

牛 津

学科英语基础丛书

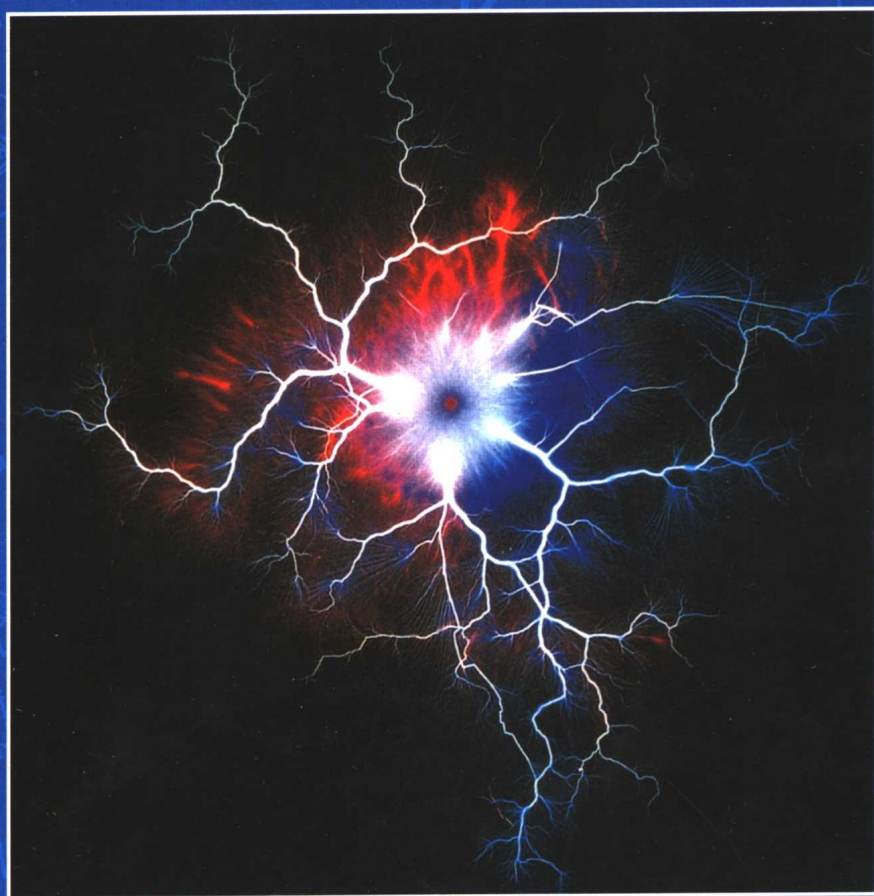
GCSE

科 学

through diagrams

SCIENCE

牛津图解中学科学



George Bethell

英汉
双语

上海教育出版社

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图书在版编目 (CIP) 数据

牛津图解中学科学 / (英) 贝瑟尔 (Bethell, G.) 编著; 王静, 王立非, 吴大智译. —上海: 上海教育出版社, 2002. 2 (2002. 9. 重印)

(牛津学科英语基础丛书)

ISBN 7-5320-7796-9

I. 牛... II. ①贝...②王...③王...④吴...
III. 英语课—中学—课外读物—英、汉
IV. G634. 413

中国版本图书馆CIP数据核字 (2002) 第007129号

牛津学科英语基础丛书

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上海世纪出版集团 出版发行
上海教育出版社

(上海永福路 123 号 邮政编码: 200031)

易文网: www.ewen.cc

上海外文图书公司总经销(海文音像出版社)

