

BIOLOGY

MOLECULAR BASIS OF INHERITANCE

MCQs

1. In a nucleotide, the nitrogen base is joined to the sugar molecule by
 - a) Phosphodiester bond
 - b) Glycosidic bond
 - c) Hydrogen bond
 - d) (a) &(b)
2. If a double stranded DNA has 20% Thymine, the percentage of Guanine in the DNA
 - a) 30%
 - b) 10%
 - c) 90%
 - d) 40%
3. If a DNA contains 1000 base pairs, what would be its length?
 - a) 3400 Å
 - b) 34000 Å
 - c) 6800
 - d) 1000 Å
4. What is not True for DNA in prokaryotes
 - a) present in the form of a compact structure called nucleoid
 - b) the coils are maintained by non-histone basic proteins
 - c) found in cytoplasm in a supercoiled condition
 - d) packaged as nucleosomes along with histones
5. Pick the right difference between a DNA and RNA
 - a) Sugar and phosphate
 - b) sugar and purines
 - c) purines and phosphate
 - d) sugar and pyrimidines
6. In the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
 - (1) If both **Assertion** and **Reason** are true and the reason is the correct explanation of the assertion, then mark (a)
 - (2) If both **Assertion** and **Reason** are true but the reason is not the correct explanation of the assertion, then mark (b)
 - (3) If **Assertion** is true but **Reason** are false, then mark (c)
 - (4) If both **Assertion** and **Reason** are false, then mark (d)

Assertion: In Griffith's experiment mice were injected by a mixture of heat killed Smooth type bacteria and live Rough type bacteria. Some mice died of pneumonia and their blood contained both live Rough type bacteria and live Smooth type bacteria.

Reason: The dead Smooth type bacteria became alive and caused pneumonia. Griffith named it as transforming principle.

7. Hershey and Chase experiment proving DNA as the genetic material was based on the principle
- a) Transduction b) transformation c) transcription d) translation
8. A bacterial colony containing DNA made up of 100% N¹⁵ nitrogen bases is allowed to replicate in a medium containing N¹⁴ bases. After one round of replication the result would be
- a) All individuals will be identical to parents
b) All individuals will be hybrids
c) Only 50% individuals would be hybrids
d) All individuals would have DNA made up of 100% N¹⁴
9. Teminism is
- a) a central dogma reverse
b) a central dogma of molecular biology
c) a circular flow of hereditary material
d) an effect of cytoplasm on functioning of DNA
10. Cistron is
- a) The coding sequence of DNA
b) The functional unit of DNA molecule that codes for a particular gene product
c) Intervening non coding sequence of DNA
d) The sequences which are removed during RNA splicing.
11. Read the statements given below and identify the **incorrect** statement.
- a) The human genome contains 3164.7 million nucleotide bases.
b) The average gene consists of 30,000 bp
c) The total number of genes is estimated at 30,000.
d) Chromosome Y has 231 genes
e) Less than 2% of the genome codes for proteins.
12. The coding sequences found in split genes are called
- a) Operons b) introns c) exons d) cistrons
13. The removal of which enzyme affects the synthesis of hnRNA in eukaryotes
- a) RNA polymerase II b) RNA primase c) RNA polymerase III d) RNA polymerase I

14. Sickle cell anemia is caused
- When valine is replaced by glutamic acid in beta polypeptide chain
 - When glutamic acid is replaced by valine in beta polypeptide chain
 - When glutamic acid is replaced by valine in alpha polypeptide chain
 - When valine is replaced by glutamic acid in alpha polypeptide chain
15. Wobble position means
- Base pairing
 - third altered base on codon
 - altered base on code
 - none of the above
16. Peptidyl transferase
- Is a 23s rRNA
 - component of ribosome
 - forms peptide bonds
 - all the three
17. Which mRNA will be translated to a polypeptide chain containing 8 amino acids?
- AUGUUAUAGACGAGU**AG**CGACGAUGU
 - AUGAGACGGACUGCAU**UCCCAACCUGA**
 - AUGCCCAACCGUUAU**UCAUGC**UAG
 - AUGUCGACAGUC**UAAAACAGCGGG**
18. Arrange the following events in the order of synthesis of a protein
- A peptide bond forms
 - A tRNA matches its anticodon to the codon in the A- site
 - The movement of second tRNA complex from A-site to P-site
 - The large subunit attaches to the small subunit and the initiator tRNA fits in the P-site
 - A small subunit binds to the mRNA
 - The activated amino acid tRNA complex attaches the initiation codon on mRNA
- iv, v, iii, ii, i, vi**
 - iv, vi, v, ii, i, iii**
 - v, iv, iii, ii, vi, i**
 - v, vi, iv, ii, i, iii**
19. Select the incorrect statement out of the five given below about lac operon when Lactose is present in the medium.
- Gene – A gets transcribed into mRNA which produces β -galactoside permease
 - Inducer-Repressor complex is formed
 - Lactose inactivates repressor protein
 - RNA polymerase transcribe Z-gene, Y-gene and A-gene
 - Allolactose is the inducer of lac operon
20. The percentage of human genome which encodes proteins is approximately
- Less than 2%
 - 5%
 - 25%
 - 99%

