

NTA CUET PAPER (30TH MAY 2023)

Instructions

Attempt only 40 questions out of the given 50 questions. Each question carries 5 marks. One mark will be deducted for a wrong answer.

Full Marks: 200

(Time: 45 Minutes)

1. Continued inbreeding and especially close inbreeding reduces fertility and productivity in animals. This happens due to

(a) Homozygosity
(b) Inbreeding depression
(c) Interspecific depression
(d) Outbreeding depression

2. Which of the following statements are incorrect?

A. In bacteria, Bt toxin exists as inactive protoxin
B. Due to alkaline pH in the gut, the toxin is converted into its active form
C. The toxin is already present in active form in bacteria
D. The inactive toxin binds to the surface of midgut and causes cell swelling and lysis.

Choose the correct answer from the options given below:

(a) A and D Only
(b) B and C Only
(c) A and B Only
(d) C and D Only

3. While developing purelines, increased homozygosity results in _____.

(a) Production of superior male only
(b) Aggregation of harmful recessive genes
(c) Accumulation of superior genes
(d) Increased fertility

4. Match the List-I with List-II.

List-I		List-II	
A.	Sea anemone and the clown fish	(i)	Competition
B.	Tiger and the deer	(ii)	Predation
C.	Flamingoes and resident fishes in South American lakes	(iii)	Commensalism
D.	Mycorrhizae	(iv)	Amensalism
		(v)	Mutualism

Choose the correct answer from the options given below:

(a) A-(iii), B-(ii), C-(i), D-(v)
(b) A-(i), B-(ii), C-(iii), D-(iv)
(c) A-(iv), B-(ii), C-(i), D-(iii)
(d) A-(v), B-(ii), C-(iii), D-(i)

5. Which of the following show Pleiotropism?

(a) Thalassaemia
(b) Phenylketonuria
(c) Haemophilia
(d) Anaemia

6. The hormone which acts on the uterine muscle and causes stronger uterine contractions is known as:

(a) Testosterone
(b) Progesterone
(c) FSH
(d) Oxytocin

7. Match the List-I with List-II.

List-I		List-II	
A.	Streptokinase	(i)	Immuno suppressive agent
B.	Cyclosporin A	(ii)	Clot buster
C.	Statins	(iii)	Helpful in removing oil stains
D.	Lipase	(iv)	Blood cholesterol lowering agents

Choose the correct answer from the options given below:

- (a) A-(ii), B-(iv), C-(iii), D-(i)
 (b) A-(iv), B-(i), C-(iii), D-(ii)
 (c) A-(ii), B-(i), C-(iv), D-(iii)
 (d) A-(iv), B-(i), C-(ii), D-(iii)

8. Select the correct statement/s about sporopollenin found in pollen grain.

- A. The hard outer layer of pollen grains is made up of sporopollenin.
 B. It is one of the most resistant organic material known.
 C. It does not withstand high temperature and strong acids.
 D. No enzyme can degrade it.

Choose the correct answer from the options given below:

- (a) A and B Only (b) A, B and D Only
 (c) C Only (d) A, B and C Only

9. Steps of replication of retrovirus (HIV) in the host cell are given below. Arrange the steps in correct sequence.

- A. Viral RNA is introduced in host cell
 B. New viruses with new RNA are produced
 C. Viral DNA is produced by reverse transcription
 D. Viral DNA incorporates into host genome
 E. Virus infects the normal cell

Choose the correct answer from the options given below:

- (a) E, A, C, D, B (b) A, C, B, D, E
 (c) C, B, D, E, A (d) B, D, A, C, E

10. Which of the following animal shows oestrus cycle?

- (a) Monkey (b) Ape
 (c) Human (d) Dog

11. According to the Central Pollution Control Board (CPCB), the particulate size responsible for causing the greatest harm to human health is:

- (a) PM 2.5 (b) PM 5.2
 (c) PM 4.0 (d) PM 4.5

12. The mass of living organisms at a particular time at each trophic level is called _____.

- (a) Carrying capacity
 (b) Standing state
 (c) Standing crop
 (d) Gross primary productivity

