

CBSE Class 11 Biology
Sample Paper 04 (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. How are living organisms divided into different taxa? What is the name given to this process?
2. What is the function of compound epithelium?
3. The male and female cone are found on the same plant in which of the Gymnosperms?
4. What is the reason of hard matrix of bones?
5. Define epiphyllous arrangement of stamens.
6. Define neural tissues.
7. Evaluate significance of mitosis.
8. What is the end product of Krebs' cycle?
9. Which hormonal deficiency is responsible for the following?
 - a. Diabetes mellitus
 - b. Goitre
 - c. Cretinism
10. Terrestrial animals are generally either ureotelic or uiricotelic, not ammonotelic, why?

11. **Assertion:** Aristotle was the earliest to attempt a more scientific basis for classification.

Reason: He used simple morphological characters to classify plants and blood for classifying animals.

- 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 : Plasmodium is a Sporozoans.

Reason : have an infectious spore-like stage in their life cycle.

- 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:** Arachidonic acid is an unsaturated fatty acid.

Reason: There are present one or more double bonds between carbon atoms in unsaturated fatty acid.

- 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:** Many molecules can move briefly across the membrane without any requirement of energy and this is called passive transport.

Reason: Neutral solutes may move across the membrane by the process of simple diffusion.

- 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:** A sigmoid curve is obtained when percentage saturation of haemoglobin with O_2 is plotted against the P_{O_2} .

Reason: Saturation is affected by factors like $P_{CO_2} > H^+$ concentration, etc.

- 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:**

Electron microscopic studies of eukaryotic cells reveal the presence of a network or reticulum of tiny tubular structures scattered in the cytoplasm that is called the endoplasmic reticulum (ER). The endoplasmic reticulum (ER) is a large network of membrane-bound tubes and sheets which look like long tubules or round or oblong bags (vesicles).

- i. The endoplasmic reticulum bearing _____ on their surface is called the rough endoplasmic reticulum (RER).
 - a. Ribosomes
 - b. Lysosomes
 - c. Golgi body
 - d. Plastids
- ii. RER is frequently observed in the cells actively involved in _____ synthesis and secretion.
 - a. Lipid
 - b. Glycoprotein
 - c. Glucose
 - d. Protein
- iii. The smooth endoplasmic reticulum is the major site for synthesis of _____.

- a. Lipid
- b. Protein
- c. Glucose
- d. Starch

iv. ER divides the intracellular space into _____ distinct compartments.

- a. Three
- b. Six
- c. Two
- d. Four

v. **Assertion:** The ER often shows ribosomes attached to their outer surface.

Reason: In animal cells, lipid-like steroidal hormones are synthesised in RER.

- 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:

Blood is the medium of transport for O_2 and CO_2 . About 97 percent of O_2 is transported by RBCs in the blood. The remaining 3 percent of O_2 is carried in a dissolved state through the plasma. Nearly 20-25 percent of CO_2 is transported by RBCs whereas 70 percent of it is carried as bicarbonate. About 7 percent of CO_2 is carried in a dissolved state through plasma.

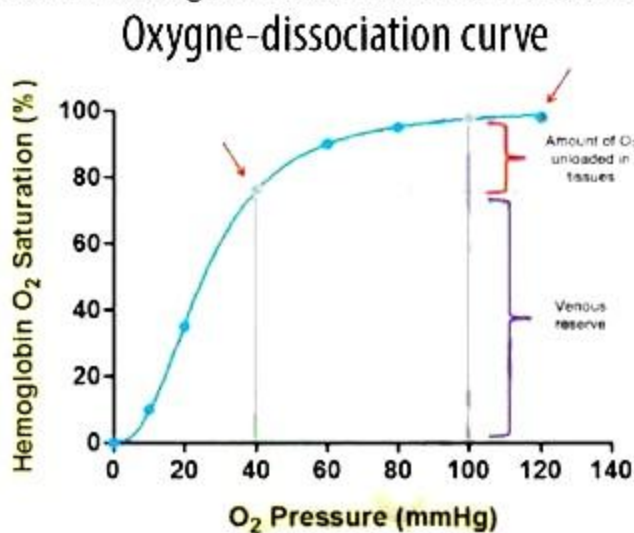
i. _____ is a red coloured iron-containing pigment present in the RBCs.

