

# ***Bloom Biology Olympiad Sample Paper***

Maximum Time : 60 Minutes

Maximum Marks : 60

## **INSTRUCTIONS**

1. There are 50 Multiple Choice Questions in this paper. Paper is divided into two sections :  
**Section-A** 40 MCQs; 1 Mark each  
**Section-B** 10 MCQs; 2 Marks each
2. Each question has Four Options, out of which **ONLY ONE** is correct.
3. All questions are compulsory.
4. There is no negative marking.
5. No electric device capables of storing and displaying visual information such as calculator and mobile is allowed during the course of the exam.

Roll No.

Student's Name

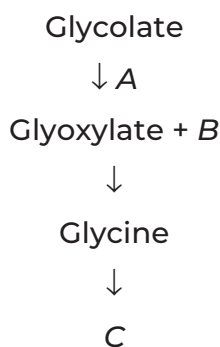
## Section-A (1 Mark each)

1. Which among the following life cycle is shown by the *Chlamydomonas*?
  - (a) Haplontic
  - (b) Diplontic
  - (c) Triplontic
  - (d) Haplo-diplontic
2. The imperfect fungi that are the decomposers of litter and help in mineral recycling belong to
  - (a) Basidiomycetes
  - (b) Deuteromycetes
  - (c) Ascomycetes
  - (d) Phycomycetes
3. Which of the following combinations of phyla and their characteristics is incorrect?
  - (a) Nematoda - roundworms, pseudocoelomate
  - (b) Cnidaria - radial symmetry, polyp and medusa body forms
  - (c) Platyhelminthes - flatworms, gastrovascular cavity, acoelomate
  - (d) Porifera - gastrovascular cavity, mouth from blastopore
4. How many chromosomes will the cell have at  $G_1$ , after S and after M-phase respectively, if it has 46 chromosomes at interphase?
  - (a) 46, 23, 23
  - (b) 46, 46, 46
  - (c) 23, 23, 23
  - (d) 23, 46, 46
5. Select the incorrect match from the options given below.

(a) Allosomes	— Sex-chromosomes
(b) Sub-metacentric chromosomes	— L- shaped
(c) Lampbrush chromosomes	— Diplotene bivalents
(d) Polytene chromosomes	— Oocytes of amphibians
6. Which one of the following is the correct pairing of a body part and the kinds of muscles tissue that moves it ?

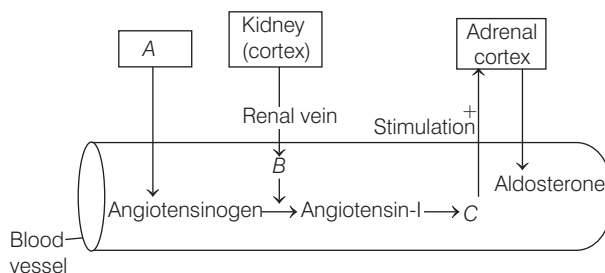
(a) Biceps of upper arm	— Smooth muscles fibres
(b) Abdominal wall	— Skeletal muscle
(c) Iris	— Involuntary smooth muscles
(d) Heart	— Involuntary unstriated muscle

7. Complete the table given below with respect to photorespiration.



- (a) A-Hydroxy pyruvate, B-PGA, C-Oxygenase  
 (b) A-Oxidase, B-H<sub>2</sub>O<sub>2</sub>, C-Serine  
 (c) A-Serine, B-NADP C-Hydroxy pyruvate  
 (d) A-Glutamate, B-H<sub>2</sub>O, C-Oxygenase
8. Estimate the cardiac output of a person having 72 heart beats per minute and a stroke volume of 50 mL.  
 (a) 360 mL (b) 7200 mL  
 (c) 500 mL (d) 3600 mL
9. If you are provided with the root tips of onion in your class and are asked to count the chromosomes. Which of the following stages can you most conveniently look into  
 (a) prophase (b) metaphase  
 (c) anaphase (d) telophase
10. A football player is fast chasing a ball in the play ground. Which one of the following groups of bones are directly contributing in this movement?  
 (a) Pelvis, ulna, patella, tarsals  
 (b) Sternum, femur, tibia, fibula  
 (c) Tarsals, femur, metatarsals, tibia  
 (d) Femur, malleus, tibia, metatarsals
11. Two taxonomic species are distinguished from each other by  
 (a) their failure to interbreed  
 (b) their ability to exchange gene freely  
 (c) their similarity in a morphological characters  
 (d) discontinuity in a set of correlated characters
12. The inspiratory reserve volume + tidal volume + expiratory reserve volume is the same.  
 (a) Inspiratory capacity + expiratory reserve volume  
 (b) Total lung capacity – functional residual capacity  
 (c) Inspiratory capacity + functional residual capacity  
 (d) Inspiratory capacity + residual volume

