CBSE Class 11 Biology

Sample Paper 01 (2020-21)

Maximum Marks: 70

Time Allowed: 3 hours

General Instructions:

i. All questions are compulsory.
ii. The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.
iii. Section–A has 14 questions of 1 mark each and 02 case-based questions. Section–B has 9 questions of 2 marks each. Section–C has 5 questions of 3 marks each and Section–D has 3 questions of 5 marks each.
iv. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
v. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. The concept of new systematics was developed by which scientist?
2. Name the different cell junctions found in tissues.
3. Why Cycas is called a living fossil?
4. Define sliding filament theory of muscle contraction.
5. Define epiphyllous arrangement of stamens.
6. What is the function of columnar epithelium?
7. During which phase of mitotic cell division, chromosomes get separated?
8. Define cellular respiration.
9. Mention the difference between hypothyroidism and hyperthyroidism.
10. Sort the following into actively or passively transported substances during reabsorption of GFR.

    Glucose, amino acids, nitrogenous wastes, Na^+, water
11. **Assertion :** Archaebacteria are special since they live in some of the harshest habitats.
    Reason : Archaebacteria having a different cell wall structure and this feature is

responsible for their survival in extreme conditions.

a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

OR

Assertion : Albugo parasitizes several crucifers.
Reason : The disease infects leaves and stems.

a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

12. **Assertion:** If the tissue is fully burnt, all the carbon compounds are oxidised to gaseous form like CO_2, water vapour and are removed and remaining is called ash.

    Reason: Analysis of compounds present in ash gives an idea of the kind of organic and inorganic constituents present in living tissues.

    a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
    b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
    c. Assertion is correct statement but reason is wrong statement.
    d. Assertion is wrong statement but reason is correct statement.

13. **Assertion:** Lipids present in the outer and inner side of the bilayer membrane are mostly the same.

    Reason: Oligosaccharides are attached to the external surface as well as the inner surface of a biomembrane.

    a. Assertion and reason both are correct statements and reason is correct explanation

for assertion.

b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

14. **Assertion:** The movement of air into and out of the lungs is carried out by creating a pressure gradient between the lungs and the atmosphere.
Reason: The diaphragm and a specialised set of muscles- external and internal intercostals between the ribs, help in generation of such gradients.
    a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
    b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
    c. Assertion is correct statement but reason is wrong statement.
    d. Assertion is wrong statement but reason is correct statement.
15. **Read the following and answer any four questions:**
The prokaryotic cells are generally smaller and multiply more rapidly than the eukaryotic cells. They may vary greatly in shape and size. The organization of the prokaryotic cell is fundamentally similar even though prokaryotes exhibit a wide variety of shapes and functions. Most prokaryotic cells, particularly bacterial cells, have a chemically complex cell envelope.
    i. Which is the outermost layer of the cell envelope in prokaryotes?
        a. Glycocalyx
        b. Cell wall
        c. Plasma membrane
        d. Mesosome
    ii. Bacteria can be classified into _____ groups on the basis of the differences in the cell envelopes and the manner in which they respond to the staining procedure developed by Gram.
        a. Two
        b. Three
        c. Five
        d. Four

iii. A special membranous structure called _____ is formed by the extensions of the plasma membrane into the prokaryotic cell.
   a. Golgi body
   b. Ribosome
   c. Mesosome
   d. Inclusion body

iv. The _____ are small bristle-like fibres sprouting out of the cell.
   a. Pili
   b. Flagellum
   c. Pseudopodia
   d. Fimbriae

v. **Assertion:** Glycocalyx in the cell envelope of prokaryotes differs in composition and thickness among different bacteria.
   Reason: It could be a loose sheath called the capsule.
   a. Both assertion and reason are true, and reason is the correct explanation of the assertion.
   b. Both assertion and reason are true, and reason is not the correct explanation of the assertion.
   c. Assertion is true but reason is false.
   d. Both assertion and reason are false.

16. **Read the following and answer any four questions:**

In human beings, the lungs are situated in the thoracic chamber which is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs, and on the lower side by the dome-shaped diaphragm. The anatomical setup of the lungs in the thorax is such that any change in the volume of the thoracic cavity will be reflected in the lung (pulmonary) cavity. Such an arrangement is essential for breathing. Breathing involves two stages - inspiration and expiration. During inspiration, the atmospheric air is drawn in and during expiration, the alveolar air is released out.

