

## NEET 2016

### Biology

1. Gause's principle of competitive exclusion states that

- (1) More abundant species will exclude the less abundant species through competition
- (2) Competition for the same resources excludes species having different food preferences
- (3) No two species can occupy the same niche indefinitely for the same limiting resources
- (4) Larger organisms exclude smaller ones through competition

**Solution:**

Gause formulated the competitive exclusion principle which states that if two species are competing with one another for the same limited resource in a specific location, the species which is able to use that resource most efficiently will eventually eliminate the competing species in that location.

**Hence, the correct option is (3).**

2. The two polypeptides of human insulin are linked together by

- (1) Hydrogen bonds
- (2) Phosphodiester bond
- (3) Covalent bond
- (4) Disulphide bridges

**Solution:**

Insulin consists of 51 amino acids and is one of the smallest proteins in the body. It contains two polypeptide chains linked by disulphide bonds. Chains A and B consist of 21 and 30 amino acids, respectively.

**Hence, the correct option is (2).**

3. The coconut water from tender coconut represents

- (1) Endocarp
- (2) Fleshy mesocarp
- (3) Free nuclear proembryo
- (4) Free nuclear endosperm

**Solution:**

When the first division is followed by rapid series of partially truncated cell cycles, where cell division (cytokinesis) cannot keep pace with nuclear division (karyokinesis), free-nuclear endosperm is formed. There are a large number of free nuclei in this endosperm. It is also known as multinuclear syncytium. Cellularization occurs later on when cell division and cell wall synthesis are able to match pace with nuclear divisions. In some cases, like coconut, the cell wall formation remains incomplete. Coconut water is free-nuclear endosperm while white kernel is cellular endosperm.

**Hence, the correct option is (4).**

4. Which of the following statements is wrong for viroids?

- (1) They lack a protein coat
- (2) They are smaller than viruses
- (3) They cause infections

(4) Their RNA is of high molecular weight

**Solution:**

A single circular RNA molecule in each viroid has low molecular weight. In viroids, capsid and envelope are absent. It is an infectious RNA particle smaller than a virus. It causes potato tuber spindle disease.

**Hence, the correction option is (4).**

5. Which of the following features is not present in the Phylum-Arthropoda?

- (1) Chitinous exoskeleton
- (2) Metameric segmentation
- (3) Parapodia
- (4) Jointed appendages

**Solution:**

The thick cuticle functions as a rigid exoskeleton for arthropods. It is composed of protein and flexible chitin and is secreted by the epidermis. Metamorphosis is a process of development in insects that involves change in form. The jointed appendages help in the movement.

Parapodia are the lateral appendages present in *Nereis*, an aquatic annelid, which helps it in swimming.

**Hence, the correction option is (3).**

6. Which of the following most appropriately describes haemophilia?

- (1) Recessive gene disorder
- (2) X-linked recessive gene disorder
- (3) Chromosomal disorder
- (4) Dominant gene disorder

**Solution:**

Haemophilia is an X-linked disorder in which persons are unable to produce a factor for blood clotting. The principal type of haemophilia in humans is due to a recessive X-linked mutation, and it is most common in males.

**Hence, the correction option is (2).**

7. Emerson's enhancement effect and Red drop have been instrumental in the discovery of

- (1) Photophosphorylation and non-cyclic electron transport
- (2) Two photosystems operating simultaneously
- (3) Photophosphorylation and cyclic electron transport
- (4) Oxidative phosphorylation

**Solution:**

Emerson performed photosynthetic experiment on chlorella. He provided monochromatic light of more than 680 nm and observed decrease in rate of photosynthesis known as red drop. Later he provided synchronised light of 680 nm and 700 nm and observed increase in rate of photosynthesis, known as enhancement effect. This experiment led to discovery of two photosystems - PS II and PS I.

**Hence, the correction option is (2).**

8. In which of the following all three are macronutrients?

- (1) Boron, zinc, manganese
- (2) Iron, copper, molybdenum

- (3) Molybdenum, magnesium, manganese
- (4) Nitrogen, nickel, phosphorus

**Solution:**

Macronutrients required in large amounts (in excess of 10 mmol per kg of dry weight). These include hydrogen, oxygen, carbon, nitrogen, potassium, calcium, magnesium, phosphorous and Sulphur. None of the option is correct w.r.t. question statement.

The option (4) seems to be more appropriate as nitrogen and phosphorous are macronutrient, but nickel is not.

**Hence, the correction option is (4).**

**9.** Name the chronic respiratory disorder caused mainly by cigarette smoking

- (1) Emphysema
- (2) Asthma
- (3) Respiratory acidosis
- (4) Respiratory alkalosis

**Solution:**

Emphysema is generally caused by a long-term irritation; cigarette smoke, air pollution, and occupational exposure to industrial dust are the most common irritants. It is a disorder characterized by destruction of the walls of the alveoli, producing abnormally large air spaces that remain filled with air during exhalation.

**Hence, the correction option is (1).**

**10.** A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called

- (1) Ley farming
- (2) Contour farming
- (3) Strip farming
- (4) Shifting agriculture

**Solution:**

Ley farming is a system of rotation of crops with legumes or grass pastures as a measure to conserve and improve soil structure and fertility and to disrupt pest and disease lifecycles.

**Hence, the correction option is (1).**

**11.** Mitochondria and chloroplast are (a) semi-autonomous organelles (b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery. Which one of the following options is correct?

- (1) Both (a) and (b) are correct
- (2) (b) is true but (a) is false
- (3) (a) is true but (b) is false
- (4) Both (a) and (b) are false

**Solution:**

Mitochondria and chloroplast are semi-autonomous organelles as they are largely self-sustainable in having its own DNA and ability to replicate themselves and, in producing their own RNA and ribosomes and also in their ability to make some of their own proteins. However, they are not completely autonomous because as they depend on other parts of the cell for their internal components.

**Hence, the correction option is (3).**

**12.** In context of amniocentesis, which of the following statement is incorrect?

- (1) It is usually done when a woman is between 14 - 16 weeks pregnant.
- (2) It is used for prenatal sex determination.
- (3) It can be used for detection of Down syndrome.
- (4) It can be used for detection of Cleft palate.

