

QB365

Important Questions - Principles of Inheritance and Variation

12th Standard CBSE

Biology

Reg.No. :

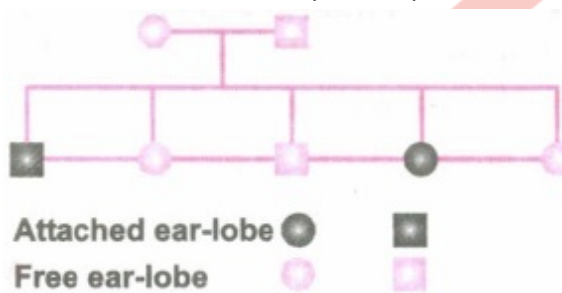
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Time : 01:00:00 Hrs

Total Marks : 50

Section - A

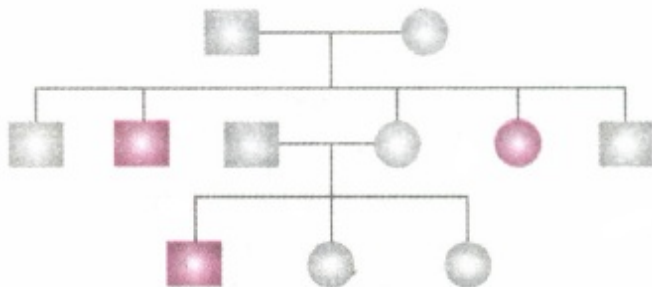
- 1) Heterozygous purple flower is crossed with recessive white flower. The progeny has the ratio : **1**
(a) 75% purple and 25% white (b) 50% purple and 50% white (c) All purple (d) All white
- 2) Superiority of hybrid over parents is **1**
(a) Digantism (b) Lethality (c) Heterosis (d) Dwarfism
- 3) Given below is a pedigree chart of a family with five children. It shows the inheritance of attached ear lobes as opposed to the free ones. The squares represent the male individuals and circles the female individuals. **1**



Which one of the following conclusions drawn is

- correct?
- (a) The parents are homozygous recessive (b) The trait is Y-linked
(c) The parents are homozygous dominant (d) The parents are heterozygous
- 4) Crossing over in diploid organisms results in **1**
(a) Recombination of linked genes (b) Segregation of alleles (c) Independent assortment
(d) Dominance of genes
- 5) After a mutation at a genetic locus the character of an organism changes due to the change in **1**
(a) DNA replication (b) protein synthesis pattern (c) RNA transcription pattern (d) protein structure
- 6) In a mutational event, when adenine is replaced by guanine, it is a case of **1**
(a) transcription (b) transition (c) transversion (d) frameshift mutation
- 7) A common test to find the genotype of a hybrid is by **1**
(a) Crossing of one F_2 progeny with female parent (b) Studying the sexual behaviour of F_1 progenies
(c) Crossing of one F_1 progeny with male parent (d) Crossing of one F_2 progeny with male parent
- 8) Indicate, the inheritance of which of the following is controlled by multiple alleles **1**
(a) Colour blindness (b) Sickle cell anaemia (c) Blood group (d) Phenylketoneuria

- 9) When a dihybrid cross is fit into a punnett square with 16 boxes, the maximum number of different phenotypes available are 1
 (a) 8 (b) 4 (c) 2 (d) 16 (e) 12
- 10) Study the pedigree chart given below. What does it shows? 1



- (a) Inheritance of a condition like phenylketonuria as an autosomal recessive trait.
 (b) The pedigree chart is wrong as this is not possible
 (c) Inheritance of a recessive sex-linked disease like haemophilia
 (d) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria.

Section - B

- 11) A garden pea plant (A) produced inflated yellow pods, and another plant (B) of the same species produced constricted green pods. Identify the dominant traits. 2
- 12) In a certain mammal, erect ears are dominant over drooping ears. In a cross between the two types, out of the four offspring produced in F_2 generation, three had erect ears and one had drooping ears. What were the genotypes of the parents? (You may represent the dominant gene as E.) 2
- 13) The following table shows the genotypes for ABO blood grouping and their phenotypes. Fill in the gaps left in the table: 2

Sr.No.	Genotype	Phenotype
1.	$I^A I^A$	A
2.	—	A
3.	$I^B I^B$	B
4.	—	B
5.	$I^B I^B$	—
6.	—	O