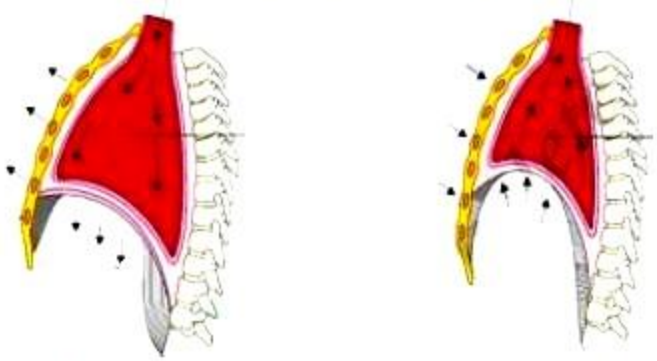
i. On average, a healthy human breathes _____ times/minute.
   a. 12 - 16
   b. 18 -20
   c. 70 - 72
   d. 80 – 84

ii. Air is sucked into the lungs by _____.
   a. Ribs lift up
   b. Diaphragm flattens
   c. Ribs flatten
   d. Both ribs lift up and diaphragm flattens

iii. What term is used for the volume of air inspired or expired during normal respiration?
   a. Tidal volume
   b. Inspiratory Reserve Volume
   c. Residual Volume
   d. Vital Capacity

iv. The residual volume of air is _____.
   a. 6000 to 8000 mL
   b. 2500 mL to 3000 mL
   c. 1000 mL to 1100 mL
   d. 1100 mL to 1200 mL

v. The following statements are drawn as conclusions for the image shown.



   I. The movement of air into and out of the lungs is carried out by creating a pressure gradient.
   II. Expiration can occur if the pressure within the lungs (intra-pulmonary pressure) is less than the atmospheric pressure.
   III. The diaphragm and a specialised set of muscles help in generation of pressure gradients.
   IV. Expiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber in the antero-posterior axis.

   Choose from below the correct alternative.
   a. a. Only I is true

b. b. I and IV are true

c. c. III and II are true

d. d. I and III are true

Section B

17. When does anaerobic respiration occur in man and yeast?
18. An owner of an apple orchard wants to get better yield and wants to wait for good market conditions to sell his apples. Which PGR should he use to achieve his goals?
19. Differentiate between Receptor and Motor endplate.
20. On what factor the respiratory quotient depends?

OR

i. What is the end product of glycolysis and where does this process occur?

ii. List the conditions under which fermentation occurs in plant cells?

21. In a way green plants and cyanobacteria have synthesized all the food on the earth. Comment.
22. What are the main steps during Calvin cycle?

OR

Why is the colour of a leaf kept in the dark frequently yellow, or pale green? Which pigment do you think is more stable?

23. Flower is a reproductive unit of a plant.
    i. It is morphologically called shoot. Explain.
    ii. On which part, floral whorls are arranged?
24. A patient complains of constant thirst, excessive passing of urine, and low blood pressure. When the doctor checked the patients' blood glucose and blood insulin level, the level was normal or slightly low. The doctor diagnosed the condition as diabetes insipidus. But he decided to measure one more hormone in patients' blood. Which hormone does the doctor intend to measure?
25. Mention any four features present in animals belonging to phylum Echinodermata.

Section C

26. Give the schematic representation of an overall view of Krebs' cycle.
27. What is morphology?

28. How are photosynthesis and respiration related to each other?
29. Write a note on mitosis.
30. Write short notes on:
    (a) Kingdom plantae (b) Kingdom animalia (c) Bacteria (d) Lichens

OR

What is the need of a classification system in biology? How did different classification systems develop over a period of time?

Section D

31. Distinguish between Annelida and Arthropoda.

OR

Describe key features of class Mammalia. Discuss how these features enable them to be at the top of the evolutionary pyramid.

32. What are gums made of ? Is Fevicol different?

OR

Explain the composition of triglyceride.

33. Thrombocytes are essential for coagulation of blood. Comment.

OR

With the help of suitable diagram describe the structure of the human heart.