**Solution:**

Cleft palate is a developmental abnormality and can be detected by sonography. Amniocentesis is a test that is used in assessing foetal well-being. It involves withdrawing some of the amniotic fluid and analyzing it. It can be used for sex determination. Although this process is of great benefit in order to assess abnormalities, it is banned in India for sex determination to legally check increasing female foeticides.

**Hence, the correction option is (4).**

**13.** In a chloroplast the highest number of protons are found in

- (1) Stroma
- (2) Lumen of thylakoids
- (3) Inter membrane space
- (4) Antennae complex

**Solution:**

The thylakoid contains photosynthetic pigments such as chlorophyll a, chlorophyll b, carotenes and xanthophylls. The chlorophylls captures energy from light during photosynthesis. It also contains coupling factors that are involved in ATP synthesis. The space inside a thylakoid sac is the lumen. Proton concentration is higher in the lumen of thylakoid due to photolysis of water,  $H^+$  pumping and NADP reductase activity in stroma.

**Hence, the correction option is (2).**

**14.** Photosensitive compound in human eye is made up of

- (1) Guanosine and Retinol
- (2) Opsin and Retinal
- (3) Opsin and Retinol
- (4) Transducin and Retinene

**Solution:**

The photopigment present in rods is called rhodopsin (rhodo- = rose; -opsin = related to vision) or visual purple. It is a purplish-red protein composed of opsin and retinal. (Opsin is a glycoprotein while retinal is a derivative of vitamin A called retinal).

**Hence, the correction option is (2).**

**15.** Spindle fibres attach on to

- (1) Telomere of the chromosome
- (2) Kinetochore of the chromosome
- (3) Centromere of the chromosome
- (4) Kinetosome of the chromosome

**Solution:**

In the mammalian cells, each kinetochore (a proteinaceous, disc-shaped structure present at the outer surface of the centromere of each chromatid that assembles at the centromere during prophase) is attached to a bundle of 20–30 microtubules, which forms a spindle fiber.

**Hence, the correction option is (2).**

**16. Which is the National Aquatic Animal of India?**

- (1) Gangetic shark
- (2) River dolphin
- (3) Blue whale
- (4) Sea-horse

**Solution:**

The National Aquatic Animal of India is River Dolphin. This mammal is also said to signify the purity of the holy Ganga as it can only persist in pure and fresh water. *Platanista gangetica* has a long pointed snout and also have visible teeth in both the upper and lower jaws.

**Hence, the correction option is (2).**

**17. Which of the following is required as inducer(s) for the expression of Lac operon?**

- (1) Glucose
- (2) Galactose
- (3) Lactose
- (4) Lactose and Galactose

**Solution:**

The lac operon is an example of an inducible operon which induces transcription of structural genes in the presence of lactose or allolactose and hence it is called an inducer. In other words, the presence of substrate induces enzyme synthesis.

**Hence, the correction option is (3).**

**18. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?**

- (1) Parathormone - Calcitonin
- (2) Insulin – Glucagon
- (3) Aldosterone - Atrial Natriuretic Factor
- (4) Relaxin - Inhibin

**Solution:**

The small quantity of relaxin produced by the corpus luteum during each monthly cycle relaxes the uterus by inhibiting contractions. During pregnancy, the placenta produces much more relaxin, and it continues to relax uterine smooth muscle and also affects the foot ligaments. At the end of pregnancy, relaxin eases delivery of the baby.

Inhibin is secreted by granulosa cells of growing follicles, by Sertoli cells after puberty and by the corpus luteum after ovulation. It is transported from the pituitary gland to the blood, where it inhibits secretion of FSH and, to a lesser extent, LH. It does not inhibit the secretion of GnRH.

**Hence, the correction option is (4).**

**19. Microtubules are the constituents of**

- (1) Cilia, Flagella and Peroxisomes
- (2) Spindle fibres, Centrioles and Cilia
- (3) Centrioles, Spindle fibres and Chromatin
- (4) Centrosome, Nucleosome and Centrioles

**Solution:**

Centrioles are parent organelles which produce basal bodies, cilia and flagella and spindle fibers during cell division of animal cells. Massules are dense, amorphous, protoplasmic plaques present in one or more series on the outside of the centrioles. They act as nucleating centers for the growth of microtubules during aster formation and production of more centrioles during  $G_2$  phase of the cell cycle.

**Hence, the correction option is (2).**

**20.** A complex of ribosomes attached to a single strand of RNA is known

- (1) Polysome
- (2) Polymer
- (3) Polypeptide
- (4) Okazaki fragment

**Solution:**

In prokaryotes, during active translation, two or more ribosomes form a complex with single mRNA and form a chain called polyribosomes or polysomes.

**Hence, the correction option is (1).**

**21.** Fertilization in humans is practically feasible only if

- (1) The sperms are transported into vagina just after the release of ovum in fallopian tube
- (2) The ovum and sperms are transported simultaneously to ampullary - isthmic junction of the fallopian tube
- (3) The ovum and sperms are transported simultaneously to ampullary - isthmic junction of the cervix
- (4) The sperms are transported into cervix within 48 hrs of release of ovum in uterus

**Solution:**

Fertilization takes place only when ovum and sperms are transported simultaneously to the ampullary-isthmic junction. This is the reason why all copulations may not lead to fertilization and pregnancy.

**Hence, the correction option is (2).**

**22.** Asthma may be attributed to

- (1) Bacterial infection of the lungs
- (2) Allergic reaction of the mast cells in the lungs
- (3) Inflammation of the trachea
- (4) Accumulation of fluid in the lungs

**Solution:**

Asthma (panting) is a disorder characterized by chronic airway inflammation, airway hypersensitivity to a variety of stimuli and airway obstruction. The trigger for asthma sometimes is an allergen such as pollen, house dust mites, molds or a particular food. Other common triggers of asthma attacks are emotional upset, aspirin, exercise and breathing cold air or cigarette smoke.

