

# NEET Biology Sample Paper 01

**A) Subject:** Biology

**B) Total Questions:** 50 Questions (All Compulsory)

**C) Marking Scheme & Rules:**

- Correct Answer: +4 marks
- Incorrect Answer: -1 mark (Negative marking)
- Unattempted Question: 0 marks
- Multiple Answers: Treated as incorrect, attracting -1 mark

## Botany (Section A)

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**Q1.** Which of the following statements is incorrect regarding the rules of Binomial Nomenclature?

- A. Biological names are generally in Latin and written in italics.
- B. The first word in a biological name represents the genus while the second component denotes the specific epithet.
- C. Both the words in a biological name, when handwritten, are separately underlined.
- D. The specific epithet starts with a capital letter while the generic name starts with a small letter.

**Q2.** Match the following organisms with their characteristic features:

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

**Q3.** Which of the following algae contains chlorophyll 'a', 'd' and phycoerythrin?

- A. Chlamydomonas
- B. Porphyra
- C. Fucus
- D. Dictyota

**Q4.** Identify the region of the root where the cells are very small, thin-walled, and with dense protoplasm:

- A. Region of Maturation
- B. Region of Elongation
- C. Region of Meristematic Activity
- D. Root Cap

**Q5.** In a monocot stem, vascular bundles are:

- A. Conjoint, open, and with endarch protoxylem
- B. Conjoint, closed, and scattered in ground tissue
- C. Radial and closed
- D. Conjoint, open, and arranged in a ring

**Q6.** The stage of Prophase I in which the "synaptonemal complex" dissolves and homologous chromosomes begin to separate is:

- A. Zygotene
- B. Pachytene
- C. Diplotene
- D. Diakinesis

**Q7.** Which of the following is the primary CO<sub>2</sub> acceptor in C<sub>4</sub> plants?

- A. Phosphoenol pyruvate (PEP)
- B. Ribulose 1,5-bisphosphate (RuBP)
- C. Oxaloacetic acid (OAA)
- D. 3-phosphoglyceric acid (PGA)

**Q8.** Match the following Plant Growth Regulators with their functions:

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

**Q9.** The functional megaspore in an angiosperm develops into:

- A. Ovule
- B. Endosperm

C. Embryo sac

D. Embryo

**Q10.** What is the expected phenotypic ratio in the  $F_2$  generation of a Mendelian dihybrid cross?

A. 3:1

B. 1:2:1

C. 9:3:3:1

D. 1:1:1:1

**Q11.** If the sequence of one strand of DNA is 5'-ATGCATGC-3', the sequence of the complementary strand in the 5'-3' direction will be:

A. 5'-TACGTACG-3'

B. 5'-GCATGCAT-3'

C. 3'-TACGTACG-5'

D. 5'-ATGCATGC-3'

**Q12.** Which process of DNA fingerprinting involves the transfer of DNA fragments from electrophoresis gel to a synthetic membrane?

A. Elution

B. Southern blotting

C. Northern blotting

D. Annealing

**Q13.** In a food chain, the population of which of the following is typically the largest?

A. Primary consumers

B. Secondary consumers

C. Producers

D. Tertiary consumers

**Q14.** The interaction where one species is harmed and the other is unaffected is called:

A. Commensalism

B. Amensalism

C. Mutualism

D. Parasitism

**Q15.** Which of the following is an example of ex-situ conservation?

A. National Park

B. Wildlife Sanctuary

C. Seed Bank

D. Biosphere Reserve

**Q16.** "The Evil Quartet" is a term used to describe:

A. Four major causes of biodiversity loss

B. Four stages of the cell cycle

C. Four types of nitrogenous bases

D. Four steps of PCR

**Q17.** The process of RNA interference (RNAi) has been used to develop plants resistant to:

A. Viruses

B. Fungi

C. Nematodes

D. Insects

**Q18.** In Bt cotton, the Bt toxin present in plant tissue as pro-toxin is converted into active toxin due to:

A. Acidic pH of the insect gut

B. Alkaline pH of the insect gut

C. Presence of enzymes in the insect gut

D. Action of microorganisms

**Q19.** Which enzyme is used to join DNA fragments?

A. DNA Polymerase

B. Restriction Endonuclease

C. DNA Ligase

D. Helicase

**Q20.** The technique of "Micro-injection" is used for:

- A. Inserting DNA into plant cells using a biolistic gun
- B. Direct injection of recombinant DNA into the nucleus of an animal cell
- C. Separation of DNA fragments
- D. Selection of transformants