21. Match the entries in column I with those of column II and choose the correct answer.

Column I	Column II
A) Alkali treatment	M) separation of DNA fragments on gel slab
B) Southern blotting	N) split DNA fragments into single strands
C) Electrophoresis	O) DNA transferred to nitrocellulose sheet
D) PCR	P) X-ray photography
E) Autoradiography	Q) produce fragments of different sizes
F) DNA treated with REN	R) DNA amplification

- (1) A - N, B - Q, C - P, D - R, E - M, F - O
(2) A - P, B - R, C - M, D - O, E - N, F - Q
(3) A - Q, B - O, C - M, D - R, E - P, F - N
(4) A - N, B - O, C - M, D - R, E - P, F - Q

22. Enzyme which can break and seal the DNA strand

- a) Topoisomerase II (b) Helicase (c) Primase (d) Restriction endonuclease

23. Match the names of scientists in column I with their achievements in column II and choose the correct answer given below

Column I	Column II
A) Watson and Crick	P) DNA fingerprinting
B) R.W. Holley	Q) Decipher genetic code
C) Marshal Nirenberg	R) Double helix of DNA
D) Jacob and Monod	S) Clover model of tRNA
E) Alec Jeffrey	T) Lac operon concept

- | | | | | |
|------|-----|-----|-----|-----|
| (A) | (B) | (C) | (D) | (E) |
| a) R | S | P | T | Q |
| b) R | S | Q | T | P |
| c) R | Q | P | T | S |
| d) R | T | S | P | Q |

24. Which of the statements give below is correct with respect to frameshift mutation

- a) a single nucleotide base change, insertion, or deletion of the genetic material
b) Glutamine is replaced by valine
c) Sickle cell anemia is an example
d) insertions or deletions of a number of nucleotides in a DNA sequence that is not divisible by three.

25. The transcription initiation factor associated with the RNA polymerase holoenzyme in prokaryotes is

- (a) β (b) ω (c) σ (d) α'

26. The stretch of codons **between** AUG and a **stop codon** is called

- a) open reading frame b) TATA box c) colinearity d) degenerate
27. The structural genes of lac operon transcribe mRNA which is
 a) polycistronic b) replicative c) monokaryotic d) monocistronic
28. If the sequence of bases in DNA is TACCGACCA, then the sequence of codons on the transcript will be
 a) ATGGCTGGT b) ATCCGAACU c) AUGGCUGGU d) AUGGACUAA
29. Match the following

Column I

Column II

- | | |
|---------------------------------|---------------------------------------|
| (A) Helicase | (M) activation of amino acid |
| (B) Peptidyl transferase | (N) joins DNA fragments |
| (C) DNA polymerase | (O) unwinds DNA helix |
| (D) DNA ligase | (P) peptide bonds between amino acids |
| (E) Aminoacyl synthetase enzyme | (Q) DNA synthesis |
| (F) RNA primase | (R) synthesis of RNA primer |

- a) A-O, B-P, C-Q, D-N, E-M, F-R
 b) A-R, B-M, C-N, D-Q, E-P, F-O
 c) A-M, B-R, C-P, D-Q, E-N, F-O
 d) A-R, B-Q, C-A, D-M, E-P, F-N

30. Genes which are active all the time synthesizing substances needed by the cell are called
 a) Cellular luxury genes b) metabolic genes
 c) house keeping genes d) control genes

ANSWERS

1)b, 2)a, 3)a, 4)d, 5)d, 6)c, 7)a, 8)b, 9)a, 10)b, 11)b, 12)c, 13)a, 14)b, 15)b, 16)d, 17)b, 18)d, 19)a, 20)a, 21)d, 22)a, 23)b, 24)d, 25)c, 26)a, 27)a, 28)c, 29)a, 30)c

PRINCIPLES OF INHERITENCE AND VARIATIONS

1. "Father of experimental Genetics"

- a) Gregor Mendel
- b) T.H.Morgan
- c) Hugo deVries
- d) Carl Correns

2. Which of the following condition is called monosomics

- a) $2n+1$
- b) $2n+2$
- c) $2n-1$
- d) $n+1$

3. A phenomenon of a single gene regulating several phenotypes is called

- a) Multiple allelism
- b) Pleiotropy
- c) Incomplete dominance
- d) Co-dominance

4. Turner's syndrome is

- a) XO
- b) XXY
- c) XXX
- d) XYY

5. X – linked recessive gene is

- a) Always expressed in male
- b) Always expressed in female
- c) Never expressed in males
- d) Always expressed in males and female

6. Which one is an example for chromosomal mutation

- a) Sickle cell anemia
- b) Muscular dystrophy
- c) Phenylketoneuria
- d) Klinefelter's syndrome

