

# PRACTICE MCQS

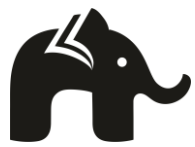
CLASS 12 BIOLOGY (TERM - I)

## PRINCIPLES OF INHERITANCE AND VARIATIONS

BY

**learn-o-hub**  
learning simplified





**Question 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

Answer: (b) 2

**Question 2:**

Which of the following statements indicates parallelism in genes and chromosomes?

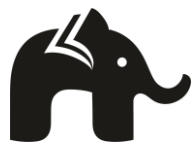
- (i) They occur in pairs
  - (ii) They segregate during gamete formation
  - (iii) They show linkage
  - (iv) Independent pairs segregate independently
- (a) (i) and (iii)
  - (b) (ii) and (iii)
  - (c) (i), (ii) and (iii)
  - (d) (i), (ii) and (iv)

Answer: (d) (i), (ii) and (iv)

**Question 3:**

ZZ/ZW type of sex determination is seen in

- (a) platypus
- (b) snails
- (c) cockroach
- (d) peacock



**Answer: (d) peacock**

ZZ/ZW type of sex determination is seen in birds.

**Question 4:**

Which of the following amino acid substitution is responsible for causing sickle cell anemia?

- (a) Valine is substituted by Glutamic acid in the  $\alpha$  globin chain at the sixth position
- (b) Valine is substituted by Glutamic acid in the  $\beta$  globin chain at seventh position
- (c) Glutamic acid is substituted by Valine in the  $\alpha$  globin chain at the sixth position
- (d) Glutamic acid is substituted by Valine in the  $\beta$  globin chain at the sixth position

**Answer: (d) Glutamic acid is substituted by Valine in the  $\beta$  globin chain at the sixth position**

**Question 5:**

In F<sub>2</sub> generation of Mendelian dihybrid cross the number of phenotypes and genotypes are

- (a) phenotypes – 4 genotypes -16
- (b) phenotypes – 9 genotypes -4
- (c) phenotypes – 3 genotypes -1
- (d) phenotypes – 4 genotypes -9

**Answer: (d) phenotypes – 4 genotypes -9**

**Question 6:**

The experimental verification of Sutton and Boveri's theory was done by

- (a) Morgan



- (b) Francis
- (c) Mendel
- (d) Correns

**Answer: (a) Morgan**

The theory given by Sutton and Boveri was named as 'Chromosomal Theory of Inheritance'. It was experimentally verified Morgan.

**Question 7:**

In human beings, where genotype AAB<sup>B</sup>CC represents dark skin colour, aabbcc represents light skin colour and AaBbCc represents intermediate skin colour; the pattern of genetic inheritance can be termed as:

- (a) Pleiotropy and codominance
- (b) Pleiotropy and incomplete dominance
- (c) Polygenic and qualitative inheritance
- (d) Polygenic and quantitative inheritance

**Answer: (d) Polygenic and quantitative inheritance**

**Question 8:**

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) Female 32, Male 31

**Answer: (b) Male 16, Female 32**

**Question 9:**

Choose the incorrect option.



- (a) - Mating between relatives
- (b) - Parents above and children below
- (c) - five unaffected offspring
- (d) - unaffected individuals

**Answer: (d)** - unaffected individuals

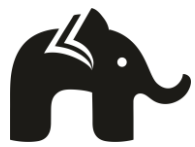
This represents affected individuals.

**Question 10:**

Rajesh and Mahesh have defective haemoglobin due to genetic disorders. Rajesh has too few globin molecules while Mahesh has incorrectly functioning globin molecules. Identify the disorder they are suffering from.

	Rajesh	Mahesh
(a)	Sickle cell anaemia - an autosome linked recessive trait	Thalassemia – an autosome linked dominant trait
(b)	Thalassemia – an autosome linked recessive blood disorder	Sickle cell anaemia - an autosome linked recessive trait
(c)	Sickle cell anaemia - an autosome linked recessive trait	Thalassemia – an autosome linked recessive blood disorder
(d)	Thalassemia – an autosome linked recessive blood disorder	Sickle cell anaemia - an autosome linked dominant trait

Answer: (b) Thalassemia – an autosome linked recessive blood disorder, Sickle cell anaemia – an autosome linked recessive trait



**Question 11:**

A cross is made between tall pea plants having green pods and dwarf pea plants having yellow pods. In the F<sub>2</sub> generation, out of 80 plants how many are likely to be tall plants?

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

**Answer: (d) 60**

Out of 9 : 3 : 3 : 1 = 16

9 + 3 will be tall.

Therefore,  $(12/16) * 80 = 60$

**Question 12:**

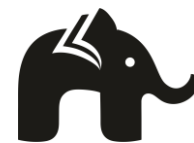
It is an autosomal recessive trait in which affected individual lack an enzyme that convert amino acid phenylalanine into tyrosine. This disorder is

- (a) Thalaseemia
- (b) Phenylketonuria
- (c) Sickle cell anaemia
- (d) Haemophilia

**Answer: (b) Phenylketonuria**

Phenylketonuria is an inborn error of metabolism which is an autosomal recessive trait in which an affected individual lacks an enzyme that converts the amino acid phenylalanine into tyrosine.