**Q21.** Which of the following is a "stop codon"?

- A. AUG
- B. UGG
- C. UAA
- D. GUG

**Q22.** Water potential of pure water at standard temperature and pressure is:

- A. 100
- B. 10
- C. 0
- D. -1

**Q23.** Match the following microbes with their industrial products:

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

**Q24.** The ozone hole over Antarctica develops each year during:

- A. Late summer
- B. Late winter and early spring
- C. Early summer
- D. Autumn

**Q25.** During the process of ecological succession, the species that invade a bare area are called:

- A. Climax species
- B. Pioneer species
- C. Seral species
- D. Invasive species

## Zoology (Section B)

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**Q26.** Bilaterally symmetrical and acoelomate animals are exemplified by:

- A. Ctenophora
- B. Platyhelminthes
- C. Aschelminthes
- D. Annelida

**Q27.** Which of the following is a matching pair of an animal and its characteristic feature?

- A. Pavo — Neumatic bones
- B. Asterias — Radial symmetry in larvae
- C. Adamsia — Bilateral symmetry
- D. Chameleon — Four-chambered heart

**Q28.** The enzyme enterokinase helps in the conversion of:

- A. Protein into polypeptides
- B. Trypsinogen into trypsin
- C. Caseinogen into casein
- D. Pepsinogen into pepsin

**Q29.** Identify the correct statement with respect to the human digestive system:

- A. Serosa is the innermost layer of the alimentary canal.
- B. Ileum is a highly coiled part.
- C. Vermiform appendix arises from the duodenum.

D. Ileum opens into the small intestine.

**Q30.** Which of the following is the correct pathway of air during inhalation in humans?

- A. Nostrils → Pharynx → Larynx → Trachea → Alveoli
- B. Nostrils → Larynx → Pharynx → Trachea → Alveoli
- C. Larynx → Nostrils → Pharynx → Trachea → Alveoli
- D. Pharynx → Nostrils → Larynx → Trachea → Alveoli

**Q31.** Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL?

- A. 1500 mL
- B. 1700 mL
- C. 2200 mL
- D. 2700 mL

**Q32.** Which one of the following is correct regarding the "QRS complex" in a standard ECG?

- A. Repolarization of auricles
- B. Depolarization of auricles
- C. Depolarization of ventricles
- D. Repolarization of ventricles

**Q33.** Presence of which of the following conditions in urine are indicative of Diabetes Mellitus?

- A. Uremia and Renal Calculi
- B. Ketonuria and Glycosuria
- C. Renal Calculi and Hyperglycaemia
- D. Glycosuria and Proteinuria

**Q34.** Match the following columns and select the correct option:

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

D. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

**Q35.** The junction between a motor neuron and the sarcolemma of the muscle fibre is called:

- A. Sensory junction
- B. Neuromuscular junction
- C. Synaptic cleft
- D. Desmosome

**Q36.** Which part of the human brain is primarily responsible for the regulation of body temperature?

- A. Cerebellum
- B. Cerebrum
- C. Hypothalamus
- D. Medulla oblongata

**Q37.** Match the following hormones with their respective disease:

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

**Q38.** In which of the following techniques, the embryos are transferred to assist those females who cannot conceive?

- A. GIFT and ZIFT
- B. ICSI and ZIFT
- C. GIFT and ICSI
- D. ZIFT and IUT

**Q39.** The contraceptive 'Saheli':

- A. is an IUD.
- B. increases the phagocytosis of sperms within the uterus.
- C. is a non-steroidal preparation.