- a. Haemoglobin
- b. Chlorophyll
- c. Phycobilin
- d. Xanthophyll

ii. Each haemoglobin molecule can carry a maximum of _____ molecules of O_2 .

- a. Two
- b. Three
- c. Four

- d. Six
- iii. A _____ curve is obtained when the percentage saturation of haemoglobin with O_2 is plotted against the pO_2 .
- Growth
 - Sigmoid
 - J- shaped
 - Logistic curve
- iv. CO_2 is trapped as _____ at the tissue level and is transported to the alveoli is released out as CO_2 .
- Carbamino-haemoglobin
 - Oxyhaemoglobin
 - Bicarbonate
 - Plasma
- v. The following statements are drawn as conclusions for the image shown.



- A sigmoid curve is highly useful in studying the effect of factors like pCO_2 , H^+ concentration, etc., on binding of O_2 with haemoglobin.
- In the alveoli, all factors are favourable for the formation of oxyhaemoglobin.
- Every 100 ml of oxygenated blood can deliver around 15 ml of O_2 to the tissues under normal physiological conditions.
- O_2 gets bound to haemoglobin at the tissues and gets dissociated in the lung surface.

Choose from below the correct alternative.

- a. Only I is true
- b. I and II are true
- c. III and IV are true
- d. I and III are true

Section B

17. Give a diagrammatic representation of fermentation process.
18. List the main uses of auxins.
19. Why does cerebral hemisphere possess many gyri?
20. When does RQ is slightly more than unity?

OR

If a person is feeling dizzy, glucose or fruit juice is given immediately but not a cheese sandwich, which might have more energy. Explain.

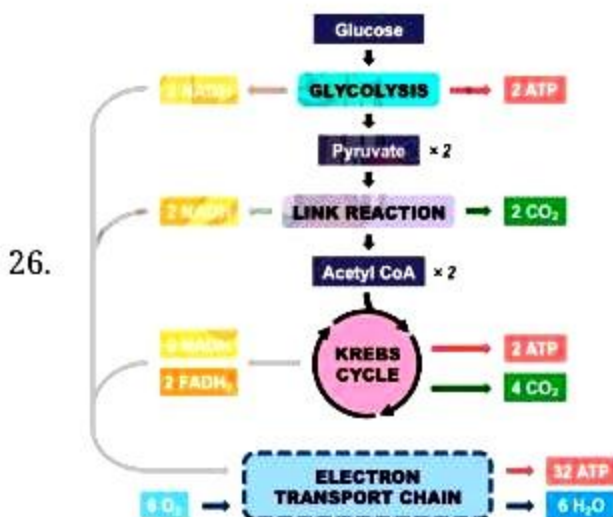
21. What is non-cyclic photophosphorylation?
22. What are the two main functions of pigments other than chlorophyll in green leaves?

OR

ATPase enzyme consists of two parts. What are those parts? How are they arranged in the thylakoid membrane? Conformational change occurs in which part of the enzyme?

23. Describe the inflorescence type of Solanaceae family.
24. What happens in case of deficiency of antidiuretic hormone?
25. What is a cnidoblast?

Section C



With the help of the schematic flow chart answer the following questions:

- i. Calculate the total number of ATP produced from the complete oxidation of one molecule of glucose under aerobic respiration in the prokaryotic organism and eukaryotic organism?
 - ii. When do cells liberate its most of the energy?
27. Differentiate between Monadelphous, Syngenesious and Synandrous Stamens.
 28. Describe the process of photorespiration.
 29. Write briefly the significance of mitosis and meiosis in a multicellular organism.
 30. Distinguish between Photosynthesis and Chemosynthesis.

OR

Find out what do the terms 'algal bloom' and 'red tides' signify.

Section D

31. What are the symmetries based on which animals can be classified? Describe with an appropriate diagram.

OR

Comment upon the habitats and external features of animals belonging to class, amphibia and reptilia.

