

27
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BIOLOGY

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BOTANY

- Which one of the following shows isogamy with non-flagellated gametes?
(a) *Sargassum* (b) *Ectocarpus*
(c) *Ulothrix* (d) *Spirogyra*
- Five kingdom system of classification suggested by R.H. Whittaker is **not** based on:
(a) Presence or absence of a well defined nucleus.
(b) Mode of reproduction.
(c) Mode of nutrition.
(d) Complexity of body organisation.
- Which one of the following fungi contains hallucinogens?
(a) *Morchella esculenta*
(b) *Amanita muscaria*
(c) *Neurospora sp.*
(d) *Ustilago sp.*
- Archaeobacteria differ from eubacteria in:
(a) Cell membrane
(b) Mode of nutrition
(c) Cell shape
(d) Mode of reproduction
- Which one of the following is **wrong** about *Chara*?
(a) Upper oogonium and lower round antheridium.
(b) Globule and nucule present on the same plant.
(c) Upper antheridium and lower oogonium.
(d) Globule is male reproductive structure.
- Which of the following is responsible for peat formation?
(a) *Marchantia* (b) *Riccia*
(c) *Funaria* (d) *Sphagnum*
- Placenta and pericarp are both edible portions in:
(a) Apple (b) Banana
(c) Tomato (d) Potato
- When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as:
(a) Vexillary (b) Imbricate
(c) Twisted (d) Valvate
- You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two?
(a) Secondary xylem
(b) Secondary phloem
(c) Protoxylem
(d) Cortical cells
- Which one of the following statements is correct?
(a) The seed in grasses is not endospermic.
(b) Mango is a parthenocarpic fruit.
(c) A proteinaceous aleurone layer is present in maize grain.
(d) A sterile pistil is called a staminode.
- Tracheids differ from other tracheary elements in:
(a) having casparian strips
(b) being imperforate
(c) lacking nucleus
(d) being lignified
- An example of edible underground stem is:
(a) Carrot (b) Groundnut
(c) Sweet potato (d) Potato
- Which structures perform the function of mitochondria in bacteria?
(a) Nucleoid (b) Ribosomes
(c) Cell wall (d) Mesosomes
- The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as:
(a) Microtubules
(b) Microfilaments
(c) Intermediate filaments
(d) Lamins
- The osmotic expansion of a cell kept in water is chiefly regulated by:
(a) Mitochondria (b) Vacuoles
(c) Plastids (d) Ribosomes
- During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C?
(a) G₀ and G₁ (b) G₁ and S
(c) Only G₂ (d) G₂ and M

