

1. Given below is a jumbled sequence of the different parts of the human alimentary canal. Rewrite them in correct sequence

Stomach, Oesophagus, large intestine, small intestine, Pharynx

Solution:

The correct sequence is as follows:

Pharynx → Oesophagus → Stomach → Small intestine → Large intestine

2. Name the following:

- (i) The three subdivisions of the small intestine
- (ii) The three subdivisions of the large intestine
- (iii) The three salivary glands

Solution:

- (i) The three subdivisions of the small intestine – Duodenum, Jejunum, Ileum
- (ii) The three subdivisions of the large intestine – Caecum, colon and rectum
- (iii) The three salivary glands – Parotid gland, submandibular gland, sublingual gland

3. Give the technical names for the following types of teeth in humans (on each side, in each jaw)

- (i) The three last grinders
- (ii) The pointed tooth for holding and tearing
- (iii) The broad sharp cutting teeth.
- (iv) The two temporary (deciduous) grinding teeth.

Solution:

The technical terms are as follows:

- (i) The three last grinders - Molars
- (ii) The pointed tooth for holding and tearing – Canines
- (iii) The broad sharp cutting teeth - Incisors
- (iv) The two temporary (deciduous) grinding teeth – Milk teeth

4. Name the following parts of a tooth:

- (i) Part exposed above the gum.
- (ii) The hard substance making the covering of the tooth.
- (iii) The soft connective tissue contained in the central space of the tooth.
- (iv) Bone-like structure fixing the root in position.
- (v) Slight constriction between the root and the crown.

Solution:

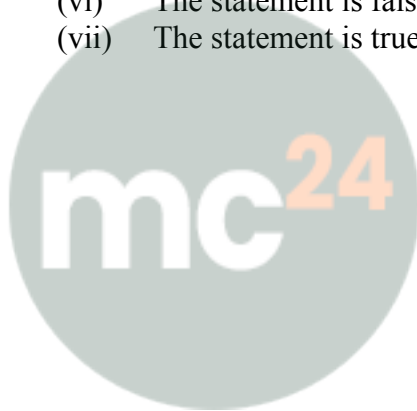
- (i) Part exposed above the gum - Crown
- (ii) The hard substance making the covering of the tooth - Enamel
- (iii) The soft connective tissue contained in the central space of the tooth - Pulp
- (iv) Bone-like structure fixing the root in position - Cement
- (v) Slight constriction between the root and the crown - Neck

1. Mention if the following statements are true (T) or false (F):

- (i) Saliva moistens and lubricates food
- (ii) Saliva contains a protein-digesting enzyme
- (iii) Saliva tends to destroy germs in the mouth
- (iv) Peristalsis occurs through all regions of the gut
- (v) The food in stomach stays for about 10 hours
- (vi) Gastric juice is alkaline
- (vii) Gastric juice contains pepsinogen.

Solution:

- (i) The statement is true.
- (ii) The statement is false. Saliva contains salivary amylase (ptyalin) that converts starch into maltose.
- (iii) The statement is true.
- (iv) The statement is true.
- (v) The statement is false. The food stays in the stomach for about 3 hours
- (vi) The statement is false. Gastric juice is highly acidic.
- (vii) The statement is true.



1. Mention if the following statements are true(T) or false(F)

- (i) **Intestinal villi have a lymph vessel called lacteal.**
- (ii) **Intestine is narrow for fast movement of food.**
- (iii) **Large intestine secretes no enzymes**
- (iv) **Bile neutralizes the acid content of the food received from the stomach**
- (v) **Pancreatic juice has enzymes to digest all the major components of food.**
- (vi) **The anus is surrounded by circular muscles**

Solution:

- (i) The statement is true.
- (ii) The statement is false. Intestine is narrow for slow movement of food allowing absorption.
- (iii) The statement is true.
- (iv) The statement is true.
- (v) The statement is true.
- (vi) The statement is true.