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Solution

Section A

1. Julian Huxley (1940) was a scientist who developed the concept of new systematics.
2. Different cell junctions found in tissues are as follows:
   i. Tight junctions
   ii. Gap junctions
   iii. Adhering junctions
3. Cycas is a living representative of once a large group of gymnosperms which has become largely extinct.
4. Sliding Filament Theory of Muscle Contraction. Mechanism of muscle contraction is best explained by the sliding filament theory which states that contraction of a muscle fibre takes place by the sliding of the thin filaments over the thick filaments.
5. When stamens are attached to the perianth, it is called epiphyllous arrangement.
6. Columnar epithelium facilitates secretion, absorption, movement of particles or mucus.
7. During anaphase of mitotic cell division, chromosomes get separated.
8. Cellular respiration involves oxidation of glucose to produce energy. Trapping of that energy and utilization of that energy. All of this happens inside a cell.
   Equation for respiration.
   $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 674$ kcal
9. Hypothyroidism is a low secretion of thyroxine hormone. Hyperthyroidism is oversecretion of thyroid hormones. It occurs due to the low or hyperactivity of the thyroid gland.
10. The substances like glucose, amino acids, Na+, etc., in the filtrate are reabsorbed actively whereas the nitrogenous wastes are absorbed by passive transport.
11. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
    Explanation: Archaebacteria are special bacteria as they live in some of the harshest habitats such as extreme salty areas (halophiles), hot springs (thermoacidphiles) and marshy areas (methanogens). They have different cell wall structures than other bacteria

having protein and non-cellulosic polysaccharide in their cell walls which is responsible for their survival in extreme conditions.

OR

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation: Albugo parasitizes several annual crucifers such as Cypsella bursa pastoris, Lepidium, Brassica campestris, Raphanus sativus and many other cruciferous weeds. The disease appears on the leaves and stems and does not attack the roots. This disease causes deformation of flowers and fruits of the host.

12. (c) Assertion is correct statement but reason is wrong statement.
    Explanation: Assertion is true but Reason is wrong.
13. (c) Assertion is correct statement but reason is wrong statement.
    Explanation: Assertion is correct statement but reason is wrong statement.
14. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
    Explanation: Assertion and reason both are correct statements and reason is correct explanation for assertion.
15. i. (a) The cell envelope in prokaryotes consists of a tightly bound three-layered structure i.e., the outermost glycocalyx followed by the cell wall and then the plasma membrane.
    ii. (a) Bacteria can be classified into two groups on the basis of the differences in the cell envelopes and the manner in which they respond to the staining procedure developed by Gram. Those bacteria that take up the gram stain are Gram-positive and those bacteria that do not take up the gram stain are called Gram-negative bacteria.
    iii. (c) A special membranous structure called mesosome is formed by the extensions of the plasma membrane into the prokaryotic cell.
    iv. (d) The fimbriae are small bristle-like fibres sprouting out of the cell.
    v. (c) Glycocalyx in the cell envelop of prokaryotes differs in composition and thickness among different bacteria. It could be a loose sheath called the slime layer in some, while in others it may be thick and tough, called the capsule. Hence, assertion statement is true but reason is false.
16. i. (a) On an average, a healthy human breathes 12-16 times/minute.

ii. (d) When we breathe in, the ribs are lifted up and the diaphragm flattens which increases the size of the chest cavity. Because of this, the air is sucked into the lungs and fills the expanded alveoli.

iii. (a) Volume of air inspired or expired during normal respiration is called tidal volume.

iv. (d) Residual volume of air is the remaining air in the lungs even after a forcible expiration. This averages 1100 mL to 1200 mL.

v. (d) The movement of air into and out of the lungs is carried out by creating a pressure gradient between the lungs and the atmosphere. Inspiration can occur if the pressure within the lungs (intra-pulmonary pressure) is less than the atmospheric pressure. The diaphragm and a specialized set of muscles – external and internal intercostals between the ribs, help in the generation of pressure gradients. Inspiration is initiated by the contraction of the diaphragm which increases the volume of thoracic chamber in the antero-posterior axis. Hence, statements I and III are true.