13. RNAi takes place in all eukaryotic organisms as a method of _____.

- (a) Transcription of functional RNA
 (b) Protein synthesis
 (c) Cellular defense
 (d) Translation of functional protein

14. Identify the correct statement about decomposition-

- A. The rate of decomposition is quicker, if detritus is rich in nitrogen and sugar.
 B. Decomposition is largely an oxygen requiring process.
 C. The rate of decomposition is slow, if detritus is rich in chitin and lignin.
 D. The rate of decomposition is slow, if detritus is rich in nitrogen and sugar.

Choose the correct answer from the options given below:

- (a) A and B Only (b) B Only
 (c) C and D Only (d) A, B and C Only

15. *Taq* polymerase is isolated from:

- (a) *Bacillus thuringiensis*
 (b) *Thermus aquaticus*
 (c) *Staphylococcus*
 (d) *Azotobacter*

16. Select the correct statements with respect to *Agrobacterium tumefaciens*.

- A. It is a pathogen of many monocot plants.
 B. It can deliver T-DNA and transform normal plant cells into tumor
 C. Tumor inducing plasmid of *Agrobacterium tumefaciens* is modified into a pathogenic cloning vector.
 D. Tumor inducing plasmid of *Agrobacterium tumefaciens* is used to deliver genes of interest into plants.

Choose the correct answer from the options given below:

- (a) A, B and D Only (b) B and D Only
 (c) A, B and C Only (d) B, C and D Only

17. Among vertebrates, the maximum number of species belong to _____.

- (a) Amphibians (b) Reptiles
 (c) Fishes (d) Birds

18. In rotifers and honey bees, the formation of new organism takes place without fertilization. This phenomenon is called _____.

- (a) Apomixis (b) Parthenocarpy
 (c) Parthenogenesis (d) Embryogenesis

19. The presence of additional copy of X chromosome in humans lead to

(a) Down's Syndrome (b) Klinefelter's Syndrome
(c) Turner's Syndrome (d) Thalassemia

20. Embryological support for evolution was disapproved by _____.

(a) Alexander Von Humboldt
(b) Paul Ehrlich
(c) Karl Ernst Von Baer
(d) Hugo deVries

21. Match the List-I with List-II.

List-I		List-II	
A.	Australian marsupial	(i)	Homologous organs
B.	Wings of butterfly and wings of a bird	(ii)	Natural selection
C.	Industrial melanism	(iii)	Adaptive radiation
D.	Forelimbs of Horse and Bat	(iv)	Analogous organs

Choose the correct answer from the options given below:

(a) A-(i), B-(ii), C-(iv), D-(iii)
(b) A-(iii), B-(iv), C-(ii), D-(i)
(c) A-(ii), B-(i), C-(iii), D-(iv)
(d) A-(iv), B-(iii), C-(i), D-(ii)

22. Which of the following is a free living soil nitrogen fixing bacteria?

(a) *Rhizobium* (b) *Glomus*
(c) *Azospirillum* (d) *Oscillatoria*

23. Arrange the following steps involved in Frederick Griffith experiment in correct order.

A. When R-strain was injected into mice, the mice remained alive.
B. When heat killed S-strain was injected into mice, the mice remained alive.
C. The *Streptococcus pneumoniae* bacteria grown on a culture plate to produce the S and R strain colonies.
D. When S-strain was injected into mice, the mice died.
E. When heat killed S-strain + live R-strain was injected into mice, the mice died.

Choose the correct answer from the options given below:

(a) A, D, B, C, E (b) C, D, A, B, E
(c) D, B, C, E, A (d) C, A, D, B, E

24. Which one of the following is NOT a correct feature of *Homo erectus*?

(a) They had large brain around 900 cc.
(b) Their fossils were discovered in Java in 1891.
(c) They used hides to protect their body and bury their dead.
(d) They lived about 1.5 million years ago.

