

1. What is the function of protein GLUT-4?
 - a. Acts as an enzyme
 - b. Enables glucose transport into cells.
 - c. Fight infectious agents
 - d. Functions as intercellular ground substance.

2. Cell in the quiescent stage (G_0)
 - a. Always become cancerous
 - b. Show indefinite proliferation
 - c. Remain metabolically inactive
 - d. Remain metabolically active

3. Consider the following statements i, ii, and iii regarding criteria for essentiality of the nutrients in plants:
 - i. The presence of elements is must for plants to complete their life cycle.
 - ii. The role of the element can be replaced by another in their life cycle.
 - iii. The elements must be directly involved in the metabolism of the plant.Choose the correct statement/s:
 - a. i and iii
 - b. i and ii
 - c. iii only
 - d. ii and iii

4. During chemiosmotic synthesis of ATP in photosynthesis :
 - a. The protons accumulate in the intermembrane space of chloroplast.
 - b. The proton gradient is not required.
 - c. The protons accumulate in the intermembrane space of mitochondrion
 - d. The protons accumulate within the lumen of the thylakoids.

5. When tripalmitin is used as respiratory substrate. The process consumes 145 molecules of oxygen and releases 102 molecules of CO_2 , then RQ would be
 - a. 0.5
 - b. 0.7
 - c. 1.4
 - d. 1.0

6. Identify the incorrect statement with reference of Biocontrol agents:
 - a. They do not show any negative impact on crop plants
 - b. They help to increase the use of synthetic pesticides.
 - c. They are significant in treating ecologically sensitive area.
 - d. They do not affect non -target pests.

7. A farmer has applied chemical fertilisers in the crop field for many successive seasons, the crop growth was poor as soil lost its fertility. Suggest the suitable microorganism that replenishes the fertility of soil in this field.
 - a. Spirulina
 - b. Nostoc
 - c. Chlorella
 - d. Spirogyra

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8. In cloning vectors, antibiotic resistance genes are helpful for.
- Transfer of foreign gene to the host
 - Selection of recombinants
 - Making the host cells competent
 - Cleaving the vector by REN
9. A student while extracting DNA from *Aspergillus* fungus requires _____enzyme to break open the cell wall.
- Cellulase
 - Lysozyme
 - Pectinase
 - Chitinase
10. Identify the DNA sequence which can be cut using EcoRI.
- 5'TGCTTAGGTA3'
3'ACGAATTCAT5'
 - 5'ACGAATTCAT3'
3'TGCTTAGGTA5'
 - 5'TGCTTAGGTA3'
3'ATGAATTCGT5'
 - 3'ACGAATTCAT5'
5'TGCTTAAGTA3'
11. Which of the following amino acids is coded by single codon?
- Valine
 - Phenylalanine
 - Tyrosine
 - Tryptophan
12. In Prokaryotes the transcription of DNA is initiated with the help of
- Rho factor
 - Elongation factor
 - Sigma factor
 - Termination factor
13. According to Human Genome Project (HGP), the total number of genes in human genome is estimated at 30,000, the number of genes present on Y-chromosome are
- 2968 genes
 - 242 genes
 - 231 genes
 - 2898 genes
14. In a crime investigation, the investigating officer collects different biological samples from the crime spot for DNA Finger-Printing Analysis. Which of the following samples is not helpful in the analysis?
- Skin shreds
 - Erythrocytes
 - Semen samples
 - Hair Follicle
15. A mature mRNA consists of bases without any stop codon in between. Calculate the number of amino acids coded by the mRNA during translation.
- 9000
 - 299
 - 300
 - 450

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16. Which one of the following ecosystem has the highest annual net primary productivity?
a. Desert
b. Tropical deciduous forest
c. Tropical rain forest
d. Temperature evergreen forest
17. Of the total incident solar radiation of percentage photosynthetically Active Radiation (PAR) captured by the plants
a. 10–20% of PAR only
b. 2–10% of PAR only
c. 0–10% of PAR only
d. 30–40% of PAR only
18. The historic convention related to conservation of biological diversity is also known as
a. Earth Summit
b. Kyoto protocol
c. World Summit
d. Montreal protocol
19. Which one of the following human activities has contributed as deforestation by north-eastern sides of India?
a. Urbanisation
b. Industrialisation
c. Mono cropping
d. Jhum cultivation
20. In an area where DDT has been used extensively, the population of birds declined significantly because -
a. Birds became vulnerable to predators.
b. Birds stopped laying eggs
c. Many of the eggs laid by birds showed pre-matured breaking
d. Earthworms in the area got eradicated.
21. The brain capacity of Homo habilis
a. 1800 cc
b. Between 650 cc – 800 cc
c. 900 cc
d. 1400 cc
22. In Bougainvillea and Cucurbita, the axillary bud is modified into thorn and tendril respectively. This is an example of
a. Co-evolution
b. Divergent Evolution
c. Micro Evolution
d. Convergent Evolution
23. Identify the incorrect statements.
a. HIV is transmitted by mosquito bite.
b. Pneumonia is a bacterial disease.
c. Cancer is a non-infectious disease
d. Ringworm is a fungal disease.
24. A person shows symptoms like Sneezing, water eyes, morning cases and difficulty in breathing on exposure to certain substances in air, which type of antibody is produced during such condition?
a. IgG
b. IgE
c. IgM
d. IgA