17. Match the following and select the correct answer:
- | | |
|-----------------|-----------------------------------|
| (A) Centriole | (i) Infoldings in mitochondria |
| (B) Chlorophyll | (ii) Thylakoids |
| (C) Cristae | (iii) Nucleic acids |
| (D) Ribozymes | (iv) Basal body cilia or flagella |
- (A) (B) (C) (D)
 (a) (iv) (ii) (i) (iii)
 (b) (i) (ii) (iv) (iii)
 (c) (i) (iii) (ii) (iv)
 (d) (iv) (iii) (i) (ii)
18. Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment?
- (a) It made possible the isolation and exact identification of auxin.
 (b) It is the basis for quantitative determination of small amounts of growth-promoting substances.
 (c) It supports the hypothesis that IAA is auxin.
 (d) It demonstrated polar movement of auxins.
19. Deficiency symptoms of nitrogen and potassium are visible first in:
- (a) Senescent leaves (b) Young leaves
 (c) Roots (d) Buds
20. In which one of the following processes CO₂ is not released?
- (a) Aerobic respiration in plants
 (b) Aerobic respiration in animals
 (c) Alcoholic fermentation
 (d) Lactate fermentation
21. Anoxygenic photosynthesis is characteristic of:
- (a) *Rhodospirillum* (b) *Spirogyra*
 (c) *Chlamydomonas* (d) *Ulva*
22. A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them?
- (a) Mutated (b) Embolised
 (c) Etiolated (d) Defoliated
23. Which one of the following growth regulators is known as 'stress hormone'?
- (a) Abscissic acid (b) Ethylene
 (c) GA₃ (d) Indole acetic acid
24. Geitonogamy involves:
- (a) fertilization of a flower by the pollen from another flower of the same plant.
 (b) fertilization of a flower by the pollen from the same flower.
 (c) fertilization of a flower by the pollen from a flower of another plant in the same population.
 (d) fertilization of a flower by the pollen from a flower of another plant belonging to a distant population.
25. Male gametocyte with least number of cell is present in:
- (a) *Pteris* (b) *Funaria*
 (c) *Lilium* (d) *Pinus*
26. An aggregate fruit is one which develops from:
- (a) Multicarpellary syncarpous gynoecium
 (b) Multicarpellary apocarpous gynoecium
 (c) Complete inflorescence
 (d) Multicarpellary superior ovary
27. Pollen tablets are available in the market for:
- (a) In vitro fertilization
 (b) Breeding programmes
 (c) Supplementing food
 (d) *Ex situ* conservation
28. Function of filiform apparatus is to:
- (a) Recognize the suitable pollen at stigma
 (b) Stimulate division of generative cell
 (c) Produce nectar
 (d) Guide the entry of pollen tube
29. Non-albuminous seed is produced in:
- (a) Maize (b) Castor
 (c) Wheat (d) Pea
30. Which of the following shows coiled RNA strand and capsomeres?
- (a) Polio virus
 (b) Tobacco mosaic virus
 (c) Measles virus
 (d) Retrovirus
31. Which one of the following is **wrongly** matched?
- (a) Transcription – Writing information from DNA to tRNA.
 (b) Translation – Using information in mRNA to make protein
 (c) Repressor protein – Binds to operator to stop enzyme synthesis.
 (d) Operon – Structural genes, operator and promoter.

32. Transformation was discovered by:
 (a) Meselson and Stahl
 (b) Hershey and Chase
 (c) Griffith
 (d) Watson and Crick
33. Fruit colour in squash is an example of:
 (a) Recessive epistasis
 (b) Dominant epistasis
 (c) Complementary genes
 (d) Inhibitory genes
34. Viruses have:
 (a) DNA enclosed in a protein coat
 (b) Prokaryotic nucleus
 (c) Single chromosome
 (d) Both DNA and RNA
35. The first human hormone produced by recombinant DNA technology is:
 (a) Insulin (b) Estrogen
 (c) Thyroxin (d) Progesterone
36. An analysis of chromosomal DNA using the Southern hybridization technique **does not** use:-
 (a) Electrophoresis (b) Blotting
 (c) Autoradiography (d) PCR
37. *In vitro* clonal propagation in plants is characterized by:
 (a) PCR and RAPD
 (b) Northern blotting
 (c) Electrophoresis and HPLC
 (d) Microscopy
38. An alga which can be employed as food for human being is:
 (a) *Ulothrix* (b) *Chlorella*
 (c) *Spirogyra* (d) *Polysiphonia*
39. Which vector can clone only a small fragment of DNA?
 (a) Bacterial artificial chromosome
 (b) Yeast artificial chromosome
 (c) Plasmid
 (d) Cosmid
40. An example of *ex situ* conservation is:
 (a) National Park
 (b) Seed Bank
 (c) Wildlife Sanctuary
 (d) Sacred Grove
41. A location with luxuriant growth of lichens on the trees indicates that the:
 (a) Trees are very healthy
 (b) Trees are heavily infested
 (c) Location is highly polluted
 (d) Location is not polluted
42. Match the following and select the correct option:
 (A) Earthworm (i) Pioneer species
 (B) Succession (ii) Detritivore
 (C) Ecosystem service (iii) Natality
 (D) Population growth (iv) Pollination
 (A) (B) (C) (D)
 (a) (i) (ii) (iii) (iv)
 (b) (iv) (i) (iii) (ii)
 (c) (iii) (ii) (iv) (i)
 (d) (ii) (i) (iv) (iii)
43. A species facing extremely high risk of extinction in the immediate future is called:
 (a) Vulnerable
 (b) Endemic
 (c) Critically Endangered
 (d) Extinct
44. The zone of atmosphere in which the ozone layer is present is called:
 (a) Ionosphere (b) Mesosphere
 (c) Stratosphere (d) Troposphere
45. The organization which publishes the Red List of species is:
 (a) ICFRE (b) IUCN
 (c) UNEP (d) WWF