25. Match the List-I with List-II.

List-I		List-II	
A.	Wheat	(i)	<i>Pusa Komal</i>
B.	<i>Brassica</i>	(ii)	<i>Himgiri</i>
C.	Cowpea	(iii)	<i>Pusa Sadabahar</i>
D.	Chilli	(iv)	<i>Pusa Swarnim</i>

Choose the correct answer from the options given below:

(a) A-(ii), B-(iv), C-(i), D-(iii)
(b) A-(ii), B-(i), C-(iii), D-(iv)
(c) A-(i), B-(iii), C-(ii), D-(iv)
(d) A-(iv), B-(i), C-(ii), D-(iii)

26. The sickle cell anaemia is a

(a) Sex linked recessive disease
(b) Autosomal recessive disease
(c) Sex linked dominant disease
(d) Autosomal dominant disease

27. Which part of human eye absorbs UV-B radiation?

(a) Iris (b) Cornea
(c) Retina (d) Choroid

28. The process of copying the genetic information from one strand of DNA to RNA is termed as

(a) Translation (b) Transcription
(c) Transportation (d) Transition

29. Which of the following is NOT a sexually transmitted disease?

(a) Trichomoniasis (b) Syphilis
(c) Cirrhosis (d) Chlamydia

30. Which of the following is a hormone releasing IUD?

(a) CuT (b) Cu7
(c) LNG-20 (d) Multiload 375

31. Match the List-I with List-II.

List-I		List-II	
A.	Physical barriers	(i)	Acid in stomach, saliva in mouth and tears in eyes
B.	Cytokine barriers	(ii)	PMNL-neutrophils and monocytes
C.	Cellular barriers	(iii)	Skin on body, mucus coating of epithelium which lines respiratory tract
D.	Physiological barriers	(iv)	Interferons

Choose the correct answer from the options given below:

(a) A-(ii), B-(i), C-(iv), D-(iii)
(b) A-(i), B-(iii), C-(ii), D-(iv)
(c) A-(iii), B-(iv), C-(ii), D-(i)
(d) A-(ii), B-(iii), C-(i), D-(iv)

32. Which vector is used for introducing nematode specific genes into the tobacco host plant.
 (a) Bacteriophage (b) *Agrobacterium*
 (c) Plasmid (d) *Bacillus thuringiensis*
33. Which of the following is a type of 'in-situ' conservation approach?
 (a) Zoological Parks (b) Botanical Gardens
 (c) Sacred Groves (d) Wildlife Safari Parks
34. Which of the following came to India as a contaminant with imported wheat _____.
 (a) *Oxalis* (b) *Parthenium*
 (c) *Hibiscus* (d) *Zostera*
35. Which of the following is a bacterial disease?
 (a) Small pox (b) Typhoid
 (c) Measles (d) Polio
36. Match the List-I with List-II.

List-I		List-II	
A.	Operator	(i)	RNA polymerase
B.	Promotor	(ii)	Permeability of the cell
C.	γ -gene	(iii)	Hydrolysis of a specific disaccharide
D.	z -gene	(iv)	Repressor protein

Choose the correct answer from the options given below:

- (a) A-(iv), B-(i), C-(ii), D-(iii)
 (b) A-(i), B-(ii), C-(iii), D-(iv)
 (c) A-(iv), B-(iii), C-(ii), D-(i)
 (d) A-(iii), B-(iv), C-(i), D-(ii)
37. The ability of some snails and fish to avoid summer related problems like heat and dessication is called _____.
 (a) Hibernation (b) Aestivation
 (c) Diapause (d) Migration
38. Arrange the following steps involved in Recombinant DNA Technology in correct sequence.
 A. Insertion of recombinant DNA into host cell/organism
 B. Cutting of source DNA as well as vector DNA at specific location and their joining
 C. Isolation of the genetic material (DNA)
 D. Obtaining the foreign gene product
 E. Culturing transformed host cells at large scale

Choose the correct answer from the options given below:

- (a) C, B, A, E and D (b) E, A, C, D and B
 (c) C, A, D, E and B (d) D, B, A, C and E

39. Select the incorrect statement/s from the following -
 A. In human male, the testes are situated outside the abdominal cavity within a pouch.
 B. Primary spermatocytes undergo mitosis to form secondary spermatocytes.
 C. Sertoli cells provide nutrition to the germ cells.
 D. Seminal plasma is rich in glucose, calcium and certain enzymes.
- Choose the correct answer from the options given below:
 (a) B Only (b) B and C Only
 (c) B and D Only (d) A and B Only
40. Match the List-I with List-II.

List-I		List-II	
(Name of microorganism)		(Chemical)	
A.	<i>Aspergillus niger</i>	(i)	Citric acid
B.	<i>Acetobacter aceti</i>	(ii)	Acetic acid
C.	<i>Clostridium butylicum</i>	(iii)	Butyric acid
D.	<i>Lactobacillus</i>	(iv)	Lactic acid

Choose the correct answer from the options given below:

- (a) A-(i), B-(ii), C-(iii), D-(iv)
 (b) A-(ii), B-(i), C-(iii), D-(iv)
 (c) A-(i), B-(ii), C-(iv), D-(iii)
 (d) A-(iii), B-(iv), C-(i), D-(ii)

Read the following passage carefully and answer the five questions that follow (Q. 41 - 45):

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.

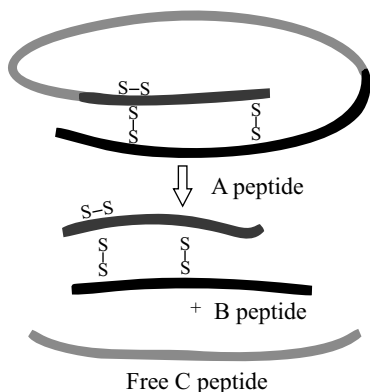
Following this synthesis of ideas, experimental verification of the chromosomal theory of inheritance by Thomas Hunt Morgan and his colleagues, led to discovering the basis for the variation that sexual reproduction produced. Morgan worked with the tiny fruit flies, which were found very suitable for such studies. They could be grown on simple synthetic medium in the laboratory. They complete their life cycle in a short span of time and a single mating could produce a large number of progeny flies. Also, there was a clear differentiation of the sexes - the male and female flies are easily distinguishable. Also, it has many types of hereditary variations that can be seen with low power microscopes.

41. The scientist who noted that "The behaviour of chromosomes was parallel to the behaviour of gene" were:
 (a) Sutton and Boveri
 (b) de Vries, Correns and Tschermak
 (c) Punnett and Bateson
 (d) Morgan and Bridges

42. Which of the following scientist worked with *Drosophila*?
- Walter Sutton and Theodor Boveri
 - Frederick Griffith
 - Thomas Hunt Morgan
 - Correns
43. *Drosophila melanogaster* complete their life cycle in
- About 1 week
 - About 2 weeks
 - About 3 to 4 weeks
 - About 7 weeks
44. Which statement is incorrect with respect to *Drosophila*.
- Could be easily grown in laboratory
 - Easily distinguishable male and female
 - Large number of contrasting traits
 - Less number of variations in their population helps in better studying of traits
45. Cross performed between yellow bodied, white eyed females and brown bodied red eyed males of *Drosophila* results in:
- 9 : 3 : 3 : 1 F_2 ratio
 - 1 : 2 : 1 F_2 ratio
 - F_2 ratio deviating from 9 : 3 : 3 : 1
 - F_1 ratio deviating from 1:2:1

Read the following passage carefully and answer the five questions that follow (Q. 46 - 50):

Insulin used for diabetes was earlier extracted from slaughtered cattle and pigs. Insulin from an animal source, though caused some patients to develop allergy or other type of reactions. Insulin consists of two short polypeptide chains: Chain A and chain B, that are linked bridges. In mammals, including human, insulin is synthesised as a pro-hormone.