- 13.** At which step, glycolysis reaches the break even point : 2 molecules of ATP consumed, and 2 new molecules have now been synthesised ?
- Splitting of fructose 6-phosphate into two trioses
  - Conversion of 1,3-bisphosphoglycerate to 3 phosphoglycerate
  - Conversion of GADP to 1,3-bisphosphoglycerate
  - Conversion of DHAP to GADP
- 14.** A decrease in photosynthetic rate with increased availability of oxygen is called
- Warburg effect
  - Richmond long effect
  - Blackman's law of limiting factors
  - Emerson's enhancement effect
- 15.** Plant and animal cells are different as the former possess 'X' which are absent in animal cells. On the other hand, animal cells have 'Y' which are absent in almost all higher plant cells. Identify X and Y in the given options.
- Cell walls and centrioles
  - Centrioles and plastids
  - Cell walls and large central vacuole
  - Cell walls and plastids
- 16.** Consider the following organisms.
- Trypanosoma*,
  - Entamoeba*
  - Pyrodinium*,
  - Halococcus*,
  - Pyrocystis*
- Which of the following organisms exhibit bioluminescence?
- 1 and 3
  - 3 and 5
  - 2 and 4
  - All of these
- 17.** The summary form of renin- angiotensin-aldosterone system is given below, some intermediate proteins, enzyme and organs are indicated by alphabets. Choose the option in which these alphabets are properly matched with the name of corresponding proteins and enzymes organs.



- A-Heart, B- PCT, C- Progesterone-II
- A-Liver, B-Renin, C-Angiotensin-II
- A-Heart, B-Renal artery, C-Angiotensin-II
- A-Kidney, B-Renin, C-Progesterone-II

**18.** Observe the following match pairs and select the incorrect one.

Column I		Column II
(a) Erythropoietin	1.	It stimulates bone marrow to increase the production of RBCs.
(b) Thyroxine	2.	It regulates the metabolic rate of the body
(c) Glucagon	3.	It stimulates stomach to convert stored glycogen into glucose.
(d) Thymosin	4.	It stimulates the development of WBC involved in producing immunity.

**19.** Consider the following statement.

“When an impulse travels along a myelinated neurons, depolarisation occurs at the nodes. It leaps over the myelin sheath from one node to the next”. Select the option which describe the above process appropriately.

- (a) Repolarisation (b) Refractory period  
(c) Axon hillock (d) Saltatory conduction

**20.** How many molecules of RuBP are required for the formation of 10 molecules of 3-phosphoglyceric acid (3PGA).

- (a) 5 (b) 10 (c) 2 (d) 20

**21.** Identify X, Y and Z in the given reaction and select the correct option.

$$X + \text{NAD}^+ + \text{Co} - \text{A} \xrightarrow[\text{Y}]{\text{Pyruvate dehydrogenase}} \text{Acetyl Co} - \text{A} + \text{NADH} + \text{Z} + \text{CO}_2 \uparrow$$

X	Y	Z
(a) $\text{Mn}^{2+}$	$\text{H}^+$	Pyruvic acid
(b) Pyruvic acid	$\text{H}^+$	$\text{Mn}^{2+}$
(c) Pyruvic acid	$\text{Mg}^{2+}$	$\text{H}^+$
(d) ATP	$\text{Mn}^{2+}$	ADP