**Hence, the correction option is (2).**

23. The avena curvature is used for bioassay of

- (1) ABA
- (2) GA<sub>3</sub>
- (3) IAA
- (4) Ethylene

**Solution:**

Bioassay is a quantitative and qualitative test used to determine the nature and function of a biochemical by using living material e.g., Went's Avena curvature test is used as bioassay for auxins.

**Hence, the correction option is (3).**

24. The standard petal of a papilionaceous corolla is also called

- (1) Carina
- (2) Pappus
- (3) Vexillum
- (4) Corona

**Solution:**

In descending imbricate or vexillary or papilionaceous, out of five petals, the largest posterior or standard petal (vexillum) is the outermost with both margins outside and overlapping two lateral petals (wings or alae) and in the two smallest anterior petals (keel), both margins are inside.

**Hence, the correction option is (3).**

25. Tricarpellary, syncarpous gynoecium is found in flowers of

- (1) Liliaceae
- (2) Solanaceae
- (3) Fabaceae
- (4) Poaceae

**Solution:**

In Liliaceae family tricarpellary, syncarpous, superior trilobular ovary is present with many ovules in each locule, axile placentation, style one with three lobed stigma.

**Hence, the correction option is (1).**

26. One of the major components of cell wall of most fungi is

- (1) Chitin
- (2) Peptidoglycan
- (3) Cellulose
- (4) Hemicellulose

**Solution:**

The cell walls of a few fungi contain cellulose, but those of most fungi contain the polysaccharide chitin. The repeating unit is N-acetylglucosamine. The glycosidic linkages in chitin are  $\beta$  (1  $\rightarrow$  4).

**Hence, the correction option is (1).**

27. Select the incorrect statement:

- (1) FSH stimulates the sertoli cells which help in spermiogenesis.
- (2) LH triggers ovulation in ovary

- (3) LH and FSH decrease gradually during the follicular phase  
 (4) LH triggers secretion of androgens from the Leydig cells

**Solution:**

Follicular phase occurs between the end of menstruation and ovulation and consists of the menstrual and preovulatory phases. The growing ovarian follicles liberate estrogens into the blood. Thus, levels of LH and FSH increase during this phase.

**Hence, the correction option is (3).**

**28.** In meiosis crossing over is initiated at

- (1) Pachytene  
 (2) Leptotene  
 (3) Zygotene  
 (4) Diplotene

**Solution:**

The first meiotic prophase is complex and is divided into

- i. Leptotene - Condensation of chromatin
- ii. Zygotene - Synapsis of homologous chromosomes
- iii. Pachytene - Crossing over
- iv. Diplotene - Dissolution of synaptonemal complex and appearance of chiasmata
- v. Diakinesis - Terminalization of chiasmata

**Hence, the correction option is (1).**

**29.** A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the  $F_1$  plants were selfed the resulting genotypes were in the ratio of

- (1) 1 : 2 : 1 :: Tall homozygous : Tall heterozygous : Dwarf  
 (2) 1 : 2 : 1 :: Tall heterozygous : Tall homozygous : Dwarf  
 (3) 3 : 1 :: Tall : Dwarf  
 (4) 3 : 1 :: Dwarf : Tall

**Solution:**

Parents - TT (Tall)  $\times$  tt (Dwarf)  
 $F_1$  generation Tt (Heterozygous tall)  
 On selfing T t (Egg)  $\times$  T t (Pollen )  
 $F_2$  generation TT (Tall): Tt (Tall: tt (dwarf) : Tt (Tall)  
 Phenotypic ratio = 3 : 1 [Tall : Dwarf]  
 Genotypic ratio  $\Rightarrow$  1 : 2 : 1 [Homozygous tall : Heterozygous tall : Dwarf]

**Hence, the correction option is (1).**

**30.** Which of the following is the most important cause of animals and plants being driven to extinction?

- (1) Over-exploitation  
 (2) Alien species invasion  
 (3) Habitat loss and fragmentation  
 (4) Co-extinctions

**Solution:**



Habitat loss and fragmentation is the primary reason for the loss of biodiversity. Activities such as cutting trees, filling a wetland, burning a forest or ploughing grassland are some of the causes of species extinction.

**Hence, the correction option is (3).**

**31.** Which one of the following is a characteristic feature of cropland ecosystem?

- (1) Absence of soil organisms
- (2) Least genetic diversity
- (3) Absence of weeds
- (4) Ecological succession

**Solution:**

Cropland ecosystem is the largest anthropogenic ecosystem. It is characterized by less diversity and high productivity.

**Hence, the correction option is (2).**

**32.** Changes in GnRH pulse frequency in females is controlled by circulating levels of

- (1) Estrogen and progesterone
- (2) Estrogen and inhibin
- (3) Progesterone only
- (4) Progesterone and inhibin

**Solution:**

Estrogens and progesterone together with gonadotropic hormones of anterior pituitary, regulate female reproductive cycle and oogenesis, maintain pregnancy, prepare mammary glands for lactation, and promote development and maintenance of female secondary sex characteristics. High level of estrogen and progesterone gives negative feedback to hypothalamus for the release of GnRH.

**Hence, the correction option is (1).**

**33.** Which of the following is not a feature of the plasmids?

- (1) Independent replication
- (2) Circular structure
- (3) Transferable
- (4) Single-stranded

**Solution:**

A plasmid is a small, circular, double-stranded DNA molecule that is separate from the main chromosome. It is found in bacteria and some yeasts. It can undergo replication along with or independent of chromosomal DNA.

**Hence, the correction option is (4).**

**34.** Which of the following features is not present in *Periplaneta americana*?

- (1) Schizocoelom as body cavity
- (2) Indeterminate and radial cleavage during embryonic development
- (3) Exoskeleton composed of N-acetylglucosamine
- (4) Metamerically segmented body

**Solution:**

Since nymph stage is present in the life cycle of cockroach, the development is called paurometabolous. Since the changes are very slow, it is called incomplete metamorphosis. The nymphs moult about 13 times to become an adult and the process takes about six to eight months. Each moult leads to an increase in size. The shedding of the chitinous exoskeleton is called ecdysis. The stage between two moultings is called instar. In the next to last nymphal stage, wing pads are present that later develop into wings.