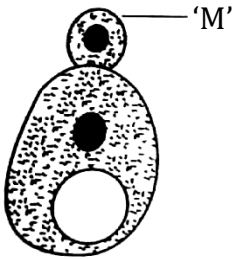
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25. A man was suffering from mental illness like depression and insomnia. Identify the drug which is normally used as medicine in such cases
- Morphine
 - Lysergic Acid Diethylamides (LSD)
 - Nicotine
 - Heroin

26. Plants like Marchantia and Funaria produce gametes by mitosis, because
- They are gametophytes
 - Plant body is haploid.
 - They are dioecious.
 - Gametophyte is diploid

27. Identify the asexual reproductive structure 'M' in the following diagram:



- Zoospore
 - Bud
 - Gemmule
 - Conidium
28. In some plants stigma and anther mature at different times because.
- It attracts pollinators
 - It facilitates self pollination
 - It prevents cross pollination
 - It facilitates cross pollination
29. Now-a-days agricultural practice is expensive to the farmers as they need to purchase hybrid seeds every year. Which of the following strategies can be employed to overcome this problem?
- Synthetic seeds
 - Production of Apomictic seeds
 - Conventional plant breeding
 - Parthenocarpy
30. Identify the correct order of steps involved in Artificial hybridization in plants:
- Artificial Pollination → Emasculation → Rebagging → Bagging
 - Rebagging → Artificial Pollination → Bagging → Emasculation
 - Emasculation → Bagging → Artificial Pollination → Rebagging
 - Bagging → Artificial pollination → Rebagging → Emasculation
31. Which of the following protozoan parasites causes sleeping sickness?
- Plasmodium
 - Entamoeba
 - Leishmania
 - Trypanosoma

32. Which of the following phyla possess body cavity as shown in the diagram below?



- a. Annelida
 - b. Porifera
 - c. Aschelminthes
 - d. Coelenterata
33. Testa and Tegmen of the seed coat represent
- a. Dried integuments
 - b. Dried Sepals
 - c. Dried Tepals
 - d. Dried petals
34. The trees growing in temperature regions show clear demarcation between spring wood and autumn wood. This is because
- a. The climatic conditions are uniform throughout the year
 - b. The water stress is more
 - c. The temperature is high
 - d. The climatic conditions are not uniform throughout the year
35. Identify the part labelled as 'M' in the diagram given below



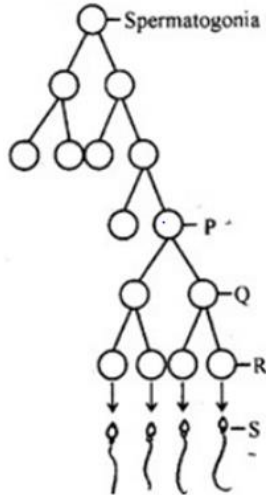
- a. Chromatid
 - b. Kinetochore
 - c. Centromere
 - d. Satellite
36. Which of these is not an advantage in genetically modified crops?
- a. Increases efficiency of mineral usage in plants
 - b. Reduces the reliance on chemical pesticides
 - c. Enhances the nutritional value of food
 - d. Increases the post harvest losses

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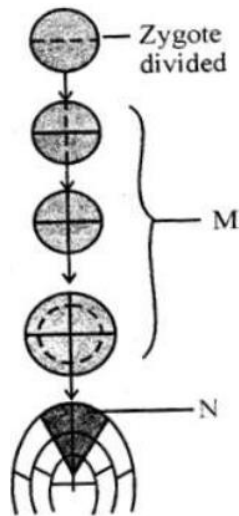
37. Some multinational companies have exploited the traditional knowledge of the indigenous people to produce commercially important bio products, without their consent. This is an example for
- Biopatent
 - Bioprospecting
 - Biopiracy
 - Bioremediation
38. In Amphibian and reptiles, the body temperature changes corresponding to external temperature. The organisms which show this kind of response is termed as -
- Partial Regulators
 - Regulators
 - Thermophiles
 - Conformers
39. Assertion (A): The Monarch butterfly feeds on poisonous weeds during its caterpillar stage. Reason (R): It helps butterfly to become distasteful to its predator.
- (A) is true (R) is false
 - (A) is true and (R) is its correct explanation
 - Both (A) and (R) are false
 - Both (A) and (R) are true, but (R) is not the correct explanation of (A)
40. From the given options, identify the correct combination of population interactions that correspond to the symbols given here.
- ++ -- +0
- Parasitism Competition Mutualism
 - Predation Competition Commensalism
 - Mutualism Competition Commensalism
 - Mutualism Parasitism Amensalism
41. The nourishing cells in the Seminiferous tubules are
- Follicular cells
 - Leydig cells
 - Sertoli cells
 - Spermatogonial cells
42. If in a normal Menstruating woman, menses occur 5th April, what will be the expected date of Ovulation?
- 10th April
 - 18th April
 - 29th April
 - 14th April