ZOOLOGY

46. Select the Taxon mentioned that represents both marine and fresh water species:
 (a) Echinoderms (b) Ctenophora
 (c) Cephalochordata (d) Cnidaria
47. Which one of the following living organisms completely lacks a cell wall?
 (a) Cyanobacteria
 (b) Sea – fan (*Gorgonia*)
 (c) *Saccharomyces*
 (d) Blue–green algae
48. *Planaria* possess high capacity of:
 (a) Metamorphosis
 (b) Regeneration
 (c) Alternation of generation
 (d) Bioluminescence
49. A marine cartilaginous fish that can produce electric current is:
 (a) *Pristis* (b) *Torpedo*
 (c) *Trygon* (d) *Scoliodon*
50. Choose the correctly matched pair:
 (a) Tendon–Specialized connective tissue
 (b) Adipose tissue – Dense connective tissue
 (c) Areolar tissue – Loose connective tissue
 (d) Cartilage–Loose connective tissue

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51. Choose the correctly matched pair:-
(a) Inner lining of salivary ducts – Ciliated epithelium
(b) Moist surface of buccal cavity – Glandular epithelium
(c) Tubular parts of nephrons – Cuboidal epithelium
(d) Inner surface of bronchioles – Squamous epithelium
52. In 'S' phase of the cell cycle:
(a) Amount of DNA doubles in each cell.
(b) Amount of DNA remains same in each cell.
(c) Chromosome number is increased.
(d) Amount of DNA is reduced to half in each cell.
53. The motile bacteria are able to move by:
(a) Fimbriae (b) Flagella
(c) Cilia (d) Pili
54. Select the option which is **not correct** with respect to enzyme action:
(a) Substrate binds with enzyme at its active site.
(b) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.
(c) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.
(d) Malonate is a competitive inhibitor of succinic dehydrogenase.
55. Which one of the following is a non - reducing carbohydrate?
(a) Maltose
(b) Sucrose
(c) Lactose
(d) Ribose 5 - phosphate
56. The enzyme recombinase is required at which stage of meiosis:
(a) Pachytene (b) Zygotene
(c) Diplotene (d) Diakinesis
57. The initial step in the digestion of milk in humans is carried out by
(a) Lipase (b) Trypsin
(c) Rennin (d) Pepsin
58. Fructose is absorbed into the blood through mucosa cells of intestine by the process called:
(a) active transport
(b) facilitated transport
(c) simple diffusion
(d) co-transport mechanism
59. Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs:
(a) as bicarbonate ions
(b) in the form of dissolved gas molecules
(c) by binding to R.B.C.
(d) as carbamino - haemoglobin
60. Person with blood group AB is considered as universal recipient because he has:
(a) both A and B antigens on RBC but no antibodies in the plasma.
(b) both A and B antibodies in the plasma.
(c) no antigen on RBC and no antibody in the plasma.
(d) both A and B antigens in the plasma but no antibodies.
61. How do parasympathetic neural signals affect the working of the heart?
(a) Reduce both heart rate and cardiac output.
(b) Heart rate is increased without affecting the cardiac output.
(c) Both heart rate and cardiac output increase.
(d) Heart rate decreases but cardiac output increases.
62. Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule?
(a) Increase in aldosterone levels
(b) Increase in antidiuretic hormone levels
(c) Decrease in aldosterone levels
(d) Decrease in antidiuretic hormone levels
63. Select the correct matching of the type of the joint with the example in human skeletal system:

Type of joint	Example
(a) Cartilaginous joint	between frontal and parietal
(b) Pivot joint	between third and fourth cervical vertebrae
(c) Hinge joint	between humerus and pectoral girdle
(d) Gliding joint	between carpals
64. Stimulation of a muscle fiber by a motor neuron occurs at:
(a) the neuromuscular junction
(b) the transverse tubules
(c) the myofibril
(d) the sarcolemmal reticulum