32. What is the difference between a nucleotide and nucleoside? Give two examples of each with their structure.

OR

Find out a qualitative test for proteins, fats and oils, amino acids and test any fruit juice, saliva, sweat and urine for the same.

33. What physiological circumstances lead to erythroblastosis foetalis?

OR

Describe conduction of heartbeat with the help of a suitable diagram.

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Solution

Section A

1. Living organisms can be divided into different taxa based on their characteristics. This process of classification is called taxonomy.
2. Compound epithelium helps to provide protection against chemical and mechanical stress.
3. Pinus
4. High concentration of calcium salts.
5. When stamens are attached to the perianth, it is called epiphyllous arrangement.
6. Neural tissue is made up of nerve cells or neurons which are excitable cells and facilitate the conduction of brain impulses .
7. Mitosis helps in growth of an organism and cell repair.
8. The end product of Kreb's cycle is same as the starting reactant: Oxaloacetic acid. Along with it, $\text{NADH} + \text{H}^+$, FADH_2 and ATP is also produced.
9. The deficiency of the following hormones leads to:
 - a. Diabetes mellitus is due to the deficiency of insulin.
 - b. Gbitre is due to deficiency of thyroxine and triiodothyronine.
 - c. Cretinism is due to deficiency of thyroxine hormone.
10. Ammonia is the most toxic amongst all excretory products and needs lots of water to be removed from the body. In terrestrial animals availability of water is not as much as in aquatic animals. So a mechanism needed to be developed to ensure less wastage of water during removal of excretory substances. This became possible by using ureotelic and urecotelic mode of excretion.
11. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation: Aristotle was the earliest to attempt a more scientific basis of classification. He used simple morphological characters to classify plants into trees, shrubs and herbs and divided animals into two groups having red blood and those that did not have red blood.

OR

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

Explanation: Under suitable conditions, the slime moulds form an aggregation called plasmodium which may grow and spread over several feet. During unfavourable conditions, the plasmodium differentiates and forms fruiting bodies bearing spores which are extremely resistant and survive for many years, even under adverse conditions. The spores are dispersed by air currents so they are infectious.

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

Explanation: Arachidonic acid is an unsaturated fatty acid due to the presence of double bond. Arachidonic acid is a carboxylic acid with a 20-carbon chain and four cis-double bonds; the first double bond is located at the sixth carbon from the omega end.

13. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

Explanation: Assertion and reason both are correct statements but reason is not correct explanation for assertion.

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 endoplasmic reticulum bearing ribosomes on their surface is called rough endoplasmic reticulum (RER).

ii. (d) RER is frequently observed in the cells actively involved in protein synthesis and secretion.

iii. (a) The smooth endoplasmic reticulum is the major site for synthesis of lipids.

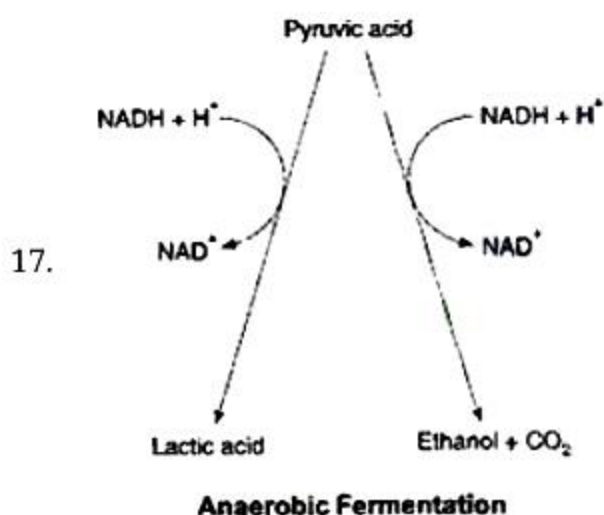
iv. (c) ER divides the intracellular space into two distinct compartments, i.e., luminal (inside ER) and extraluminal (cytoplasm) compartments.

v. (c) The ER often shows ribosomes attached to their outer surface. In animal cells, lipid-like steroidal hormones are synthesised in SER. Hence, assertion is true but reason is false.