43. Identify the cells represented as P, Q, R and S in the given schematic representation of spermatogenesis.



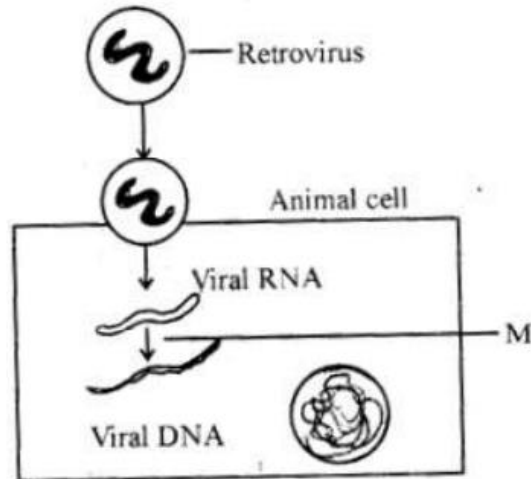
- a. P – Spermatozoa
Q – Spermatids
R – Secondary Spermatocyte
S – Primary Spermatocyte
 - b. P – Primary Spermatocyte
Q – Secondary Spermatocyte
R – Spermatids
S – Spermatozoa
 - c. P – Secondary Spermatocyte
Q – Spermatids
R – Spermatozoa
S – Primary Spermatocyte
 - d. P – Secondary Spermatocyte
Q – Primary Spermatocyte
R – Spermatozoa
S – Spermatids
44. The method of natural contraception which requires correct knowledge of Menstrual cycle is
- a. Periodic Abstinence
 - b. Lactational Amenorrhoea
 - c. IUDs – Intrauterine Devices
 - d. Coitus interrupts
45. A childless couple visit Assisted Reproductive Technologies (ARTs) centre to get assistance to have child. On diagnosis, it was noticed that there was low sperm count in the male partner. Which of the following strategy of ART is most suitable in this case?
- a. Gamete Intra-Fallopian Transfer (GIFT)
 - b. Artificial Insemination (AI)
 - c. Zygote Intra-Fallopian Transfer
 - d. In vitro Fertilisation (IVF)

46. In the following diagrammatic representation showing stages of embryonic development, identify the type of growth phase labelled as M and N:



- a. M is geometric phase and N is arithmetic phase
b. Both M and N are arithmetic phases.
c. M is arithmetic phase and N is geometric phase
d. Both M and N are geometric phases
47. Indigestion of fats in humans may be an indication of
a. Intestinal ulcers
b. Under secretion of saliva
c. Inflammation of liver
d. Under secretion of amylopsin
48. Choose the correct statement from the following :
a. Erythroblastosis foetalis may result when foetus is Rh^{-ve} and mother is Rh^{+ve}
b. Histamine, Serotonin and Heparin are secreted by basophils
c. Atherosclerosis is often referred as angina pectoris
d. Person with blood group AB can donate blood to person with blood group A
49. In blind spot of the human eye
a. Both cones and rods are absent.
b. Only cones are absent
c. Both cones and rods are present.
d. Only rods are absent
50. A boy after attaining sexual maturity shows muscular growth, growth of facial and axillary hair, aggressiveness and low pitch of voice. These changes are attributed to _____ hormone.
a. Estrogen
b. Testosterone
c. Secretin
d. Glucagon

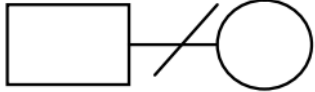
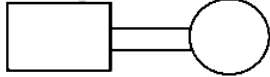

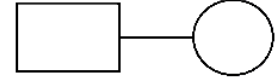
51. Identify the enzyme that catalyses the step labelled as 'M' in the given schematic representation of Replication of retrovirus



- a. Reverse transcriptase
b. RNA Polymerase
c. Recombinase
d. DNA ligase
52. In animal breeding, the maximum genetic variations can be achieved through.
a. Inbreeding
b. Outcrossing
c. Interspecific hybridization
d. Crossbreeding
53. The oil content and quality of groundnut variety was improved by plant breeding technique. This is an example of
a. Bioremediation
b. Biomagnification
c. Biodegradation
d. Biofortification
54. Microbes like spirulina can be good alternate to the conventional sources of proteins for human nutrition because
a. Their proteins are different from plant proteins.
b. they give more biomass in less time
c. they have high fibre content
d. they are produced using synthetic fertilisers
55. Consider the following morphological biochemical or physiological characteristics of plants.
i. Presence of hairy leaves
ii. Production of more nectar in flower
iii. High sugar content in plant parts
iv. Presence of higher aspartic acid concentration.
Choose the correct combination of statements which give natural resistance to plants against insect pests:
a. iii and iv
b. i and ii
c. i and iv
d. ii and iii