- 14) Explain two situations when independent assortment of genes occurs resulting in 50 % recombinations. 2
- 15) What will be the genotypes of the parents, if the offspring had phenotypes in the following proportion? (a) 9 : 3 : 3 : 1 (b) 1 : 1 : 1 : 1 (use the symbols Aa and Bb) 2
- 16) Which of the two, sperm or ovum, determines the sex of the offspring in fowl? Justify your answer. 2
- 17) Thalassaemia α is different from thalassaemia β . Justify. 2
- 18) What will be the consequence, if cytokinesis does not follow the telophase stage of cell division? What term is given to this phenomenon? 2
- 19) How is the child affected, if it has grown from the zygote formed by an XX-egg fertilised by a Y-carrying sperm? What do you call this abnormality? 2

20) How do biologists use cross over frequencies to map genes on chromosomes? 2

Section - C

21) A child has blood group O. If the father has blood group A and mother has blood group B, work out the genotypes of the parents and the possible genotypes of the other offspring. 5

22) In four o'clock plants red colour (R) is incompletely dominant over white(r), the heterozygous having pink colour. What will be the offspring in a cross between red flower and a pink flower? 5

23) A normal male marries a carrier female for haemophilia. What is the possibility of male child being haemophic and what is the probability of female carrier? What is the probability of female child infected? 5

24) What exactly is dominance? Why are some alleles dominant and some recessive? 5

Section - A

1) (b) 50% purple and 50% white 1

2) (c) Heterosis 1

3) (d) The parents are heterozygous 1

4) (a) Recombination of linked genes 1

5) (d) protein structure 1

6) (b) transition 1

7) (c) Crossing of one F₁ progeny with male parent 1

8) (c) Blood group 1

9) (b) 4 1

10) (a) Inheritance of a condition like phenylketonuria as an autosomal recessive trait. 1

Section - B

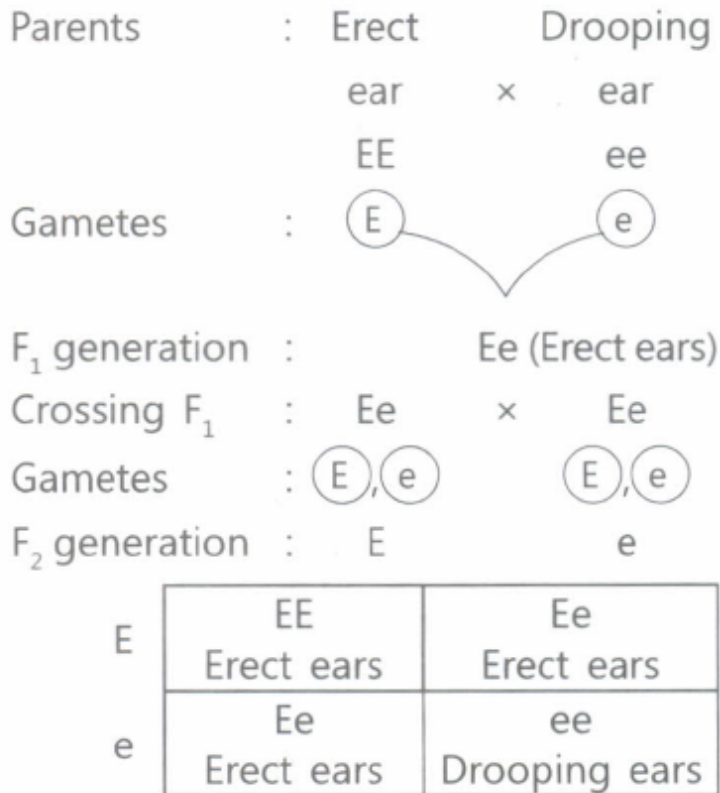
11) Inflated pods and green pods 2

12)

2

Since drooping ears, the recessive trait has appeared in the progeny, both the parents must be heterozygous, i.e. Ee.

- These individuals (with genotype, Ee) are produced by a cross between parents of the two types i.e. with erect ears and drooping ears; so both the parents must be homozygous, i.e. EE and ee.



The phenotypic ratio is 3 Erect ears : 1 Drooping ears.

13) 2. I^Ai

4. I^Bi 5. AB

6. ii

2

14)

2

(i) The genes must be situated on different chromosomes. (ii) If present on the same chromosome, the genes should be as far as possible always allowing crossing over between them.

15) (a) AaBb × AaBb (b) AaBb × aabb

2

16)

2

In fowls, the sex of the offspring is determined by the type of ovum fertilised.

- In fowls, the males are homogametic (ZZ) and produce only type of sperms all with one Z-chromosome and the autosomes.

- The females are heterogametic (ZW) and produce two types of ova, some with one Z-chromosome and some with one W-chromosome, along with the autosomes.