各地新华书店经销

商务印书馆上海印刷股份有限公司印刷

开本 890×1240 1/16 印张 17

2002 年 2 月第 1 版 2002 年 9 月第 2 次印刷

印数 6,151—9,200 本

ISBN 7-5320-7796-9/G·7899 定价: 28.40 元

Biology checklist

LIFE PROCESSES AND LIVING THINGS

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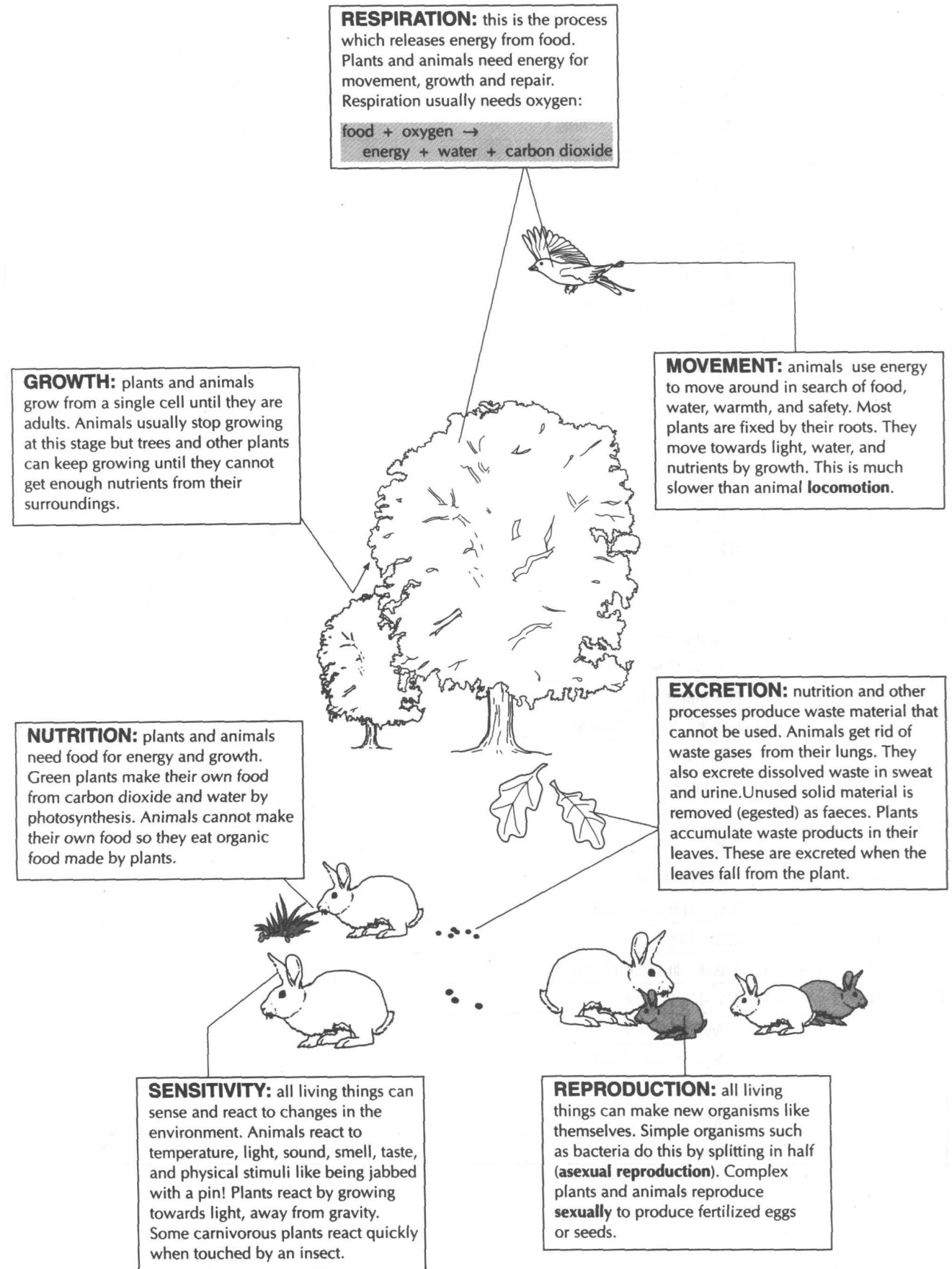
生物学要点