65. Injury localized to the hypothalamus would most likely disrupt:
- short - term memory.
 - co-ordination during locomotion.
 - executive functions, such as decision making.
 - regulation of body temperature.
66. Which one of the following statements is **not correct**?
- Retinal is the light absorbing portion of visual photo pigments.
 - In retina the rods have the photopigment rhodopsin while cones have three different photopigments.
 - Retinal is a derivative of Vitamin C.
 - Rhodopsin is the purplish red protein present in rods only.
67. Identify the hormone with its **correct** matching of source and function:
- Oxytocin - posterior pituitary, growth and maintenance of mammary glands.
 - Melatonin - pineal gland, regulates the normal rhythm of sleepwake cycle.
 - Progesterone - corpus-luteum, stimulation of growth and activities of female secondary sex organs.
 - Atrial natriuretic factor - ventricular wall increases the blood pressure.
68. Fight-or-flight reactions cause activation of:
- the parathyroid glands, leading to increased metabolic rate.
 - the kidney, leading to suppression of reninangiotensin-aldosterone pathway.
 - the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine.
 - the pancreas leading to a reduction in the blood sugar levels.
69. The shared terminal duct of the reproductive and urinary system in the human male is:
- Urethra
 - Ureter
 - Vas deferens
 - Vasa efferentia
70. The main function of mammalian corpus luteum is to produce:
- estrogen only
 - progesterone
 - human chorionic gonadotropin
 - relaxin only
71. Select the correct option describing gonadotropin activity in a normal pregnant female:
- High level of FSH and LH stimulates the thickening of endometrium.
 - High level of FSH and LH facilitate implantation of the embryo.
 - High level of hCG stimulates the synthesis of estrogen and progesterone.
 - High level of hCG stimulates the thickening of endometrium.
72. Tubectomy is a method of sterilization in which:
- small part of the fallopian tube is removed or tied up.
 - ovaries are removed surgically.
 - small part of vas deferens is removed or tied up.
 - uterus is removed surgically.
73. Which of the following is a hormone releasing Intra Uterine Device (IUD)?
- Multiload 375
 - LNG-20
 - Cervical cap
 - Vault
74. Assisted reproductive technology, IVF involves transfer of:
- Ovum into the fallopian tube.
 - Zygote into the fallopian tube.
 - Zygote into the uterus.
 - Embryo with 16 blastomeres into the fallopian tube.
75. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind?
- 25%
 - 0%
 - 50%
 - 75%
76. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is:
- 0.4
 - 0.5
 - 0.6
 - 0.7
77. A human female with Turner's syndrome:
- has 45 chromosomes with XO.
 - has one additional X chromosome.
 - exhibits male characters.
 - is able to produce children with normal husband.

2014-6

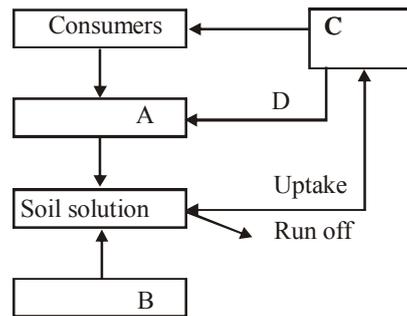
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78. Select the correct option:
 Direction of RNA synthesis Direction of reading of the template DNA strand
- (a) 5'—3' 3'—5'
 (b) 3'—5' 5'—3'
 (c) 5'—3' 5'—3'
 (d) 3'—5' 3'—5'
79. Commonly used vectors for human genome sequencing are:
 (a) T-DNA
 (b) BAC and YAC
 (c) Expression Vectors
 (d) T/A Cloning Vectors
80. Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of:
 (a) Analogous organs
 (b) Adaptive radiation
 (c) Homologous organs
 (d) Convergent evolution
81. Which one of the following are analogous structures?
 (a) Wings of Bat and Wings of Pigeon.
 (b) Gills of Prawn and Lungs of Man.
 (c) Thorns of *Bougainvillea* and Tendrils of *Cucurbita*
 (d) Flippers of Dolphin and Legs of Horse
82. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below?



