Glucose and amino acids pass into the blood capillaries of the villus. The capillaries join to the hepatic portal vein through which absorbed nutrients are taken to the liver.

Fatty acids and glycerol may combine in the intestinal lining to form fats once again. These fats pass into the lacteals. From lacteals, they enter the lymphatic system. The lymphatic system also form a network of lymph vessels all over the body and joins to the blood stream.

THE STRUCTURE OF THE VILLUS

ADAPTATIONS OF THE VILLUS TO ABSORPTION

I) It has a thin epithelium which allows easy diffusion of food materials.
II) It is densely supplied with blood vessels i.e. highly vascularized to offer efficient transport to the absorbed food nutrients.
III) Villi are many in number, providing a large surface area for absorption.
IV) They have lacteals for absorption of lipids.

THE LARGE INTESTINES

Water and undigested matter i.e. Cellulose/ vegetable fibres (roughage), mucus and dead cells from the lining of the gut, pass into the large intestines.
No enzyme is secreted in the large intestines/ colon.
The colon absorbs much of the water from the undigested residue. The remaining semi-solid waste (faeces) is passed into the rectum and is expelled by peristalsis at intervals through the anus; a process known as **Egestion.**
Minerals salts that were not absorbed in the ileum are absorbed in the colon.
Synthesis and absorption of vitamin k and B_{12} into the blood stream.

THE CAECUM AND APPENDIX

In man these structures are small and lost function i.e. are vestigial.

ASSIMILATION

The utilization of digested food.
The soluble digested food materials are carried around the body in the blood plasma.
The living cells absorb these nutrients from blood and metabolise them.

GLUCOSE

It is oxidized to carbondioxide and water in the protoplasm of the cell i.e.it is a raw material for respiration. In this action, energy is released which enables many chemical processes to occur.

FATS

These are used in the formation of cell membranes and other structures IN CELLS.
Fats can as well be oxidised to release energy when the carbohydrates are in short supply.
NB: twice as much energy is obtained from fats as from glucose.

AMINO ACIDS

They are used in the synthesis of proteins and in growth and repair of warn out tissues.
When glucose and fats are unavailable (during starvation) amino acids are oxidised to release energy.

STORAGE OF DIGESTED FOOD

GLUCOSE
The concentration of glucose in the blood of a normal person is about 90mg/100cm^3

However after a meal containing carbohydrates, the glucose or blood sugar level increases to about 140mg/100cm^3.
The excess glucose not required immediately for energy production in the cells is converted to glycogen in the liver and in muscles for storage. This conversion is effected by a hormone insulin**.**
Glucose ——insulin→ glycogen
When the blood sugar level falls to about 70mg/100cm^3, the liver then coverts the stored glycogen to glucose and releases it into the blood stream. The conversion of glycogen to glucose is caused by a hormone **Glucagon**.
NB: 1. Muscle glycogen is not normally returned into circulation but it is used by active muscles as a source of energy.
2. Excess glucose not stored as glycogen is converted to fats and stored in fat cells (adipose tissue).
3. Too much blood sugar causes **Diabetes meritus.**
4. Extremely less sugars in blood causes **Diabetes insipidus.**

FATS

Some special cells can accumulate droplets of fat in their cytoplasm. As these droplets increase in size and number, they join together to form one fat globule. Groups of such cells form an adipose tissue beneath the skin which insulates the body against heat loss.
There is no limit to the amount of fats stored because of its high energy value.

AMINO ACIDS

Excess amino acids are not stored in the body. They are transaminated or deaminated in the liver.

THE LIVER

Functions of the liver

The liver is responsible for the formation of bile which emulsifies fats.
The liver stores vitamins i.e. fat soluble vitamins A and B.
Produces heat for the body.
The liver deaminates excess proteins.
Regulates blood sugar level.
Manufactures plasma proteins i.e. fibrinogen responsible for blood clotting, albumen and globulin.
The liver is responsible for the storage of iron and other minerals like potassium and copper.
The liver detoxifies harmful substances into harmless ones e.g. hydrogen peroxide to water and oxygen.
The liver eliminates sex-hormones i.e. testosterone and oestrogen.

CELLULOSE DIGESTION

Digestion of cellulose in ruminant animals.
Ruminants are animals which chew cud. Cud is unchewed grass which is regurgitated or brought back to the mouth for rechewing.
Examples of ruminants; cattle, sheep, and antelope.
They have a four-chambered stomach.

Diagram showing the stomach of a ruminant.

In the mouth, saliva produced does not contain any enzyme so only mastication and softening of food occurs.

Movement of food in the oesophagus is also by peristalsis.

The rumen (largest chamber)

Food is stored temporarily before returning to the mouth for rechewing. Here food is also softened and fermented.

Bacteria, fungi and protozoa breakdown the cellulose into products of nutritional value.

THE RETICULUM (TOWEL)

Bacteria action continues. It also sieves (separates) finely ground materials from coarse ones and retains stones, hard pieces of wood, etc.

THE OMASUM (many piles)

In the omasum, the food is ground finely and some water absorption takes place.

ABOMASUM

In the abomasum (true stomach), enzymatic digestion of proteins takes place and digestion beyond this point (chamber) proceeds in the same way as in man.

Digestion of cellulose in non-ruminants

Herbivores like rabbits, horses, and zebras etc. which are non-ruminants have cellulose digesting bacteria in the caecum.

Comparison between ruminants and non-ruminants.

Similarities

In both, the young animal has a single stomach where digestion takes place.

In both, final digestion of proteins and carbohydrates is in the small intestines.

In both, the large intestine carries out water absorption.

Differences.

Ruminants	Non-ruminants
Chew cud	Do not chew cud
Have a four chambered stomach	Have one stomach
Do not have salivary amylase in the mouth	Have salivary amylase in the mouth
Most digestion and absorption takes place in the stomach	Takes place in the ileum
Cellulose digesting bacteria are produce in the stomach	Cellulose digesting bacteria produced in the caecum.