**Hence, the correction option is (2).**

**35.** In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to

- (1) Allergic response
- (2) Graft rejection
- (3) Auto-immune disease
- (4) Active immunity

**Solution:**

The antibodies reacting with their own tissues are called autoantibodies. These autoantibodies produced by the B cells are either destroyed or rendered inactive. As a result, the body develops an immunologic tolerance towards itself. The disruption in this tolerant state can lead to autoimmune diseases.

**Hence, the correction option is (3).**

**36.** Match the terms in Column I with their description in Column II and choose the correct option

Column I	Column II
(a) Dominance	(i) Many genes govern a single character
(b) Codominance	(ii) In a heterozygous organism only one allele expresses itself
(c) Pleiotropy	(iii) In a heterozygous organism both alleles express themselves fully
(d) Polygenic	(iv) A single gene influences inheritance many characters

- (1) a-(ii), b-(i), c-(iv), d-(iii)
- (2) a-(ii), b-(iii), c-(iv), d-(i)
- (3) a-(iv), b-(i), c-(ii), d-(iii)
- (4) a-(iv), b-(iii), c-(i), d-(ii)

**Solution:**

Dominance - A relationship between two alleles of one gene, in which one allele is expressed even in heterozygous condition.

Codominance - When two equally dominant factors coexist, neither allele is dominant, or even partially dominant, over the other.

Pleiotropy - When a single gene controls multiple phenotypes that are mostly unrelated.

Polygenic inheritance – A genetic inheritance by which a trait is determined by combined effect of two or more genes present on different loci of the chromosome.

**Hence, the correction option is (2).**

**37.** Joint Forest Management Concept was introduced in India during

- (1) 1960s
- (2) 1970s
- (3) 1980s
- (4) 1990s

**Solution:**

Joint Forest Management (JFM) was introduced by the Government of India in 1980 to work in collaboration with local communities to protect the forests. A major victory was achieved in 1980 when a 15-year ban was introduced on felling trees in the forests of the Himalayas. The movement gained a nationwide importance and spread across India. It has been observed in Himachal Pradesh (North), Karnataka (South), Rajasthan (West), Bihar (East), Vindhya (Central India).

**Hence, the correction option is (3).**

**38. Pick out the correct statements:**

- (a) Haemophilia is a sex-linked recessive disease.
  - (b) Down's syndrome is due to aneuploidy.
  - (c) Phenylketonuria is an autosomal recessive gene disorder.
  - (d) Sickle cell anaemia is an X-linked recessive gene disorder.
- (1) (a) and (d) are correct
  - (2) (b) and (d) are correct
  - (3) (a), (c) and (d) are correct
  - (4) (a), (b) and (c) are correct

**Solution:**

Haemophilia is an inherited deficiency (sex linked recessive disease) of clotting in which bleeding may occur spontaneously or after only minor trauma.

The presence of an extra copy of chromosome 21 leads to Down syndrome.

Phenylketonuria or PKU is an autosomal genetic error of protein metabolism characterized by elevated blood levels of the amino acid phenylalanine.

Sickle cell anaemia is an autosomal recessive disorder that is inherited.

**Hence, the correction option is (4).**

**39. Which one of the following statements is wrong?**

- (1) Cyanobacteria are also called blue-green algae
- (2) Golden algae are also called desmids
- (3) Eubacteria are also called false bacteria
- (4) Phycomycetes are also called algal fungi

**Solution:**

Eubacteria are true bacteria. They are prokaryotic. Their cell wall is made up of peptidoglycan and no membrane bound organelles are present in it.

**Hence, the correction option is (3).**

**40. Proximal end of the filament of stamen is attached to the**

- (1) Anther
- (2) Connective
- (3) Placenta
- (4) Thalamus or petal

**Solution:**

The shoot apical meristem gets converted into floral meristem. The shoot tip becomes slightly swollen forming thalamus or receptacle. The floral whorls appear as outgrowths from the nodes which are borne only at the tip of the receptacle.

**Hence, the correction option is (4).**

**41.** Which of the following approaches does not give the defined action of contraceptive?

- (1) Barrier methods - Prevent fertilization
- (2) Intra uterine devices-Increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms
- (3) Hormonal contraceptives- Prevent/retard entry of sperms, prevent ovulation and fertilization
- (4) Vasectomy- Prevents spermatogenesis

**Solution:**

In vasectomy, a portion of each vas deferens is removed. In order to gain access to the vas deferens, an incision is made with a scalpel (conventional procedure) or a puncture is made with special forceps (non-scalpel vasectomy). Next the ducts are located and cut, each is tied (ligated) in two places with stitches, and the portion between the ties is removed. They are tied up through a small incision on the scrotum. Although sperm production continues in the testes, sperm can no longer reach the exterior. The sperms degenerate and are destroyed by phagocytosis.

**Hence, the correction option is (4).**

**42.** The taq polymerase enzyme is obtained from

- (1) *Thermus aquaticus*
- (2) *Thiobacillus ferrooxidans*
- (3) *Bacillus subtilis*
- (4) *Pseudomonas putida*

**Solution:**

DNA polymerase enzyme that is stable at high temperatures. DNA polymerase I enzyme from *Thermus aquaticus* named Taq I or Taq polymerase is generally used to carry out the amplification. Since this organism lives in hot springs, many of its enzymes, including Taq polymerase, are thermostable (resistant to denaturation by heat treatment).

**Hence, the correction option is (1).**

**43.** Identify the correct statement on inhibin

- (1) Inhibits the secretion of LH, FSH and Prolactin
- (2) Is produced by granulose cells in ovary and inhibits the secretion of FSH
- (3) Is produced by granulose cells in ovary and inhibits the secretion of LH
- (4) Is produced by nurse cells in testes and inhibits the secretion of LH

**Solution:**

Inhibin is secreted by granulosa cells of growing follicles, by Sertoli cells after puberty and by the corpus luteum after ovulation. It is transported from the pituitary gland to the blood, where it inhibits secretion of FSH and, to a lesser extent, LH. It does not inhibit the secretion of GnRH.