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56. Identify the odd one among the following disorders:
- a. Haemophilia
 - b. Sickle-cell -Anaemia
 - c. Phenyl Ketonuria
 - d. Thalassemia
57. From the chromosomal complements given below, identify the one which shows female heterogamety.
- a. XX - XO
 - b. XX - XY
 - c. XX - XXY
 - d. ZZ - ZW
58. In Morgan's experiment with *Drosophila*, when yellow bodied white eyed female was crossed with brown bodied red eyed male and their F₁ Progeny were intercrossed. What was the percentage of recombinants in F₂ generation?
- a. 62.8%
 - b. 98.7%
 - c. 1.3%
 - d. 37.2%
59. In the following symbols, used in human pedigree Analysis, identify the symbol that denotes consanguineous mating.
- a. 
 - b. 
 - c. 
 - d. 
60. Which of the following Nitrogen bases is found only in DNA?
- a. Cytosine
 - b. Adenine
 - c. Thymine
 - d. Guanine

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ANSWER KEYS

1. (b)	2. (d)	3. (a)	4. (c)	5. (b)	6. (a)	7. (b)	8. (b)	9. (d)	10. (d)
11. (d)	12. (c)	13. (c)	14. (b)	15. (c)	16. (c)	17. (b)	18. (a)	19. (d)	20. (c)
21. (b)	22. (b)	23. (a)	24. (b)	25. (b)	26. (b)	27. (b)	28. (b)	29. (c)	30. (c)
31. (d)	32. (c)	33. (a)	34. (a)	35. (d)	36. (d)	37. (c)	38. (b)	39. (b)	40. (c)
41. (c)	42. (b)	43. (b)	44. (a)	45. (b)	46. (a)	47. (b)	48. (b)	49. (a)	50. (b)
51. (a)	52. (c)	53. (d)	54. (b)	55. (c)	56. (a)	57. (d)	58. (c)	59. (b)	60. (c)

Solution

1. (b)
GLUT4 is an insulin-responsive glucose transporter that is found in the adipose tissue, and brain. It is present in the cytoplasm of cells in vesicles from which it is translocated to the plasma membrane under the influence of insulin.
2. (d)
In G_0 , some cells in the adult animals do not appear to exhibit division (e.g., heart cells) and many other cells divide only occasionally. These cells that do not divide further exist G_1 phase to enter an inactive stage called quiescent stage (G_0) of the cell cycle. Cells in this stage remain metabolically active but no longer proliferate unless called on to do so depending on the requirement of the organism.
3. (a)
The criteria for essentiality of an element are given below:
(a) The element must be absolutely necessary for supporting normal growth and reproduction. In the absence of the element the plants do not complete their life cycle or set the seeds.
(b) The requirement of the element must be specific and not replaceable by another element. In other words, deficiency of any one element cannot be met by supplying some other element.
(c) The element must be directly involved in the metabolism of the plant.
4. (c)
During chemiosmotic synthesis, ATP synthesis is linked to development of a proton gradient across a membrane. This time these are membranes of the thylakoid. There is one difference though, here the proton accumulation is towards the inside of the membrane, i.e., in the lumen. In respiration, protons accumulate in the inter membrane space of the mitochondria when electrons move through the ETS.
5. (b)
Respiratory quotient (RQ) or respiratory ratio can be defined as the ratio of the volume of CO_2 evolved to the volume of O_2 consumed during respiration. The value of respiratory quotient depends on the type of respiratory substrate. Its value is one for carbohydrates. However, it is always less than one for fats as fats consume more oxygen for respiration than carbohydrates. It can be illustrated through the example of tripalmitin fatty acid, which consumes 145 molecules of O_2 for respiration while 102 molecules of CO_2 are evolved. The RQ value for tripalmitin is 0.7.
6. (a)
Biocontrol refers to the use of biological methods for controlling plant diseases and pests. In modern society, these problems have been tackled increasingly by the use of chemicals – by use of insecticides and pesticides. These chemicals are toxic and extremely harmful, to human beings and animals alike, and have been polluting our environment (soil, ground water), fruits, vegetables and crop plants.

7. (b)

Blue green algae such as nostoc are very good at fixing nitrogen in the soil. They grow in symbiotic association with the roots of plant forming a legume where nitrogen fixation for the plant takes place. It provides the plant and the soil with nitrogen. It is an effective way of increasing production of plant along with soil fertility.

8. (b)

Antibiotic resistance gene present in the vector is mainly used for the selection of transformed bacterial cell. This transformed bacterial cell contains a recombinant vector with antibiotic resistance gene so that it can resist from the antibiotic (tetracycline) containing media. The non- transformed cell failed to survive in the antibiotic containing media during the selection process.

