

AIPMT 2011 Mains — Biology Question Paper with Solutions

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

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1. The cells lining the blood vessels belong to the category of

- (A) Columnar epithelium
- (B) Connective tissue
- (C) Smooth muscle tissue
- (D) Squamous epithelium

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2. Select the correct statement with respect to diseases and immunisation

- (A) Certain protozoans have been used to mass produce hepatitis B vaccine
- (B) Injection of snake antivenom against snake bite is an example of active immunisation
- (C) If due to some reason B- and T-lymphocytes are damaged, the body will not produce antibodies against a pathogen
- (D) Injection of dead / inactivated pathogens causes passive immunity

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3. Which one of the following animals may occupy more than one trophic level in the same ecosystem at the same time?

- (A) Goat
- (B) Frog
- (C) Sparrow
- (D) Lion

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4. Which one of the following is essential for photolysis of water ?

- (A) Copper
- (B) Boron
- (C) Manganese
- (D) Zinc

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5. What happens during fertilisation in humans after many sperms reach close to the ovum?

- (A) Cells of corona radiata trap all the sperms except one
- (B) Only two sperms nearest the ovum penetrate zona pellucida
- (C) Secretions of acrosome helps one sperm enter cytoplasm of ovum through zona pellucida
- (D) All sperms except the one nearest to the ovum lose their tails

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6. Bulk of carbon dioxide (CO₂) released from body tissues into the blood is present as

- (A) 70% carbamino-haemoglobin and 30% as bicarbonate
- (B) Carbamino-haemoglobin in RBCs
- (C) Bicarbonate in blood plasma and RBCs
- (D) Free CO₂ in blood plasma

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7. In mitochondria, protons accumulate in the

- (A) Intermembrane space
- (B) Matrix
- (C) Outer membrane
- (D) Inner membrane

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8. The unequivocal proof of DNA as the genetic material came from the studies on a

- (A) Viroid
- (B) Bacterial virus
- (C) Bacterium
- (D) Fungus

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9. Whorled simple leaves with reticulate venation are present in

- (A) China Rose
- (B) Alstonia
- (C) Calotropis
- (D) Neem

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10. Three of the following pairs of the human skeletal parts are correctly matched with their respective inclusive skeletal category and one pair is not matched.

Identify the non-matching pair.

- (A) Humerus and ulna – Appendicular skeleton
- (B) Malleus and stapes – Ear ossicles
- (C) Sternum and ribs – Axial skeleton
- (D) Clavicle and glenoid cavity – Pelvic girdle

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11. What is common between vegetative reproduction and Apomixis ?

- (A) Both occur round the year
- (B) Both produce progeny identical to the parent
- (C) Both are applicable to only dicot plants
- (D) Both bypass the flowering phase

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12. Read the following statement having two blanks (A and B): "A drug used for ___(A)___ patients is obtained from a species of the organism ___(B)___." The one correct option for the two blanks is

- (A) A: Swine flu, B: Monascus
- (B) A: AIDS, B: Pseudomonas
- (C) A: Heart, B: Penicillium
- (D) A: Organ-transplant, B: Trichoderma

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13. Which one of the following conditions of the zygotic cell would lead to the birth of a normal human female child?

- (A) Only one X chromosome
- (B) One X and one Y chromosome
- (C) Two X chromosomes
- (D) Only one Y chromosome

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14. The 24 hour (diurnal) rhythm of our body such as the sleep-wake cycle is regulated by the hormone

- (A) Adrenaline
- (B) Melatonin
- (C) Calcitonin
- (D) Prolactin

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15. Which one of the following pairs is wrongly matched while the remaining three are correct?

- (A) Bryophyllum – Leaf buds
- (B) Agave – Bulbils
- (C) Penicillium – Conidia
- (D) Water hyacinth – Runner

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16. Which one of the following is not considered as a part of the endomembrane system?