16. i. (a) Haemoglobin is a red coloured iron-containing pigment present in the RBCs.

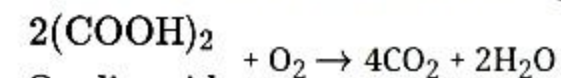
- ii. (c) Each haemoglobin molecule can carry a maximum of four molecules of O_2 .
- iii. (b) A sigmoid curve is obtained when the percentage saturation of haemoglobin with O_2 is plotted against the pO_2 .
- iv. (c) CO_2 is trapped as bicarbonate at the tissue level and is transported to the alveoli is released out as CO_2 .
- v. (b) A sigmoid curve is highly useful in studying the effect of factors like pCO_2 , H^+ concentration, etc., on the binding of O_2 with haemoglobin. In the alveoli, where there is high pO_2 , low pCO_2 , lesser H^+ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin. Every 100 ml of oxygenated blood can deliver around 5 ml of O_2 to the tissues under normal physiological conditions. O_2 gets bound to haemoglobin in the lung surface and gets dissociated at the tissues.

Section B



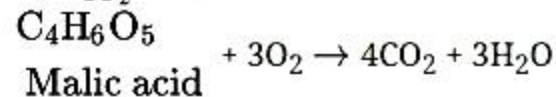
- 18. Main uses of auxins are the following:
 - i. Induces Rooting
 - ii. Induce Flowering
 - iii. Prevents premature fruit drop
 - iv. Induces parthenocarpy
- 19. Gyri increase the surface area of the cerebral cortex and help in the formation of the brain division. Increasing the surface area of the brain allows more neurons to be packed into the cortex so that it can process more information.
- 20. RQ slightly more than unity is found when organic acids are broken down as respiratory

substrates under aerobic conditions, e.g.,



Oxalic acid

$$\text{RQ} = \frac{4\text{CO}_2}{1\text{O}_2} = 4.0$$



Malic acid

$$\text{RQ} = \frac{4\text{CO}_2}{3\text{O}_2} = 1.3$$

OR

Glucose or fruit juice is an immediate source of energy as it gets absorbed quickly whereas cheese sandwich requires time for digestion and absorption. A sick person requires immediate energy supply, so glucose or fruit juices are given for instant energy instead of a cheese sandwich which has more energy than glucose or fruit juice.

21. It is the process of formation of ATP and NADPH, during which electron emitted by reaction centre P_{700} is not returned to it but is substituted by the electron emitted by reaction centre P_{680} , which in turn gets the electron released by photolysis of water.
22. **The functions of pigments other than chlorophyll are :**
 - i. to absorb light energy and transfer it to chlorophyll for photosynthesis,
 - ii. to protect the chlorophyll molecule from photo-oxidation.

OR

ATPase enzyme consists of two parts; called F_0 head and F_1 head. The F_0 head is towards the inner side of the thylakoid, while F_1 is towards the outer side of the thylakoid. The conformational change occurs in F_1 part of the enzyme.

23. Solitary, axillary or terminal, umbellate or occasionally helicoid and scorpoid cyme.
24. Deficiency of ADH can lead to diminished ability of the kidney to conserve water leading to water loss and dehydration. This disease is known as diabetes insipidus.
25. Cnidoblasts are special structures containing stinging capsules. The poisonous substance from the stinging capsule is used to kill the prey.

Section C

26. i. In a prokaryotic cell, oxidation of a glucose molecule always provides 38 ATP

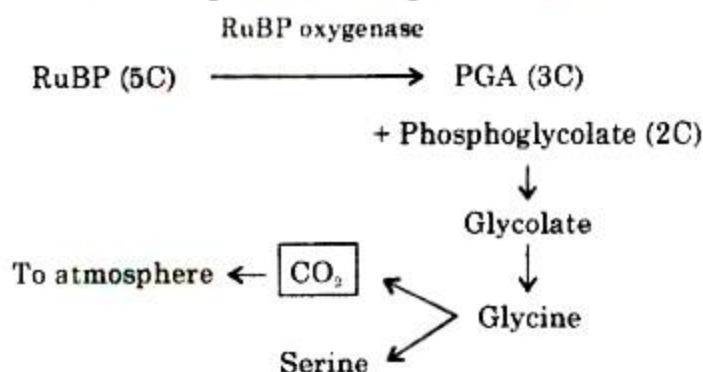
molecules because NADH does not enter the mitochondria. In Eukaryotic cell, oxidation of a glucose molecule always provides 36 ATP molecules.