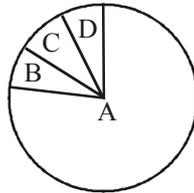
- (a) Hallucinogen (b) Depressant
 (c) Stimulant (d) Pain - killer
83. At which stage of HIV infection does one usually show symptoms of AIDS:-
 (a) Within 15 days of sexual contact with an infected person.
 (b) When the infected retro virus enters host cells.

- (c) When HIV damages large number of helper T-Lymphocytes.
 (d) When the viral DNA is produced by reverse transcriptase.
84. To obtain virus - free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken:
 (a) Apical meristem only
 (b) Palisade parenchyma
 (c) Both apical and axillary meristems
 (d) Epidermis only
85. What gases are produced in anaerobic sludge digesters?
 (a) Methane and CO₂ only
 (b) Methane, Hydrogen Sulphide and CO₂
 (c) Methane, Hydrogen Sulphide and O₂
 (d) Hydrogen Sulphide and CO₂
86. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to:
 (a) Western Chat
 (b) Meghalaya
 (c) Corbett National Park
 (d) Keoladeo National Park
87. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks:-



- | A | B | C | D |
|-------------------|---------------|---------------|-------------|
| (a) Rock minerals | Detritus | Litter fall | Producers |
| (b) Litter fall | Producers | Rock minerals | Detritus |
| (c) Detritus | Rock minerals | Producer | Litter fall |
| (d) Producers | Litter fall | Rock minerals | Detritus |

88. Given below is the representation of the extent of global diversity of *invertebrates*. What groups the four portions (A-D) represent respectively?



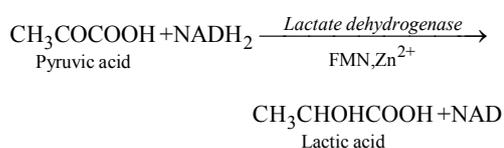
- | A | B | C | D |
|-----------------|---------------------|---------------------|---------------------|
| (a) Insects | Crustaceans | Other animal groups | Molluscs |
| (b) Crustaceans | Insects | Molluscs | Other animal groups |
| (c) Molluscs | Other animal groups | Crustaceans | Insects |
| (d) Insects | Molluscs | Crustaceans | Other animal groups |
89. A scrubber in the exhaust of a chemical industrial plant removes:-
- gases like sulphur dioxide
 - particulate matter of the size 5 micrometer or above
 - gases like ozone and methane
 - particulate matter of the size 2.5 micrometer or less
90. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain?
- plant → mice → snake → peacock:
- 0.02 J
 - 0.002 J
 - 0.2 J
 - 0.0002 J