**22.** Which among the following is not a correct difference between viruses and viroids ?

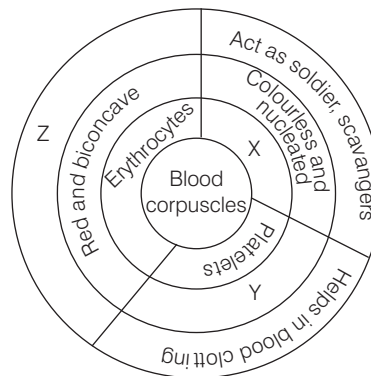
- (a) Viruses contain only DNA whereas, viroids don't contain DNA  
(b) Viruses contain proteins coat whereas, viroids don't contain proteins coat  
(c) Viruses contain RNA whereas, viroids don't contain RNA  
(d) Viruses are found in bacteria, animals and plants, but viroids only found in plant

**23.** Select the incorrect statement about Agnatha.

- (a) These are known as jawless fishes  
(b) Scales and fins are present  
(c) They adopt parasitic mode of nutrition  
(d) They have a circular mouth that acts as a sucker

- 24.** A somatic cell that has completed the S-phase of its cell cycle, as compared to gamete of the same species, has
- (a) twice the number of chromosomes and twice the amount of DNA
  - (b) twice the number of chromosomes and four times the amount of DNA
  - (c) same number of chromosomes, but twice the amount of DNA
  - (d) four times the number of chromosomes and twice the amount of DNA
- 25.** A nucleotide is a component that forms the structure of a DNA molecule. Select the correct number of components does each nucleotide contain?
- (a) 2
  - (b) 3
  - (c) 1
  - (d) 4
- 26.** On which of the following factor does the respiratory quotient depend ?
- (a) The respiratory concentration of oxygen
  - (b) The respiratory substrate used during respiration
  - (c) The volume of CO<sub>2</sub> evolved
  - (d) Energy evolved during respiration
- 27.** The disorders related to cardiac system causes the various abnormalities in human beings. Angina pectoris is one of the common disorder related to circulatory system. Select the possible cause of angina pectoris out of the following.
- (a) Lack of oxygen in heart muscles
  - (b) Increase in blood pressure
  - (c) Deposition of phosphorus in blood vessels
  - (d) Irregular heartbeat
- 28.** Consider the following functions of hormones in plants.
- I. One hormone hastens the maturity period in juvenile conifers.
  - II. A second hormone controls xylem differentiation.
  - III. A third hormone increases the tolerance of plants to various stresses.
- On the basis of given functions, identify the hormones from the options given below.
- (a) Auxin, gibberellin and cytokinin
  - (b) Gibberellin, auxin and cytokinin
  - (c) Abscissic acid, auxin, gibberellin
  - (d) Gibberellin, auxin and ABA
- 29.** 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
- (a) polyteny
  - (b) aneuploidy
  - (c) polyploidy
  - (d) somaclonal variation

- 30.** Consider the following figure which represents blood corpuscles and its type, colour, structure and function .



Identify X, Y and Z from the options given below.

	X	Y	Z
(a)	Red blood cells	Coloured and bilobed nucleus	Non-phagocytic
(b)	White blood cells	Colourless and non nucleated	Transport of oxygen and some amount of CO <sub>2</sub>
(c)	White blood cells	Coloured and bean-shaped nucleus	Release heparin
(d)	Leucocyte	Coloured and enucleated	Engulf germs

- 31.** Refer to the symptoms given below.

Whole body : Excessive thirst, water electrolyte imbalance, dehydration, fatigue or malaise, headache or weight loss.

Urinary : Excessive urination or bed wetting.

Which of the following hormone is responsible for the above symptoms?

- (a) Melanocyte
- (b) Prolactin
- (c) Thyroid Stimulating Hormone (TSH)
- (d) Vasopressin

- 32.** During the transmission of nerve impulse through a nerve fibre, the potential of the inner side of the plasma membrane has which type of electric charge?