- (A) Vacuole
- (B) Lysosome
- (C) Golgi complex
- (D) Peroxisome

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17. In Kranz anatomy, the bundle sheath cells have

- (A) Thin walls, no intercellular spaces and several chloroplasts
- (B) Thick walls, many intercellular spaces and few chloroplasts
- (C) Thin walls, many intercellular spaces and no chloroplasts
- (D) Thick walls, no intercellular spaces and large number of chloroplasts

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18. Sweet potato is homologous to

- (A) Ginger
- (B) Turnip
- (C) Potato
- (D) Colocasia

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19. Ureters act as urinogenital ducts in

- (A) Frog's both males and females
- (B) Frog's males
- (C) Human males
- (D) Human females

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20. Which one of the following is a possibility for most of us in regard to breathing, by making a conscious effort ?

- (A) One can consciously breathe in and breathe out by moving the diaphragm alone, without moving the ribs at all
- (B) The lungs can be made fully empty by forcefully breathing out all air from them
- (C) One can breathe out air totally without oxygen
- (D) One can breathe out air through eustachian tubes by closing both the nose and the mouth

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21. Read the following four statements (A-D) about certain mistakes in two of them:

(A) The first transgenic buffalo Rosie produced milk which was human alpha-lactalbumin enriched

(B) Restriction enzymes are used in isolation of DNA from other macro-molecules

(C) Downstream processing is one of the steps of R-DNA technology

(D) Disarmed pathogen vectors are also used in transfer of R-DNA into the host

Which are the two statements having mistakes?

- (A) Statements (A) and (C)
- (B) Statements (A) and (B)
- (C) Statements (B) and (C)
- (D) Statements (C) and (D)

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22. The pathogen *Microsporium* responsible for ringworm disease in humans belongs to the same Kingdom of organisms as that of

- (A) *Rhizopus*, a mould
- (B) *Ascaris*, a round worm
- (C) *Taenia*, a tapeworm
- (D) *Wuchereria*, a filarial worm

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23. Which one of the following techniques made it possible to genetically engineer living organisms?

- (A) Heavier isotope labelling
- (B) Hybridization
- (C) Recombinant DNA techniques
- (D) X-ray diffraction

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24. Biodiversity of a geographical region represents

- (A) Genetic diversity present in the dominant species of the region
- (B) Species endemic to the region
- (C) Endangered species found in the region
- (D) The diversity in the organisms living in the region

AIPMT 2011 Mains · Q28

25. "Good ozone" is found in the

- (A) Stratosphere
- (B) Ionosphere
- (C) Mesosphere
- (D) Troposphere

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26. Which one of the following is a wrong matching of a microbe and its industrial product, while the remaining three are correct?

- (A) *Clostridium butylicum* - lactic acid
- (B) *Aspergillus niger* - citric acid
- (C) Yeast - statins
- (D) *Acetobacter aceti* - acetic acid

AIPMT 2011 Mains · Q29

27. Guttation is the result of

- (A) Osmosis
- (B) Root pressure
- (C) Diffusion
- (D) Transpiration

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28. Silencing of mRNA has been used in producing transgenic plants resistant to

- (A) White rusts
- (B) Bacterial blights
- (C) Bollworms
- (D) Nematodes

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29. Which one of the following statements is totally wrong about the occurrence of notochord while the other three are correct

- (A) It is absent throughout life in humans from the very beginning
- (B) It is present throughout life in *Amphioxus*
- (C) It is present only in larval tail in *Ascidians*
- (D) It is replaced by a vertebral column in adult frog

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30. The technique called gamete intrafallopian transfer (GIFT) is recommended for those females

- (A) Whose cervical canal is too narrow to allow passage for the sperms
- (B) Who cannot provide suitable environment for fertilisation
- (C) Who cannot produce an ovum
- (D) Who cannot retain the foetus inside uterus

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31. Common cold is not cured by antibiotics because it is

- (A) Caused by a Gram-negative bacterium
- (B) Not an infectious disease
- (C) Caused by a virus
- (D) Caused by a Gram-positive bacterium

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32. Which one of the following options gives the correct matching of a disease with its causative organism and mode of infection?