HINTS & SOLUTIONS

BOTANY

1. (d) In *Spirogyra*, sexual reproduction occurs through conjugation. Gametes are non-flagellated morphologically similar. But physiologically different (isogamy with physiological anisogamy).
2. (a) **Five kingdom system of classification** was proposed by **R.H. Whittaker** (1969). The five kingdom classification is based on the following criteria :
 - Complexity of cell structure – Prokaryotes or Eukaryotes
 - Complexity of organisms body – Unicellular or Multicellular
 - Mode of obtaining nutrition – Autotrophs or Heterotrophs
 - Phylogenetic relationships
3. (b) Several mushrooms such as *Amanita muscaria*, *Psilocybe mexicana* and *Panaeolus* spp. secrete hallucinogenic substances like psilocybin and psilocin. These substances may destroy brain cells and perception power of human beings.
4. (a) Archaeobacteria differ from other bacteria in having a different cell wall structure. They lack peptidoglycan in cell wall and possess a monolayer of branched fatty acids attached to glycerol by ether bonds in their cell membranes.
5. (c) *Chara* is a green alga found attached to bottoms of shallow water of ponds, pools and lakes. Male sex organ is called antheridium. Female sex organ is called oogonium. Oogonium is borne at the top of four celled filament.
6. (d) *Sphagnum*, a moss, provides peat that have long been used as fuel. It has the capacity to retain water for long periods and as such used to cover the plant roots during transportation
7. (c) Tomato — edible part is pericarp and placenta.
8. (b) If the margins of sepals or petals overlap one another but not in any particular direction as in *Cassia* and gulmohur, the aestivation is called imbricate.
9. (c) Anatomically fairly old dicotyledonous root is distinguished from the dicotyledonous stem by position of protoxylem. In dicot root the protoxylem is located near the periphery of the vascular cylinder while in dicot stem the protoxylem is located near the centre of vascular bundle *i.e.*, the xylem is endarch.
10. (c) Generally, monocotyledonous seeds (*e.g.*, grasses) are endospermic but some as in orchids are non-endospermic. Mango is a drupe fruit develop from multicarpellary, syncarpous, superior ovary having one or many seeded. A sterile stamen is called a staminode. In monocots, outer covering of endosperm separates the embryo by a proteinous layer called aleurone layer.
11. (b) The walls of vessels (tracheary elements) are lignified and less thicker than tracheids. The lumen is wider. Vessels differ from tracheids in being cell fusions arising through the dissolution of end walls.
12. (d) Potato is an example of edible underground stem.
 - It is differentiated into nodes and internodes. The ‘eyes’ on potato tuber indicate axillary buds at the nodes.
 - It bears scaly leaves. The leaves do not store food.
 - Axillary buds arise at the nodes.
 - Does not bear roots.
13. (d) In some bacteria (*e.g.*, *Bacillus subtilis*) the plasma membrane form certain invaginations or in foldings called mesosomes in the cytoplasm. The mesosomes have various functions, viz., respiratory, secretory etc.
14. (b) Microtubule, microfilament and intermediate filaments along with ER form cytoskeleton. Microfilaments are non-living, solid and consists of actin protein. They are 4-6 nm in diameter.
15. (b) The vacuole is bound by a single membrane called tonoplast. It also functions as semipermeable membrane. It segregates vacuolar contents from cytoplasm, allows osmotic entry or exit of water, concentration and storage of nutrients as well as wastes.

16. (c) In M-phase both 4C and 2C of DNA are present in different stages.
17. (a) Centrosome is an organelle usually containing two cylindrical structures called centrioles. The centrioles form the basal body of cilia or flagella. In chloroplast a number of organised flattened membranous sacs called the thylakoids are present in the stroma. Chlorophyll pigments are present in the thylakoids. Each mitochondrion is a double membrane bound structure. The inner membrane forms a number of infoldings called the cristae towards the matrix. The cristae increase the surface area.
18. (b) **Charles Darwin and his son Francis Darwin** observed that the coleoptiles of Oat (*Avena sativa*) and canary grass (*Phalaris canariensis*) responded to unilateral illumination by growing towards the light source (**phototropic curvature or phototropism**). After a series of experiments, it was concluded that the tip of the coleoptile was the site of production of a substance, that caused the bending of coleoptile.
19. (a) The parts of the plants that show the deficiency symptoms also depend on the mobility of the element in the plant. For element that are actively mobilised within the plants and exported to young developing tissues, the deficiency symptoms tend to appear first in the older tissues. *For example*, nitrogen, potassium and magnesium are visible first in the senescent leaves.
20. (d) **Lactic acid fermentation** : It occurs in lactic acid bacteria (*Lactobacillus*) and muscles (Human). Pyruvic acid produced in glycolysis is reduced by NADH₂ to form lactic acid without producing carbon dioxide.
21. (a) In *Rhodospirillum*, electron donor is organic compound during photosynthesis.
22. (c) Etiolation is depigmentation of leaf when plant is placed in dark for more than 36 hrs.
23. (a) Abscisic Acid (ABA) is called stress hormone which works in adverse environmental condition when there is low water content in atmosphere or in drought conditions. ABA causes the stomatal closure of leaves due to which the water loss by the plant is minimized.
24. (a) **Geitonogamy** is the transfer of pollen grains in different flowers of same plant.
25. (c) Male gametophyte is highly reduced in angiosperm and is known as pollen grain. It is 2 or 3-celled.
26. (b) Aggregate fruits (Etaerio) develop from the multicarpellary apocarpous ovary. They are of following types; Etaerio of follicles, etaerio of achenes, etaerio of berries, etaerio of drupes.
27. (c) Pollen grains are rich in nutrients therefore used as food supplements. Athletes and race horses use these as tablets to enhance performance.
28. (d) Filiform apparatus helps in the entry of pollen tube into a synergid in ovule. Filiform apparatus is in form of finger like projection comprising a core of micro fibrils enclosed in a sheath. It resembles transfer cells meant for short distance movement of metabolites. It is responsible for the absorption of food from the nucleus.
29. (d) **Exalbuminous (non-endospermic) seeds** usually store reserve food material in cotyledons. In these seeds, the endosperm is used up and not present in mature seeds, *e.g.*, bean, gram and pea.
30. (b) **TMV (Tobacco Mosaic Virus)** is a rod-shaped virus. The rod has a core which contains helically coiled single stranded **RNA**. There is a protective covering of protein called **capsid** around the infective part. Capsid consists of small subunits called **capsomeres** and has antigenic property.