2. Name the enzyme which digests:

- (i) **Starch in the mouth**
- (ii) **Fats in the ileum**
- (iii) **Protein in the duodenum**
- (iv) **Sucrose in the ileum**

Solution:

- (i) The enzyme that digests starch in the mouth is salivary amylase or ptyalin.
- (ii) The enzyme that digests fats in the ileum is Lipase
- (iii) The enzyme that digests proteins in the duodenum is trypsin
- (iv) The enzyme that digests sucrose in the ileum is sucrase

3. What are the end-products of digestion of:

- (i) **Proteins**
- (ii) **Fats**
- (iii) **Starch**
- (iv) **Sucrose**

Solution:

Listed below are the end products:

- (i) Proteins – Peptides and amino acids
- (ii) Fats – fatty acids, glycerol,
- (iii) Starch - Maltose
- (iv) Sucrose – Glucose and fructose

Progress Check

Fill in the blanks:

- (i) Liver stores glucose as _____
- (ii) Liver produces _____ only in embryo
- (iii) Urea is produced in _____ by the de-amination of extra _____
- (iv) For testing the action of saliva on starch the material has to be kept at a temperature of about _____ °C.

Solution:

- (i) Glycogen
- (ii) Red blood cells(RBCs)
- (iii) Liver, amino acids
- (iv) 38



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Mention the constituents of food if the end result of the test shows:

- (i) White to yellow and yellow to orange colour (after adding ammonium hydroxide).**
- (ii) Turning blue-black after adding iodine solution**
- (iii) Blue green to deep red with appearance of precipitate when added to Fehling solution**
- (iv) Ash that does not burn after continued heating.**

Solution:

- (i) The food contains protein.
- (ii) The food contains starch.
- (iii) The food contains glucose.
- (iv) The food contains mineral substance.



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Review Questions

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A. Multiple ChoiceType

1. Pylorus is an opening from
- (a) Oesophagus into stomach
 - (b) Mouth cavity into esophagus
 - (c) Stomach into intestine
 - (d) Intestine into rectum

Solution:

(c) stomach into intestine

Pylorus is an opening from the stomach into the duodenum to be precise.

2. Gastric juice contains
- (a) HCl and pepsin
 - (b) Pepsin and trypsin
 - (c) Trypsin and HCl
 - (d) Amylopsin and pepsin

Solution:

(a) HCl and pepsin

Gastric juice is strongly acidic and consists of HCl and essential digestive enzyme pepsin.

3. The water from the digested food is mainly absorbed by
- (a) Stomach
 - (b) Duodenum
 - (c) Colon
 - (d) Rectum

Solution:

(c) Colon

Colon is part of the large intestine and mainly absorbs water and some remnants of digested food.

4. Which one of the following pairs of types of teeth perform one common function as stated against it?
- (a) Incisors, canines- Holding
 - (b) Canines, premolars - Tearing
 - (c) Premolars, molars - Grinding
 - (d) Molars, incisors- Tearing

Solution:

(c) Premolars, molars - Grinding

Both premolars and molars are involved in grinding the food.

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B. Very short answer type

1. What is the dental formula of a normal human adult?

Solution:

The dental formula of a normal human adult is as given below:

Human adult: $\frac{2}{2} \frac{1}{1} \frac{2}{2} \frac{1}{1} = 32$ (permanent teeth) with wisdom teeth added.

2. Mention two reflexes which occur when a person chews and swallows food.

Solution:

The two reflexes are as follows:

- When a person chews food, saliva is secreted
- When a person swallows food, tongue flexes pressing upwards and back against the palate.

3. Consider the following two statements A & B and select the right from (i) – (iv) about their correctness.

A. Small intestine is shorter than large intestine.

B. Small intestine is wider than large intestine.

Options:

- (i) Both the statements are correct.
- (ii) Both the statements are wrong.
- (iii) Statement A is correct, B is wrong.
- (iv) Statement B is correct, A is wrong.

Solution:

(ii) Both the statements are wrong.

Small intestine is longer than the large intestine. It is about 7 meters longer while large intestine is about 1.5 meters long. Large intestine is wider than the small intestine.

C. Short Answer Type

1. What is digestion? Why do only animals require a digestive system?

Solution:

Digestion is a life process observed in living entities wherein complex food materials that are ingested is broken down into simpler substances due to the action of enzymes.