- ii. Most of the energy in the cells is liberated by oxidation of carbohydrates when pyruvic acid is converted into CO_2 and H_2O .

27.

Monadelphous Stamens	Syngenesious Stamens	Syndrous Stamens
All the stamens of a flower are fused in one bundle by their filaments only.	Anthers of all the stamens are fused.	Anthers and filaments of all the stamens are fused.
The staminal tube is formed around the base of the pistil which may extend to cover the style.	Fused anthers make a tube around the style.	Fused anthers and filaments form a compact mass.
Anthers and upper part of the filaments are free.	Filaments of all the stamens are free.	No part of stamen is free.

28. It is a process of loss of photosynthetically fixed carbons, occurring in some plants during intense heat and low carbon dioxide concentrations. Under these conditions, the enzyme **Rubisco** functions as **RuBP oxygenase** and converts Ribulose Bi Phosphate (5 carbon) into Phosphoglyceric acid (3 carbon) and **Phosphoglycolate** (2 carbon). Soon glycolate is formed of phosphoglycolate. In peroxisomes, glycolate soon changes into glycine and glycine into serine and CO_2 ; without production of assimilatory powers (ATP and NADPH₂). Important changes are summarised below as :



29. **Significance of Mitosis:**

- i. Mitosis facilitates the development of the single-cell zygote into a full-grown organism.

- ii. It facilitates the growth of an organism.
- iii. It facilitates repair of worn out or damaged tissues.
- iv. It facilitates vegetative propagation in flowering plants.
- v. It facilitates regeneration in some animals; like planaria.

Significance of Meiosis:

- i. Meiosis ensures that the number of chromosomes becomes diploid in gametes. This helps in ensuring the conservation of specific chromosomal number in each species.
- ii. Meiosis facilitates genetic variability in populations. This is brought about because of crossing over during prophase-I.

30.

Photosynthesis	Chemosynthesis
Photosynthesis occurs in sunlight.	It occurs day and night both.
Light is necessary.	Light is not necessary.
Sun energy is taken up by chlorophyll. $\text{CO}_2 + \text{H}_2\text{O} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{C}_2\text{H}_{12}\text{O}_6 + \text{O}_2$	Inorganic substances of the environment provide energy. $\text{CO}_2 + \text{H}_2\text{S} \xrightarrow[\text{Chlorophyll}]{\text{Bacterial}} \text{Sugar} + \text{Sulphur}$

OR

Dianoflagellates can be of different colours depending on the type of pigment present. The red dianoflagellate sometimes multiply at a very rapid rate. This is called as algal bloom. This gives a red appearance to the part of affected sea. This is also known as 'red tide'. Toxins released by them can kill other marine species.

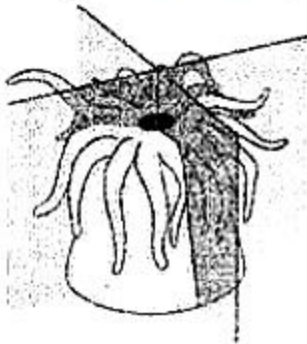
Section D

31. Animals can be categorized on the basis of their symmetry. sponges are mostly asymmetrical, i.e., any plane that passes through the centre does not divide them into equal halves.
- **Radial Symmetry:** When any plane passing through the central axis of the body divides the organism into two identical halves, it is called radial symmetry.