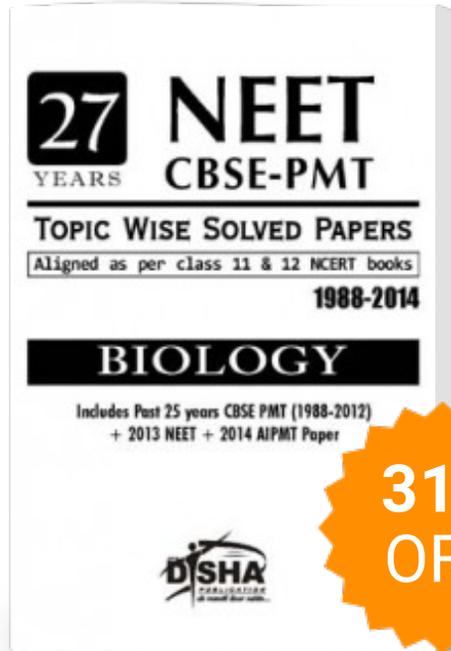
31. (a) Process of copying genetic information from DNA to RNA is called **transcription**. At a time only one DNA strand is being transcribed into RNA. The strand of DNA with polarity 3' → 5' act as **template strand** and the DNA strand with polarity 5' → 3' act as **coding strand**.
32. (c) Frederick Griffith (in 1928), a British Medical officer described the phenomenon of **bacterial transformation**. He carried out experiment with *Streptococcus pneumoniae* (bacterium causing pneumonia) which is used to infect mice. By using S Strain (heat killed) and R strain (live) it was concluded that R strain has been transformed by some material of S strain which makes R strain virulent and enable to synthesize smooth polysachharide.
33. (b) **Epistasis** is the phenomenon of suppression of phenotypic expression of gene by a nonallelic gene which shows its own effect. A dominant epistatic allele suppresses the expression of a nonallelic gene whether the latter is dominant or recessive. For example, fruit colour of Summer Squash (*Cucurbita pepo*) is governed by a gene which produces yellow colour in dominant state (Y-) and green colour in recessive state (yy).
34. (a) All viruses are nucleoprotein (Nucleic acid + Protein) in the structure. The nucleic acid (DNA and RNA) is genetic material. In a particular virus either DNA or RNA is genetic material never both are present in a virus.
Single stranded RNA or ss RNA - Tobacco mosaic virus (TMV)
Virus envelope is known as capsid. The capsid is composed of protein subunits called capsomere.
35. (a) Mammalian hormones were among the first products prepared in bacteria by r-DNA technology. Human insulin and human growth hormone are earliest examples.
36. (d) PCR is a technique for enzymatically replicating DNA without using a living organism such as *E. coli* or Yeast. It is commonly used in medical and biological research labs for a variety of tasks like detection of hereditary diseases, identification of genetic fingerprints etc.
37. (a) Now a days PCR and RAPD technique are used for the characterisation of *in vitro* clonal propagation in plants.
38. (b) *Chlorella* and *Spirulina* are unicellular algae, rich in proteins and are used as food supplements by space travellers.
39. (c) Plasmids are small extranuclear circular DNAs which carry extrachromosomal genes in bacteria and some fungi. They replicate independently. The best known vectors which are also available commercially are pBR322 and pUC-18.
40. (b) In *Ex-situ* conservation the threatened animals and plants are taken out of their natural habitat and are protected in special parks or areas like, **Zoological parks, Wild life safari parks and Botanical gardens** etc. The *ex situ* conservation also includes **cryopreservation**, fertilization of eggs *in vitro* and propagation of plants through '**Tissue culture methods**', preservation of seeds through **Seed banks**.
41. (d) Lichens are very good pollution indicators they do not grow in polluted areas. They are sensitive to sulphur dioxide pollution.
42. (d) Detritivores, (*e.g.* earthworm) break down detritus into smaller particles. The species that invade a bare area in succession is called pioneer species. The products of ecosystem processes are termed as ecosystem services, *e.g.*, healthy forest ecosystems purify air and water, mitigate droughts and floods etc. Nataly refers to number of births during a given period in the population.
43. (c) **Critically Endangered** : The taxon facing very high risk of extinction in the wild can become extinct any moment in the immediate future, *e.g.* *Sus salvinus* (Pigmy Hog), *Berberis nilghiriensis*.

