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**Max Time : 2 hr** **Class = 12th Biology Test**  **Max Marks : 45**

**PRINCIPLE OF INHERITANCE AND VARIATION**

1. Multiple choice Questions: [ 1 x 11 = 11 ]
2. A cross is made between tall pea plants having green pods and dwarf pea plants having yellow pods. In the F2 generations, out of 80 plants, how many are likely to be dwarf plants?

|  |  |  |  |
| --- | --- | --- | --- |
| a) 15 | b) 20 | c) 45 | d) 60 |

1. How many types of gametes would be produced if the genotype of a parent is AaBB?

|  |  |  |  |
| --- | --- | --- | --- |
| a) 1 | b) 2 | c) 3 | d) 4 |

1. What would be the genotype of the parents if the offspring have the phenotypes in 1 : 1 proportion?

|  |  |  |  |
| --- | --- | --- | --- |
| a) Aa X Aa | b) AA X AA | c) Aa X AA | d) Aa X Aa |

1. Which of the following combination of chromosome numbers represents the correct sex-determination pattern in honey bees?

|  |  |  |  |
| --- | --- | --- | --- |
| a) Male 32 & female 16 | b) Male 16 & female 32 | c) Male 31 & female 32 | d) Male 32 & female 31 |

1. The correct statement with respect to thalassemia in human is :
2. -thalassemia is controlled by a single gene HBB.
3. The gene for -thalassemia is located on chromosome 16.
4. -thalassemia is controlled by two closely liked gene HBA1 and HBA2.
5. In -thalassemia the production of -globin chain is affected.
6. The following are results of crossing a females fly (AaBb) with a male fly (aabb). AaBb (1005) aabb (1000)

Aabb (200) aaBb (210) ; which two genotypes are the recombinant offsprings?

|  |  |  |  |
| --- | --- | --- | --- |
| a) AaBb & Aabb | b) AaBb & aaBb | c) Aabb & aaBb | d) AaBb & aabb |

1. If both parents have sickle-cell trait, then there is …………. of the child having sickle-cell anaemia.

|  |  |  |  |
| --- | --- | --- | --- |
| a) 25 % risk | b) 50 % risk | c) 75 % risk | d) No risk |

**Assertion-Reason Type Questions**

**DIRECTIONS :** In each of the following questions, a statement of Assertion (A) is given followed by a corresponding statement of Reason (R) just below it. Of the statements, mark the correct answer as:

1. If both assertion and reason are true, but reason is the true explanation of the assertion.
2. If both assertion and reason are true, but reason is not the true explanation of the assertion.
3. If assertion is true, but reason is false.
4. If assertion is false, but reason is true.
5. **Assertion:** In 4’o clock plant, a cross between homozygous white flowers and homozygous red flower produces ink flowers.

**Reason:** In these plants, the flower color is determined by three alleles.

1. **Assertion:** When two genes in a dihybrid cross are situated on the same chromosomes, the proportion of parental gene combinations is much higher than non-parental type.

**Reason:** Higher parental gene combinations can be attributed to crossing over between two genes.

1. **Assertion:** Law of independent assortment can be studied through dihybrid cross.

**Reason:** Only those gene show independent assortment which are liked.

1. **Assertion:** In thalassemia, an abnormal myoglobin chain is synthesis due to a gene defect.

**Reason:** -thalassemia is controlled by genes HBA1 and HBA2 located on chromosome 16.

1. Differentiate between multiple allelism and Pleiotropic gene. [ 2 ]
2. Why do human females rarely haemophilic? Explain. How do haemophilia patients suffers.? [ 2 ]
3. Who proposed chromosomal theory of inheritance? and explain the postulates of the theory. [ 2 ]
4. How does a test cross help to determine the genotype of an individuals? [ 2 ]
5. A true breeding pea plant, homozygous dominant for inflated green pods (FFGG) is crossed with another pea plant with constricted yellow pods (ffgg). With the help of Punnett square show the above cross and mention the results obtained phenotypically and genotypically for F1 generation and F2 generation. **[ 3 ]**
6. (i) List different allelic forms of gene ‘I’ in humans. Explain the different phenotypic expression, controlled by these three forms. **[ 3 ]**

(ii) A woman with blood group A marries a man with blood group O. Discuss the possibilities of the inheritance of the blood group in the following. “They produce children some with blood group O and some with A blood group”.

1. A cross between a normal couple resulted in a son which was haemophilic and a normal daughter. In course of time, when a daughter marries to a normal man the grandson was also haemophilic. **[ 3 ]**
2. Represent the cross in the form of pedigree chart. Give the genotype of daughter and her husband.
3. Write the conclusion you drawn from the inheritance pattern of this diseases.
4. (a) Give the differences between linkage and crossing over. **[ 3 ]**

(b) Define gene mapping.

1. Read the following case study and answer the following questions: **[ 1 + 1 + 2 = 4 ]**

The chromosome number is fixed for all normal organisms leading to species specification whereas any abnormality in the chromosome number of an organism result into abnormal individuals. For examples, in humans 46 is the fixed number of chromosomes both in male and female. In male, it is 44+ XY and in female sit is 44 + XX. Thus, the human male is heterogametic , in other words produces two types of gametes i.e. ’22 + X’ and ’22 + Y’. Human female, on the other hand is homogametic i.e. produces only one type of gamete ’22 + X’ chromosome only. Sometimes an error may occur produces abnormal gametes which on fertilization produces abnormal individuals.

1. State what is Aneuploidy?
2. If during spermatogenesis, the chromatid of sex chromosomes fails to segregate during meiosis, write only the different type of gametes with altered chromosome number that could possibly be produced.
3. A normal human sperm (22 + Y) fertilizes an ovum with karyotype ‘22 + XX’. Name the disorder that person would suffer from and write symptoms of the disorder.

Or

Name a best known and most common autosomal aneuploid abnormality in humans and also write symptoms of the diseases.

1. (i) Explain the mechanism of sex determination in humans. **[ 5 ]**

(ii) Differentiate between male heterogamety and female heterogamety with the help of an example of each.

1. In shorthorn cattle, the coat colours red or white are controlled by a single pair of alleles. A calf which receives the allele for red coat from its mother and the allele for white coat from its father is called as ‘Roan’. It has an equal number of red and white hairs in its coat. **[ 5 ]**
2. Is this an example of codominance or of incomplete dominance?
3. Give a reason for your answer.
4. With the help of genetic cross explain what will be the consequent phenotype of the calf when :
5. Red is dominant over white (b) Red is incompletely dominant.