- (a) First negative, then positive and again back to negative
- (b) First positive, then negative and continue to be negative
- (c) First negative, then positive and continue to be positive
- (d) First positive, then negative and again to positive

**33.** Select the answer with correct matching of the nerve with its origin and function.

	Nerve	Origin	Function
(a)	Olfactory	Lateral side of medulla	Smell
(b)	Abducens	Pons Varolii	Rotation of eyeball
(c)	Vagus	Both medulla and spinal cord	Movement of tongue
(d)	Hypoglossal	Ventral side of medulla oblongata	Movement of muscles of pharynx, larynx, neck, shoulder

**34.** If lines were drawn on a typical ECG recording showing where atrial and ventricular systole begin and end, then the ventricular systole would be seen as beginning during a ..... and ending during the next .....

- (a) T-wave, P-wave (b) PR segment, T-wave  
(c) QRS complex, T-wave (d) P- wave, QRS complex

**35.** A microbiologist has taken blood from a patient and kept it in a test tube for analysis of blood corpuscles and plasma. He has four tubes in front of him. Which of these following tube he will not use for this purpose?

- (a) Test tube containing calcium bicarbonate  
(b) Test tube containing heparin  
(c) Test tube containing sodium EDTA  
(d) Test tube containing sodium oxalate

**36.** Listed below are four respiratory capacities (a-d) with their respiratory volumes in a normal human adult. Select the incorrect match pair.

	Respiratory capacities	Respiratory volumes
(a)	Residual volume	1200 mL
(b)	Vital capacity	4500 mL
(c)	Inspiratory reserve volume	1100 mL
(d)	Inspiratory capacity	3500 mL

**37.** Consider the following regarding to the fruit type.

A : At maturity, splits into smaller units called mericarps.

B : *Acacia*, coriander

Which of the following correctly represent the both A and B?

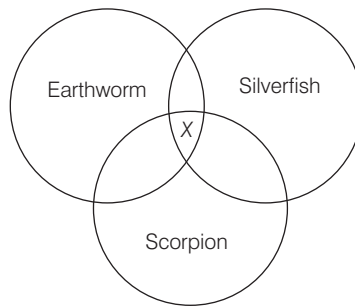
- (a) Dehiscent dry fruit (b) Fleshy fruit  
(c) Indehiscent fruit (d) Schizocarpic fruit

**38.** Which of the following option represents the phases of prophase-I in correct order?

- (a) Leptotene → Zygotene → Pachytene → Diplotene  
(b) Zygotene → Leptotene → Pachytene → Diplotene  
(c) Leptotene → Pachytene → Zygotene → Diplotene  
(d) Zygotene → Leptotene → Diplotene → Pachytene



39. The following Venn diagram shows three species earthworm, silverfish & scorpion, showing a common feature represented by X.



Which of the following option correctly represented by 'X'?

- (a) They all belong to the same phylum
  - (b) They all have jointed paired appendages
  - (c) They all possess dorsal heart
  - (d) They are aquatic
40. 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 utilisation. In which of the following physiological groups would you assign this plant?
- (a)  $C_3$
  - (b)  $C_4$
  - (c) CAM
  - (d) Nitrogen fixer

## Section-B (2 Marks each)

**Direction** (Q. Nos. 41-44) Each of these questions contains two statements : Assertion and Reason. Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

- (a) Both A and R are true and R is the correct explanation of A
  - (b) Both A and R are true, but R is not the correct explanation of A
  - (c) A is true, but R is false
  - (d) A is false, but R is true
41. **Assertion** (A) The cyclic flow results only in the synthesis of ATP, but not  $\text{NADPH} + \text{H}^+$ .  
**Reason** (R) The membrane lamellae of the grana have both PS-I and PS-II.
42. **Assertion** (A) Inspiration is initiated by the contraction of diaphragm, which increases the volume of thoracic chamber in the anterior-posterior axis.  
**Reason** (R) An increase in intra-pulmonary pressure causes the expulsion of air from the lungs.

