Blue Print (As per PU Board)

Topic	1 mark questions	2 marks questions	3 marks questions	5 marks questions	Total Marks
Principles of Inheritance and Variation	-	1	1	1	10

One mark questions

1. **What is pedigree analysis**
   Answer: The study of an inherited trait in a group of related individuals to determine the pattern and characterises of the trait
2. **Who had proposed the chromosomal theory of inheritance?**
   Answer: Sutton and Boveri
3. **Who coined the term genetics?**
   Answer: William Bateson

Two marks questions

4. **Differentiate between incomplete dominance and co-dominance**
   Answer:

	Incomplete dominance		Co-dominance
1	Incomplete Dominance is a condition where F_1 has a phenotype that did not resemble either of the two parents and is in between the two.	1	Co-dominance is a condition in which the F_1 generation resembles both parents.
2	The Resulting trait is produced by partial dominance of one allele over the other	2	The Resulting trait is produced by the expression of both the alleles at the same time.

(Each difference carrier 1 mark)

5. **Define the terms autosomes and allosomes**
   Answer: The chromosomes that determine somatic characters of the body are called autosomes
   The chromosomes (X and Y) which determine sex of the organism are called allosomes or sex chromosome. **(Each definition carrier 1 mark)**

6. **Distinguish between dominant and Recessive character**
   Answer:

	Dominant Character		Recessive Character	
1	The character appear in the first generation by suppressing the other character	1	The character fails to appear in the first generation as it is suppressed by the dominant character	**(1 mark)**
2	It is expressed in heterozygous condition	2	It is expressed in homozygous condition	**(1 mark)**

Three marks questions

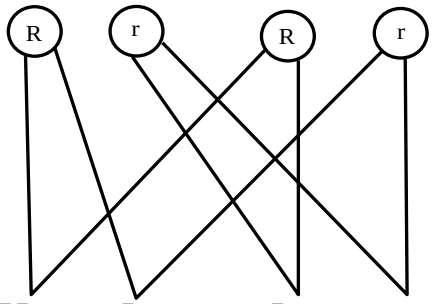
7. **Write short notes on phenylketonuria**
   Answer: phenylketonuria is an inborn error of metabolism. It is caused due to absence of phenylalanine hydroxylase enzyme that coverts amino acid phenyl alanine into tyrosine, as result; phenylalanine is accumulated and converted into phenyl pyruvic acid and other derivation, which accumulate in brain resulting in mental retardation. **(3 marks)**
8. **Why Mendel's work was not recognized? Give any three reason**
   Answer: (i) Communication was not easy in those days.
   (ii) His concept of factors that controlled expression of trait and of the pair of allele , which did not blend with each other, was not accepted by his contemporaries.
   (iii) Mendel's approach of using mathematics to explain biological phenomena was totally new and unacceptable to many of the biologist of his time
   (iv) Microscope was not discovered at that time **(3 marks)**
9. (**a) What are polygenes? Give examples**
   (b) What is co-dominance? Give examples
   Answer: (a) **Polygenes:-**
   It is a condition in which two or more genes influence a single trait in an additive manner. **(0.5 mark)**
   Eg:- human skin colour and height which vary in population in gradation **(1 mark)**
   (b) **Co-dominance:-**
   The resulting trait is produced by the expression of both the allele at the same time **(0.5 mark)**
   Eg:- AB blood group **(1 mark)**

Five marks questions

10. **Explain incomplete dominance with a suitable example**
    Answer: It is a condition in which neither of the two alleles is completely dominant over the other and both the alleles influence the phenotype resulting in intermediate phenotype expression is called incomplete dominance **(2.5 marks)**
    Incomplete dominance was reported in the flowers of Mirabilis Jalapa commonly called as 4 o'clock plant. When plant with red flower (RR) is crossed with plant bearing white flowers (rr) plants with pink coloured (Rr) flower were obtained in the F_1 generation. When F_1 pink flowered plants are self-crossed; Red, pink and white flower coloured plants were obtained in the ratio of 1:2:1 in the F_2 generation.

    Phenotype: Red flowered X White flower
    Genotype: RR X rr
    Gametes : (R) (r)

    F_1 generation: ↓ Rr (All pink)
    Pink flowered plants (Rr) were self-crossed
    Phenotype : pink flower X Pink flower
    Genotype : Rr X Rr
    Gameter



    RR Rr Rr rr
    Red Pink pink white
    Phenotypic Ratio : Red : Pink : White
    1 : 2 : 1

Genotypic Ratio : RR Rr rr
1 : 2 : 1 **(2.5 marks)**

11. **Describe the contribution of sutton and boveri by making a comparison between the behaviors of chromosomes and genes during meiosis, to explain mendeli laws**
Answer: Walter Sutton and Theodore Boveri noted that the behaviour of chromosomes was parallel to the behaviour of genes and used chromosome movement to explain mendel's laws chromosomes as well as gene occur in pair. The two alleles of a gene pair are located on homologous sites on homologous chromosomes
Comparison between the Behavior of Chromosomes and gene

	Chromosomes		Gene
1	Occurs is pairs	1	Occurs in pairs
2	Segregate at the time gamete formation such that only one of each pair is transmitted to a gamete	2	Segregate at the time of gamete formation such that only one of each pair is transmitted to a gamete
3	One pair segregate independently of each other	3	One pair segregates indepently of another pair

Sutton and Boveri argued that the pairing and separation of a pair of chromosomes would lead to the segregation of a pair of factors they carried Sutton united the knowledge of chromosomal segregation with Mendelian principles and called it the chromosomal theory of inheritance. **(5 marks)**

12. **What are genetic disorders? Write short notes on the following Mendelian disorder**
(a) Haemophilia (b) Sickle cell anaemia
Answer: The disorder caused due to either alternation in a single gene (Mendelian disorder) or variation in chromosomal numbers (chromosomal disorders) are called genetic disorders.
(a) Haemophilia :-
It is a 'X' linked recessive genetic disorder, in which blood fails to clot due to absence of clotting factors, as a result continuous bleeding occurs even from a small wound or cut and leads to death, in severe conditions, therefore, called bleeder's disease. The disease was first reported in the royal family of England ; Queen Victoria was the carries and she transmitted the defective gene to her descendant's, hence called royal disease. **(2.5 marks)**
(b) Sickle cell anaemia:-
This is an autosomal linked recessive genetic disorder. It is caused due to replacement of glutamic acid by valine at the 6^{th} position of the beta globin chain of haemoglobin molecule, resulting in abnormal haemoglobin formation. The abnormal haemoglobin molecules undergo polymerization under low oxygen tension causing change in shape of RBC from biconcave to elongated sickle like structure.
The sickle shaped, red blood cells cannot pass through the narrow blood capillaries, they clog and obstruct the flow of blood and this greatly reduce the availability of oxygen to body cells and tissue, They may damage the blood vessels internally, this in turn causes bleeding and anaemia. **(2.5 marks)**