- (A) Elephantiasis – Wuchereria bancrofti – With infected water and food
- (B) Malaria – Plasmodium vivax – Bite of male Anopheles mosquito
- (C) Typhoid – Salmonella typhi – With inspired air
- (D) Pneumonia – Streptococcus pneumoniae – Droplet infection

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33. Frogs differ from humans in possessing

- (A) Nucleated red blood cells
- (B) Thyroid as well as parathyroid
- (C) Paired cerebral hemispheres
- (D) Hepatic portal system

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34. Test cross in plants or in Drosophila involves crossing

- (A) The F_1 hybrid with a double recessive genotype
- (B) Between two genotypes with dominant trait
- (C) Between two genotypes with recessive trait
- (D) Between two F_1 hybrids

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35. The logistic population growth is expressed by the equation

- (A) $dN/dt = rN$
- (B) $dN/dt = rN[(N - K)/N]$
- (C) $dt/dN = Nr[(K - N)/K]$
- (D) $dN/dt = rN[(K - N)/K]$

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36. About which day in a normal human menstrual cycle does rapid secretion of LH (popularly called LH-surge) normally occur?

- (A) 5th day
- (B) 11th day
- (C) 14th day
- (D) 20th day

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37. In the history of biology, the human genome project led to the development of

- (A) Bioinformatics
- (B) Biosystematics
- (C) Biotechnology
- (D) Biomonitoring

38. The type of muscles present in our

- (A) Thigh are striated and voluntary
- (B) Upper arm are smooth muscle fibres fusiform in shape
- (C) Heart are involuntary and unstriated smooth muscles
- (D) Intestine are striated and involuntary

39. Consider the following four statements whether they are correct or wrong:

(A) The sporophyte in liverworts is more elaborate than that in mosses

(B) Salvinia is heterosporous

(C) The life-cycle in all seed bearing plants is diplontic

(D) In Pinus male and female cones are borne on different trees

The two wrong statements together are

- (A) Statements (B) and (C)
- (B) Statements (A) and (B)
- (C) Statements (A) and (C)
- (D) Statements (A) and (D)

40. In angiosperms, functional megaspore develops into

- (A) Endosperm
- (B) Pollen sac
- (C) Embryo sac
- (D) Ovule

41. Which one of the following aspects is an exclusive characteristic of living things?

- (A) Perception of events happening in the environment and their memory
- (B) Increase in mass by accumulation of material both on surface as well as internally
- (C) Isolated metabolic reactions occur in vitro
- (D) Increase in mass from inside only

42. Some vascular bundles are described as open because these

- (A) Possess conjunctive tissue between xylem and phloem
- (B) Are not surrounded by pericycle
- (C) Are surrounded by pericycle but no endodermis
- (D) Are capable of producing secondary xylem and phloem

43. Which one of the following correctly represents the normal adult human dental formula?

- (A) (2123)/(2123)
- (B) (3133)/(3133)
- (C) (3131)/(3121)
- (D) (2133)/(2123)

44. Bacillus thuringiensis forms protein crystals which contain insecticidal protein.

This protein:

- (A) Is activated by acid pH of the foregut of the insect pest
- (B) Does not kill the carrier bacterium which is itself resistant to this toxin
- (C) Binds with epithelial cells of midgut of the insect pest ultimately killing it
- (D) Is coded by several genes including the gene cry

45. Which one of the following structures in Pheretima is correctly matched with its function?

- (A) Setae-defence against predators
- (B) Typhlosole - storage of extra nutrients
- (C) Clitellum - secretes cocoon
- (D) Gizzard - absorbs digested food

46. Which one of the following is not an essential mineral element for plants while the remaining three are?

- (A) Cadmium
- (B) Phosphorus
- (C) Iron
- (D) Manganese

47. Both, hydrarch and xerarch successions lead to

- (A) Highly dry conditions
- (B) Excessive wet conditions
- (C) Medium water conditions
- (D) Xeric conditions