9. (d)

In order to use the DNA for genetic engineering processes, it must be in pure form, free from other macromolecules. This is termed DNA isolation and is the pioneer step. Since the DNA is enclosed within the membranes, it is required to break open the cell to release DNA along with other macromolecules such as RNA, proteins, polysaccharides, lipids, etc. and from this mixture, DNA is purified. A release of DNA from a cell is achieved by treating the cells or tissues with enzymes such as chitinase (fungus), etc. These enzymes degrade cell wall; plasma membrane degrading enzymes like lipase, etc., are also needed. Since, yeast is a fungus and fungal cell wall is made of chitin (fungal cellulose), isolation of DNA necessarily requires the use of enzyme chitinase.

10. (d)

In the laboratory, restriction enzymes are used to cut DNA into smaller fragments. The cuts are always made at specific nucleotide sequences. Different restriction enzymes recognize and cut different DNA sequences. EcoRI is a restriction enzyme that cleaves DNA double helices into fragments at specific sites. It is also a part of the restriction modification system. The DNA sequence can be cut using EcoRI is 3'ACGAATTCAT5', 5'TGCTTAAGTA3'.

11. (d)

- Valine is code for GTC, GTA and GTG.
- The codons UUU and UUC codes for phenylalanine only. This feature of the genetic code is called degenerate.
- Tyrosine is code for ATA, ATG.
- Tryptophan, encoded by a single codon UGG.

12. (c)

Sigma factor proteins promote binding of RNA polymerase to promoter sites within DNA sequences to allow for initiation of transcription. Sigma factors are specific for the gene and are affected by the cellular environment. Sigma factors can regulate at both the transcriptional and the translational level.

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13. (c)

According to salient features of human genome project, the total number of genes in human genome is estimated at 30,000, Chromosome 1 has most genes (2968), and the Y has the fewest (231).

14. (b)

Erythrocytes contain the pigment hemoglobin, which imparts the red colour to blood, and transport oxygen and carbon dioxide to and from the tissues. In a crime investigation, the investigating officer collects different biological samples from the crime spot for DNA finger printing analysis. Skin shreds, semen sample and hair follicle are helpful in the DNA finger printing.

15. (c)

- 3 bases contain 1 codon
- 900 bases contain 300 codons
- The number of amino acids coded by this mRNA during translation 300 codes contains 300 amino acids.

16. (c)

The tropical rain forest is a hot, moist biome found near Earth's equator. Tropical rainforests receive from 60 to 160 inches of precipitation that is fairly evenly distributed throughout the year. The tropical rain forest has highest annual net primary productivity (9000 K cal / m² / yr). Net primary productivity is the rate at which all the plants in an ecosystem produce net useful chemical energy.

17. (b)

Source of energy in an ecosystem is solar energy. 50 per cent of the solar energy incident over Earth is present in PAR (photo synthetically active radiation). Almost 1 to 5 percent of incident solar energy or 2 to 10 percent of PAR is captured by photosynthetic organisms in synthesis of organic matter.

18. (a)

The United Nations Conference on Environment and Development (UNCED), also known as the Rio de Janeiro Earth Summit, the Rio Summit, the Rio Conference, and the Earth Summit was a major United Nations conference held in Rio de Janeiro from 3 to 14 June 1992. More than 100 heads of states met in Rio de Janeiro in Brazil. Earth Summit was created as a response for Member States to cooperate together internationally on development issues after the Cold War.

19. (d)

Slash and burn agriculture, commonly called as Jhum cultivation in the north-eastern states of India, has also contributed to deforestation. In slash and burn agriculture, the farmers cut down the trees of the forest and burn the plant remains. The ash is used as a fertilizer and the land is then used for farming or cattle grazing. After cultivation, the area is left for several years so as to allow its recovery. The farmers then move on to other areas and repeat this process.

20. (c)

DDT was commonly used as a pesticide. On the prolonged use of the pesticide, there were many side effects observed. The plants were accumulated with these chemicals and the pesticide entered the food chain. The birds were affected due to the presence of the pesticide. The birds lay the eggs but due to the effect of this chemical, the egg shells were very thin. The shell break and the embryos did not develop. So, there was a failure in the hatching of the birds from the eggs.

21. (b)

Homo-habilis were first human like being with 650–800cc cranial capacity.

22. (b)

- Divergent evolution is the process whereby groups from the same common ancestor evolve and accumulate differences, resulting in the formation of new species. Divergent evolution creates homologous organs.
- Homologous organs are the organs which have similar structure and different function and have the same developmental origin. For example, the thorn of Bougainvillea and tendril of Cucurbita. Thorns and tendrils both are axillary in position and are the modifications of axillary buds. But they both perform different functions as thorns are for protection and tendrils are for support.

23. (a)

- HIV can't be transmitted through saliva, so it can't be transmitted through a mosquito's bite.
- Bacterial pneumonia is an infection of your lungs caused by certain bacteria. The most common one is Streptococcus (pneumococcus).
- Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. It is a major cause of death in developed countries. Most cancers are non-infectious diseases caused by a combination of genetic and environmental factors.
- Ringworm is a common infection of the skin and nails that is caused by fungus.