- 43. Assertion (A)** The nodal musculature has the ability to generate action potentials without any external stimuli, i.e. it is auto-excitabile.  
**Reason (R)** The number of the action potential that could be generated in a minute vary at different parts of the nodal system.
- 44. Assertion (A)** In induced fit hypothesis, the active site of enzyme does not initially exist in a shape complementary to the substrate.  
**Reason (R)** The active site of enzyme is hard and elongated.
- 45.** Consider the following statements and choose the incorrect statements from the options given below.
- Hypertension ruptures glomerular capillaries and leads to renal calculi.
  - Juxtaglomerular apparatus cells secrete enzyme alkaline phosphatase that modulate blood pressure.
  - Complete reabsorption by active transport of glucose takes place in distal convoluted tubule.
  - In distal convoluted tubule, about 19 % of water is absorbed by the action of antidiuretic hormones or vasopressin.
  - About 75% of water from filtrate is reabsorbed in PCT by osmosis during reabsorption of solutes.

**Codes**

- |                   |                    |
|-------------------|--------------------|
| (a) I, II and IV  | (b) I, IV and V    |
| (c) I, II and III | (d) II, III and IV |

- 46.** Read the following statements regarding muscles proteins.
- The complex protein, tropomyosin is distributed at regular intervals on the troponin.
  - The globular head of meromyosin consist of light meromyosin.
  - Actin is a thin filament and is made up of two F- actins.
  - Myosin is a thick filament and also a polymerised protein.
- Choose the incorrect statements from the options given below.
- |                |                   |
|----------------|-------------------|
| (a) I and II   | (b) III and IV    |
| (c) II and III | (d) I, III and IV |

- 47.** Read the following statements and select the correct option.
- Statement I** Small amount of urea enter the thick segment of the ascending limb of Henle's loop which is transported back to the interstitium by the collecting tubule.
- Statement II** Interstitial gradient helps in the easy passage of water from the collecting tubule thereby concentrating the filtrate.
- Both statement I and statement II are correct
  - Both statement I and statement II are incorrect
  - Statement I is correct, but statement II is incorrect
  - Statement I is incorrect, but statement II is correct

**Direction** (Q. Nos. 48-50) Read the following passage and answer the questions that follows

Plastids are found in all plant cells and in euglenoid. These can be observed easily under the microscope as they are large in size. They bear specific pigments, thus imparting specific colour to the plants.

**48.** The ..... store proteins in grains.

- |                 |                  |
|-----------------|------------------|
| (a) amyloplasts | (b) aleuroplasts |
| (c) elaioplasts | (d) carotenoids  |

**49.** The space limited by the inner membrane of the chloroplast is called ..... .

- |            |               |
|------------|---------------|
| (a) matrix | (b) cytoplasm |
| (c) stroma | (d) lumen     |

**50.** Identify the type of colourless plastid that has varied shapes and sizes with stored nutrients.

- |                  |                  |
|------------------|------------------|
| (a) Leucoplasts  | (b) Chloroplasts |
| (c) Chromoplasts | (d) Carotenoids  |

## Explanations

- 1.** (a) *Chlamydomonas* exhibits haplontic life cycle, i.e. gametophyte is the dominant phase in this life cycle.
- 2.** (b) Deuteromycetes are the imperfect fungi which include all those fungi in which the sexual stage is either absent or not known.
- 3.** (d) Porifera does not have gastrovascular cavity as it does not have specialised tissues and these are mostly asymmetrical, acoelomate.
- 4.** (b) Interphase, though called the resting phase is the time during which the cell is preparing for the division. G<sub>1</sub>-phase corresponds to the interval between mitosis and initiation of DNA replication. S or synthesis phase mark the period during which DNA synthesis or replication take place.  
There is no change in the chromosomes number after G<sub>1</sub>, S-phase and M-phase of the cell cycle.
- 5.** (d) Polytene chromosomes are strongly amplified form of interphase chromosome, found in the salivary gland cells of *Drosophila*. They arise through many rounds of DNA replication without subsequent separation of daughter chromatids.
- 6.** (c) The correctly matched pair given in option (c) and can be explained as  
The iris consists of two sheets of involuntary smooth muscles with contrary actions : dilation (expansion) and contraction (constriction). These muscles control the size of the pupil. Other options are incorrectly matched and can be corrected as  
Biceps of upper arm are classified as skeletal muscles. Cardiac muscle cells are located in the walls of the heart appear striated and are under involuntary controls. Abdominal wall is made up of smooth muscle fibres that help in the paristaltic movements.