48. The breakdown of detritus into smaller particles by earthworm is a process called

- (A) Mineralisation
- (B) Catabolism
- (C) Humification
- (D) Fragmentation

49. Consider the following statements (A)-(D) each with one or two blanks.

(A) Bears go into ___(1)___ during winter to ___(2)___ cold weather

(B) A conical age pyramid with a broad base represents ___(3)___ human population

(C) A wasp pollinating a fig flower is an example of ___(4)___

(D) An area with high levels of species richness is known as ___(5)___

Which one of the following options gives the correct fill ups for the respective blank numbers from (1) to (5) in the statements?

- (A) (3) - expanding, (4) - commensalism, (5) - biodiversity park
- (B) (1) - hibernation, (2) - escape, (3) - expanding, (5) - hot spot
- (C) (3) - stable, (4) - commensalism, (5) - marsh
- (D) (1) - aestivation, (2) - escape, (3) - stable, (4) - mutualism

50. One of the constituents of the pancreatic juice while poured into the duodenum in humans is

- (A) Trypsin
- (B) Enterokinase
- (C) Trypsinogen
- (D) Chymotrypsin

Answer key and explanations

1. Answer: (D) Squamous epithelium

The inner lining of blood vessels (endothelium) is a single layer of flat, thin cells, i.e. simple squamous epithelium, which suits diffusion across the vessel wall. Columnar epithelium lines the stomach and intestine, not blood vessels; smooth muscle lies in the middle layer of the wall, not the lining.

2. Answer: (C) If due to some reason B- and T-lymphocytes are damaged, the body will not produce antibodies against a pathogen

B-lymphocytes produce antibodies and need helper T-cells to do so, so damage to both lymphocyte types stops antibody production against a pathogen. Hepatitis B vaccine is produced in yeast, not protozoans; snake antivenom supplies ready-made antibodies (passive immunity); and dead or inactivated pathogens stimulate the body's own response (active immunity).

3. Answer: (C) Sparrow

A sparrow eats grains and fruits (primary consumer) as well as insects (secondary consumer), so it occupies two trophic levels at once. A goat is strictly herbivorous and a lion strictly a top carnivore; a frog feeds mainly on insects.

4. Answer: (C) Manganese

Splitting of water in photosystem II is carried out by the oxygen-evolving complex, which needs manganese along with calcium and chloride ions. Copper (in plastocyanin), boron and zinc are not involved in photolysis of water.

5. Answer: (C) Secretions of acrosome helps one sperm enter cytoplasm of ovum through zona pellucida

When sperms reach the ovum, the acrosome releases enzymes that help a single sperm penetrate the zona pellucida and enter the ovum; changes in the zona then block other sperms. The corona radiata does not selectively trap sperms, only one (not two) sperm enters, and the other sperms do not lose their tails.

6. Answer: (C) Bicarbonate in blood plasma and RBCs

About 70% of CO₂ is carried as bicarbonate, formed mainly in RBCs by carbonic anhydrase and carried largely in plasma; about 20-25% travels as carbamino-haemoglobin and about 7% as dissolved CO₂. The trap reverses the percentages: carbamino-haemoglobin is the minor form, not 70%.

7. Answer: (A) Intermembrane space

During electron transport, complexes in the inner membrane pump protons from the matrix into the intermembrane space, where they build up; their return through ATP synthase drives ATP formation. Protons are pumped out of the matrix, so they do not accumulate there.

8. Answer: (B) Bacterial virus

Hershey and Chase grew bacteriophages (bacterial viruses) with radioactive phosphorus or sulphur and found that only the labelled DNA entered the bacteria, giving unequivocal proof that DNA is the genetic material. Griffith's and Avery's work on the bacterium *Streptococcus* was suggestive but not unequivocal.

