

AIPMT 2012 Mains — Biology Question Paper with Solutions

46 Biology questions as set in the paper · answers checked by RankUp

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1. How many organisms in the list given below are autotrophs ? Lactobacillus, Nostoc, Chara, Nitrosomonas, Nitrobacter, Streptomyces, Sacharomyces, Trypanosoma, Porphyra, Wolfia

- (A) Four
- (B) Five
- (C) Six
- (D) Three

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2. For its activity, carboxypeptidase requires

- (A) Zinc
- (B) Iron
- (C) Niacin
- (D) Copper

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3. Which one of the following structures is an organelle within an organelle ?

- (A) Ribosome
- (B) Peroxisome
- (C) ER
- (D) Mesosome

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4. Which one of the following is a wrong statement regarding mutations ?

- (A) Deletion and insertion of base pairs cause frame-shift mutations
- (B) Cancer cells commonly show chromosomal aberrations
- (C) UV and Gamma rays are mutagens
- (D) Change in a single base pair of DNA does not cause mutation

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5. A test cross is carried out to

- (A) determine the genotype of a plant at F_2
- (B) predict whether two traits are linked
- (C) assess the number of alleles of a gene
- (D) determine whether two species or varieties will breed successfully

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6. How many plants in the list given below have marginal placentation? Mustard, Gram, Tulip, Asparagus, Arhar, Sun hemp, Chilli, Colchicum, Onion, Moong, Pea, Tobacco, Lupin

- (A) Four
- (B) Five
- (C) Six
- (D) Three

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7. Through their effect on plant growth regulators, what do the temperature and light control in the plants?

- (A) Apical dominance
- (B) Flowering
- (C) Closure of stomata
- (D) Fruit elongation

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8. Which one of the following generally acts as an antagonist to gibberellins ?

- (A) Zeatin
- (B) Ethylene
- (C) ABA
- (D) IAA

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9. As compared to a dicot root, a monocot root has :

- (A) More abundant secondary xylem
- (B) Many xylem bundles
- (C) Inconspicuous annual rings
- (D) Relatively thicker periderm

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10. Vernalisation stimulates flowering in

- (A) Zamikand
- (B) Turmeric
- (C) Carrot
- (D) Ginger

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11. What is the function of germ pore ?

- (A) Emergence of radicle
- (B) Absorption of water for seed germination
- (C) Initiation of pollen tube
- (D) Release of male gametes

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12. Which one of the following statements is wrong ?

- (A) When pollen is shed at two-celled stage, double fertilization does not take place
- (B) Vegetative cell is larger than generative cell
- (C) Pollen grains in some plants remain viable for months
- (D) Intine is made up of cellulose and pectin

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13. Plants with ovaries having only one or a few ovules are generally pollinated by

- (A) Bees
- (B) Butterflies
- (C) Birds
- (D) Wind

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14. Sacred groves are specially useful in

- (A) generating environmental awareness
- (B) preventing soil erosion
- (C) year-round flow of water in rivers
- (D) conserving rare and threatened species

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15. The rate of formation of new organic matter by rabbit in a grassland is called

- (A) Net productivity
- (B) Secondary productivity
- (C) Net primary productivity
- (D) Gross primary productivity

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16. Cuscuta is an example of

- (A) Ectoparasitism
- (B) Brood parasitism
- (C) Predation
- (D) Endoparasitism

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17. The second stage of hydrosere is occupied by plants like

- (A) Azolla
- (B) Typha
- (C) Salix
- (D) Vallisneria

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18. In gobar gas, the maximum amount is that of

- (A) Butane
- (B) Methane
- (C) Propane
- (D) Carbon dioxide

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19. Read the following four statements (A-D):

(A) Colostrum is recommended for the new born because it is rich in antigens.

(B) Chikungunya is caused by a Gram negative bacterium.

(C) Tissue culture has proved useful in obtaining virus-free plants.

(D) Beer is manufactured by distillation of fermented grape juice.

How many of the above statements are wrong?