Animals require a digestive system for the following reasons:

- Need for complex and larger molecules such as carbohydrates, lipids, proteins to be broken down into simpler particles which are later absorbed and used by the body.
- This process of disintegrating larger molecules to finer particles is possible only due to the process of digestion.
- The breakdown of different larger macro molecules takes place in different parts of the digestive system

2. What are the end-products of the digestion of: Starch, proteins and fats respectively?

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Solution:

The end products are as follows:

Starch – Maltose

Proteins – Small peptides and amino acids

Fats – Glycerol and fatty acids

3. Why is there no enzyme to digest vitamins?

Solution:

Vitamins are consumed by the cells in their original form and do not require digestion. They do not require enzymes to digest as they are either fat soluble or water soluble. From the digestive tract, they are directly absorbed and carried to the cells by blood. The cells absorb them and utilize them when required. Vitamins perform the action of catalysis or act as enzymes required in chemical reactions occurring in the body.

4. How is thorough chewing of food helpful in digestion?

Solution:

Chewing food is one of the most important parts of food digestion. Ensuring food is chewed thoroughly is even more important as it helps the complex food to be broken down into simpler and fine particles. Chewing causes the saliva to be secreted by the salivary glands. Saliva moistens food and forms bolus which can be easily swallowed. Saliva contains special enzymes which causes the disintegration of carbohydrates.

5. What is the function of rectum?

Solution:

Rectum serves as a temporary storage site for undigested food. It possesses smooth muscles that are voluntary in nature and eliminates faeces from the body through the anus.

6. What is roughage? Give two examples.

Solution:

It is a dietary fiber that majorly contains cellulose. Roughage cannot be digested by the human body as humans do not contain cellulose-digesting enzymes. Examples – Green leafy vegetables, fruits, beans, nuts.

7. Mention two ways in which the ileum of a mammal is adapted for the absorption of digested food.

Solution:

Listed below are two ways in which ileum is adapted to absorb digested food:

- The ileum is very lengthy hence it provides much more surface area for absorption
- Ileum has numerous villi which further causes the surface area to increase thereby increasing the quantity of absorption of digested food.

8. The stomach secretes gastric juice, which contains hydrochloric acid. What is its function?

Solution:

Hydrochloric acid performs the following functions in the stomach:

- It kills bacteria present in the food by mixing up with the food.
- To act on proteins, it activates pepsin.

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D. Long Answer Type

1. Prepare a possible vegetarian menu for your dinner which would provide all the necessary nutrients.

Solution:

Tabulated below is a vegetarian menu providing all the necessary nutrients:

Food item	Nutrient
Chapati/rice	Carbohydrates
Daal/Chick pea curry	Proteins
Fruit salad	Vitamins
Sabji made with green leaves	Minerals

2. What are the main characteristics of an enzyme?

Solution:

Main characteristics of an enzyme are as follows:

- It gets destructed by heating as it is a protein
- It is specific as it acts on only one kind of substrate
- Acts as a catalyst
- It influences the rate of chemical reaction and speeds up the reaction
- From the fixed substrate it always forms the same end products.
- It acts best at a specific pH only
- Typically at the temperature ranging between 35- 40 degree Celsius, it acts best.

3. Why is the small intestine the most important organ of the digestive system?

Solution:

It is because it performs two important functions of digestion and absorption. In the duodenum, it obtains two important digestive juices namely – the bile and the pancreatic juice. Both the juices virtually complete the process of digestion of proteins, starch, carbohydrates etc. Once the food is broken down, the small intestine is responsible to absorb simple particles such as amino acids, glucose etc.

4. How is the liver an important organ in our body?

Solution:

The liver performs the following functions in the body:

- Detoxifies
- Produces bile
- Generates heat
- Controls blood sugar levels
- Controls amino acid levels
- Produces foetal red blood cells
- Produces heparin and fibrinogen
- Checks blood volume
- Destructs dead red blood cells

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- Storage of minerals and vitamins
- Excretes metallic and toxic substances

5. Define the following terms:

- (a) Peristalsis
 (b) Omnivore
 (c) Pylorus
 (d) Kilocalorie
 (e) Assimilation

Solution:

- (a) Peristalsis – It is defined as the rhythmic contraction and relaxation of the muscles of the alimentary canal which propels the food through the gut
- (b) Omnivore – These are the organisms that consume both animals and plants
- (c) Pylorus – It is the passage at the inferior end of the stomach which opens into the duodenum
- (d) Kilocalorie – It is defined as the energy required for raising the temperature of 1kg water by 1 degree Celsius. It is a unit of energy.
- (e) Assimilation – It is the conversion of the absorbed digested food into body material