24. (b)

Immunoglobulin E (IgE) is antibodies produced by the immune system. If you have an allergy, your immune system over reacts to an allergen by producing antibodies called Immunoglobulin E (IgE). These antibodies travel to cells that release chemicals, causing an allergic reaction. This can cause wheezing, itching, running nose, watery or itchy eyes, and other symptoms.

25. (b)

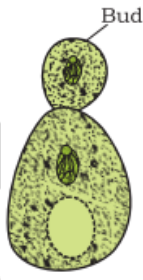
Drugs like barbiturates, amphetamines, benzodiazepines, lysergic acid diethyl amides (LSD), and other similar drugs, that are normally used as medicines to help patients cope with mental illnesses like depression and insomnia, are often abused.

26. (b)

- Liverworts usually grow in moist and shady habitats. The plant body is haploid. Thallus is dorsiventral and closely appressed to the substrate. Some members have tiny leaf-like appendages in two rows on the stem-like structures. For example: marchantia.
- Gametophyte is the predominant stage of the life cycle of moss. The leafy stage develops from the protonema as a lateral bud. The leafy stage consists of upright, slender axes bearing spirally arranged leaves. It is attached to the soil through multicellular and branched rhizoids. The leafy stage bears the sex organs. Vegetative reproduction takes place by fragmentation and budding in the secondary protonema.

27. (b)

A single individual (parent) is capable of producing offspring. As a result, the offspring that are produced are not only identical to one another but are also exact copies of their parent is known as asexual reproduction.



The small bulb-like projection coming out from the yeast cell is called a bud.

28. (b)

In dichogamy, the anther and stigma mature at different times. Either anthers dehisce before the stigma becomes receptive (called protandry) or stigma becomes receptive before anthers dehisce (called protogyny). During this time, if pollen grains of another plant of the same species fall on the stigma of the dichogamy flower then, the type of pollination that will occur is cross pollination.

29. (c)

Conventional plant breeding is the development or improvement of cultivars using conservative tools for manipulating plant genome within the natural genetic boundaries of the species. The general strategy is to breed a cultivar whose genetic purity and productivity can be sustained by its natural mating system. Conventional plant breeding is used to overcome the problem of purchasing hybrid seeds.

30. (c)

Artificial hybridization is one of the major approaches of crop improvement programme. In such crossing experiments it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination (from unwanted pollen). This is achieved by emasculation and bagging techniques.

The process of hybridization involves following steps:

- Emasculation
- Bagging
- Artificial Pollination
- Rebagging

31. (d)

In flagellated protozoans, the members of this group are either free-living or parasitic. They have flagella. The parasitic forms cause diseases such as sleeping sickness. Example: Trypanosoma.

32. (c)



In some animals, the body cavity is not lined by mesoderm; instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called pseudocoelom and the animals possessing them are called pseudocoelomates, e.g., aschelminthes.

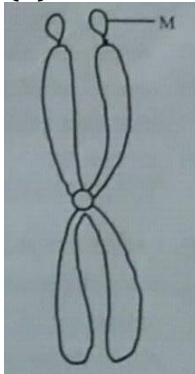
33. (a)

The ovule maturation leads to the developmental changes in integuments in form of reduction and disorganization of the thickening. The ovules are covered with two layers of integuments. The outer integument is called as testa while inner integument is called as tegmen. The seeds are developmentally matured ovules containing two integument layers. The seed coat is developed from integuments which protect the embryo from mechanical injuries and desiccation. Testa and tegmen of the seeds coat represent two layers of dried integuments.

34. (a)

In plants of temperate regions, cambium is more active in spring and less active in autumn seasons. In temperate regions, climatic conditions are not uniform throughout the year. However, in tropics, climatic conditions are uniform throughout the year.

35. (d)



A few chromosomes have non-staining secondary constrictions at a constant location. This gives the appearance of a small fragment called the satellite i.e. M is represented as satellite.

36. (d)

Genetically Modified or GM Crops are that type of plants whose DNA has been modified through genetic engineering for imbedding a new trait to the plant which does not occur naturally in the species. GM plants have been useful in many ways. Genetic modification has:

- Made crops more tolerant to abiotic stresses (cold, drought, salt, heat).
- Reduced reliance on chemical pesticides (pest-resistant crops).
- Helped to reduce post harvest losses.
- Increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).
- Enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice

37. (c)

Biopiracy is the term used to refer to the use of bio-resources by multinational companies and other organizations without proper authorization from the countries and people concerned without compensatory payment.

38. (b)

In regulator organisms are able to maintain homeostasis by physiological (sometimes behavioural also) means which ensures constant body temperature, constant osmotic concentration, etc. All birds and mammals, and a very few lower vertebrate and invertebrate species are indeed capable of such regulation (thermoregulation and osmoregulation).

39. (b)

The butterfly acquires this chemical during its caterpillar stage by feeding on a poisonous weed. Monarch butterfly is highly distasteful to its predator (bird) because of a special chemical present in its body.