9. Answer: (B) Alstonia

Alstonia has whorled phyllotaxy (more than two leaves at a node) with simple leaves showing reticulate venation. China rose has alternate phyllotaxy, *Calotropis* opposite phyllotaxy, and neem has pinnately compound leaves.

10. Answer: (D) Clavicle and glenoid cavity - Pelvic girdle

The clavicle and the glenoid cavity (on the scapula) belong to the pectoral girdle, not the pelvic girdle, so this pair is mismatched. Humerus and ulna are limb bones of the appendicular skeleton, malleus and stapes are ear ossicles, and sternum and ribs belong to the axial skeleton.

11. Answer: (B) Both produce progeny identical to the parent

Neither vegetative reproduction nor apomixis involves meiosis and fusion of gametes, so both give progeny genetically identical to the parent. Apomixis forms seeds and so does not bypass flowering, and neither process is restricted to dicots.

12. Answer: (D) A: Organ-transplant, B: Trichoderma

Cyclosporin A, an immunosuppressant given to organ-transplant patients, is obtained from the fungus *Trichoderma polysporum*. *Monascus* yields statins (cholesterol-lowering), and *Penicillium* yields penicillin, an antibiotic rather than a heart drug.

13. Answer: (C) Two X chromosomes

A normal human female has 44 autosomes plus two X chromosomes (44 + XX). A single X gives Turner's syndrome, X with Y gives a male, and a zygote with only a Y chromosome is not viable.

14. Answer: (B) Melatonin

Melatonin, secreted by the pineal gland, regulates the 24-hour (diurnal) rhythm including the sleep-wake cycle. Adrenaline is the emergency hormone, calcitonin lowers blood calcium and prolactin stimulates milk production.

15. Answer: (D) Water hyacinth - Runner

Water hyacinth (*Eichhornia*) propagates vegetatively by offsets, not runners, so this pair is wrongly matched. Bryophyllum forms buds on leaf margins, Agave forms bulbils and *Penicillium* reproduces by conidia.

16. Answer: (D) Peroxisome

The endomembrane system comprises the ER, Golgi complex, lysosomes and vacuoles, whose functions are coordinated. Peroxisomes, like mitochondria and chloroplasts, work independently of this system and are not counted in it.

17. Answer: (D) Thick walls, no intercellular spaces and large number of chloroplasts

In Kranz anatomy of C_4 leaves, the bundle sheath cells are large, have thick walls, lack intercellular spaces and contain a large number of chloroplasts, where the Calvin cycle runs. Thin walls, intercellular spaces or few chloroplasts describe mesophyll-type cells, not the bundle sheath.

18. Answer: (B) Turnip

Sweet potato is a modified (adventitious) root swollen with food, and turnip is also a modified root, so the two are homologous. Ginger and potato are modified stems (rhizome and tuber) and *Colocasia* has a corm, so they are only analogous to sweet potato.

19. Answer: (B) Frog's males

In male frogs the testes connect to the kidneys through vasa efferentia, so the ureter carries both sperms and urine and works as a urinogenital duct. In female frogs the ureter carries only urine, and in humans the ureter never carries gametes.

20. Answer: (A) One can consciously breathe in and breathe out by moving the diaphragm alone, without moving the ribs at all

With conscious effort one can breathe by moving the diaphragm alone (abdominal breathing) while keeping the ribs still. The lungs can never be emptied completely because the residual volume always remains, and expired air still contains about 16% oxygen.

21. Answer: (B) Statements (A) and (B)

Rosie was a transgenic cow, not a buffalo, and restriction enzymes cut DNA at specific sites; isolation of DNA from other macromolecules uses enzymes such as lysozyme, cellulase, ribonuclease and protease. Downstream processing is a recognised step of recombinant DNA technology and disarmed pathogens are used as vectors, so those two statements are correct.

