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7. Meiosis is important because:

- ☒ A. It generates haploid gametes for sexual reproduction
- ☒ B. It generates variations
- ☒ C. Both (a) and (b)
- ☒ D. Meiosis and mitosis are the same and are interchangeable

In sexually reproducing organisms, the new organism is formed by the union of cells from the mother and the father. In order to create a diploid organism, the uniting cells must be haploid so as to maintain the constant chromosome number in the baby. Gametes are haploid cells formed from special diploid cells by meiotic cell division. Hence, meiosis is essential for sexual reproduction.

Also, during meiosis, non-sister chromatids of homologous chromosomes crossover and exchange genetic material. This leads to recombination of genetic material and this generates variation between the species from one generation to the next generation. Variations play an important role in evolution.

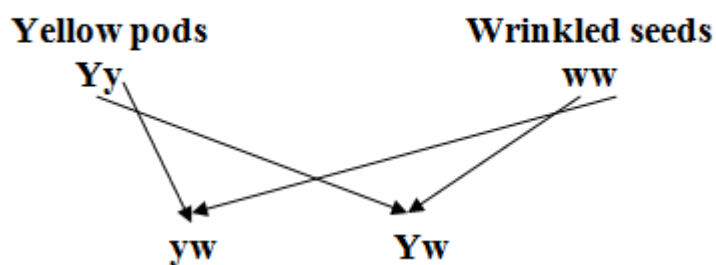
In mitosis, the parent cell divides to give rise to two identical daughter cells. Whereas in meiosis, a parent cell divides to give rise to four daughter cells which have half the chromosome number as the parent cell. Hence mitosis and meiosis are not interchangeable.

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8. A plant with yellow pod and wrinkled seeds with genotype $Yyww$ will give you the following gametes

- ☒ A. yy and Ww
- ☒ B. Yw and yw
- ☒ C. WW and yy
- ☒ D. yy and ww

A plant with yellow pod and wrinkled seeds with genotype $Yyww$ will give you Yw and yw gametes



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9. Based on observations in monohybrid cross, Mendel postulated which of the following laws?

- ☐ A. Law of dominance
- ☐ B. Law of segregation
- ☒ C. Both a & b
- ☐ D. Law of independent assortment

Based on his observations in monohybrid cross, Mendel proposed two general rules. Today these rules are known as laws or principles of inheritance- the law of dominance (first law). The law of dominance which states that characters are controlled by discrete units called factors. Factors occur in pairs. In a dissimilar pair of factors one member of the pair dominates (dominant) the other (recessive). The second law is the law of segregation (second law). The law of segregation states that although the parents contain two alleles during gamete formation, the factors or alleles of a pair segregate from each other such that a gamete receives only one of the two factors.

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10. In Mendel's monohybrid cross of tall vs dwarf plants, the F_1 progeny are ____.

- ☐ A. Homozygous
- ☒ B. Heterozygous
- ☐ C. Hemizygous
- ☐ D. Either a or b

Mendel's monohybrid cross involves two pure plants, say one tall (TT) and one short (tt). Hence F_1 progeny would have been all heterozygous (Tall, say Tt). The tall plant will produce only one type of gamete with the dominant allele (T). Similarly, the dwarf plant will produce only one type of gamete with the recessive allele (t). In the F_1 these two gametes will fuse and the offspring will be a heterozygous tall plant (Tt).