6. List the enzymes and their action on food in the stomach and intestine.

Solution:

The table below shows the different regions, enzymes and the action of the enzymes on the food

Part of the body	Name of the enzyme	Action on food
Stomach	Pepsin	Converts proteins into polypeptides
Small intestine - Duodenum	Trypsin	Acts on proteins – peptones and proteases to produce peptides and amino acids.
	Amylopectin	Acts on starch to produce maltose
	Steapsin	Acts on emulsified fats to produce fatty acids and glycerol
Small intestine - Ileum	erepsin	It acts on proteins and peptides to produce amino acids
	Maltase	Acts on maltose to produce glucose
	Sucrase	Acts on sucrose to produce glucose and fructose
	Lactase	Acts on lactose to produce glucose and galactose
	Lipase	Acts on fats to produce fatty acids and glycerol

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7. Give any four reasons why water is necessary in our body.

Solution:

Significance of water in the body:

- Water is the fundamental necessity for digesting food as well as absorbing food.
- Water forms the basic and major component of blood in the body that is responsible to carry oxygen and nutrients from all the cells to all the cells.
- It forms the chief constituent of another major liquid in the body – saliva and mucus which bring about lubrication of the membranes which line the digestive system starting with the mouth.
- It is crucial in maintaining the body temperature

8. You have been supplied with a sample of food. How will you perform tests for the presence of starch and proteins in it?

Solution:

The following tests can be carried out:

Test for starch:

Aim: To detect the presence of starch in the sample

Procedure and Inference:

- Add some starch powder to a test tube containing water, shake well. Boil well to make a solution.
- Add some drops of iodine solutions when the solution cools down.
- Iodine solution can be prepared by dissolving 1g iodine with 1g potassium iodide in 100ml of distilled water, dilute this solution before using.
- The solution in the test tube would turn blue-black indicating the presence of starch.

Test for proteins

Aim: To detect the presence of proteins in the given sample

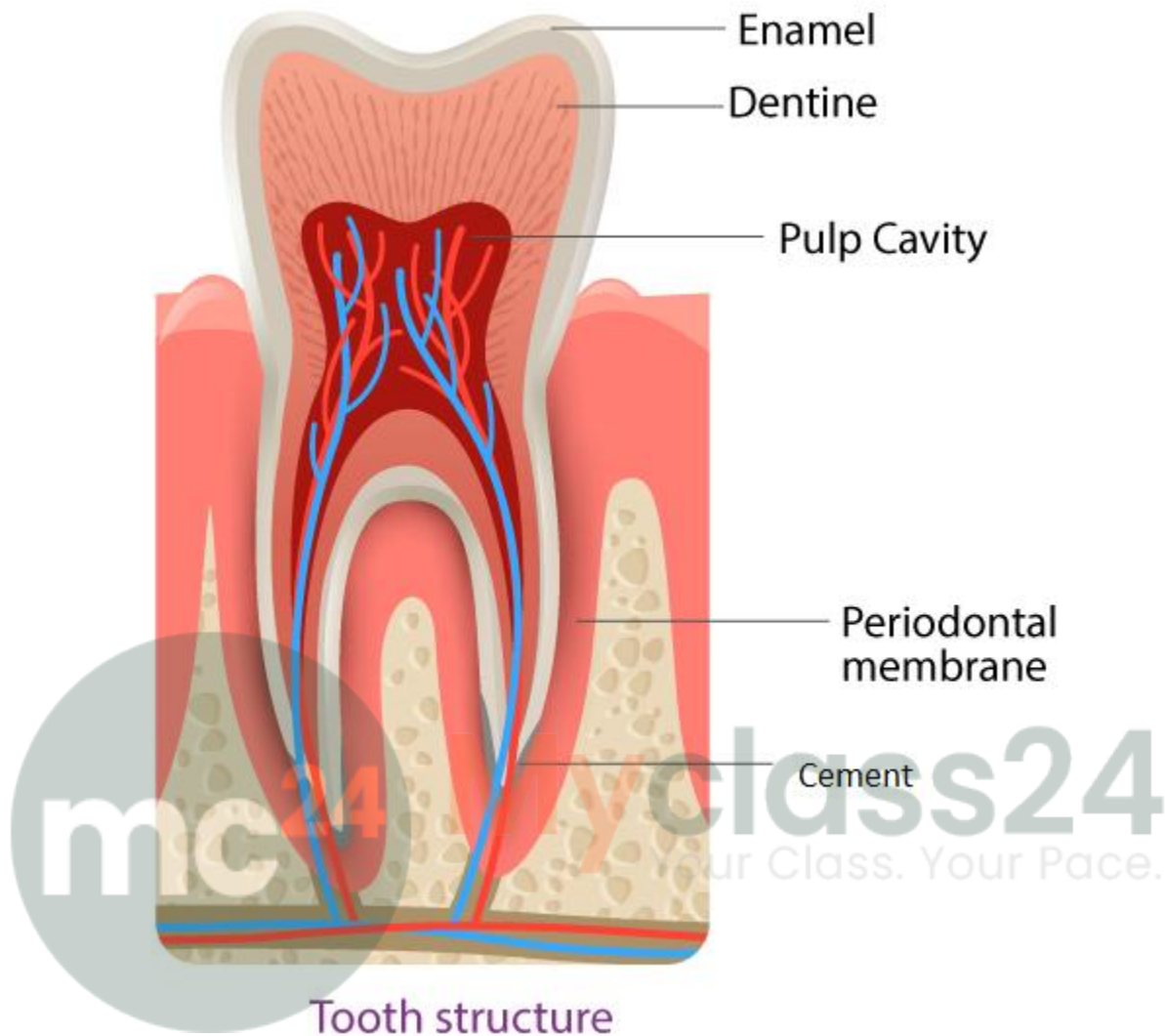
Procedure and Inference:

- In a test tube add a few pieces of the sample (hard-boiled egg)
- Add a few drops of dilute nitric acid so as to seal the food
- Gently heat the test tube, rinsing off the acid with water, to this add ammonium hydroxide
- Observe the changes – from the initial white, color changes to yellow
- After adding ammonium hydroxide – the color changes from yellow to orange.

E. Structured/Application/Skill Type

1. Draw a labeled diagram to show the internal structure of a mammalian tooth with two roots.

Solution:



2. Try to swallow the saliva in your mouth, and feel your neck with your hand. What happens in the neck?

Solution:

When saliva is swallowed, there is a shift in the movement of larynx, it is pulled upwards so as to get it closer to the back of the tongue when the epiglottis (a flap) closes its opening. It then goes towards the Oesophagus.

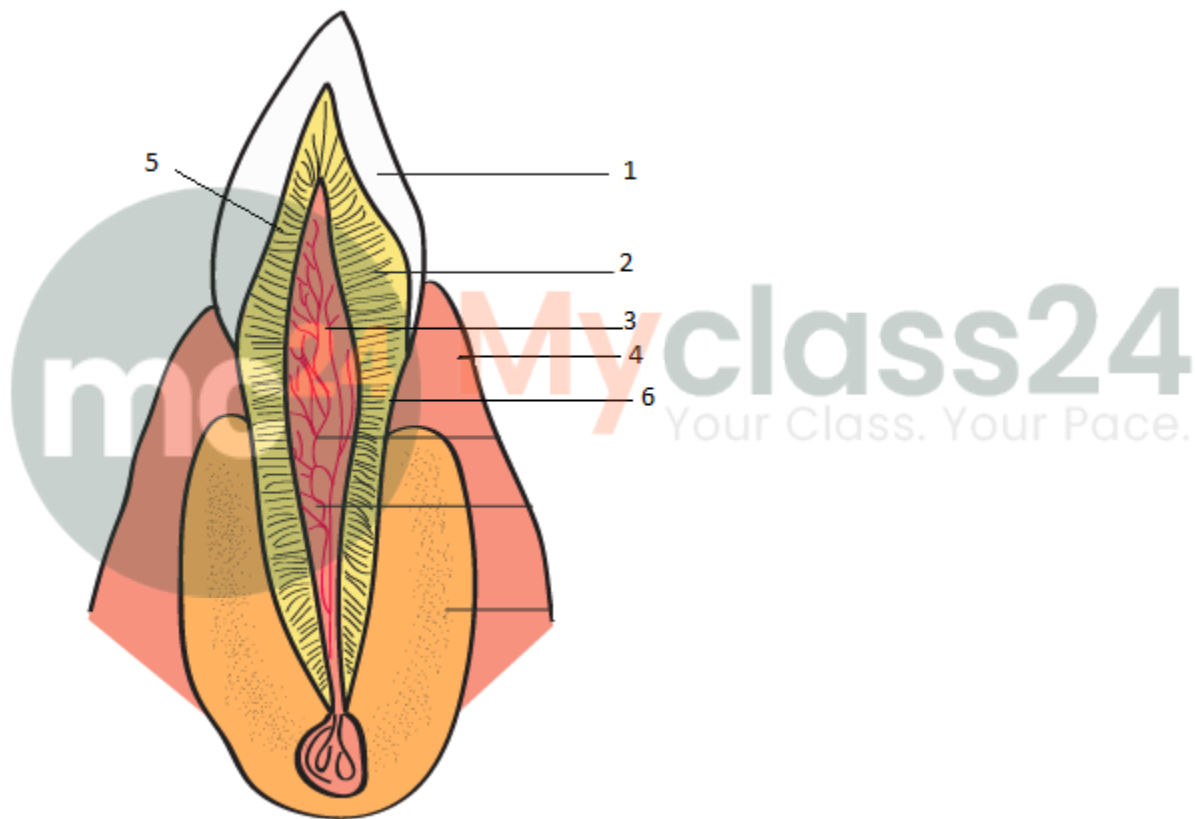
3. Complete the following table by filling in the blanks 1 to 8.

Organ	Enzyme	Food acted upon	Final product
1	Pepsin	2	3
Mouth	4	5	Disaccharide
6	7	Maltose	8

Solution:

- 1 – Stomach
- 2 – Proteins
- 3 – Polypeptides
- 4 – Amylase
- 5 – Starch
- 6 – Ileum
- 7 – Maltase
- 8 – Glucose

4. Study the diagram given below and then answer the questions that follow:



- (a) Name the parts labeled 1,2,3,4,5 and 6.
- (b) Identify the tooth and give a reason to support your answer.
- (c) Describe the structure of the part labeled '3'.
- (d) Give the total number of the type of tooth mentioned in '1' above, in the mouth of an adult and state its function.

Solution:

- (a) The parts labeled are:
 - 1 – Enamel
 - 2 – Dentine
 - 3 – Pulp

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- 4 – Gum