**Hence, the correction option is (2).**

**44.** Which part of the tobacco plant is infected by *Meloidogyne incognita*?

- (1) Flower
- (2) Leaf
- (3) Stem
- (4) Root

**Solution:**

*Meloidogyne incognita* causes root knot disease in the tobacco plant.

**Hence, the correction option is (4).**

**45.** Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain

- (1) Activated pathogens
- (2) Harvested antibodies
- (3) Gamma globulin
- (4) Attenuated pathogens

**Solution:**

Salk vaccine was first available in 1955. It was injected and consisted of inactivated poliovirus. Attenuated (live organisms that are treated to eliminate their virulence) poliovirus was used by Albert Sabin to develop oral vaccine.

**Hence, the correction option is (4).**

**46.** Which one of the following cell organelles is enclosed by a single membrane?

- (1) Mitochondria
- (2) Chloroplasts
- (3) Lysosomes
- (4) Nuclei

**Solution:**

Nuclei, mitochondria and chloroplasts are double membrane bound organelles. Lysosomes are single membrane bound organelle.

**Hence, the correction option is (3).**

**47.** Lack of relaxation between successive stimuli in sustained muscle contraction is known as

- (1) Spasm
- (2) Fatigue
- (3) Tetanus
- (4) Tonus

**Solution:**

Tetanus is a serious medical condition caused due to an endotoxin. It affects nervous system, leading to painful muscle contractions, particularly of your jaw and neck muscles. It is commonly known as "lockjaw." In this, sustained muscle contraction due to repeated stimulus occurs.

**Hence, the correction option is (3).**

**48.** Which of the following is not a stem modification?

- (1) Pitcher of *Nepenthes*
- (2) Thorns of citrus

- (3) Tendrils of cucumber
- (4) Flattened structures of *Opuntia*

**Solution:**

In some plants, the leaves are modified to trap insects for nitrogen in low nitrogen environments. The traps can be active or passive. In active traps, the lids close on mechanical stimulation thereby trapping the insect in the pitcher. The lamina of the leaf gets modified into a pitcher while the leaf apex serves as the lid. For example, pitcher plant (*Nepenthes*).

**Hence, the correction option is (1).**

**49.** Water soluble pigments found in plant cell vacuoles are

- (1) Xanthophylls
- (2) Chlorophylls
- (3) Carotenoids
- (4) Anthocyanins

**Solution:**

Sap vacuoles are filled with fluid containing mineral salts, sugars, amino acids, proteins, waste products and water soluble anthocyanin pigments. The fluid present is called vacuolar sap. Anthocyanin are water soluble vacuolar pigments that may appear red, purple or blue depending on pH.

**Hence, the correction option is (4).**

**50.** Select the correct statement

- (1) Gymnosperms are both homosporous and heterosporous
- (2) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms
- (3) *Sequoia* is one of the tallest trees
- (4) The leaves of gymnosperms are not well adapted to extremes of climate

**Solution:**

*Sequoia sempervirens*, also known as coast redwood of California, is the tallest living plant in the world and reaches up to 366 feet (some Australian eucalypts are found to be even taller).

**Hence, the correction option is (3).**

**51.** Which of the following is not required for any of the techniques of DNA fingerprinting available at present?

- (1) Polymerase chain reaction
- (2) Zinc finger analysis
- (3) Restriction enzymes
- (4) DNA-DNA hybridization

**Solution:**

A zinc finger is a small protein structural motif that is characterized by the co-ordination of one or more Zn ions in order to stabilise the folds.

**Hence, the correction option is (2).**

**52.** Which type of tissue correctly matches with its location?

Tissue	Location
(1) Smooth muscle	Wall of intestine

- (2) Areolar tissue                      Tendons  
(3) Transitional epithelium          Tip of nose  
(4) Cuboidal epithelium              Lining of stomach

**Solution:**

Smooth muscle tissues are present in iris of eyes; walls of hollow internal structures such as blood vessels, airways to lungs, stomach, intestines, gall bladder, urinary bladder and uterus. Tendon is dense connective tissue and connects muscle to bone. Tip of nose consists of elastic cartilage.

**Hence, the correction option is (1).**

**53.** A plant in your garden avoids photorespiratory losses, has improved water use efficiency, shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilization. In which of the following physiological groups would you assign this plant?

- (1)  $C_3$   
(2)  $C_4$   
(3) CAM  
(4) Nitrogen fixer

**Solution:**

Under high light intensity and high temperature (30–40°C),  $C_4$  plants show 2–3 times higher rate of photosynthesis (measured by  $CO_2$  uptake or  $O_2$  evolution) than  $C_3$  plants. At high temperatures in  $C_3$  plants, the rate of photosynthesis decreases more rapidly as compared to photorespiration. In  $C_4$  plants, because of absence of or suppressed photorespiration and stability of  $C_4$  pathway enzymes, photosynthesis continues to occur at the same pace even if temperature is high. High light intensity does not saturate a  $C_4$  plant as it does to a  $C_3$  plant.

**Hence, the correction option is (2).**

**54.** Which of the following structures is homologous to the wing of a bird?

- (1) Dorsal fin of a Shark  
(2) Wing of a Moth  
(3) Hind limb of Rabbit  
(4) Flipper of Whale

**Solution:**

Homologous structures are those which have the same basic structure and developmental origin, but different functions and appearance. Forelimbs of frog and flippers of whale are homologous to human forelimbs. Wings of bird and flipper of whale are modified fore limbs but wings help in flying and flippers help in swimming.

**Hence, the correction option is (4).**

**55.** Which of the following characteristic features always holds true for the corresponding group of animals?

- (1) Cartilaginous endoskeleton - Chondrichthyes  
(2) Viviparous - Mammalia  
(3) Possess a mouth with an upper and a lower jaw- Chordata  
(4) 3-chambered heart with one incompletely divided ventricle- Reptilia

**Solution:**

Chondrichthyes are cartilaginous marine fishes. Reptiles have 3-chambered heart except crocodiles. Mammals are viviparous except prototherian mammals; chordates have jaws except protochordates and cyclostomes.