46. Proinsulin is made up:

- Peptide A
- Free peptide
- Peptide B
- Peptide C

Choose the correct answer from the options given below:

- A, C, D only
- A, B, D only
- B, C, D only
- A, B, C only

47. Insulin is synthesised as _____ in mammals.

- Pro-hormone
- Pro-enzyme
- Peptide C
- Disulfide bond

48. Bonds which link 'A' and 'B' peptide chains of human insulin are _____.

- Peptide
- Disulfide
- Covalent
- Hydrogen

49. Identify the correct statements.

- Insulin was earlier extracted from the liver of slaughtered animals.
- Eli Lilly, an American company is producing insulin using r-DNA technique.
- Some diabetics developed allergy with the animal sourced insulin.
- Pro-insulin can control diabetes.

Choose the correct answer from the options given below:

- A and B only
- B and D only
- B and C only
- A and D only

50. Patient with diabetes have:

- Normal blood glucose level
- Normal glucose and electrolyte level in blood
- Blood glucose level less than normal level
- Blood glucose more than normal level

Answer Key

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (d) | 3. (b) | 4. (a) | 5. (b) | 6. (d) | 7. (c) | 8. (b) | 9. (a) | 10. (d) |
| 11. (a) | 12. (c) | 13. (c) | 14. (d) | 15. (b) | 16. (b) | 17. (c) | 18. (c) | 19. (b) | 20. (c) |
| 21. (b) | 22. (c) | 23. (b) | 24. (c) | 25. (a) | 26. (b) | 27. (b) | 28. (b) | 29. (c) | 30. (c) |
| 31. (c) | 32. (b) | 33. (c) | 34. (b) | 35. (b) | 36. (a) | 37. (b) | 38. (a) | 39. (c) | 40. (a) |
| 41. (a) | 42. (c) | 43. (b) | 44. (d) | 45. (c) | 46. (a) | 47. (a) | 48. (b) | 49. (c) | 50. (d) |

Explanations

1. (b) Inbreeding depression refers to the reduction in fertility and productivity that occurs when closely related individuals' mate.

Continued inbreeding increases the chances of homozygosity, which can lead to the expression of harmful recessive genes.

Interspecific depression refers to reduced fitness when individuals from different species hybridize.

Outbreeding depression occurs when individuals from different populations or breeds mate, leading to reduced fitness in the offspring.

2. (d) In bacteria, Bt toxin exists as an inactive protoxin. The toxin is converted into its active form due to alkaline pH in the gut. The active toxin binds to the surface of the midgut and causes cell swelling and lysis in susceptible insects.
3. (b) The process of inbreeding, which leads to increased homozygosity, can result in the aggregation of harmful recessive genes.
4. (a) In commensalism, one species benefit while the other is neither benefited nor harmed. In the case of the sea anemone and the clown fish, clownfish benefit from the association by finding protection, while the sea anemone is not significantly affected either positively or negatively.
- Predation is an interaction where one species (predator) hunts, kills and consumes another species (prey). In the case of the tiger and the deer, the tiger is the predator that hunts and kills the deer for food.
- Competition occurs when two or more species compete for the same limited

resources, such as food, water, or nesting sites. In this case, flamingoes and resident fishes in South American lakes might compete for food resources (e.g., aquatic plants, small invertebrates) within the ecosystem.

Mycorrhizae is a type of mutualistic association between certain fungi and the roots of plants.

5. (b) Pleiotropism refers to a phenomenon in genetics where a single gene can affect multiple, seemingly unrelated, phenotypic traits. In the case of phenylketonuria (PKU), a single gene mutation can lead to a variety of symptoms and issues, such as intellectual disabilities, behavioral problems and skin disorders, among others. This is an example of pleiotropy because a single genetic mutation affects multiple aspects of an individual's phenotype.
6. (d) Oxytocin is a hormone that acts on the uterine muscle and causes stronger contractions.
7. (c) Streptokinase is used as a clot buster in medical situations where there is a need to break down blood clots, such as in cases of heart attacks or deep vein thrombosis.
- Cyclosporin A is an immunosuppressive drug commonly used in organ transplantation and autoimmune diseases.
- Statins are a class of drugs used to lower cholesterol levels in the blood. They work by inhibiting an enzyme involved in cholesterol production, thus reducing overall cholesterol levels and helping to prevent cardiovascular diseases.