Section B

17. Anaerobic respiration occurs in man in muscles at the time of excessive exercising. Blood supply does not meet the oxygen demand of the exercising body. At that time in muscle, lactic acid is produced as a result of anaerobic respiration. In yeast also, anaerobic respiration occurs in the condition of absence of oxygen.

18. He should use Gibberellins. Gibberellins help increase the size of apples. Moreover, they also delay senescence so apple can be left on branches for a longer duration. This will give the orchard owner enough time to wait for good market conditions.

19. **Difference between Receptor and Motor endplate:**

Receptor	**Motor endplate**
Structure of the sensory terminal is a receptor.	It occurs at the **neuromuscular junction.**
On the new fibre, there are structures for collecting information which is called receptors.	The axon of a neuron ends into a muscle fibre or a gland cell.

20. $\text{R.Q.} = \frac{\text{Volume of } CO_2 \text{ evolved}}{\text{Volume of } O_2 \text{ consumed}}$

RQ depends upon the type of respiratory substrate used during respiration. It is different for different substrates.

OR

i. The end product of glycolysis Glucose + 2ADP + 2Pi + 2NAD $\longrightarrow$ 2 Pyruvic acid + 2ATP + $2NADH_2$ It occurs in cytoplasm, i.e., outside the mitochondria.

ii. Fermentation in plant cells occurs in the absence of oxygen.

21. Cyanobacteria are unicellular prokaryotic organisms. Besides, some primitive cellular cell organelles, they have photosynthetic lamellae where photosynthetic pigments are present. There are chlorophyll-a c, phycocyanin, and phycoerythrin. These coloured pigments impart typical blue-green colour to the bacteria and enable them to manufacture food for themselves and aquatic animals. Green plants are multicellular organisms capable of making food and light energy in special cell organelles called a chloroplast by a process called photosynthesis. So, bacteria and green plants make food for living organisms on earth.
22. The three stages of Calvin cycle are: (a) Carboxylation (b) Reduction and (c) Formation of Hexose Sugar and Regeneration of RuBP.

OR

Chlorophyll is unable to absorb energy in the absence of light and loses its stability, giving the leaf a yellowish colour. This shows that xanthophyll is more stable.

23. i. Flower is the reproductive unit of the plant. It is considered, as a shoot because the position of the buds of both flower and shoot is the same and can be terminal or axillary in position.

ii. Floral whorls are arranged on the thalamus, swollen end of the axis.

24. The doctor intended to check Vasopressin or Anti-Diuretic hormone in the blood because the low level of this hormone can result in excessive passing of urine and low blood pressure.
25. **Four Main Features of Animals belonging to Phylum Echinodermata :**

i. Called spiny bodied animals which are exclusively **marine.**

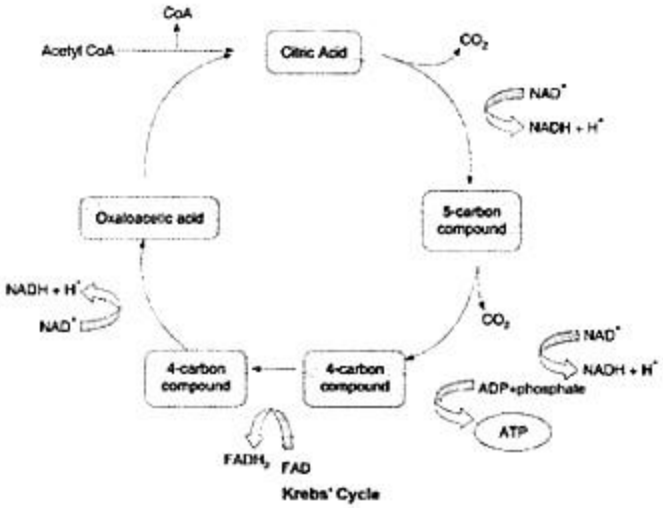
ii. Triploblastic, coelomate having **water vascular system** in them.

iii. Locomotion by **tube feet** occurs.