**Hence, the correction option is (1).**

**56.** Which of the following statements is not true for cancer cells in relation to mutations?

- (1) Mutations in proto-oncogenes accelerate the cell cycle
- (2) Mutations destroy telomerase inhibitor
- (3) Mutations inactivate the cell control
- (4) Mutations inhibit production of telomerase

**Solution:**

Mutations in the genes that regulate cell growth and cell division can result in cancer. This difference in growth potential is often attributed to the presence of telomerase (enzyme that maintains the telomeres at the ends of the chromosomes) in cancer cells and its absence in normal cells. Cancerous cells have high telomerase activity. Telomerase inhibitors are used in cancer treatment.

**Hence, the correction option is 4).**

**57.** The amino acid Tryptophan is the precursor for the synthesis of

- (1) Melatonin and Serotonin
- (2) Thyroxine and Triiodothyronine
- (3) Estrogen and Progesterone
- (4) Cortisol and Cortisone

**Solution:**

Serotonin and melatonin of pineal gland and thyroxine from thyroid gland are derived from tryptophan. Thyroxine and tri-iodothyronine are synthesized by attaching iodine to the amino acid tyrosine.

**Hence, the correction option is (1).**

**58.** Following are the two statements regarding the origin of life

- (a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
- (b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.

On the above statements which one of the following options is correct?

- (1) (a) is correct but (b) is false
- (2) (b) is correct but (a) is false
- (3) Both (a) & (b) are correct
- (4) Both (a) & (b) are false

**Solution:**

The earliest organisms were anaerobes as molecular oxygen was absent in primordial environment. These anaerobes were chemoautotrophs as they were able to synthesize organic molecules from inorganic molecules. They were unable to perform photolysis of water and never released oxygen.

**Hence, the correction option is (3).**

**59.** Reduction in pH of blood will

- (1) Reduce the rate of heart beat
- (2) Reduce the blood supply to the brain



- (3) Decrease the affinity of hemoglobin with oxygen
- (4) Release bicarbonate ions by the liver

**Solution:**

As acidity increases (pH decreases), the affinity of haemoglobin for O<sub>2</sub> decreases, and O<sub>2</sub> dissociates more readily from haemoglobin. When pH decreases, the entire oxygen– haemoglobin dissociation curve shifts to the right; at any given pO<sub>2</sub>, Hb is less saturated with O<sub>2</sub>, a change termed the Bohr effect.

**Hence, the correction option is (3).**

**60.** Analogous structures are a result of

- (1) Divergent evolution
- (2) Convergent evolution
- (3) Shared ancestry
- (4) Stabilizing selection

**Solution:**

If the structures in organisms are similar and carry out similar functions but do not have same embryological origin or similar anatomy, they are known as analogous structures. For example, the wings of birds and insects are analogous structures. Analogy indicates convergent evolution. It explains that in a similar habitat, similar structures can develop for similar function but these structures are not identical. These similar adaptive functional structures are present due to adaptations in organisms having different ancestors and have evolved over a period of time.

**Hence, the correction option is (2).**

**61.** Which of the following is a restriction endonuclease?

- (1) Hind II
- (2) Protease
- (3) DNase I
- (4) RNase

**Solution:**

Restriction endonuclease is an enzyme that cleaves internal phosphodiester bonds within a DNA molecule at a particular position only. Hind II is an example of restriction endonuclease. This enzyme cuts the DNA molecule at a particular site within a specific sequence of six base pairs.

**Hence, the correction option is (1).**

**62.** The term ecosystem was coined by

- (1) E.P. Odum
- (2) A.G. Tansley
- (3) E. Haeckel
- (4) E. Warming

**Solution:**

The term ecosystem was first introduced in 1935 by Sir Arthur G. Tansley and further work done by E.P. Odum (better known as Father of Ecology) led to better understanding of ecosystems.

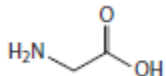
**Hence, the correction option is (2).**

**63.** Which one of the following statements is wrong?

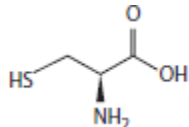
- (1) Sucrose is a disaccharide
- (2) Cellulose is a polysaccharide
- (3) Uracil is a pyrimidine
- (4) Glycine is a sulphur containing amino acid

**Solution:**

Glycine is simplest amino acid in which 'R' is replaced by H (Hydrogen).



Cysteine is a sulphur containing amino acid.



**Hence, the correction option is (4).**

**64.** In bryophytes and pteridophytes, transport of male gametes requires

- (1) Wind
- (2) Insects
- (3) Birds
- (4) Water

**Solution:**

Pteridophytes are placed between the bryophytes and gymnosperms. They share the following similarities with bryophytes:

- i. Like bryophytes, they require water for fertilization.
- ii. They contain a sterile jacket around sex organs.
- iii. They have well-developed archegonia and antheridia

**Hence, the correction option is (4).**

**65.** When does the growth rate of a population following the logistic model equal zero? The logistic model is given as  $dN/dt = rN(1 - N/K)$

- (1) When  $N/K$  is exactly one
- (2) When  $N$  nears the carrying capacity of the habitat
- (3) When  $N/K$  equals zero
- (4) When death rate is greater than birth rate

**Solution:**

In logistic growth model population growth equation is described as

$$dN/dt = rN \left( \frac{K - N}{K} \right)$$

where  $N$  = population density at time  $t$

$r$  = Intrinsic rate of natural increase

$K$  = carrying capacity

when  $N/K = 1$ , then  $(K - N) / N = 0$

Therefore,  $dN/dt = 0$

**Hence, the correction option is (1).**

**66.** Which one of the following statements is not true?

- (1) Tapetum helps in the dehiscence of anther
- (2) Exine of pollen grains is made up of sporopollenin
- (3) Pollen grains of many species cause severe allergies
- (4) Stored pollen in liquid nitrogen can be used in the crop breeding programmes

**Solution:**

Tapetum is the innermost layer of cells. These cells are generally polyploid, multinucleate and possess dense cytoplasm. In tapetal cells, the nucleus divides but cytokinesis does not take place so same cell contains two or more nuclei. Its main function is to provide nourishment to the developing pollen grains. Besides delivering nutrients, it also deposits a lipid-rich coat containing Ubisch granules around each microspore for exine formation and pollen kit in the case of entomophilous pollen grains.