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40. (c)

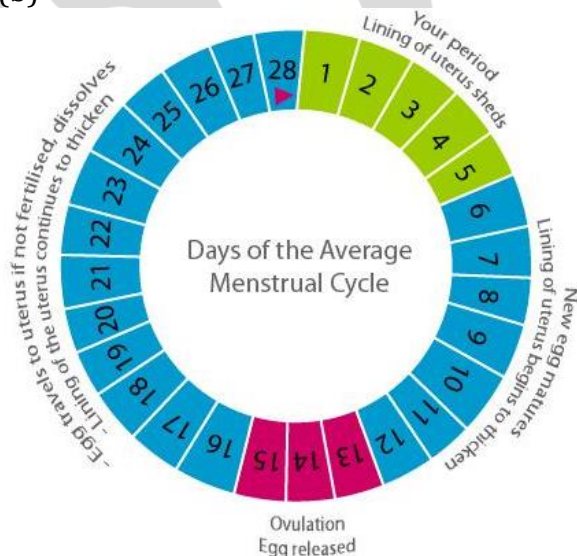
Species A	Species B	Name of Interaction
+	+	Mutualism
-	-	Competition
+	-	Predation
+	-	Parasitism
+	0	Commensalism
-	0	Amensalism

Both the species benefit in mutualism and both lose in competition in their interactions with each other. In both parasitism and Predation, only one species benefits (parasite and predator, respectively) and the interaction is detrimental to the other species (host and prey, respectively). The interaction where one species is benefitted and the other is neither benefitted nor harmed is called commensalism.

41. (c)

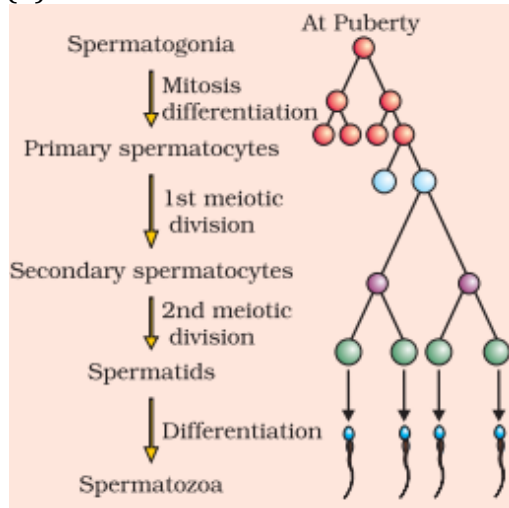
The large sustentacular cells that extend from the capsule to the lumen of the seminiferous tubule are called sertoli cells. They serve to support, nourish, and regulate the maturation of sperm cells during spermatogenesis.

42. (b)



Normal menstruating woman, menses occur on 5th April. The expected date of ovulation is 18th April.

43. (b)



Spermatogenesis is the process of the production of sperms from the immature germ cells in males. The correct sequence is P-Primary Spermatocyte, Q-Secondary Spermatocyte, R- Spermatid and S-Spermatozoa

44. (a)

Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Periodic abstinence is one such method in which the couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle when ovulation could be expected. As chances of fertilization are very high during this period, it is called the fertile period. Therefore, by abstaining from coitus during this period, conception could be prevented.

45. (b)

Infertility cases either due to inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculates, could be corrected by artificial insemination (AI) technique. In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus of the female.

46. (a)

- In the figure, the zygote undergoes mitotic division. In the initial stage or the M stage every progeny cell retains its capacity to divide and form progeny cells. Here no cells are undergoing differentiation. So, here the division occurs in $2n$ manner, growth in unicellular organisms and certain higher plants. The graph plotted here is exponential gradually moving to sigmoid.
- In stage N, not all the progeny cells retain their capacity to divide; some stop division and undergo differentiation. So, here the division occurs as 2,4,6,8 i.e. in an arithmetic progression. Example: growth in root and stem. The graph plotted here is linear.

47. (b)

Indigestion is often a sign of an underlying problem, such as ulcers, or gallbladder disease i.e. indigestion of fats in human may be an indication of inflammation of liver.

48. (b)

- Erythroblastosis fetalis classically results from incompatibility, which may develop when a woman with Rh-negative blood is impregnated by a man with Rh-positive blood and conceives a foetus with Rh-positive blood, sometimes resulting in haemolysis.
- Mast cells are a type of granular basophil cells in the connective tissue that releases heparin, histamine and serotonin during inflammation and allergic reactions.
- Coronary Artery Disease, often referred to as atherosclerosis, affects the vessels that supply blood to the heart muscle. It is caused by deposits of calcium, fat, cholesterol and fibrous tissues, which makes the lumen of arteries narrower. Angina is also called 'angina pectoris'. A symptom of acute chest pain appears when not enough oxygen is reaching the heart muscle. Angina can occur in men and women of any age but it is more common among the middle-aged and elderly. It occurs due to the conditions that affect the blood flow.
- Donors with blood type AB can donate to recipients with blood type AB only.