Lipase is an enzyme that breaks down fats and oils into smaller molecules. It is used in various applications, including laundry detergents, to help remove oil and grease stains from fabrics.

8. (b) Sporopollenin (the most organic resistant material) is known for its exceptional resistance to a wide range of environmental conditions, including high temperatures and strong acids.
9. (a) The replication of a retrovirus like HIV involves several steps in a specific sequence:
- E. Virus infects the normal cell.
- A. Viral RNA is introduced in the host cell.
- C. Viral DNA is produced by reverse transcription by the enzyme reverse transcriptase.
- D. The newly synthesized viral DNA is integrated into the host cell's genome.
- B. The newly synthesized viral DNA is used to produce new viral RNA genomes.
10. (d) The oestrus cycle is a reproductive cycle observed in most mammals, except for higher primates (monkeys, apes and humans). During the oestrus cycle, female animals experience periods of sexual receptivity and fertility, commonly referred to as "heat" or "estrus."
11. (a) PM refers to particulate matter with a diameter of 2.5 micrometers or smaller. These fine particles are of particular concern for human health because they can penetrate deep into the respiratory system and even enter the bloodstream, posing significant health risks. The Central Pollution

Control Board (CPCB) and other health organizations often emphasize the harmful effects of PM 2.5 on respiratory health and overall well-being.

12. (c) The mass of living organisms at a particular time at each trophic level is referred to as the "standing crop." It represents the amount of biomass present in a specific ecosystem or habitat at a given moment.
13. (c) RNA interference (RNAi) is a natural process that occurs in eukaryotic organisms as a method of cellular defense against viruses and other foreign genetic elements.
14. (d) Decomposition primarily relies on the presence of oxygen.
Under specific climatic conditions, the rate of decomposition varies: slower when detritus contains lignin and chitin and faster when it's rich in nitrogen and water-soluble substances like sugars.
15. (b) *Taq* polymerase is a heat-stable DNA polymerase enzyme that was originally isolated from the thermophilic bacterium *Thermus aquaticus*.
16. (b) *Agrobacterium tumefaciens* is not a pathogen of monocot plants; it mainly affects dicot plants.
The tumor-inducing plasmid of *Agrobacterium tumefaciens* (Ti plasmid) is indeed modified for use as a vector in genetic engineering, but it is not necessarily turned into a pathogenic cloning vector.
17. (c) Among vertebrates, the largest and most diverse group is fishes. Fishes include a wide variety of species, ranging from jawless fish like lampreys and hagfishes to cartilaginous fish like sharks and rays, as well as bony fish species like Rohu, sea horse. This immense diversity in the fish group contributes to the large number of species among vertebrates.
18. (c) In rotifers and honey bees, the formation of new organisms without fertilization is called parthenogenesis. Parthenogenesis is a type of asexual reproduction in which an egg develops into an embryo without being fertilized by a sperm.
19. (b) Klinefelter's Syndrome is a genetic disorder in humans that results from the presence of an additional X chromosome in males, typically resulting in a karyotype of XXY. This

condition can lead to various physical and developmental differences, including infertility, reduced testosterone levels and other hormonal imbalances.