**Hence, the correction option is (1).**

**67.** Which of the following would appear as the pioneer organisms on bare rocks?

- (1) Lichens
- (2) Liverworts
- (3) Mosses
- (4) Green algae

**Solution:**

The species that inhabit an area is termed as pioneer community. The pioneer species are generally small hardy species that spread into un-colonized areas generally algae and lichens. They are perennial species that spread quickly and produce large amount of seeds for the next season.

**Hence, the correction option is (1).**

**68.** Which one of the following is the starter codon?

- (1) AUG
- (2) UGA
- (3) UAA
- (4) UAG

**Solution:**

AUG has dual role to play. It serves both as an initiator codon as well as codon for methionine.

**Hence, the correction option is (1).**

**69.** Which one of the following characteristics is not shared by birds and mammals?

- (1) Ossified endoskeleton
- (2) Breathing using lungs
- (3) Viviparity
- (4) Warm blooded nature

**Solution:**

Viviparous organisms also produce live young. The developing embryos derive nourishment mainly from the mother and not the egg. Mammals are viviparous, while birds are oviparous. Oviparous organisms lay eggs, and the young hatch from the eggs outside the mother's body.

**Hence, the correction option is (3).**

**70.** Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?

- (1) Biological names can be written in any language
- (2) The first word in a biological name represents the genus name and the second is a specific epithet
- (3) The names are written in Latin and are italicised
- (4) When written by hand, the names are to be underlined

**Solution:**

The rules followed in nomenclature of organisms are as follows:

- (i) The scientific names are either Latinized or derived from Latin.
- (ii) The “first name” or genus name is the same for all organisms in the same genus.
- (iii) If the scientific name is handwritten, each word is underlined separately. If it is printed, it should be italicized to indicate that it has a Latin origin.

**Hence, the correction option is (1).**

**71.** Blood pressure in the pulmonary artery is

- (1) Same as that in the aorta
- (2) More than that in the carotid
- (3) More than that in the pulmonary vein
- (4) Less than that in the venae cavae

**Solution:**

Arteries carry blood away from the heart to other organs. They are usually deep seated. The pressure of the blood is high and the flows at a fast speed with jerks according to the heart beats. The low blood pressure in veins allows blood returning to the heart to slow and even back up; the valves aid in venous return by preventing the backflow of blood.

**Hence, the correction option is (3).**

**72.** Cotyledon of maize grain is called

- (1) Plumule
- (2) Coleorhiza
- (3) Coleoptile
- (4) Scutellum

**Solution:**

Monocots have a single cotyledon which is known as scutellum. It is situated on one side of the embryonal axis.

**Hence, the correction option is (4).**

**73.** In the stomach, gastric acid is secreted by the

- (1) Gastrin secreting cells
- (2) Parietal cells
- (3) Peptic cells
- (4) Acidic cells

**Solution:**

Gastric glands in the mucosa of the stomach composed of cells that empty their secretions into narrow channels called gastric pits. Types of cells are chief cells (secrete pepsinogen), parietal cells (secrete hydrochloric acid and intrinsic factor), surface mucus and mucus neck cells (secrete mucus) and G cells (secrete gastrin).

**Hence, the correction option is (2).**

**74.** Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers?

- (1) Nitrous oxide
- (2) Ozone
- (3) Ammonia
- (4) Methane

**Solution:**

Ozone is a natural trace gas in Earth's atmosphere. In the lower atmosphere (troposphere), ozone helps trap heat to keep the Earth warm. In the upper atmosphere (stratosphere), it works as an effective screen for UV light. A 5% loss of ozone may increase 10% increase of UV-B radiation that causes cataract, inflammation of cornea (snow-blindness) and skin cancer.

**Hence, the correction option is (2).**

**75.** Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom

- (1) Animalia
- (2) Protista
- (3) Monera
- (4) Fungi

**Solution:**

The protists are mostly unicellular, with some are colonial and some simple multicellular organisms closely related to single protist cells. All single celled eukaryotes like chrysophytes (diatoms and desmids), Euglenoids (*Euglena*), Dinoflagellates and slime moulds are included in kingdom Protista.

**Hence, the correction option is (2).**

**76.** Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options:

- (1) Both processes cannot happen simultaneously
- (2) Both processes can happen together because the diffusion coefficient of water and CO<sub>2</sub> is different
- (3) The above processes happen only during night time
- (4) One process occurs during day time, and the other at night

**Solution:**

Diffusion of water vapour and CO<sub>2</sub> are independent process. Their diffusion depends on the difference in their partial pressure. Thus, they have different diffusion coefficient.

**Hence, the correction option is (2).**

**77.** In mammals, which blood vessel would normally carry largest amount of urea?

- (1) Renal Vein
- (2) Dorsal Aorta

- (3) Hepatic Vein
- (4) Hepatic Portal Vein

**Solution:**

Urea is synthesized in liver. So maximum amount of urea is present in hepatic vein and minimum in renal vein.

**Hence, the correction option is (3).**

**78.** Seed formation without fertilization in flowering plants involves the process of

- (1) Sporulation
- (2) Budding
- (3) Somatic hybridization
- (4) Apomixis

**Solution:**

Apomixis It is a type of asexual reproduction that resembles sexual reproduction. In this, seeds are produced without fertilization. Hence, all the individuals produced apomictically are genetically similar to the parent producing them.

**Hence, the correction option is (4).**

**79.** Which of the following is wrongly matched in the given table?

	Microbe	Product	Application
(1)	<i>Trichoderma polysporum</i>	Cyclosporin A	immunosuppressive drug
(2)	<i>Monascus purpureus</i>	Statins	lowering of blood cholesterol
(3)	<i>Streptococcus</i>	Streptokinase	removal of clot from blood vessel
(4)	<i>Clostridium butylicum</i>	Lipase	removal of oil stains

**Solution:**

Butyric acid is produced by fermentative activity of *Clostridium butylicum*. Lipase is produced by the microbes (e.g., *Penicillium roqueforti*) that releases butyric, caproic and caprylic acids.