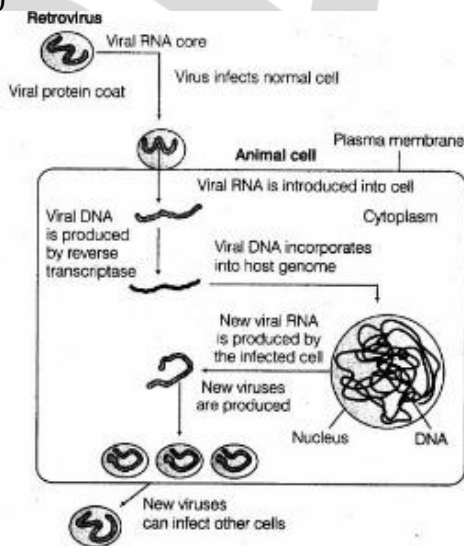
49. (a)

Photoreceptor cells (rods and cones) are not present in that region and hence, it is called the blind spot.

50. (b)

Testosterone is linked to many of the changes seen in boys during puberty (including an increase in height, body and pubic hair growth, and changes in sexual and aggressiveness and low pitch of voice).

51. (a)



Retroviruses infect the host cell and inject their genetic material, RNA, into the host cell. Inside the host cell, viral DNA is produced from the viral RNA by the enzyme reverse transcriptase which used RNA as a template to synthesize DNA. The viral DNA gets incorporated into the host genome and is replicated as the host genome replicates. Viral RNA is produced from the replicated viral DNA by transcription which then forms new virus particles. The viruses are then released which infect other cells.

52. (c)

- When breeding is between animals of the same breed it is called inbreeding,
- Out-crossing: This is the practice of mating of animals within the same breed, but having no common ancestors on either side of their pedigree up to 4-6 generations.
- Interspecific hybridization: In this method, male and female animals of two different species are mated. The maximum genetic variations are present in it. In some cases, the progeny may combine desirable features of both the parents, and may be of considerable economic value, e.g., the mule
- Cross-breeding: In this method, superior males of one breed are mated with superior females of another breed.

53. (d)

Biofortification refers, breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats – is the most practical means to improve public health.

Breeding for improved nutritional quality is undertaken with the objectives of improving –

- Protein content and quality;
- Oil content and quality;
- Vitamin content; and
- Micronutrient and mineral content.

54. (b)

Microbes like spirulina can be grown easily on materials like waste water from potato processing plants (containing starch), straw, molasses, animal manure and even sewage, to produce large quantities and can serve as food rich in protein, minerals, nutrition because of high rate of biomass production and growth in less time.

55. (c)

Insect resistance in host crop is due to morphological, biochemical or physiological characteristics. Some characters which make the plants resistance to insects are:

- High aspartic acids
- Presence of hairy leaves
- Low nitrogen and sugar content in maize make them resistant to stem borers.
- Production of less nectar in flower.

56. (a)

Most common and prevalent Mendelian disorders are Haemophilia, Cystic fibrosis, Sickle-cell anaemia, Colour blindness, Phenylketonuria, Thalassaemia, etc. It is important to mention here that such Mendelian disorders may be dominant or recessive. Haemophilia is sex linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny and other disease is autosomal recessive disorder.

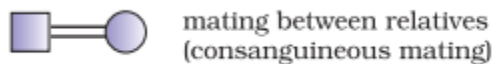
57. (d)

Birds show different mechanism of sex determination. In this case, the total number of chromosome is same in both males and females. But two different types of gametes in terms of the sex chromosomes are produced by females, i.e., female heterogamety. In order to have a distinction with the mechanism of sex determination described earlier, the two different sex chromosomes of a female bird has been designated to be the Z and W chromosomes. In these organisms the females have one Z and one W chromosome, whereas males have a pair of Z-chromosomes besides the autosomes.

58. (c)

Morgan hybridized yellow-bodied, white-eyed females to brown-bodied, red-eyed males and intercrossed their F1 progeny. He observed that the two genes did not segregate independently of each other and the F2 ratio deviated very significantly from the 9:3:3:1. Morgan and his group also found that even when genes were grouped on the same chromosome, some genes were very tightly linked (showed very low recombination) while others were loosely linked (showed higher recombination). For example, he found that the genes white and yellow were very tightly linked and showed only 1.3 per cent recombination while white and miniature wing showed 37.2 per cent recombination.

59. (b)



Consanguineous marriages are those between related individuals, defined simply as those that share a common ancestor.

60. (c)

DNA is a polymer of deoxyribonucleotides. The deoxyribonucleotides are made up of phosphoric acid and deoxyribonucleosides. The deoxyribonucleosides are made up of deoxyribose sugars and nitrogenous bases. The nitrogenous bases present in DNA are purine (adenine or guanine) and pyrimidine (cytosine or thymine).

- Thymine is specifically found in DNA.
- Uracil is found in RNA
- Guanine and cytosine is found in DNA as well as in RNA