7. (b) The A, B and C to be identified as oxidase,  $\text{H}_2\text{O}_2$  and serine, respectively. Photorespiration involves three organelles, i.e. chloroplast, peroxisomes and mitochondria only. In the presence of  $\text{O}_2$ , RuBP binds to  $\text{O}_2$ . As a result of this, PGA (3C) and phosphoglycolate are formed. Glycolate oxidase is a key enzyme for the glycolate-glyoxylate conversion during photorespiration, which catalyses the oxidation of glycolate to generate glyoxylate and  $\text{H}_2\text{O}_2$ . The glycine is converted into serine into mitochondria.
8. (d) Cardiac output is the amount of blood pumped by the heart per minute. It is a mechanism whereby blood flows around the body, especially providing blood flow to the brain and other vital organs.
- Cardiac output = Heart rate  $\times$  Stroke volume Or  $\text{CO} = \text{HR} \times \text{SV}$
- $\text{CO} = 72 \times 50$
- $= 3600 \text{ ml}$
9. (b) The most convenient stage will be seen is metaphase through which the chromosomes can be counted well because at metaphase stage, the chromosomes are aligned at the equatorial plate.
10. (c) When the player is chasing the ball, he is running fast and his legs are involved in this. So the bones of legs are directly contributing in this movement and these bones are tarsals, femur, metatarsals and tibia.
11. (a) Two taxonomic species are distinguished from each other by their failure to interbreed, because two different taxonomic species cannot breed among themselves.
12. (a) Inspiratory Capacity (IC) is the total volume of air a person can inspire after a normal expiration. This includes Tidal Volume and Inspiratory Reserve Volume (TV + IRV). So, the option (a) is correct for the above statement.
13. (b) During glycolysis, the step of conversion of 1, 3-bisphosphoglycerate to 3 phosphoglycerate is considered as break point. This step is the enzymatic transfer of a phosphate group from 1,3-bisphosphoglycerate to ADP by phosphoglycerate kinase, forming ATP and 3-Phosphoglycerate. At this step, glycolysis has reached the break even point : 2 molecules of ATP were consumed and 2 new molecules have now been synthesised.
14. (a) The inhibition of photosynthesis by high  $\text{O}_2$  level is termed as Warburg effect. However, the inhibition is observed mostly in  $\text{C}_3$ -plants. The  $\text{C}_4$ -plants are hardly effected by varying  $\text{O}_2$  concentration.
15. (a) The X and Y are to be identified as cell walls and centrioles, respectively. Plant cell possess cells walls, plastids and large central vacuole which are absent in animal cells. On the other hand, animal cells have centrioles which are absent in almost all higher plant cells.
16. (b) *Pyrodinium* and *Pyrocystis* are the dinoflagellates which shows bioluminescence. These organisms produce light by using a luciferin-luciferase reaction.
17. (b) A, B and C alphabets are to be identified as liver, renin and angiotensin-II, respectively. In Renin-angiotensin-aldosterone system, several organs are involved such as liver, blood vessels and kidneys. The angiotensinogen is synthesised and secreted mainly by the liver and is found in the  $\alpha$ -globulin fraction of plasma. In the blood, renin initiates a chemical reaction that converts the plasma protein of angiotensinogen into angiotensin-I and further to angiotensin-II, which activates the adrenal cortex to release aldosterone.