- (A) Two
- (B) Three
- (C) Four
- (D) One

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20. Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produced (in the host cells)

- (A) both sense and anti-sense RNA
- (B) a particular hormone
- (C) an antifeedant
- (D) a toxic protein

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21. Biolistics (gene-gun) is suitable for

- (A) Disarming pathogen vectors
- (B) Transformation of plant cells
- (C) Constructing recombinant DNA by joining with vectors
- (D) DNA finger printing

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22. In genetic engineering, the antibiotics are used

- (A) as selectable markers
- (B) to select healthy vectors
- (C) as sequences from where replication starts
- (D) to keep the cultures free of infection

23. For its action, nitrogenase requires :

- (A) High input of energy
- (B) Light
- (C) Mn^{2+}
- (D) Superoxide radicals

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24. Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them?

- (A) Pteropus and Ornithorhynchus – Viviparity
- (B) Garden lizard and Crocodile – Three chambered heart
- (C) Ascaris and Ancylostoma – Metameric segmentation
- (D) Sea horse and Flying fish – Cold blooded (poikilothermal)

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25. Which one of the following categories of animals is correctly described with no single exception in it?

- (A) All reptiles possess scales, have a three chambered heart and are cold blooded (poikilothermal)
- (B) All bony fishes have four pairs of gills and an operculum on each side
- (C) All sponges are marine and have collared cells
- (D) All mammals are viviparous and possess diaphragm for breathing

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26. Which one of the following organisms is scientifically correctly named, correctly printed according to the International Rules of Nomenclature and correctly described?

- (A) *Musca domestica* – The common house lizard, a reptile
- (B) *Plasmodium falciparum* – A protozoan pathogen causing the most serious type of malaria
- (C) *Felis tigris* – The Indian tiger, well protected in Gir forests
- (D) *E. coli* – Full name *Entamoeba coli*, a commonly occurring bacterium in human intestine

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27. Which one of the following cellular parts is correctly described ?

- (A) Thylakoids – flattened membranous sacs forming the grana of chloroplasts
- (B) Centrioles – sites for active RNA synthesis
- (C) Ribosomes – those on chloroplasts are larger (80S) while those in the cytoplasm are smaller (70S)
- (D) Lysosomes – optimally active at a pH of about 8.5

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28. Identify the meiotic stage in which the homologous chromosomes separate while the sister chromatids remain associated at their centromeres :

- (A) Metaphase I
- (B) Metaphase II
- (C) Anaphase I
- (D) Anaphase II

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29. Which one of the following biomolecules is correctly characterised ?

- (A) Lecithin – a phosphorylated glyceride found in cell membrane
- (B) Palmitic acid – an unsaturated fatty acid with 18 carbon atoms
- (C) Adenylic acid – adenosine with a glucose phosphate molecule
- (D) Alanine amino acid – contains an amino group and an acidic group anywhere in the molecule

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30. The idea of mutations was brought forth by

- (A) Hugo de Vries, who worked on evening primrose
- (B) Gregor Mendel, who worked on *Pisum sativum*
- (C) Hardy Weinberg, who worked on allele frequencies in a population
- (D) Charles Darwin, who observed a wide variety of organisms during sea voyage

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31. What is it that forms the basis of DNA fingerprinting?

- (A) The relative proportions of purines and pyrimidines in DNA
- (B) The relative difference in the DNA occurrence in blood, skin and saliva
- (C) The relative amount of DNA in the ridges and grooves of the fingerprints
- (D) Satellite DNA occurring as highly repeated short DNA segments

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32. Which one of the following options gives the correct categorisation of six animals according to the type of nitrogenous wastes (A - Ammonotelic, B - Ureotelic, C - Uricotelic) they give out?

- (A) A: Pigeon, Humans; B: Aquatic Amphibia, Lizards; C: Cockroach, Frog
- (B) A: Frog, Lizards; B: Aquatic Amphibia, Humans; C: Cockroach, Pigeon
- (C) A: Aquatic Amphibia; B: Frog, Humans; C: Pigeon, Lizards, Cockroach
- (D) A: Aquatic Amphibia; B: Cockroach, Humans; C: Frog, Pigeon, Lizards

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33. Green revolution in India occurred during

- (A) 1960s
- (B) 1970s
- (C) 1980s
- (D) 1950s

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34. Which one of the following pairs of chemical substances is correctly categorised?