D. is a post-coital contraceptive.

**Q40.** Variations caused by mutation, as proposed by Hugo de Vries, are:

- A. Small and directional
- B. Random and directionless
- C. Random and directional
- D. Small and directionless

**Q41.** Flippers of Penguins and Dolphins are examples of:

- A. Convergent evolution
- B. Divergent evolution
- C. Adaptive radiation
- D. Natural selection

**Q42.** Which of the following is an autoimmune disease?

- A. Myasthenia gravis
- B. Arthritis
- C. Osteoporosis
- D. Gout

**Q43.** Identify the correct match for the following pair:

- A. Plasmodium vivax — Urticaria
- B. Wuchereria bancrofti — Elephantiasis
- C. Salmonella typhi — Common cold
- D. Haemophilus influenzae — Typhoid

**Q44.** The substance produced by a cell in viral infection that can protect other cells from further infection is:

- A. Serotonin
- B. Colostrum
- C. Interferon
- D. Histamine

- Q45.** Cyclosporin A, used as an immunosuppressive agent, is produced from:
- A. *Monascus purpureus*
  - B. *Saccharomyces cerevisiae*
  - C. *Trichoderma polysporum*
  - D. *Aspergillus niger*
- Q46.** Which of the following is a lymphoid organ?
- A. Thymus
  - B. Tonsils
  - C. Peyer's patches
  - D. All of the above
- Q47.** In the nomenclature of restriction enzyme 'EcoRI', the letter 'R' stands for:
- A. Genus
  - B. Species
  - C. Strain
  - D. Order
- Q48.** If a recombinant DNA is inserted within the coding sequence of an enzyme  $\beta$ -galactosidase, it results in:
- A. Insertional inactivation
  - B. Activation of the enzyme
  - C. Transformation of the host
  - D. Color formation in colonies
- Q49.** The first clinical gene therapy was given for the treatment of:
- A. Diabetes mellitus
  - B. Chickenpox
  - C. Adenosine deaminase (ADA) deficiency
  - D. Rheumatoid arthritis
- Q50.** The process of separating and purifying a protein before marketing is called:
- A. Upstream processing
  - B. Downstream processing
  - C. Bioreaction
  - D. Elution
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## Solutions

1. **(D)** In Binomial Nomenclature, the generic name (Genus) always starts with a capital letter, while the specific epithet (species) starts with a small letter. Example: *Mangifera indica*.
2. **(A)** Halophiles: Salt-loving bacteria (Salty areas).  
Thermoacidophiles: Thrive in high temperature and low pH (Hot springs).  
Methanogens: Produce methane (Marshy areas/Rumen of cattle).  
Cyanobacteria: Photosynthetic autotrophs (Aquatic/Chlorophyll 'a').
3. **(B)** *Porphyra* is a red alga (Rhodophyceae). Red algae are characterized by the presence of chlorophyll 'a', 'd', and the red pigment r-phycoerythrin.
4. **(C)** The region of meristematic activity is located a few millimeters above the root cap. The cells in this region are small, thin-walled, and have dense protoplasm to facilitate rapid division.
5. **(B)** In monocot stems, vascular bundles are scattered in the ground tissue. They are conjoint and closed (lacking cambium) and exhibit endarch protoxylem.
6. **(C)** During the Diplotene stage of Prophase I, the synaptonemal complex dissolves, and the recombined homologous chromosomes begin to separate from each other except at the sites of crossovers (chiasmata).
7. **(A)** In  $C_4$  plants, the primary  $CO_2$  acceptor is Phosphoenol pyruvate (PEP), located in the mesophyll cells. It is converted into oxaloacetic acid (OAA) by the enzyme PEP carboxylase.
8. **(A)** Auxin: Responsible for apical dominance.  
Gibberellin: Promotes bolting (internode elongation) in rosette plants.  
Cytokinin: Promotes lateral bud growth, overcoming apical dominance.  
Ethylene: A gaseous hormone essential for fruit ripening.
9. **(C)** In most angiosperms, three megaspores degenerate, and only one remains functional. This functional megaspore undergoes mitoses to develop into the 7-celled, 8-nucleate embryo sac (female gametophyte).
10. **(C)** In a typical Mendelian dihybrid cross (e.g., Round Yellow vs. Wrinkled Green seeds), the  $F_4$  generation phenotypic ratio is 9:3:3:1.
11. **(B)** DNA strands are antiparallel. For the sequence 5'-ATGCATGC-3', the complementary strand is 3'-TACGTACG-5'. Reading this in the 5'-3' direction gives 5'-GCATGCAT-3'.
12. **(B)** Southern blotting is the technique used to transfer DNA fragments from an agarose gel to a synthetic membrane (like nitrocellulose or nylon) during DNA fingerprinting.
13. **(C)** In a typical upright pyramid of numbers, the producers (plants) are the most numerous to support the subsequent trophic levels.