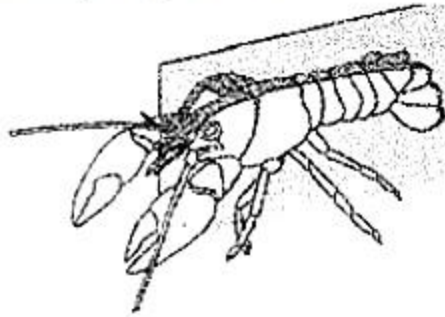
Coelenterates, ctenophores and echinoderms have this kind of body plan.

- **Bilateral Symmetry:** In certain animals, the body can be divided into identical left and right halves in only one plane and this type of symmetry is called bilateral symmetry.

Examples: Annelids, Arthropods, Mammals.



Radial Symmetry



Bilateral Symmetry

OR

Class - Amphibia

Habitat: Amphibians are first cold-blooded vertebrates that can live on land as well as in water. They use both gills and lungs for breathing, when in water gills are used and lungs on land. They are mostly found in warm countries.

External features:

- i. The body is compressed and cylindrical and differentiated into the head and trunk.
- ii. The larval stage is spent in water and adulthood on land.
- iii. Nostrils are connected to the buccal cavity eyes have eyelids.
- iv. Skin is mostly smooth, moist, highly vascular, and rich in the gland. Scales are generally absent. It helps in cutaneous respiration.
- v. Amphibians mostly have two pairs of pentadactyl limbs. They are used for locomotion.
- vi. A pair of external nares for olfaction, a pair of eyes with movable eyelids are present. The tympanum represents the ear. E.g., *Rana* (frog), *Bufo* (toad), *Erythronia* (tree frog), *Rhacophorus* (flying frog), *Salamandra* (salamander), etc.
- vii. Fertilization is external.

Class - Reptilia

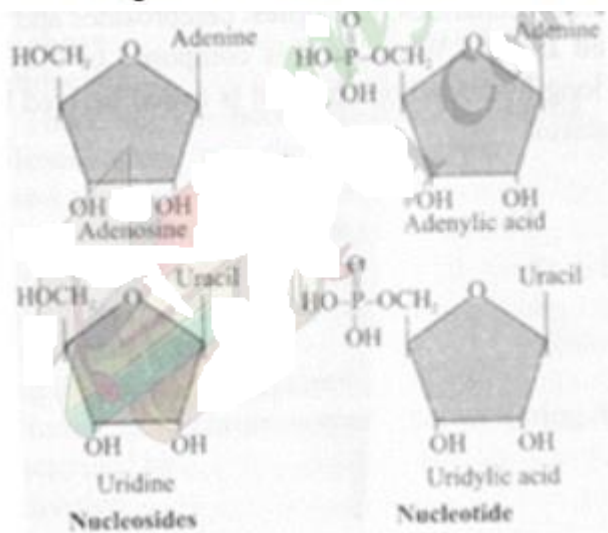
Habitat: Reptiles are mostly terrestrial animals, mainly found in warmer parts of the

world. Only a few of them live in water such as crocodiles, turtles.

External features:

- i. The body may be long, cylindrical, or short and broad. It is divisible as head, neck, trunk, and tail.
 - ii. They live on land predominantly.
 - iii. They have dry, rough, and non-glandular skin. It is provided with horny, epidermal scales or scutes.
 - iv. Appendages are of two pairs of pentadactyl limbs with powerful horny claws. Limbs are locomotory organs.
 - v. Sense organs like eyes, ears, and nose are well developed.
 - vi. Eyelids and nictitating membranes are present in lizards but absent in snakes.
E.g. Calotes (garden lizard), Draco (flying lizard), Naja (cobra), Hemidactylus (wall lizard)
 - vii. Fertilization is internal.
32. There are many biomolecules which have heterocyclic rings. Some of them are nitrogen bases. When nitrogen bases are found attached to sugar; they are called nucleosides. When nitrogen bases and sugar are found attached to a phosphate group; they are called nucleotides. Adenosine, guanosine, thymidine, uridine, and cytidine are nucleosides. Adenylic acid, thymidylic acid, guanylic acid, uridylic acid and cytidylic acid are nucleotides.