- 5 – Crown
- 6 – Cement

- (b) The type of teeth shown in the given figure has only one root. Hence it is a canine or incisor that is used to bite or pierce.
- (c) The structure labeled '3' is the pulp. It is a soft connective tissue that is present in the pulp cavity of the tooth. It contains the nerve fibers, lymph vessels, blood capillaries. From the crown of the tooth, the pulp opens through the pulp cavity at the base of the root.
- (d) The type of teeth mentioned in the figure and its function are as follows:

Type of teeth	Number of teeth	Function
Incisors	8	Used to cut and bite
Canines	4	Used to tear and hold food
Premolars	8	Used to grind and crush food
Molars	12	Used to grind and crush food

5. Study the following dental formula and then answer the questions that follow:

i – c – pm – m –

- (a) State the total number of teeth present in the dentition
- (b) Is the dentition that of a carnivore or herbivore? Give a reason to support your answer.
- (c) Name an animal possessing such a dentition.
- (d) Give the dental formula of an adult human being.

Solution:

- (a) The total number of teeth present in the given dentition are – 20 teeth
- (b) The given dentition is that of a herbivore as canines are not present in the given dentition. Carnivore requires canines as it assists in tearing and holding food. The teeth in herbivores help to bite, gnaw and cut while the teeth in carnivores are much more sharper that help to catch, kill and tear the prey.
- (c) Goat is an example of a herbivore having this dentition
- (d) The dental formula of an adult is as follows:

Human adult: $\frac{2}{1} \frac{1}{1} \frac{2}{2} \frac{3}{3} = 32$ (permanent teeth) with wisdom teeth added