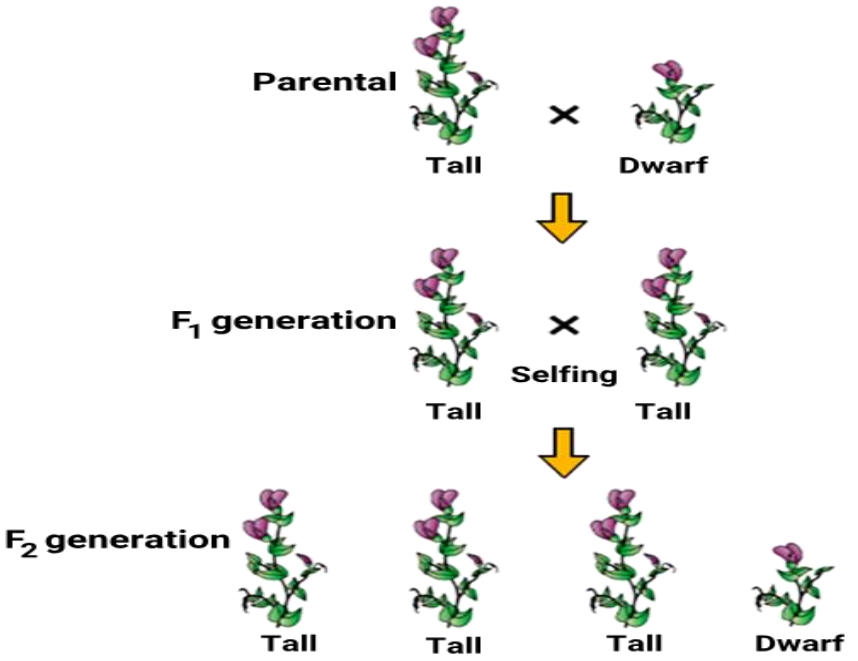
CBT SEPTEMBER 2023
CLASS – XII : BIOLOGY

SECTION 1: PRINCIPLES OF INHERITANCE & VARIATION
TOPIC: MEDELIAN INHERITANCE

Read the following passage and answer the given questions:
Hybridisation experiment carried out by Mendel where he crossed tall and dwarf pea plants to study the inheritance of one gene. He collected the seeds produced as a result of this cross and grew them to generate plants of the first hybrid generation. This generation is also called the Filial1 progeny or the F1. Mendel observed that all the F1 progeny plants were tall, like one of its parents; none were dwarf (Figure given below) He made similar observations for the other pairs of traits. He found that the F1 always resembled either one of the parents, and that the trait of the other parent was not seen in them.



Q.1.If a plant heterozygous for tallness is selfed, the F2 generation has both tall and dwarf plants. This proves the principle of…
a. Dominance
b. Segregation
c. Independent assortment
d. Incomplete dominance
Answer: b
Feedback: Law of segregation states that alleles for genes segregate from each other whether it is for tall (TT) or dwarf (tt) so that the gamete carries one allele for each gene, whereas law of dominance states that the phenotype which is expressed is the dominant character and other is recessive, since there are both tall & dwarf plants, this means that both characters are expressed .
So, the correct answer is "Segregation".

Q.2.Mendel's principle of segregation was based on the separation of alleles in the garden pea during…
a. Embryonic development
b. Seed formation
c. Gamete formation
d. Pollination

Answer: c
Feedback: According to Mendel's monohybrid cross, during gamete formation, the alleles for each gene segregate from each other so that each gamete carries only one allele for each gene. It is called Law of Segregation.
So, the correct option is 'Gamete formation'.

Q.3.Mendel crossed a pure white flowered recessive pea plant with a dominant pure violet flowered plant, the first generation of hybrids from the cross should show:
a. 50% white flowers and 50% violet flowers
b. All violet flowered plants
c. 75% violet flowered and 25% white flowered plants
d. All white flowered plants
Answer: b
Feedback: A trait that fully manifests itself, in heterozygous condition, is referred to as the dominant trait and the allele controlling it is known as a dominant allele. The trait that does not express itself in heterozygous condition or whose effect is masked by the presence of a dominant trait is known as a recessive trait.
Therefore, a cross between red-flowered pea plant (RR) and white-flowered pea plant (rr) will obtain all red-flowered plant (Rr) in F1 generation as red color is dominant over recessive white color. If a white color was dominant characters, it would have expressed itself in F1 generation. A cross between two pure breeding varieties produces a uniform F1 generation of dominant individuals. Thus, the correct answer is option B.