14. **(B)** Amensalism is an interaction where one species is harmed (inhibited) while the other remains unaffected (e.g., *Penicillium* inhibiting bacterial growth).
15. **(C)** Seed banks involve the preservation of genetic material outside their natural habitat, which is the definition of ex-situ conservation. National Parks and Sanctuaries are in-situ.
16. **(A)** "The Evil Quartet" refers to the four major drivers of biodiversity loss: Habitat loss and fragmentation, Over-exploitation, Alien species invasion, and Co-extinctions.
17. **(C)** RNA interference (RNAi) is used to create pest-resistant plants, specifically targeting the nematode *Meloidogyne incognita* which infects tobacco roots.
18. **(B)** The Bt toxin exists as an inactive pro-toxin. Once ingested by an insect, it is converted into an active form due to the alkaline pH of the insect's gut, which solubilizes the crystals.
19. **(C)** DNA Ligase acts as "molecular glue" by facilitating the joining of DNA strands together by catalyzing the formation of a phosphodiester bond.
20. **(B)** Micro-injection is a method where recombinant DNA is directly injected into the nucleus of an animal cell using a microscopic needle.
21. **(C)** The three stop codons (nonsense codons) that terminate protein synthesis are UAA (Ochre), UAG (Amber), and UGA (Opal).
22. **(C)** By convention, the water potential of pure water at standard temperatures and atmospheric pressure is taken to be zero.
23. **(A)** *Aspergillus niger* (Fungus): Citric acid.  
*Acetobacter aceti* (Bacterium): Acetic acid.  
*Clostridium butylicum* (Bacterium): Butyric acid.  
*Lactobacillus*: Lactic acid.
24. **(B)** The ozone hole over Antarctica is a seasonal phenomenon that occurs during late winter and early spring (September to October).
25. **(B)** Pioneer species are the first organisms to colonize a bare area (e.g., lichens on rocks or phytoplanktons in water).
26. **(B)** Platyhelminthes (flatworms) are the only group that exhibits bilateral symmetry while being acoelomate (lacking a body cavity). Ctenophores have radial symmetry, and Aschelminthes are pseudocoelomate.
27. **(A)** Pavo (Peacock) belongs to the class Aves. Birds possess pneumatic (hollow) bones to reduce body weight for flight. Larvae of Echinoderms like *Asterias* show bilateral symmetry, while adults show radial symmetry.
28. **(B)** Enterokinase is an enzyme secreted by the intestinal mucosa. Its specific role is to activate the inactive proenzyme trypsinogen into active trypsin, which then activates other pancreatic enzymes.