生命过程及生物

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3	A2- 细胞: 构筑生命的基石		C34
4	A3- 细胞, 组织, 器官及系统		
5	A4- 植物的器官: 根, 茎, 叶和花		
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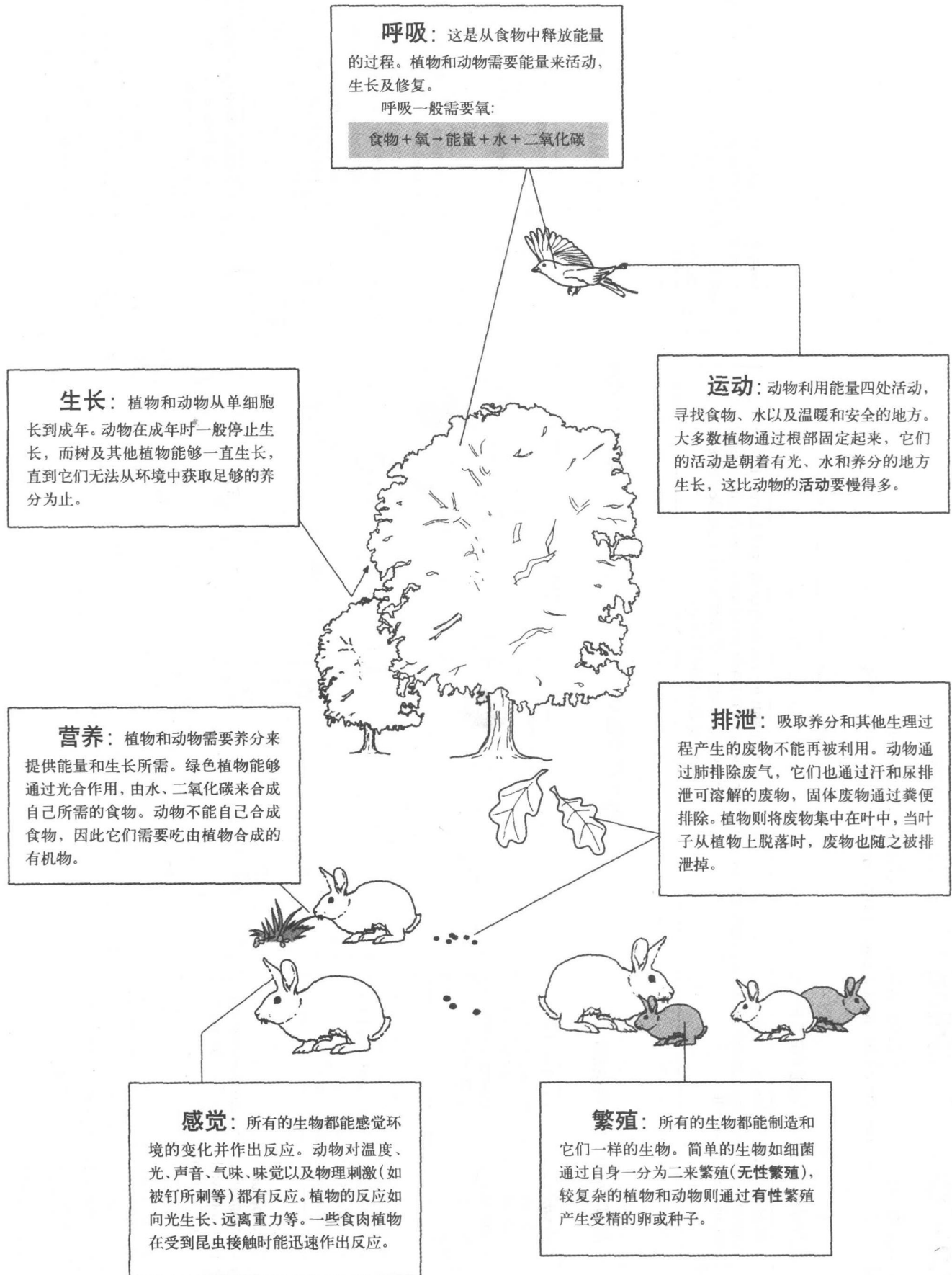
A1 – Living things: their characteristics

The biosphere is made up of living and non-living things. Plants and animals are living things because they have these characteristics:



A1-生物: 特征

生物圈是由有生命体和无生命体组成。植物和动物是有生命体，因为它们具有以下特征：



A2 – Cells: building blocks of life

Living things are made of cells. Many of the chemical reactions which keep organisms alive (metabolic functions) take place in cells.