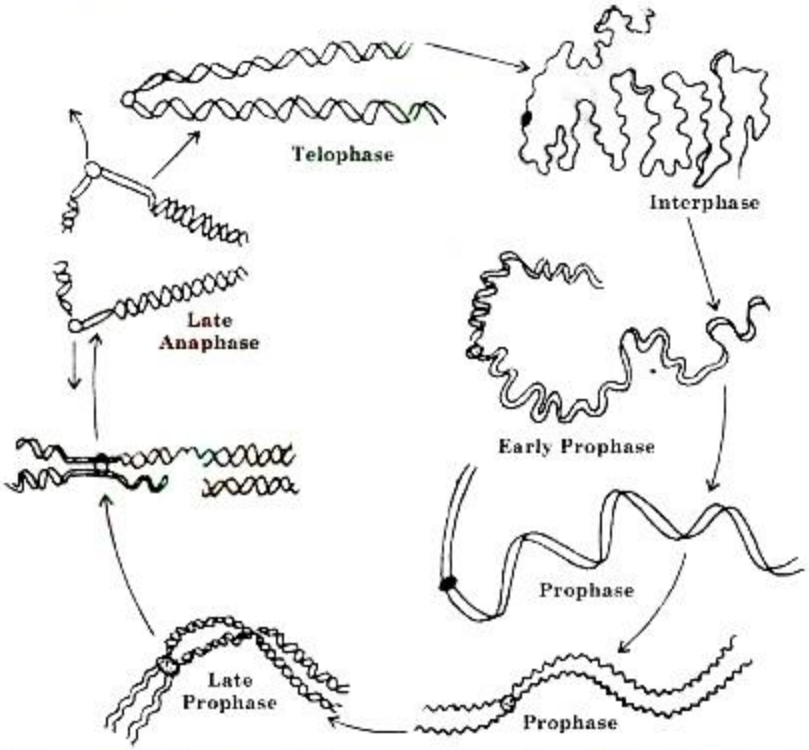
iv. **Radially symmetrical** animals e.g., Asterias, Echinus, Antedon, and Cucumaria, etc.

Section C

26.



27. Morphology is the study of the form, structure and configuration of an organism.
28. Photosynthesis and respiration are related to each other in certain ways. We know that respiration involves oxidation of carbohydrates to produce energy. Since carbohydrates for respiration are prepared during photosynthesis, hence respiration cannot happen without photosynthesis. Moreover, respiration also needs oxygen which is a byproduct of photosynthesis. Similarly, carbon dioxide is an important raw material for photosynthesis and much of the carbon dioxide comes as a byproduct of respiration.
29. **Mitosis:** It occurs in somatic cells. The main stages of mitosis are prophase, metaphase, anaphase and telophase. The prophase is marked by shortening and thickening of the chromosome.



The centrioles move to opposite poles. The nuclear envelope is dissolved. The spindle

fibres begin to appear but the nucleoli disappear. In metaphase, the chromosomes are arranged in the centre to form the **equatorial plate.** The centromere lies on the equator and arms towards the poles. At anaphase, the centromere divides separating the two chromatids of each pair. The chromosomes migrate towards the opposite poles. The telophase starts when the chromosomes reach opposite poles.

30. a. **Kingdom plantae.** All green plants are taken under this kingdom. Majority of members are autotrophic. Exceptions are certain parasitic plants, like venus fly trap. Plants show alternation of generation. Reproduction is vegetative asexual and sexual.
    b. **Kingdom animals.** Animals are mobile. They show holozoic nutrition, i.e. they ingest their food and break complex food substance into simpler compounds. Animals can be unicellular and multicellular. Reproduction is asexual and sexual.
    c. **Bacteria.** Bacteria are unicellular. Among bacteria there are certain species which are believed to be on earth since life began on earth. Bacteria can be beneficial and harmful to humans. Nutrition is heterotrophic and autotrophic.
    d. **Lichens.** Lichens are a very good example of symbiosis. Lichens are combination of algae and fungi. The algal part provides food and base to the fungal part, while the fungal part provides gases to the algal part. They are supposed to be very good tool to identify level of pollution in a given ecosystem.

OR

There are millions of species on this planet. The largest phylum Arthropoda alone comprises of millions of species. To study all of them properly we need some system for categorizing them, based on some common characteristics.

Apart from that think of the differences in language and you will find different names for the same species in different languages. In the absence of a system of nomenclature it would have been difficult to share scientific knowledge among the scientists of different nations.