- (A) Calcitonin and thymosin – Thyroid hormones
- (B) Pepsin and prolactin – Two digestive enzymes secreted in stomach
- (C) Troponin and myosin – Complex proteins in striated muscles
- (D) Secretin and rhodopsin – Polypeptide hormones

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35. The supportive skeletal structures in the human external ears and in the nose tip are examples of

- (A) ligament
- (B) areolar tissue
- (C) bone
- (D) cartilage

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36. A fall in glomerular filtration rate (GFR) activates

- (A) juxta glomerular cells to release renin
- (B) adrenal cortex to release aldosterone
- (C) adrenal medulla to release adrenaline
- (D) posterior pituitary to release vasopressin

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37. Which one of the following characteristics is common both in humans and adult frogs ?

- (A) Four - chambered heart
- (B) Internal fertilisation
- (C) Nucleated RBCs
- (D) Ureotelic mode of excretion

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38. Which one of the following human organs is often called the "graveyard" of RBCs?

- (A) Gall bladder
- (B) Kidney
- (C) Spleen
- (D) Liver

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39. The secretory phase in the human menstrual cycle is also called

- (A) luteal phase and lasts for about 6 days
- (B) follicular phase lasting for about 6 days
- (C) luteal phase and lasts for about 13 days
- (D) follicular phase and lasts for about 13 days

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40. Select the correct statement about biodiversity :

- (A) The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as well as numerous rare animals
- (B) Large scale planting of Bt cotton has no adverse effect on biodiversity
- (C) Western Ghats have a very high degree of species richness and endemism
- (D) Conservation of biodiversity is just a fad pursued by the developed countries

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41. Which one of the following sets of items in the options given below are correctly categorised with one exception in it?

- (A) Items: UAA, UAG, UGA; Category: Stop codons; Exception: UAG
- (B) Items: Kangaroo, Koala, Wombat; Category: Australian marsupials; Exception: Wombat
- (C) Items: Plasmodium, Cuscuta, Trypanosoma; Category: Protozoan parasites; Exception: Cuscuta
- (D) Items: Typhoid, Pneumonia, Diphtheria; Category: Bacterial diseases; Exception: Diphtheria

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42. Which one of the following statements is correct with respect to immunity ?

- (A) Preformed antibodies need to be injected to treat the bite by a viper snake
- (B) The antibodies against small pox pathogen are produced by T-lymphocytes
- (C) Antibodies are protein molecules, each of which has four light chains
- (D) Rejection of a kidney graft is the function of B-lymphocytes

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43. The first clinical gene therapy was given for treating

- (A) Diabetes mellitus
- (B) Chicken pox
- (C) Rheumatoid arthritis
- (D) Adenosine deaminase deficiency

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44. Which one of the following represents a palindromic sequence in DNA ?

- (A) 5'-GAATTC-3' / 3'-CTTAAG-5'
- (B) 5'-CCAATG-3' / 3'-GAATCC-5'
- (C) 5'-CATTAG-3' / 3'-GATAAC-5'
- (D) 5'-GATACC-3' / 3'-CCTAAG-5'

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45. Where do certain symbiotic microorganisms normally occur in human body?

- (A) Caecum
- (B) Oral lining and tongue surface
- (C) Vermiform appendix and rectum
- (D) Duodenum

46. Consider the following four statements (a-d) and select the option which includes all the correct ones only.

(a) Single cell Spirulina can produce large quantities of food rich in protein, minerals, vitamins etc.

(b) Body weight-wise the microorganism Methylophilus methylotrophus may be able to produce several times more proteins than the cows per day

(c) Common button mushrooms are a very rich source of vitamin C

(d) A rice variety has been developed which is very rich in calcium

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

Answer key and explanations

1. Answer: (C) Six

Autotrophs make their own food: Nostoc, Chara, Porphyra and Wolffia are photosynthetic, while Nitrosomonas and Nitrobacter are chemoautotrophs, giving six. Lactobacillus, Streptomyces, Saccharomyces and Trypanosoma are heterotrophs, so counting only the photosynthetic ones (four) is the trap.