As a result, phenylalanine is accumulated and converted into phenylpyruvic acid and other derivatives. Accumulation of these in brain results in mental retardation.



**Question 13:**

In *Antirrhinum*, RR is phenotypically red flowers, rr is white and Rr is pink. Select the correct phenotypic ratio in F1 generation when a cross is performed between RR X Rr:

- (a) 1 red: 2 Pink: 1 white
- (b) 2 Pink: 1 white
- (c) 2 Red: 2 Pink
- (d) All Pink

Answer: (c) 2 Red: 2 Pink

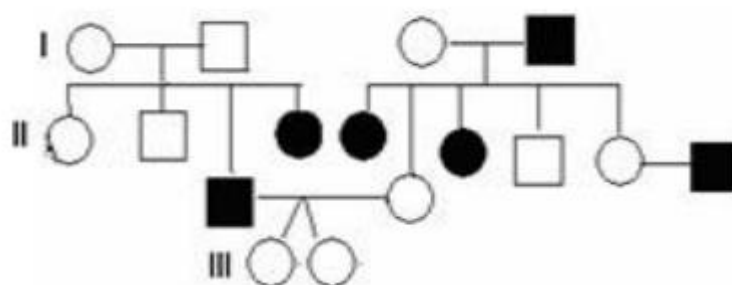
**Question 14:**

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

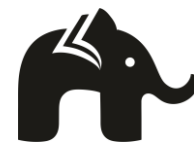
Answer: (d) Aa x aa

**Question 15:**



What is the pattern of inheritance in the above pedigree chart?

- (a) Autosomal dominant
- (b) Autosomal recessive



- (c) Sex -linked dominant
- (d) Sex -linked recessive

Answer: (b) Autosomal recessive

**Question 16:**

A couple has two daughters. What is the probability that the third child will also be a female?

- (a) 25%
- (b) 50%
- (c) 75%
- (d) 100%

Answer: (b) 50%

Everything an egg is fertilized by a sperm, the probability is 50%.

**Question 17:**

Genotypic ratio of 1:2:1 is obtained in a cross between

- (a) AB X AB
- (b) Ab X Ab
- (c) Ab X ab
- (d) ab X ab

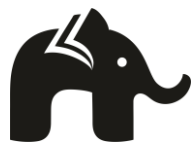
Answer: (b) Ab X Ab

**Question 18:**

Which of the following statement matches the disorder shown in the picture?

- (a) Palm is broad with characteristic palm crease.
- (b) It is caused due to the presence of an additional copy of X-chromosome.
- (c) It can describe as 45 with X0.
- (d) It causes the formation of abnormal haemoglobin molecules.





**Answer: (a) Palm is broad with characteristic palm crease.**

This picture shows Down's syndrome.

It is caused due to the presence of an additional copy of the chromosome number 21 (trisomy of 21).

**Question 19:**

Which of the following disorder is caused by point mutation?

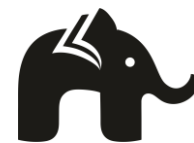
- (a) Down's syndrome
- (b) Night blindness
- (c) Thalassemia
- (d) Sickle cell anaemia

**Answer: (d) Sickle cell anaemia**

Sickle cell anaemia is an autosome linked recessive trait that can be transmitted from parents to the offspring when both the partners are carrier for the gene. The disease is controlled by a single pair of allele, HbA and HbS . The defect is caused by the substitution of Glutamic acid by Valine at the 6th position of the beta globin chain of the haemoglobin molecule.

**Question 20:**

What is the probability of production of dwarf offspring in a cross between two heterozygous tall pea plants?



- (a) 0%
- (b) 25%
- (c) 50%
- (d) 75%

**Answer: (b) 25 %**

Cross between two heterozygous tall pea plants can be expressed as:

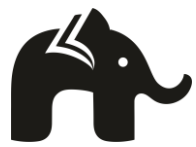
Parents	Tt Tall	×	Tt Tall
Gametes	T t	↓	T t
Progeny	♀/♂	T	t
	T	TT (Tall)	Tt (Tall)
	t	Tt (tall)	tt (dwarf)

This shows that the probability of dwarf offspring is 25%.

### Assertion Reason based questions:

Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true and R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is False but R is true



**Question 21:**

A: When the two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations is much higher than non parental type.

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

Answer: (c) A is true but R is false

**Question 22:**

A: Mendelian disorders are transmitted to offspring on the same lines as in the principles of inheritance.

R: The pattern of inheritance of Mendelian disorders cannot be traced in the family by the pedigree analysis.

Answer: (c) A is true but R is false

Mendelian disorders are transmitted to offspring on the same lines as in the principles of inheritance. The pattern of inheritance of Mendelian disorders can be traced in the family by the pedigree analysis.