**Hence, the correction option is (4).**

**80.** In a testcross involving F<sub>1</sub> dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates

- (1) The two genes are located on two different chromosomes
- (2) Chromosomes failed to separate during meiosis
- (3) The two genes are linked and present on the same chromosome
- (4) Both of the characters are controlled by more than one gene

**Solution:**

Complete linkage is defined as the state in which genes closely located in the chromosome are so close together they are virtually never separated by crossing over and are always transmitted together, thus the proportion of parental gene combinations are much higher than the non-parental or recombinant type.

**Hence, the correction option is (3).**

**81.** It is much easier for a small animal to run uphill than for a large animal, because

- (1) It is easier to carry a small body weight
- (2) Smaller animals have a higher metabolic rate
- (3) Small animals have a lower O<sub>2</sub> requirement
- (4) The efficiency of muscles in large animals is less than in the small animals

**Solution:**

Basal metabolic rate is the minimum amount of energy needed to keep your body functioning, that includes breathing and heart beating. It is inversely proportional to the size of body, thus smaller animals have a higher metabolic rate.

**Hence, the correction option is (2).**

**82.** Which of the following is not a characteristic feature during mitosis in somatic cells?

- (1) Spindle fibres
- (2) Disappearance of nucleolus
- (3) Chromosome movement
- (4) Synapsis

**Solution:**

Zygotene is the second stage of prophase I of meiosis and is also known as the synaptic stage. It is marked by the visible association of homologous chromosomes with one another. This process of chromosome pairing is called synapsis.

**Hence, the correction option is (4).**

**83.** Which of the following statements is not correct?

- (1) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style
- (2) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers
- (3) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil
- (4) Some reptiles have also been reported as pollinators in some plant species

**Solution:**

The genotypes of the pollen grains (male gametes, hence the name gametophytic) and the genotypes of diploid stigmatic or stylar tissues govern the process of gametophytic incompatibility.

**Hence, the correction option is (1).**

**84.** Specialised epidermal cells surrounding the guard cells are called

- (1) Complementary cells
- (2) Subsidiary cells
- (3) Bulliform cells
- (4) Lenticels

**Solution:**

The guard cells are bounded by some cells that are functionally associated with and quite distinct from other epidermal cells. These are called subsidiary or accessory cells. Subsidiary cell may be at the same

level or slightly raised as in *Prunus*, potato, etc. or subsidiary cells may be present above the guard cell then stomata is called sunken stomata as in *Musa* and xerophytic plants. The guard cells along with subsidiary cells and stomatal aperture or pore form the stomatal apparatus.

**Hence, the correction option is (2).**

**85.** Which of the following guards the opening of hepatopancreatic duct into the duodenum?

- (1) Semilunar valve
- (2) Ileocaecal valve
- (3) Pyloric sphincter
- (4) Sphincter of Oddi

**Solution:**

The opening of bile duct into the pancreatic duct is surrounded by sphincter of Boyden. The passage of pancreatic juice and bile through the hepato-pancreatic duct into the small intestine is regulated by a mass of smooth muscle known as the sphincter of Oddi. The other major duct of the pancreas, the accessory duct (duct of Santorini), leads from the pancreas and empties into the duodenum about 2.5 cm superior to the hepato-pancreatic ampulla.

**Hence, the correction option is (4).**

**86.** Stems modified into flat green organs performing the functions of leaves are known as

- (1) Cladodes
- (2) Phyllodes
- (3) Phylloclades
- (4) Scales

**Solution:**

In arid habitats, plants shed their leaves to conserve water lost through transpiration. In such plants, the stems become flattened or cylindrical, fleshy and photosynthetic, and are called phylloclades. They serve both as photosynthetic as well as storage organs. They have nodes and internodes as in *Opuntia*.

**Hence, the correction option is (3).**

**87.** The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the

- (1) Halophiles
- (2) Thermoacidophiles
- (3) Methanogens
- (4) Eubacteria

**Solution:**

Natural gas is a biogas which results after long period of decay of animal and vegetable matter brought about by bacteria in the presence of high pressure and optimum temperature. The way  $\text{CO}_2$  is the chief gas in fermentation of dough, cheese, etc., methane is produced along with  $\text{CO}_2$  and other gases during anaerobic digestion of cellulosic material. These strictly anaerobic bacteria are called methanogens. Some examples of methanogens are *Methanobacterium*, *Methanococcus*, etc.

**Hence, the correction option is (3).**

**88.** A river with an inflow of domestic sewage rich in organic waste may result in



- (1) Drying of the river very soon due to algal bloom
- (2) Increased population of aquatic food web organisms
- (3) An increased production of fish due to biodegradable nutrients
- (4) Death of fish due to lack of oxygen

**Solution:**

The dissolved oxygen (DO) in water is used by the aquatic plant and animal life for breathing. The decay of dead organic matter in water bodies is also carried out by bacteria using dissolved oxygen. If there is enough bacterial activity, the oxygen in the water available to fish and other organisms can be reduced to levels so low that they may die.

**Hence, the correction option is (4).**

**89.** A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in

- (1) Aneuploidy
- (2) Polyploidy
- (3) Somaclonal variation
- (4) Polyteny

**Solution:**

Polyploidy cells have a chromosome number that is more than double the haploid number. It happens when the chromosomes duplicate, but remain in the same cell leading to an increase in chromosome number.

**Hence, the correction option is (2).**

**90.** A typical fat molecule is made up of

- (1) Three glycerol molecules and one fatty acid molecule
- (2) One glycerol and three fatty acid molecules
- (3) One glycerol and one fatty acid molecule
- (4) Three glycerol and three fatty acid molecules

**Solution:**

A triglyceride consists of two types of building blocks, a single glycerol molecule (forms the backbone of a triglyceride) and three fatty acid molecules. Three fatty acids are attached by dehydration synthesis reactions, one to each carbon of the glycerol backbone. The chemical bond formed where each water molecule is removed is an ester linkage.

**Hence, the correction option is (2).**