2. Answer: (A) Zinc

Carboxypeptidase is a metalloenzyme that needs zinc as its cofactor. Niacin is a vitamin forming the coenzymes NAD/NADP, not the cofactor of this enzyme.

3. Answer: (A) Ribosome

Mitochondria and chloroplasts contain their own 70S ribosomes, so ribosomes occur as an organelle within an organelle. Peroxisomes and ER lie free in the cytoplasm, and mesosomes are infoldings of the bacterial plasma membrane.

4. Answer: (D) Change in a single base pair of DNA does not cause mutation

A change in a single base pair is itself a mutation (a point mutation, as in sickle-cell anaemia), so that statement is wrong. Insertions and deletions do shift the reading frame, cancer cells commonly show chromosomal aberrations, and UV and gamma rays are mutagens.

5. Answer: (A) determine the genotype of a plant at F₂

A test cross crosses a dominant-phenotype plant (such as one from the F₂) with the homozygous recessive parent; the offspring ratio reveals whether that plant is homozygous or heterozygous. It is not a tool for testing linkage or counting alleles.

6. Answer: (C) Six

Marginal placentation is typical of the monocarpellary ovary of Fabaceae: gram, arhar, sun hemp, moong, pea and lupin, which makes six. Mustard has parietal placentation and tulip, asparagus, colchicum, onion, chilli and tobacco have axile placentation.

7. Answer: (B) Flowering

Light (photoperiodism) and low temperature (vernalisation) both act through growth regulators to decide when a plant flowers. Stomatal closure is driven by ABA in response to water stress, not by photoperiod and temperature.

8. Answer: (C) ABA

ABA promotes dormancy and inhibits growth, so it generally opposes gibberellins, which break dormancy and promote germination and elongation. Zeatin (a cytokinin) and IAA (an auxin) are growth promoters.

9. Answer: (B) Many xylem bundles

Monocot roots are polyarch, with many xylem bundles, whereas dicot roots usually have two to six. Monocot roots show no secondary growth, so they have no secondary xylem, annual rings or periderm to compare.

10. Answer: (C) Carrot

Biennials such as carrot need a cold period (vernalisation) before they can flower. Zamikand, turmeric and ginger are propagated vegetatively by underground stems and are not classic vernalisation examples.

11. Answer: (C) Initiation of pollen tube

Germ pores are thin areas of the exine where sporopollenin is absent, and the pollen tube grows out through them. The male gametes leave only later, from the tip of the tube inside the synergid, and the radicle comes out of the seed, not the pollen.

12. Answer: (A) When pollen is shed at two-celled stage, double fertilization does not take place

Pollen shed at the two-celled stage still achieves double fertilisation, because the generative cell divides into two male gametes inside the pollen tube. The other statements are true: the vegetative cell is larger, some pollen (e.g. of Solanaceae) stays viable for months, and the intine is cellulose and pectin.

13. Answer: (D) Wind

Wind-pollinated flowers usually have a single ovule in each ovary and many flowers in an inflorescence. Insect- and bird-pollinated flowers often have many ovules, since one visit can deliver many pollen grains.

14. Answer: (D) conserving rare and threatened species

Sacred groves are forest patches protected by religious tradition, and they act as refuges for many rare and threatened species, a form of in situ conservation. Benefits such as soil protection are side effects, not their special value.

15. Answer: (B) Secondary productivity

Secondary productivity is the rate at which consumers such as a rabbit form new organic matter. Gross and net primary productivity refer only to producers (green plants).

16. Answer: (A) Ectoparasitism

Cuscuta (dodder) grows on the outer surface of its host plant and draws nutrients through haustoria, which makes it an ectoparasite. Brood parasitism is egg-laying in another bird's nest, as the cuckoo does.