44. (c) The ozone (O_3) found in upper part of the atmosphere, i.e., Stratosphere, is **Good ozone**, since, it acts as a shield for absorbing UV-radiations from sun.
45. (b) IUCN or WCN maintains a red data book which is a catalogue of threatened plants and animals facing risk of extinction. The IUCN red list (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.

ZOOLOGY

46. (d) Members of Ctenophora, Cephalochordata and Echinodermata are exclusively marine.
47. (b) *Gorgonia* (sea-fan) is an animal. All animals lack cell wall.
48. (b) *Planaria* is a flatworm which possess a high power of regeneration.
49. (b) *Torpedo* is a sluggish fish. It is carnivorous. The prey is first killed by electric shock. The shock can also be harmful for human beings.
50. (c) Tendon is dense regular connective tissue. Adipose tissue is a type of loose connective tissue located mainly beneath the cells. Cartilage is a type of specialised connective tissue.
51. (c) (i) Inner lining of salivary ducts - Compound epithelium
(ii) Moist surface of buccal cavity - Compound epithelium
(iii) Tubular parts of nephrons - Cuboidal epithelium.
(iv) Inner surface of bronchioles – Ciliated epithelium.
52. (a) During S or synthesis phase, replication or duplication of chromosomal DNA and synthesis of histone proteins takes place. During this time the amount of DNA per cell doubles.
53. (b) Motile bacteria have thin filamentous extensions from their cell wall called flagella.
54. (b) Inhibitions of succinic dehydrogenase by malonate is an example of competitive inhibition. Thus it is reversible reaction. On increasing the substrate (succinate) concentration the effect of inhibitor is removed and V_{max} remain same.
55. (b) Sucrose is classified under non reducing sugars because it does not have any free aldehyde or keto group.
56. (a) The enzyme recombinase is required at Pachytene stage of meiosis. It catalyzes the exchange of short pieces of DNA between two long DNA strands, particularly the exchange of homologous regions between the paired maternal and paternal chromosomes.
57. (c) Rennin (also called chymosin) is an enzyme that occurs in gastric juice and is a constituent of rennet. It coagulates milk by converting caseinogen to casein. The initial step in the digestion of milk in humans is carried out by rennin.
58. (b) Facilitated transport is a form of passive transport in which materials are moved across the plasma membrane by a transport protein down their concentration gradient; hence, it does not require energy.
59. (a) CO_2 from the respiratory tissues to the lungs is transported by the blood in 3 ways:
(i) In dissolved state or as a physical solution: Very small amount physically dissolved in plasma (7% i.e. \cong 0.3 ml of CO_2 by each 100 ml of blood).
(ii) Bicarbonate ions: \cong 70% (i.e. \cong 2.5 ml per 100 ml of blood) CO_2 diffuses in plasma & then into RBCs where it (in the presence of carbonic anhydrase) combines with H_2O to form carbonic acid which is almost spontaneously dissociated into hydrogen ion and bicarbonate ions.
(iii) Carbaminohaemoglobin : \cong 23% (i.e. \cong 1 ml of CO_2 per 100 ml of blood) combines with haemoglobin forming an unstable compound.
60. (a) Karl Landsteiner reported first time ABO blood groups in human beings. A, B and O blood groups were discovered by

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