- 18.** (c) The incorrect match pair given in option (c) and it can be corrected as Glucagon stimulates liver to convert stored glycogen into glucose.
- 19.** (d) The statement given in question describes the process of saltatory conduction. It is also known as node to node conduction, since myelin is absent in this region (nodes are the gaps along the axonal sheath).
- 20.** (a) 5 molecules of RuBP (Ribulose 1, 5 biphosphate) is required for the formation of 10 molecules of 3- phosphoglyceric acid (3PGA). One molecule of RuBP is required to form two molecules of 3 PGA. One molecule of RuBP is combined with  $\text{CO}_2$  and form two molecules of 3PGA with the help of RuBisCO enzyme.
- 21.** (c) The pyruvate is decarboxylated oxidatively to produce  $\text{CO}_2$  and NADH. The product combines with sulphur containing coenzyme-A to form acetyl Co-A or activated acetate. The reaction occur in the presence of an enzyme complex pyruvate dehydrogenase. The formation of acetyl Co-A is the intermediate step that results in production of 2 molecules of  $\text{CO}_2$  and 2 molecules of  $\text{NADH}_2$  through the metabolism of 2 molecules of pyruvic acid.
- 22.** (a) The viruses contains both RNA and DNA whereas viroid don't contains DNA. The viruses contains protein coat while, viroids don't contains. Viruses are found in bacteria, animals and plants while, viroids are found in plant.
- 23.** (b) Agnatha are also called jawless fishes. Scales and fins are absent in these fishes. They adopt parasitic mode of nutrition. Their circular mouth acts as a sucker. They are aquatic and most of them are extinct. The only class that exists in this super class is Cyclostomata.
- 24.** (b) A somatic cell is a cell with two complete sets of chromosomes ( $2n$ ). Whereas gametes possess a single set of chromosomes ( $n$ ). Somatic cells are present everywhere in the body. In S-phase, DNA is synthesised or replicated. The chromosome number remains the same in the S-phase of the cell division. Whereas the amount of DNA doubles in the cell. In the somatic cell that has completed the S-phase, the chromosome number will be double and the amount of DNA present cell will be four times as compared to a gamete haploid ( $n$ ), of the same species.
- 25.** (b) Each nucleotide consists of a pentose sugar, a phosphate group and a nitrogenous base such as adenine (A), Guanine (G), Cytosine (C) and Thymine (T) or Uracil (U). These are the building blocks of nucleic acids which are the genetic material.
- 26.** (b) The respiratory Quotient (RQ) mainly depends upon the type of respiratory substrate used during respiration. In living organisms, respiratory substrates are often more than one.
- 27.** (a) Angina pectoris is a heart disease in which acute chest pain occurs when adequate amount of oxygen does not reach the heart muscles. It is caused due to conditions which affect proper blood flow.
- 28.** (d) Gibberellin hormone hastens the maturity period in juvenile conifers. Auxin hormone controls xylem differentiation whereas, ABA increases the tolerance of plants to various stresses. The cytokinin hormones promotes cell division in plants.
- 29.** (c) In plant cells, cytokinesis involves the formation of a cell plate that represent the middle lamella. If cell plate formation does not take place, cytokinesis will be incomplete and two daughter cells will not be formed. This results in the formation of a single cell containing the double number of chromosomes. This condition is known as polyploidy.
- 30.** (b) X is to be identified as white blood cells. Y is to be identified as colourless and non nucleated whereas, Z is to be identified as the function of RBC, i.e. transport of oxygen and some amount of  $\text{CO}_2$ .