17. Answer: (D) Vallisneria

A hydrosere passes from phytoplankton to submerged plants (Vallisneria, Hydrilla), then floating plants (Azolla), reed swamp (Typha), sedge meadow and finally woodland (Salix). The second stage is therefore the submerged stage, not the floating stage of Azolla.

18. Answer: (B) Methane

Biogas (gobar gas) produced by methanogens in cattle dung is mostly methane, about 50–70%. Carbon dioxide is the second main component but present in a smaller amount.

19. Answer: (B) Three

Three are wrong. Colostrum is valuable because it is rich in antibodies (IgA), not antigens; chikungunya is caused by a virus; and beer is brewed from malted barley without distillation. Only the statement about tissue (meristem) culture giving virus-free plants is right.

20. Answer: (A) both sense and anti-sense RNA

Nematode-resistant tobacco uses RNA interference. The introduced DNA makes both sense and antisense RNA, which pair into double-stranded RNA that silences the nematode's mRNA, so no toxin or hormone is involved.

21. Answer: (B) Transformation of plant cells

In biolistics, gold or tungsten microparticles coated with DNA are shot into cells, a method suited to transforming plant cells. Disarming pathogens and joining DNA to vectors are done with enzymes, not a gene gun.

22. Answer: (A) as selectable markers

Antibiotic-resistance genes on a vector act as selectable markers: only transformed cells survive on medium containing the antibiotic. The replication start site is the ori, not an antibiotic sequence.

23. Answer: (A) High input of energy

Nitrogenase needs a large energy input, about 16 ATP for each N_2 reduced to ammonia, and it works only in the absence of oxygen. It does not need light, and oxygen radicals inactivate it.

24. Answer: (D) Sea horse and Flying fish - Cold blooded (poikilothermal)

The sea horse and the flying fish are both bony fishes and therefore cold-blooded (poikilothermous). Ornithorhynchus lays eggs, unlike the viviparous bat Pteropus; the crocodile has a four-chambered heart; and Ascaris and Ancylostoma are unsegmented roundworms.

25. Answer: (B) All bony fishes have four pairs of gills and an operculum on each side

Every bony fish has four pairs of gills covered by an operculum on each side. The other groups have exceptions: crocodiles have a four-chambered heart, some sponges (Spongilla) live in freshwater, and monotremes lay eggs.

26. Answer: (B) Plasmodium falciparum - A protozoan pathogen causing the most serious type of malaria

Plasmodium falciparum is correctly named and causes malignant malaria, the most serious kind. Musca domestica is the housefly, the tiger is Panthera tigris and Gir protects lions, and E. coli stands for Escherichia coli, not Entamoeba.

27. Answer: (A) Thylakoids - flattened membranous sacs forming the grana of chloroplasts

Thylakoids are flattened membranous sacs stacked into grana inside chloroplasts. Chloroplast ribosomes are the smaller 70S type and cytoplasmic ones are 80S, lysosomes work best at an acidic pH of about 5, and centrioles organise spindles rather than making RNA.

28. Answer: (C) Anaphase I

In anaphase I the homologous chromosomes move apart while each still has two sister chromatids joined at the centromere. The sister chromatids separate only in anaphase II.

29. Answer: (A) Lecithin - a phosphorylated glyceride found in cell membrane

Lecithin is a phospholipid, a glyceride carrying a phosphate group, and it is a major part of cell membranes. Palmitic acid is a saturated 16-carbon fatty acid, and adenylic acid contains ribose, not glucose.

30. Answer: (A) Hugo de Vries, who worked on evening primrose

Hugo de Vries proposed the mutation theory after his work on the evening primrose (Oenothera lamarckiana), describing sudden large changes that he called mutations. Darwin stressed small continuous variations, and Mendel described factors, not mutations.

31. Answer: (D) Satellite DNA occurring as highly repeated short DNA segments

DNA fingerprinting compares repetitive DNA, satellite DNA such as VNTRs whose copy number differs between people. The purine to pyrimidine ratio is the same in everyone, and the technique has nothing to do with skin ridges.