7. Indicate, the inheritance of which of the following is controlled by multiple alleles

- a) Colour blindness
- b) Sickle cell anemia
- c) Blood group
- d) Phenylketoneuria

8. Segregation of genes occurs in

- a) Embryo formation
- b) Anaphase II
- c) Anaphase I
- d) Metaphase II

9. Child has blood group "O" and his father is "B" type. Then genotype of the father should be

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

10. Hb^A and Hb^S alleles of normal and sickle cell haemoglobin are

- a) Co-dominant alleles
- b) Multiple alleles
- c) Dominant-recessive alleles
- d) Cumulative alleles

11. Erythroblastosis foetalis occurs when

- a) Mother is Rh negative and father is Rh positive
- b) Father is Rh negative and mother is Rh positive
- c) Both are Rh positive
- d) Both are Rh negative

12. A holandric gene cause hypertrichosis. When a man with hypertrichosis marries a normal women, what percentage of their daughters would be expected to have hypertrichosis?

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

13. In birds, females are

- a) XX
- b) ZZ
- c) ZO
- d) ZW

14. In Snapdragon two plants with pink flowers were hybridized. The F_1 plants produced red, pink and white flowers in the proportion of 1 red, 2 pink and 1 white. What could be the genotype of the two plants used for hybridization? Red flower colour is determined by RR and white by rr genes.

- a) Rr
- b) rr
- c) rrr
- d) RR

15. Test cross is a cross between

- a) Hybrid x Dominant parent
- b) Hybrid x Recessive parent
- c) Hybrid x Hybrid
- d) Dominant parent x Recessive parent

16. Which Mendelian cross can produce two genotypes and two phenotypes?

- a) Monohybrid cross
- b) Monohybrid test cross
- c) Incomplete dominance
- d) Co-dominance

17. The “cri-du-chat” syndrome is caused by change in chromosome structure involving

- a) Deletion
- b) Duplication
- c) Inversion
- d) Translocation

18. The ability of a gene to have multiple phenotypic effects is known as

- a) Pleiotropy
- b) Co-dominance
- c) Incomplete dominance
- d) Incomplete dominance

19. Match the following organism with the type of sex determination found in them

Column I

- A) ZW-ZZ type
- B) ZO-ZZ
- C) XX-XO
- D) XX-XY

Column II

- M) Grasshopper
- N) Drosophila
- O) Hen
- P) Butterfly

- a) A- M, B-P, C- O, D-N
- b) A-O, B- N, C-M, D- P
- c) A-O, B-P, C-M, D-N
- d) A- N, B-P, C-M, D- O

20. Which is the false statement?

- a) Sickle cell anemia is a recessive autosomal disorder
- b) Phenylketonuria is a recessive allosomal disorder
- c) Haemophilia is a recessive sex linked disorder
- d) Colour blindness is a recessive allosome linked disorder

21. Eyes that slant upwards with epicanthus is a characteristic of

- a) Klinefelter's syndrome
- b) Turner's syndrome
- c) Down's syndrome
- d) Super female

22. If heterozygous round seeded pea plants are self pollinated, the offsprings will be

- a) 75% round
- b) 50% heterozygous
- c) 25% rr
- d) All of these

23. Round seed is dominant over wrinkled seeds in Pea. If homozygous, round seeded Pea plants are crossed with wrinkled seeded plants, the offsprings will be

- a) All round
- b) All wrinkled
- b) 75% round and 25% wrinkled
- d) 50% round and 50% wrinkled

24. Mendel developed his basic principles of heredity by

- a) Microscopic study of chromosomes and genes
- b) Mathematical analysis of the offspring of Pea plant
- c) Breeding experiments with *Drosophila*
- d) Anatomical studies of Pea plant

25. When two hybrids are crossed, the percentage of recessive is

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

26. How many different genotypes are possible from a cross between the parents RR and rr

- a) Four
- b) One
- c) Three
- d) Two

27. Which of the following disorder shows Criss cross inheritance?

- a) Haemophilia
- b) Colour blindness
- c) Erythroblastosis foetalis
- d) (a) & (b)

28. Skin colour is controlled by

- a) Pleiotropic genes
- b) Dominant genes
- c) Polygenes
- d) Recessive gene

29. Cinderella of Genetics is

- a) *Pisum sativum*
- b) Snapdragon
- c) *Oenothera*
- d) *Drosophila*

30. The plant in which Hugo de Vries introduces the concept of mutation is

a) *Oenothera lamarckiana*

b) *Pisum sativum*

c) *Allium cepa*

d) *Mirabilis jalapa*

ANSWERS

1) b), 2) c, 3) b, 4) a, 5) a, 6) d, 7)c, 8) c, 9)b, 10)c, 11)a, 12)d, 13)d, 14)a, 15) b,
16) b, 17)a, 18) a, 19) c, 20)b, 21) c, 22) d, 23)b, 24) b, 25)a, 26)b, 27)d, 28)c, 29) d,
30)a