- 31.** (d) Vasopressin or antidiuretic hormone is responsible for the above symptoms. Its under (hypo) secretion causes overproduction of urine leading to diabetes insipidus.
- 32.** (a) The signal that travels along the length of a nerve fibre and the means by which information is transmitted through the nerve system is called nerve impulse. During resting phase, inside the plasma membrane is negatively charged (polarised  $-70$  mV, resting potential). As the stimulus reaches it becomes positively charged ( $+45$  mV, action potential). This condition is known as depolarisation of nerve fibre. As impulse passes away it regains its original ionic distribution and becomes repolarised.
- 33.** (b) The cranial nerve called abducens arises from the pons Varolii and motor nature helps in the rotation of eyeball. The other incorrect pairs can be corrected as,  
Olfactory arises from the olfactory epithelium in nasal cavity. Vagus arises from the lateral side and floor of the medulla and helps in respiratory reflexes, peristaltic intestine movement. Hypoglossal nerve helps in the movement of tongue.
- 34.** (c) The QRS complex represents depolarisation of the ventricles and followed by ventricular contraction whereas, T-wave represent the repolarisation of the ventricles and mark the beginning of ventricular relaxation.
- 35.** (a) The microbiologist would not use the test tube containing calcium bicarbonate as it has important role in blood clotting. For analysis of blood it is important that blood should not be clot. The clotting of blood can be prevented by adding chelating agents (including heparin, sodium oxalate and sodium EDTA) which remove calcium which is important for blood coagulation.
- 36.** (c) The inspiratory reserve volume is the incorrect match with its respiratory volume and can be corrected as
- | Respiratory capacities     | Respiratory volume |
|----------------------------|--------------------|
| Inspiratory reserve volume | 3000 mL            |
- 37.** (d) The correct option is (d), schizocarpic fruits at maturity, splits into smaller units called mericarps. This type of fruit is present in *Acacia*, coriander, *Acer*, etc.
- 38.** (a) Prophase-I is the first stage of meiosis. It is divided into five sub-phases in a sequence of leptotene, zygotene, pachytene, diplotene and diakinesis.
- 39.** (c) Earthworm belongs to phylum-Annelida whereas, scorpion and silverfish belong to phylum-Arthropoda. They all possess dorsal heart.
- 40.** (b) This plant is a  $C_4$ -plant. They have special type of leaf anatomy called Kranz anatomy. They can tolerate higher temperatures and they show a response to high intensities of light.
- 41.** (b) Both A and R are true, but R is not the correct explanation of A. It can be explained as  
The membrane or lamellae of the grana have both PS-I and PS-II, whereas, the stroma lamellae membranes lack PS-II as well as NADP reductase enzyme. The excited electron does not pass onto  $NADP^+$  but is cycled back to the PS-I complex through the ETC. Hence, the cyclic flow results only in the synthesis of ATP, but not of  $NADPH+H^+$ .
- 42.** (b) Both A and R are true, but R is not the correct explanation of A. It can be explained as  
The overall increase in the thoracic volume causes a similar increase in pulmonary volume. An increase in pulmonary volume decreases the intra-pulmonary pressure to less than the atmospheric pressure which forces the air from outside to move inside the lungs, i.e. inspiration.

**43.** (b) Both A and R are true but R is not the correct explanation of A.

The SAN can generate the maximum number of action potential, i.e.  $70-75 \text{ min}^{-1}$ , and is responsible for initiating and maintaining the rhythmic contractile activity of the heart.

**44.** (c) A is true, but R is false. R can be corrected as

Induced fit model stated that when the substrate comes in contact with the active site, the active site modulates according to the shape of the substrate to form an enzyme substrate complex.

**45.** (c) Statements I, II and III are incorrect and can be corrected as

Hypertension ruptures the glomerular capillaries and leads to nephrosclerosis. The enzyme called renin is secreted by juxtaglomerular apparatus cells which modulate blood pressure. In Proximal Convoluted Tubule (PCT), complete reabsorption of glucose takes place by active transport. Rest all statements are correct.

**46.** (a) The statements I and II are incorrect. These incorrect statements can be corrected as Tropomyosin is a long- coiled alpha helical molecule. The two filaments of tropomyosin run closely along the entire length of actin. The globular head of meromyosin consist of heavy meromyosin.

**47.** (d) Statement I is incorrect, but statement II is correct. Incorrect statement can be corrected as Small amount of urea enter the thin segment of the ascending limb of Henle's loop which is transported back to the interstitium by the collecting tubule.

NaCl is transported by ascending limb of Henle's loop which is exchanged with the descending limb of vasa recta. NaCl is returned to interstitium by the ascending portion of vasa recta. This transport of substances by Henle's loop and vasa recta is called counter-current mechanism which maintain a concentration gradient in the medullary interstitium.

**48.** (b) The aleuroplasts is the type of plastid that store proteins in grains.

**49.** (c) The space limited by the inner membrane of the chloroplast is called the stroma.

**50.** (a) Leucoplasts are the colourless plastid of varied shapes and sizes with stored nutrients.