20. (c) Karl Ernst von Baer was the one who disapproved the embryological support for evolution.
21. (b) Australian marsupials shows adaptive radiation, where diverse species evolve from a common ancestor. Wings of butterfly and bird exemplify analogous organs, adapted for similar functions but with different evolutionary origins. Industrial melanism showcases natural selection, as darker moths thrived in polluted environments over white moths. Forelimbs of horse and bat are homologous organs, derived from a common ancestor but adapted for different functions.
22. (c) *Azospirillum* is a genus of free-living soil bacteria that can fix atmospheric nitrogen and promote the growth of certain plants. *Rhizobium*, on the other hand, is a nitrogen-fixing bacterium that forms symbiotic associations with legume plants, while *Glomus* is a type of mycorrhizal fungus and *Oscillatoria* is a type of cyanobacteria.
23. (b) The correct arrangement of steps involved in Frederick Griffith's experiment is:
The *Streptococcus pneumoniae* bacteria (S and R strains) are grown on a culture plate to produce the S and R strain colonies. (Step C)
When live S-strain bacteria are injected into mice, the mice died. (Step D)
When R-strain bacteria are injected into mice, the mice remain alive. (Step A)
When heat killed S-strain was injected into mice, the mice remained alive.
When a mixture of heat-killed S-strain and live R-strain bacteria is injected into mice, the mice died. (Step E)
So, the correct order is C, D, A, B, E.
24. (c) *Homo erectus* is known to have used tools and possibly had some form of clothing, there is no concrete evidence to support the claim that they used hides to protect their bodies or engaged in burying their dead in a ritualistic manner. The use of hides for protection and burial practices are more associated with later hominin species and human ancestors.

25. (a) *Himgiri* is a wheat variety engineered for its resistance to leaf and stripe rust.

Pusa Komal is a cowpea variety bred to withstand bacterial blight. *Pusa Sadabahar* is a chilli variety cultivated for its resistance to both chilli mosaic virus and leaf curl. *Pusa Swarnim* is a *Brassica* variety developed for its resistance against white rust.

26. (b) Sickle cell anemia is an autosomal recessive genetic disorder caused by a mutation in the hemoglobin gene. It affects the structure of hemoglobin, leading to the formation of abnormal sickle-shaped red blood cells. To express the disease, an individual must inherit two copies of the mutated gene, one from each parent.
27. (b) Cornea absorbs the UV-B radiation.
28. (b) The process of copying the genetic information from one strand of DNA to RNA is called transcription. During transcription, an RNA molecule is synthesized using a DNA template strand.
29. (c) Cirrhosis is a medical condition characterized by scarring and damage to the liver tissue, often caused by long-term liver diseases such as chronic alcoholism or viral hepatitis. It is not transmitted through sexual contact.
Trichomoniasis, syphilis and chlamydia are sexually transmitted infections caused by specific pathogens and they are transmitted primarily through sexual contact.
30. (c) LNG-20 refers to a levonorgestrel-releasing intrauterine device (IUD). It releases the hormone levonorgestrel into the uterus, which provides contraceptive effects by thickening cervical mucus, inhibiting sperm movement. CuT, Cu7 and Multiload 375 are examples of copper-based IUDs, which do not release hormones but instead rely on the natural spermicidal properties of copper ions.
31. (c) Physical barriers include the skin and mucus lining the respiratory tract, which physically prevent pathogens from entering the body. Cytokine barriers involve the release of signaling molecules like interferons to inhibit viral replication. Cellular barriers involve immune cells like PMNL-neutrophils and monocytes, which directly combat pathogens. Physiological barriers refer to the acidic environment of the stomach, saliva and tears, which help destroy pathogens.