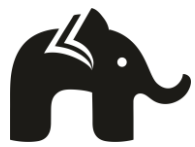
**Question 23:**

A: Turner's syndrome is caused due to the absence of the X chromosome.

R: Such individuals have rudimentary ovaries and lack secondary sexual characteristics.

Answer: (a) Both A and R are true and R is the correct explanation of A

Turner's syndrome is caused due to the absence of X-chromosome. Individuals having a single X-chromosome (AA + XO) have female sexual differentiation but ovaries are rudimentary.



Other associated phenotypes of this condition are short stature, webbed neck, broad chest, lack of secondary sexual characteristics and sterility.

## Case Study Based Questions:

### Question 24:

In court, a woman of AB blood group claims that a man of O blood group is the father of her son having O blood group. The judge orders to take the help of a geneticist to solve the problem. Finally, it was concluded that man of O blood group was not the father of woman's son.

1. Which of the following phenomenon is seen in blood group inheritance in humans?
  - (a) Pleiotropy
  - (b) Polygenic inheritance
  - (c) Co-dominance
  - (d) Epistasis
2. Out of the three alleles of gene I, the sugar polymers on the plasma membrane of RBCs is controlled by how many alleles?
  - (a) All three
  - (b) Two
  - (c) One
  - (d) Zero
3. Another blood group system known as ABO blood group system is also seen in human is controlled by
  - (a) B-gene
  - (b) C-gene
  - (c) I-gene
  - (d) n-gene



4. A person with blood group A can show genotype

- (a)  $I^A I^A$
- (b)  $I^A I^B$
- (c)  $I^B I^A$
- (d)  $I^B I^B$

5. Choose the incorrect statement about color blindness.

- (a) Colour blindness is a sex-linked recessive disorder which occurs due to defect in either red or green cone of eye.
- (b) It is due to mutation in certain genes present in the Y chromosome.
- (c) It occurs in about 8 % of males and only about 0.4 % of females.
- (d) The genes that lead to red-green colour blindness are on the X chromosome.

**Answer:**

1. (c) Co-dominance

Co-dominance is seen in blood group inheritance in humans.

2. (b) Two

The plasma membrane of RBC has sugar polymers that protrude from its surface and the kind of sugar is controlled by I gene.

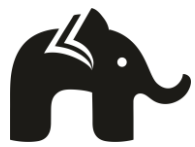
3. (c) I-gene

ABO blood group is controlled by I –gene which has three alleles  $I^A$ ,  $I^B$ , and i.

4. (a)  $I^A I^A$

An individual with blood group A shows genotype  $I^A I^A$ .

5. (b) It is due to mutation in certain genes present in the Y chromosome.



**Question 25:**

In incomplete dominance, the genes of an allelomorphic pairs are not expressed as dominant or recessive but they are expressed partially when present together in a hybrid. As a result, an intermediate character is obtained. It is not a blending inheritance because parental characters reappear in the F<sub>2</sub> generation without any modification.

1. Phenotypic ratio of incomplete dominance in *Mirabilis jalapa*

- (a) 2:1:1
- (b) 1:2:1
- (c) 3:1
- (d) 2:4

2. A cross between an individual with unknown genotype for a trait with recessive plant for that trait is

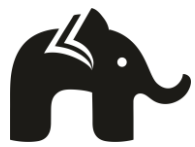
- (a) back cross
- (b) reciprocal cross
- (c) monohybrid cross
- (d) test cross

3. Which of the following statements is true regarding the law of segregation?

- (a) Law of segregation is the law of purity of genes.
- (b) Alleles separate from each other during gametogenesis.
- (c) Segregation of factors is due to the segregation of chromosomes during meiosis.
- (d) All of the above

4. When a cross occurs between a cattle is having red hair (RR) and other is having white hair (WW) which are equally dominant in the co-dominance condition, then the cross produces \_\_\_\_\_ offspring.

- (a) RW
- (b) RR



(c) WW

(d) rr

5. In the multiple alleles, a particular gene can have more than two alleles but in case of an individual can possess only \_\_\_\_\_ of these.

(a) One

(b) Two

(c) Five

(d) Six

**Answer:**

1. (b) 1 : 2 : 1

In *Mirabilis jalapa*, we can cross a plant with red flowers and with white flowers, the offspring will have pink petals. The phenotypic ratio comes out to be 1:2:1.

2. (d) test cross

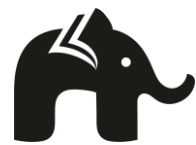
A cross between an individual with unknown genotype for a trait with recessive plant for that trait is test cross. Test cross is cross between individual with unknown genotype and an individual with a phenotypically recessive individual.

3. (d) All of the above

According to the law of segregation, the alleles do not show any blending and that both the characters are recovered as such in the F<sub>2</sub> generation though one of these is not seen at the F<sub>1</sub> stage.

4. (a) RW

5. (b) Two



\*\*\*\*\*