Following are structures of some of them:



OR

Qualitative tests for proteins, amino acids and fats:

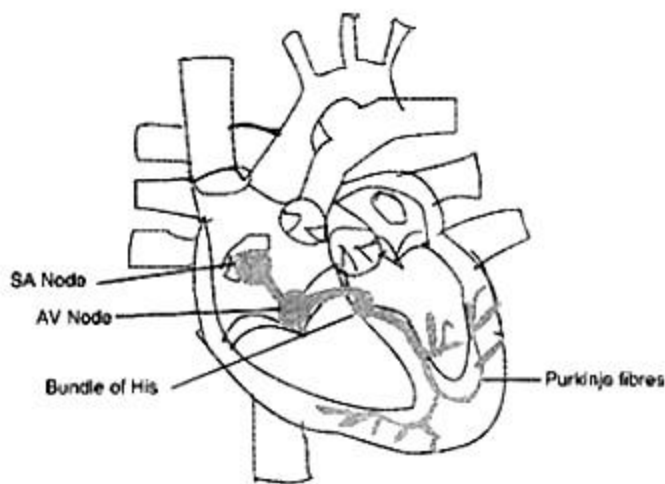
- i. **Biuret Test:** Biuret test for protein identifies the presence of protein by producing the violet colour of the solution. Biuret $\text{H}_2\text{NCONHCONH}_2$ reacts with copper ion in a basic solution and gives violet colour.
- ii. **Liebermann-Burchard Test for Cholesterol:** This is a mixture of acetic anhydride and sulphuric acid. This gives a green colour when mixed with cholesterol.
- iii. **Grease Test for Oil:** Certain oils give a translucent stain on clothes. This test can be used to show presence of fat in vegetable oils.

These tests can be performed to check presence of proteins, amino acids and fat in any of the fluid mentioned in the question.

33. **Rh factor:** Besides A and B, another antigen called Rh factor was reported from erythrocytes of certain persons. Rh factor was discovered by **Landsteiner in Rhesus Monkey**. About 85% of the people are Rh^+ i.e., have Rh^+ antigen. Rh factor is expressed by the dominant R gene. Rh-positive individuals are RR or Rr, while Rh-negative are rr. Disorders may arise as a result of the incompatibility of gene products in the blood of the newborn and its mother. The incompatibility may lead to **hemolytic** (blood cell destroying) **disorder** in the child be even fatal if not attended to. If a woman is Rh-negative and his husband is Rh^+ then the child may be Rh^+ . Blood from the foetus may pass through some defect in placenta into maternal bloodstream and stimulate the formation of antibodies i.e. anti-Rh antibodies. Then, when this woman becomes pregnant a second time, some of these antibodies may pass through the placenta into the child's stream and cause clumping of RBC cells. This is called **erythroblastosis foetalis** or **HDN**.

OR

Conduction of Heart Beat: The entire heart is made of cardiac muscles. The walls of ventricles are much thicker than that of the atria. A specialized cardiac musculature called the nodal tissue is present at specific locations in the heart.



Nerve Bundles in Heart

SA Node: A patch of nodal tissue is present in the right upper corner of the right atrium called the sino-atrial node (SAN).

AV Node: Another mass of nodal tissue is seen in the lower left corner of the right atrium close to the atrioventricular septum called the atrioventricular node (AVN).

Bundle of His: A bundle of nodal fibres, atrioventricular bundle (AV bundle) continues from the AVN which passes through the atrioventricular septa to emerge on the top of the inter-ventricular septum and immediately divides into a right and left bundle. These branches give rise to minute fibres throughout the ventricular musculature of the respective sides and are called Purkinje fibres.

These fibres along with right and left bundles are known as the bundle of HIS.

Generation of Heart Beat: The nodal musculature has the ability to generate action potentials without any external stimuli, i.e., it is autoexcitable. However, the number of action potentials that could be generated in a minute vary at different parts of the nodal system. The SA Node can generate the maximum number of action potentials, i.e., $70-75 \text{ min}^{-1}$, and is responsible for initiating and maintaining the rhythmic contractile activity or beating of the heart. Therefore, it is called the pacemaker. Our heart normally beats 70-75 times in a minute (average 72 beats per minute).