To make things easier and systematic the need for classifications was felt. Earlier attempts by people like Aristotle segregated living beings into plants and animals. This was good point to start with, but there are certain living beings which do not fit in either of plants or animals.

So a three kingdom classification was devised. The three kingdom classification was used for some time. But as none of the scientific theory is permanent so further discoveries led

to creation of a five kingdom classification. The five kingdom classification is the most accepted system of classification.

Section D

31.

Annelida	Arthropoda
Elongated and metamerically segmented body.	Body segmented, differentiated into cephalic, thoracic and abdominal regions.
Appendages borne on body segments.	Appendages may be segmented or jointed.
Setae are present.	Setae are absent.
The body wall dermo-muscular.	The body wall is not dermo muscular.
The body cavity is a coelom.	The body cavity is a haemocoel.
The respiratory pigment is haemoglobin.	The respiratory pigment is absent.
Blood is red.	Blood is colourless or bluish.
Blood vascular system is closed type.	Blood vascular system is of open type.
Cilia and nephridia are present.	Cilia and nephridia are absent.
No exoskeleton.	The exoskeleton is chitinous.

OR

Key Features of Mammalia

Unique Characters. The most unique mammalian characteristic is the presence of milk producing glands (mammary glands) by which the young ones are nourished. They have two pairs of limbs, adapted for walking, running, climbing, burrowing, swimming or flying. The skin of mammals is unique in possessing hair. External ears or pinnae are present. Different types of teeth are present in
the jaw.

Circulatory System. Heart is four-chambered. They are homoiothermous. Respiration is

by lungs.

Reproduction. Sexes are separate and fertilization is internal. They are viviparous with few exceptions and development is direct.

Mammary glands enable animals of this class in nurturing the progeny for a longer duration. This helps in preparing them in a better way in the ways and means of survival. In other words they get trained in getting food and selecting partners for reproduction.

In higher mammals forelimbs are utilized for grabbing things which enables them in handling objects. Especially in human the opposite orientation of thumb compared to other fingers help them in manipulating tools.

Larger mammals can see up to a great distance because their limbs enable them to hold their eyes on a higher plane. This helps them in sensing danger and opportunity from a greater distance so that they can react accordingly.

Presence of hair on body gives better insulation against temperature. So, most of the mammals can survive in variety of environmental conditions.

Majority of them are viviparous. This means there is lesser strain on body of the female and a longer life span for her. Moreover, this also ensures that the offspring can be of very large size.

Heart is four chambered, so there is complete segregation of oxygenated and deoxygenated blood. This is a more efficient mode of exchange of gases. This enables mammals to do more vigorous physical activities.

Presence of teeth enables mammals to ingest more variety of food. So, mammals can be herbivorous, carnivorous and omnivorous. This enables mammals to utilize more natural resources compared to other animals.

Presence of external ear helps them in catching sound waves from a longer distance. Once again the advantage is of sensing opportunity and danger from a larger distance. This gives ample of reaction time to mammals.

They are homoiothermous which means they can control their body temperature and don't have to depend on external environment for that. No matter what is the environmental condition.

32. Gums are polysaccharides of natural origin, capable of causing a large viscosity increase in solution, even at small concentrations.

    Fevicol is a synthetic glue. These adhesives are a mixture of ingredients (typically polymers) dissolved in a solvent. As the solvent evaporates, the adhesive hardens.

Depending on the chemical composition of the adhesive, they will adhere to different materials to greater or lesser degree. These adhesives are typically weak and are used for household applications.

OR

Triglycerides are the predominant component of most food fats and oils. The minor components include mono- and diglycerides, free fatty acids, phosphatides, sterols, fatty alcohols, fat-soluble vitamins, and other substances. A triglyceride is composed of glycerol and three fatty acids. Ester bonds form between each fatty acid and the glycerol molecule. General structure of a triglyceride is shown below—

Chemical formula

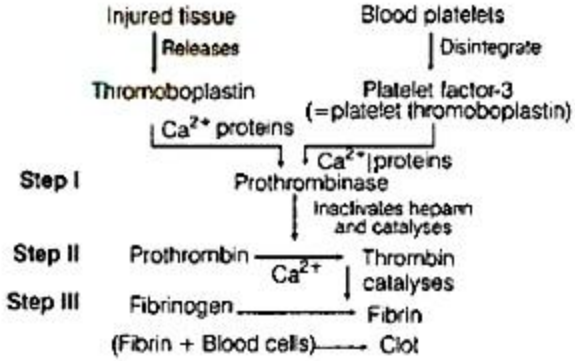
RCOO - $CH_2CH(-OOCR)\ CH_2$ - OOCR''

where R, R', and R'' are longer alkyl chains. The three fatty acids RCOOH, R'COOH and R''COOH can be or same.