22. Answer: (A) Rhizopus, a mould

Microsporum, which causes ringworm, is a fungus, so it shares kingdom Fungi with the mould *Rhizopus*. *Ascaris*, *Taenia* and *Wuchereria* are worms belonging to kingdom Animalia.

23. Answer: (C) Recombinant DNA techniques

Recombinant DNA technology, cutting and joining DNA with restriction enzymes and ligase and inserting it into a host, made it possible to genetically engineer organisms. Isotope labelling and X-ray diffraction were tools for studying DNA, and hybridization is conventional breeding.

24. Answer: (D) The diversity in the organisms living in the region

Biodiversity of a region is the total variety of all organisms living there, at genetic, species and ecosystem levels. Endemic, endangered or dominant species are only parts of that diversity.

25. Answer: (A) Stratosphere

Ozone in the stratosphere absorbs harmful ultraviolet-B radiation from the sun, so it is called 'good ozone'. Ozone in the troposphere, near the ground, is a harmful pollutant ('bad ozone').

26. Answer: (A) *Clostridium butylicum* - lactic acid

Clostridium butylicum produces butyric acid; lactic acid comes from bacteria such as *Lactobacillus*, so this pair is wrong. *Aspergillus niger* produces citric acid, *Acetobacter aceti* acetic acid, and the yeast *Monascus purpureus* statins.

27. Answer: (B) Root pressure

Guttation, the loss of water droplets from leaf tips and margins through hydathodes at night or early morning, is caused by root pressure when transpiration is low. Transpiration is water loss as vapour, which is the opposite situation.

28. Answer: (D) Nematodes

RNA interference, in which double-stranded RNA silences the parasite's mRNA, was used to make tobacco plants resistant to the nematode *Meloidogyne incognita*. Bollworm resistance comes from cry genes (*Bt* toxin), not mRNA silencing.

29. Answer: (A) It is absent throughout life in humans from the very beginning

All chordates, humans included, have a notochord at some stage; in humans it forms in the embryo and is later replaced by the vertebral column, so saying it is absent from the very beginning is totally wrong. Amphioxus keeps it throughout life, ascidians have it only in the larval tail and in frogs it is replaced by the vertebral column.

30. Answer: (C) Who cannot produce an ovum

In GIFT an ovum collected from a donor is placed in the fallopian tube of a female who cannot produce ova but can provide the right environment for fertilisation and development. A female who cannot provide a suitable environment for fertilisation would not benefit, because fertilisation in GIFT takes place inside her own tube.

31. Answer: (C) Caused by a virus

Common cold is caused by rhinoviruses, and antibiotics act on bacterial structures and processes, so they have no effect on viruses. It is an infectious disease spread by droplets or contact, not a bacterial one.

32. Answer: (D) Pneumonia - Streptococcus pneumoniae - Droplet infection

Pneumonia is caused by Streptococcus pneumoniae (and Haemophilus influenzae) and spreads by droplet infection. Elephantiasis spreads through the bite of the female Culex mosquito, malaria through female (not male) Anopheles, and typhoid through contaminated food and water, not inspired air.

33. Answer: (A) Nucleated red blood cells

Frog RBCs are nucleated, while mature human RBCs lack a nucleus. Both frogs and humans have thyroid and parathyroid glands, paired cerebral hemispheres and a hepatic portal system.

34. Answer: (A) The F₁ hybrid with a double recessive genotype

A test cross crosses an organism showing the dominant phenotype, typically the F₁ hybrid, with the recessive parent; for two genes that is the double recessive genotype. Crossing two F₁ hybrids is a selfing or F₂ cross, not a test cross.

35. Answer: (D) $dN/dt = rN[(K - N)/K]$

Logistic (Verhulst-Pearl) growth is $dN/dt = rN[(K - N)/K]$: growth slows as N approaches the carrying capacity K. $dN/dt = rN$ is exponential growth, and the other forms invert either the derivative or the term (N - K).