32. Answer: (C) A: Aquatic Amphibia; B: Frog, Humans; C: Pigeon, Lizards, Cockroach

Aquatic amphibians excrete ammonia; frogs and humans are ureotelic; and pigeons, lizards and cockroaches conserve water by excreting uric acid. The adult frog is ureotelic, which rules out the options that call it ammonotelic or uricotelic.

33. Answer: (A) 1960s

India's Green Revolution came in the 1960s with high-yielding semi-dwarf wheat and rice varieties. By the 1970s food production had already risen as a result.

34. Answer: (C) Troponin and myosin - Complex proteins in striated muscles

Troponin and myosin are both proteins of the contractile machinery of striated muscle. Thymosin comes from the thymus, not the thyroid; prolactin is a pituitary hormone; and rhodopsin is a visual pigment, not a hormone.

35. Answer: (D) cartilage

The external ear (pinna) and the tip of the nose are supported by flexible cartilage. Bone would be rigid, and ligaments join bone to bone rather than forming such frameworks.

36. Answer: (A) juxta glomerular cells to release renin

A fall in GFR is sensed by the juxtaglomerular apparatus, whose JG cells release renin. Renin begins the renin-angiotensin pathway, which only later causes aldosterone release from the adrenal cortex.

37. Answer: (D) Ureotelic mode of excretion

Both humans and adult frogs excrete urea (ureotelic). Frogs have a three-chambered heart, nucleated RBCs and external fertilisation, whereas humans have a four-chambered heart and enucleate RBCs.

38. Answer: (C) Spleen

The spleen filters the blood and destroys old, worn-out RBCs, earning the name 'graveyard of RBCs'. The liver breaks down haemoglobin products but is not the organ called the graveyard.

39. Answer: (C) luteal phase and lasts for about 13 days

After ovulation the corpus luteum secretes progesterone, so the secretory phase is the luteal phase, lasting from about day 15 to day 28 (roughly 13–14 days). The follicular phase is the proliferative phase before ovulation.

40. Answer: (C) Western Ghats have a very high degree of species richness and endemism

The Western Ghats are a biodiversity hotspot with very high species richness and many endemic species, especially amphibians and plants. Deserts have low diversity, and biodiversity conservation is a global need, not a fad.

41. Answer: (C) Items: Plasmodium, Cuscuta, Trypanosoma; Category: Protozoan parasites; Exception: Cuscuta

Plasmodium and Trypanosoma are protozoan parasites, while Cuscuta is a parasitic flowering plant, so it is the true exception. UAG is itself a stop codon, the wombat is a marsupial, and diphtheria is a bacterial disease, so the 'exceptions' in the other sets are not exceptions.

42. Answer: (A) Preformed antibodies need to be injected to treat the bite by a viper snake

Snake antivenom supplies preformed antibodies (passive immunisation), which is needed for a quick response to viper venom. Antibodies are made by B-lymphocytes and have two light and two heavy chains, and graft rejection is mediated by T-lymphocytes.

43. Answer: (D) Adenosine deaminase deficiency

The first clinical gene therapy (1990) was given to a four-year-old girl with adenosine deaminase (ADA) deficiency, putting a functional ADA cDNA into her lymphocytes. Diabetes is treated with recombinant insulin, which is not gene therapy.

44. Answer: (A) 5'-GAATTC-3' / 3'-CTTAAG-5'

5'-GAATTC-3' reads the same 5'→3' on both strands (the EcoRI site), which makes it a palindrome. In the other options the second strand does not read the same as the first in the 5'→3' direction.

45. Answer: (A) Caecum

The caecum, a blind sac at the start of the large intestine, hosts certain symbiotic micro-organisms. The vermiform appendix is a vestigial outgrowth of the caecum and the rectum only stores faeces.

46. Answer: (D) Statements (a), (b)

Spirulina is a protein-, mineral- and vitamin-rich single-cell food, and 250 kg of Methylophilus methylotrophus can make about 25 tonnes of protein a day, far more than a cow. Button mushrooms are not a rich vitamin C source, and the biofortified rice variety is rich in iron, not calcium.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.