32. (b) *Agrobacterium tumefaciens* is a commonly used vector for introducing genes into plants, including tobacco.
33. (c) Sacred groves are areas of land that are protected and preserved due to their religious, cultural, or spiritual significance. They are considered a form of “in-situ” conservation, as they involve the protection of natural habitats and ecosystems in their original locations. Zoological parks, botanical gardens and wildlife safari parks are also important for conservation but are typically considered forms of “ex-situ” conservation, where species are protected outside their natural habitats.
34. (b) *Parthenium* (*Parthenium hysterophorus*), commonly known as “Carrot grass” came to India as a contaminant with imported wheat. It is an invasive weed that has spread extensively in various parts of the country and has become a significant environmental and agricultural issue.
35. (b) Typhoid is a bacterial disease caused by the bacterium *Salmonella typhi*. Smallpox, measles and polio are viral diseases caused by different types of viruses.
36. (a) In gene regulation, an operator is a DNA sequence where a repressor protein binds, controlling gene expression. A promoter is a DNA sequence where RNA polymerase attaches to initiate transcription. The α -gene is associated with hydrolyzing specific disaccharides and the γ -gene influences cell permeability.
37. (b) Aestivation is the ability of certain animals, such as snails and fish, to enter a state of dormancy during hot and dry conditions, particularly in the summer. It is a survival strategy that helps them avoid problems related to heat and desiccation (drying out) by reducing their metabolic activity and conserving water. Hibernation is a similar process, but it occurs during the cold winter months. Diapause is a form of dormancy in insects and other organisms triggered by environmental conditions, while migration involves the seasonal movement of animals from one region to another.
38. (a) The correct sequence of steps involved in recombinant DNA technology is as follows:
C. Isolation of the genetic material (DNA)
B. Cutting of source DNA as well as vector DNA at specific location and their joining
A. Insertion of recombinant DNA into host cell/organism
E. Culturing transformed host cells at large scale
D. Obtaining the foreign gene product
39. (c) Primary spermatocytes undergo the first meiotic division to form secondary spermatocytes, not mitosis. Meiosis is the process by which the chromosome number is reduced by half in germ cells. Seminal plasma is rich in fructose (not glucose), calcium and certain enzymes.
40. (a) *Aspergillus niger* is used in the production of citric acid. *Acetobacter aceti* is responsible for the production of acetic acid (vinegar). *Clostridium butylicum* produces butyric acid. *Lactobacillus* species are involved in the fermentation process, producing lactic acid.
41. (a) The scientists who noted that “The behavior of chromosomes was parallel to the behavior of genes” were Walter Sutton and Theodor Boveri.
42. (c) Thomas Hunt Morgan is the scientist who extensively worked with *Drosophila melanogaster* (fruit flies) to study genetics and make significant contributions to the understanding of gene linkage and chromosome mapping.
43. (b) *Drosophila melanogaster*, commonly known as the fruit fly, completes its life cycle in approximately 2 weeks under optimal laboratory conditions.
44. (d) *Drosophila melanogaster* is known for having a large number of variations and genetic diversity in its population, which makes it an excellent model organism for studying traits and genetic inheritance.
45. (c) The cross between yellow-bodied, white-eyed females (double recessive) and brown-bodied, red-eyed males (double dominant) involves two different gene loci that are not on the same chromosome. According to Mendel’s law of independent assortment, these genes assort independently during gamete formation.
In a typical Mendelian dihybrid cross, where two genes are segregating independently, the expected phenotypic ratio in the F_2 generation is 9 : 3 : 3 : 1. However, if there is some degree of linkage or interaction between these genes, the actual observed ratios may deviate from the expected ratio.
46. (a) Proinsulin is made up of three parts: Peptide A, Peptide B and a connecting peptide (C-peptide). During the processing of proinsulin, the C-peptide is cleaved and the remaining parts (Peptide A and Peptide B) are then joined together to form mature insulin.
47. (a) Insulin is synthesized as a pro-hormone in mammals. It is initially produced as proinsulin, which includes the A and B chains of insulin connected by a connecting peptide (C-peptide). Proinsulin is then cleaved to form the mature insulin hormone and C-peptide.
48. (b) The bonds that link the ‘A’ and ‘B’ peptide chains of human insulin are disulfide bonds.
49. (c) Insulin was not extracted from the liver of slaughtered animals. It was initially extracted from the pancreas of animals like pigs and cows. Pro-insulin itself is not used to control diabetes. Instead, pro-insulin is processed to produce mature insulin and C-peptide, which are used to manage diabetes.
50. (d) Patients with diabetes typically have blood glucose levels that are higher than the normal range. Diabetes is a condition characterized by the body’s inability to properly regulate blood glucose (sugar) levels.