36. Answer: (C) 14th day

In a 28-day cycle, LH rises to a peak (the LH surge) around the middle of the cycle, about day 14, and this surge triggers ovulation. Days 5 and 11 fall in the follicular phase and day 20 in the luteal phase.

37. Answer: (A) Bioinformatics

The Human Genome Project produced enormous amounts of sequence data, and storing, retrieving and analysing it led to the rapid growth of bioinformatics. Biotechnology existed long before the project and is not its product.

38. Answer: (A) Thigh are striated and voluntary

Thigh muscles are skeletal muscles: striated and voluntary. Upper arm muscles are also skeletal, not smooth; heart muscle is striated though involuntary; and intestinal muscle is smooth (unstriated) and involuntary.

39. Answer: (D) Statements (A) and (D)

The sporophyte of mosses is more elaborate than that of liverworts, so the liverwort statement is wrong, and Pinus is monoecious with male and female cones on the same tree, so that statement is wrong too. Salvinia is heterosporous and all seed plants have a diplontic life cycle, so those two are correct.

40. Answer: (C) Embryo sac

In angiosperms the functional megaspore divides by three free-nuclear mitoses to form the embryo sac, the female gametophyte. The ovule is the structure that contains the megaspore, and endosperm forms only after fertilisation.

41. Answer: (A) Perception of events happening in the environment and their memory

Consciousness, the ability to sense the environment and remember it, is the defining property found only in living things. Increase in mass by surface accumulation also occurs in non-living things such as crystals and mountains, and isolated metabolic reactions in vitro are not living.

42. Answer: (D) Are capable of producing secondary xylem and phloem

A vascular bundle is open when cambium is present between xylem and phloem, so it can produce secondary xylem and phloem. Conjunctive tissue lies between separate xylem and phloem patches in roots and does not make a bundle open.

43. Answer: (A) (2123)/(2123)

Each half of the adult human upper and lower jaw has 2 incisors, 1 canine, 2 premolars and 3 molars, giving 2123/2123 and 32 teeth. Formulas with 3 incisors or 3 premolars per half do not match the human count of 32 teeth.

44. Answer: (C) Binds with epithelial cells of midgut of the insect pest ultimately killing it

Bt protoxin is activated by the alkaline pH of the insect's gut; the active toxin binds to midgut epithelial cells, makes pores and kills the insect. The bacterium is not harmed because it keeps the toxin as an inactive protoxin, not because it is resistant, and acid pH does not activate it.

45. Answer: (C) Clitellum - secretes cocoon

The clitellum of *Pheretima* secretes the cocoon in which the eggs are deposited. Setae help in locomotion, the typhlosol increases the absorptive area of the intestine, and the gizzard grinds food rather than absorbing it.

46. Answer: (A) Cadmium

Cadmium is a toxic heavy metal and not an essential element for plants. Phosphorus is a macronutrient, while iron and manganese are essential micronutrients.

47. Answer: (C) Medium water conditions

Hydrarch succession moves from water towards drier conditions and xerarch from dry towards wetter conditions, so both end in a mesic (medium water) climax. Neither ends in extreme wet or xeric conditions.

48. Answer: (D) Fragmentation

Breaking detritus into smaller particles by detritivores such as earthworms is fragmentation. Humification is the formation of humus, and mineralisation is the later release of inorganic nutrients from humus.

49. Answer: (B) (1) - hibernation, (2) - escape, (3) - expanding, (5) - hot spot

Bears hibernate to escape the cold winter, a broad-based conical age pyramid indicates an expanding population, and an area with very high species richness is a hotspot. Fig and wasp is mutualism, not commensalism, and a broad base means growth, not stability, so only the choice with hibernation, escape, expanding and hot spot fills its blanks correctly.

50. Answer: (C) Trypsinogen

Pancreatic juice enters the duodenum carrying inactive trypsinogen, which is converted to active trypsin by enterokinase secreted by the intestinal mucosa. Trypsin and chymotrypsin are the active forms produced only after this activation, and enterokinase comes from the intestine, not the pancreas.

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