Chain lengths of the fatty acids in naturally occurring triglycerides can be of varying lengths, but chains consisting of 16, 18 and 20 carbons are the most common. Natural fatty acids found in plants and animals are typically composed only of even number of carbon atoms due to the way they are biosynthesized from acetyl CoA. Bacteria, however, possess the ability to synthesize odd - and branched-chain fatty acids. Consequently, ruminant animal fat contains odd-numbered fatty acids, such as 15, due to the action of bacteria in the rumen.

33. i. **Thromboplastin** helps in the formation of an enzyme prothrombinase (which inactivates heparin) that converts the inactive plasma protein, i.e., prothrombin into its active form **thrombin.**

    ii. Thrombin thus acts as a proteolytic enzyme to convert fibrinogen molecule (produced from the liver in the presence of vitamin-K) to form insoluble fibrin monomer.



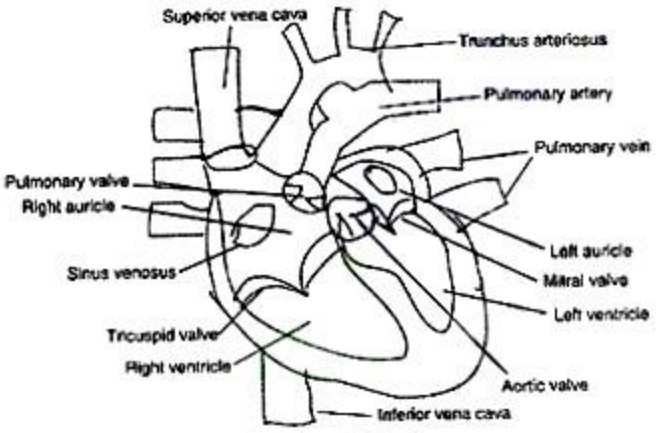
This reaction required thrombokinase an enzyme complex, which is formed by a series of linked enzymatic reactions (with cascade effects) which involves a number of various factors present in the plasma in their inactive state. Both the changes mentioned above require Ca^{2+} ions for their reaction.

iii. These fibrin monomers polymerise to long, sticky fibres. The fibrin threads form a fine network of threads called fibrins, in which dead and damaged formed elements of blood are trapped.
This finally leads to the formation of a clot or **coagulum,** which is a dark reddish-brown **scum** formed over the surface of injury.

OR

Heart

i. **Location and Size:** Heart, the mesodermally derived organ, is situated in the thoracic cavity, in between the two lungs, slightly tilted to the left. It has the size of a clenched fist.



Structure of Heart

ii. **Structure:** The heart is protected by a double-walled membranous pericardium, enclosing the pericardial fluid.
The heart has four chambers:
   a. Two relatively small upper chambers called atria and
   b. Two larger lower chambers called ventricles.

iii. **Septum:** A thin, muscular wall called the intertribal septum separates the right and the left atria, whereas a thick-walled, the inter-ventricular septum, separates the left and the right ventricles The atrium and the ventricle of the same side are also separated by a thick fibrous tissue called the atrioventricular septum. However, each

of these septa are provided with an opening through which the two chambers of the same side are connected.

iv. **Valves:** The opening between the right atrium and the right ventricle is guarded by a valve formed of three muscular flaps or cusps, the tricuspid valve, whereas a bicuspid or mitral valve guards the opening between the left atrium and the left ventricle. The openings of the right and the left ventricles into the pulmonary artery and the aorta respectively are provided with the semilunar valves. The valves in the heart allow the flow of blood only in one direction, i.e., from the atria to the ventricles and from the ventricles to the pulmonary artery or aorta. These valves prevent any backward flow of blood.