. - When the ovum with Z-chromosome is fertilized, the zygote develops into a male, and when the ovum with W is fertilised

17)

2

Thalassemia α	Thalassemia β
- It is under the control of two genes HBA ₁ and HbA ₂ on chromosome 16.	- It is controlled by a single gene HBB on chromosome 11.
- The synthesis of α chain is impaired	- The synthesis of β chain is impaired.

18) - It leads to an increase in a whole set of chromosomes of the organism. - It is called polyploidy.

2

19) (i) The zygote will be XXY. It means the zygote is male with feminine characters.

2

(ii) This abnormality is called Klinefelter's syndrome.

20)

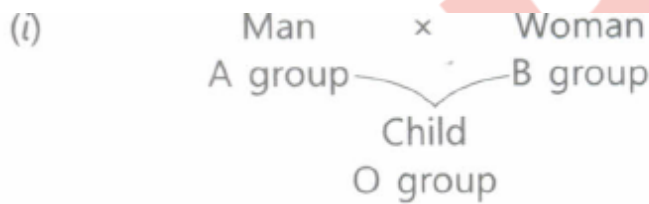
2

The father genes are on a chromosome, the more frequently they will cross over. By comparison, the more frequently they will cross over. By comparison, genes that are close together on a chromosome, are less likely to be separated. The analysis of how often the traits appear together helps to establish linkage map, which shows the relative positions of genes on chromosomes.

Section - C

21)

5



(it) - The child has O group blood, whose genotype is homozygous recessive (ii), where one allele has come from each of the parents.

- So both the parents must be heterozygous for the blood group character.

Parent : Father x Mother
 A group x B group
 $I^A i$ x $I^B i$

Gametes : (I^A, i) (I^B, i)

Progeny :

	I^A	i
I^B	$I^A I^B$ AB-blood group	$I^B i$ B-blood group
i	$I^A i$ AB-blood group	ii O-blood group

The progeny/their offspring may have blood group A, B or AB also, apart from O.

22)

5

- (i) In the monohybrid, cross red is incompletely dominant over white.
- (ii) Red-flowered plants have genotype **RR** and white flowered plants have genotype **rr**.
- (iii) Pink flowers have a genotype **Rr**.
- (iv) Red-flowered plants will form gametes with **R** genes and pink flowers will produce two types of gametes with **R** gene and **r** gene.
- (v) Arrangement of gametes in chequer board. $2RR : 2Rr$

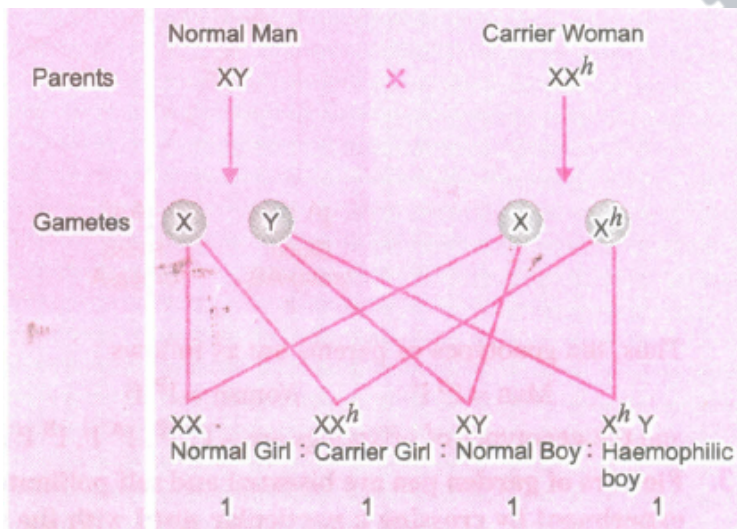
Red flowers-- 50%

Pink flowers--- 50%

	R	r
R	RR	Rr
r	Rr	rr

23)

5



male sex is determined by Y-chromosome which does not bear the gene for haemophilia. In the given case, when a normal male marries a carrier female the resultant offsprings will be follows- this marriage results in the four types of offsprings in equal ratio i.e.,

Normal Girl with XX genotype

Normal boy with XY genotype

carrier Girl with XX^h genotype

The defect of haemophilia does not appear in the girl carrier because the second X chromosome possesses therefore female child can be a carrier but does not develop diseases. The male child on the other hand can develop the disease.

24)

5

Dominance:

- Every gene contains the information to express a particular trait.
- In a diploid organism, there are two alternate forms of a gene, or a pair of alleles.
- The two alleles may be similar (homo-zygous) or may be different (heterozygous).
- One of them may be different due to some changes that it has undergone, which modify the information of that particular allele.
- The phenotype will be dependent on the original unmodified allele.