Q.4 In a monohybrid cross the F1 progeny resembles neither of its parents. What would be true in this case :
a) The parental traits would not appear in any of the F2 progenies
b) The F2 phenotypic ratio will be different from the F2 genotypic ratio
c) It could be the case of incomplete dominance
d) The F2 phenotypic ratio will be similar to any of Mendelian monohybrid cross
Answer: c
Feedback: In a monohybrid cross, if the F1 hybrid exhibits a new phenotype that seems intermediate between those of parents, and yet, does not completely resemble either of them, it is a case of incomplete dominance.
Codominance is when both the traits are expressed fully, also leading to a new phenotype, but the phenotype does not seem like an intermediate of the two traits.

Q.5. A cross between two tall plants resulted in offspring having ¼ dwarf plants. What would be the genotypes of both the parents?
A TT and Tt
b. Tt and Tt
c. TT and TT
d. Tt and tt
Answer: b
Feedback: Tt and Tt - This is the correct answer because if one parent is homozygous dominant and the other parent is heterozygous, then there is a 50% chance that each offspring will inherit a T allele and be tall, and a 50% chance they will inherit a t allele and be dwarf.

SECTION 1: MOLECULAR BASIS OF INHERITANCE
TOPIC: SEARCH OF GENETIC MATERIAL + EVOLUTION

DNA as an acidic substance present in nucleus was first identify by Frederick Meischer in 1869. He named is as 'Nuclein', however due to technical limitations in isolating

such a long polymer intact the elucidation of structure of DNA remained elusive for a very long time of period. Wilkins and Franklin in 1953 got very fine x-ray photography of DNA. It was only in 1953 that James Watson and Francis Crick based on the X-ray diffraction data produced by Rosalind Franklin and Maurice Wilkins proposed a very simple but famous double helical 3D model for the structure of DNA. One of the hallmarks of their preposition was specific base pairing between the two strands of polynucleotide chain. However this proposition was also based on the observation of Ervin Chargaff 1950 that for a double standard DNA the ratio between Adenine & Thymine and Guanine and Cytosine are constant and equal. Once the base pairing confers a unique property to the polynucleotide chain, they are said to be complementary to each other and therefore if the sequence of bases in one strand is known then the sequence in another strand can be predicted. Also if such strands from a DNA that is parental DNA acts as a template for synthesis of a new strand the two double standard DNA, i.e. daughter DNA produced would be identical to the parental DNA molecule. Because of this, genetic implications of the structure of DNA became very clear.

Francis Crick James Watson Rosalind Franklin Maurice Wilkins Linus Pauling

1. DNA is..
a. An Alkaline Substance
b. Acidic Substance
c. Semi acidic Substance
d. Semi Alkaline Substance
Answer: b
Feedback: DNA is acidic in nature because of phosphate groups. The phosphate group has hydrogen which exits by leaving behind a negative charge on it when needed hence it exhibits traits of being acidic.

2. X-ray photography of DNA is performed by which of the following scientist...
a. Frederick Meischer in 1869.
b. Ervin Chargaff 1950
c. Rosalind Franklin & Maurice Wilkins in 1953
d. James Watson and Francis Crick in 1953
Answer: c
Feedback: 1953: Rosalind Franklin and Maurice Wilkins use X-ray analyses to demonstrate that DNA has a regularly repeating helical structure.

3. In double standard DNA Adenine and Thymine are:
a. Always constant
b. Never be constant
c. Adenine is more than Thymine
d. Adenine is less than Thymine
Answer: a
Feedback: Chargaff's rule states that In DNA, the proportion of adenine always equals to that of thymine and the proportion of guanine always equals to that of cytosine, i.e, A=T and G=C.

4. Which type of selection is Industrial melanism observed in moth, *Biston betularia*?
a) Stabilising
b) Directional
c) Disruptive
d) Artificial
Answer: b
Feedback: In directional selection, the population changes towards one particular direction. It means this type of selection favours small or large-sized individuals and more individuals of that type will be present in next generations. The mean size of the population changes. Examples are evolution of DDT resistant mosquitoes, industrial melanism in peppered moth and evolution of giraffe.

5. The first form of the could have come from pre-existing non-living organic molecules was proposed by :
a) S.L. Miller
b) Oparin and Haldane
c) Charles Darwin
d) Alfred Wallace
Answer: b
Feedback: Theory of abiogenesis was proposed by Oparin and Haldane. It proposed that the first form of life could have come from pre-existing, non-living organic molecules