29. **(B)** The small intestine is divided into the duodenum, jejunum, and ileum. The ileum is the longest and most highly coiled portion. Serosa is the outermost layer, and the vermiform appendix arises from the caecum, not the duodenum.
30. **(A)** The correct sequence for inhaled air is: External nostrils → Nasal passage → Pharynx → Larynx (sound box) → Trachea (windpipe) → Bronchi → Bronchioles → Alveoli (site of gas exchange).
31. **(A)** Expiratory Capacity (EC) is the total volume of air a person can expire after a normal inspiration. It is calculated as:  $EC = 500 \text{ mL} + 1000 \text{ mL} = 1500 \text{ mL}$   
 $EC = 500 \text{ mL} + 1000 \text{ mL} = 1500 \text{ mL}$ . Residual Volume is not used in this specific calculation.
32. **(C)** In a standard Electrocardiogram (ECG), the P-wave represents atrial depolarization, the QRS complex represents ventricular depolarization (leading to contraction), and the T-wave represents ventricular repolarization.
33. **(B)** Diabetes Mellitus is characterized by hyperglycemia, which leads to the excretion of glucose in urine (Glycosuria) and the formation of ketone bodies (Ketonuria) due to the breakdown of fats.
34. **(A)** • Gout: Inflammation of joints due to uric acid crystal accumulation. • Osteoporosis: Age-related disorder characterized by decreased bone mass, often linked to low estrogen. • Tetany: Rapid spasms due to low calcium in body fluids. • Muscular dystrophy: Progressive degeneration of skeletal muscle, usually a genetic disorder.
35. **(B)** The neuromuscular junction (or motor-end plate) is the specific chemical synapse formed by the contact between a motor neuron and a muscle fiber.
36. **(C)** The hypothalamus contains several centers which control body temperature, urge for eating, and drinking. It also secretes various hypothalamic hormones.
37. **(A)** • Insulin deficiency: Diabetes mellitus. • Thyroxine deficiency: Goitre. • Corticoid deficiency: Addison's disease. • Growth Hormone excess (in adults): Acromegaly. • ADH deficiency: Diabetes insipidus.
38. **(D)** In In-Vitro Fertilization (IVF), the zygote or early embryo (up to 8 blastomeres) is transferred into the Fallopian tube (ZIFT), or embryos with more than 8 blastomeres are transferred into the uterus (IUT).
39. **(C)** 'Saheli' is an oral contraceptive for females developed by CDRI, Lucknow. It is a "once-a-week" pill that is non-steroidal and has very few side effects.
40. **(B)** According to Hugo de Vries, mutations are the cause of evolution. Unlike Darwin's small and directional variations, de Vries proposed that mutations are large, random, and directionless.
41. **(A)** Convergent evolution occurs when different structures evolve for the same function in different species. The flippers of penguins (birds) and dolphins (mammals) are analogous structures serving the same purpose.

42. (A) Myasthenia gravis is an autoimmune disorder that affects the neuromuscular junction, leading to fatigue, weakening, and paralysis of skeletal muscles.
43. (B) *Wuchereria bancrofti* (filarial worm) causes a slowly developing chronic inflammation of the organs, usually the lymphatic vessels of the lower limbs, known as Elephantiasis or Filariasis.
44. (C) Interferons are proteins secreted by virus-infected cells. They act as a cytokine barrier to protect non-infected neighboring cells from further viral infection.
45. (C) Cyclosporin A is a bioactive molecule used as an immunosuppressive agent in organ-transplant patients. It is produced by the fungus *Trichoderma polysporum*.
46. (D) The immune system consists of lymphoid organs. Primary lymphoid organs include bone marrow and thymus. Secondary lymphoid organs include the spleen, lymph nodes, tonsils, and Peyer's patches of the small intestine.
47. (C) In EcoRI: 'E' comes from the genus (*Escherichia*), 'co' from the species (*coli*), 'R' is the name of the strain (RY 13), and 'I' (Roman numeral) indicates the order in which the enzyme was isolated.
48. (A) Insertional inactivation is a technique used to select recombinants. When a foreign DNA is inserted within the coding sequence of  $\beta$ -galactosidase, the enzyme becomes inactive, and the recombinant colonies do not produce color.
49. (C) The first clinical gene therapy was given in 1990 to a 4-year-old girl with adenosine deaminase (ADA) deficiency, which is caused by the deletion of the gene for ADA.
50. (B) Downstream processing includes the separation and purification of the product after the biosynthetic stage. It ensures the product is ready for clinical trials or marketing.