COMMON FEATURES OF CELLS

All cells (with a few exceptions) have these three things:

Cell membrane: a thin 'skin' which surrounds the cell contents. It controls the passage of dissolved substances into and out of the cell.

Cytoplasm: the contents of the cell (except for the nucleus). It is made up of water and dissolved substances. It also contains small structures (**organelles**) where chemical reactions take place.

Nucleus: the 'control centre' of the cell. It contains the genetic material (**DNA**) which carries the instructions that control the structure and activities of the cell. (Red blood cells do not have nuclei.)

PLANT CELL

Cell wall: a rigid (stiff) cell wall made of cellulose. This gives support. As a result, plant cells are fairly regular in shape. Water and dissolved substances can pass through the **permeable** cell wall.

Vacuole: the large, permanent vacuole contains water and dissolved substances (**cell sap**). This helps to maintain pressure in the cells.

Chloroplasts: these contain **chlorophyll** and the **enzymes** needed for photosynthesis. They are found in the cells of green plants.

Stored food (starch): photosynthesis produces glucose (sugar). This is converted into **starch** and stored in the cytoplasm.

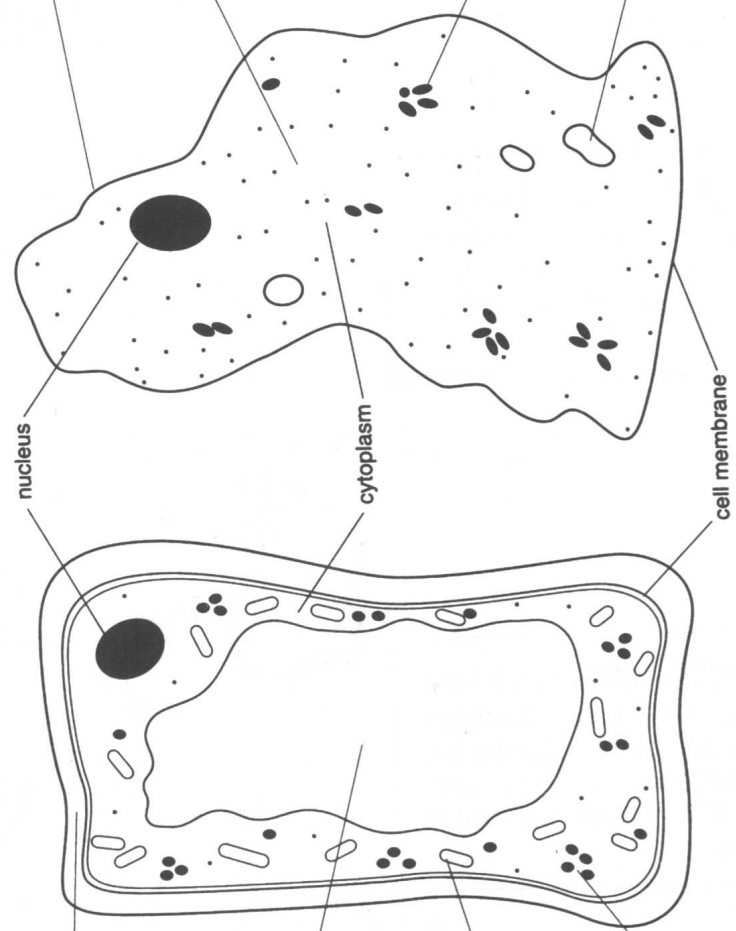
ANIMAL CELL

Irregular shape: animal cells do not have a rigid cell wall so they are irregular in shape.

Denser cytoplasm: animal cells contain more dissolved substances and more organelles than plant cells. For example, animal cells contain more of the rod-like structures called **mitochondria** where respiration takes place. This is so they can release lots of energy quickly for fast movement.

Stored food (glycogen): carbohydrates are stored as glycogen in animal cells.

Vacuoles: animal cells may have several small, temporary vacuoles. These can be for digestion or the excretion of excess water.



A2-细胞：构筑生命的基石

生物由细胞组成。维持生物生存的许多化学反应（新陈代谢）也都在细胞里进行。

细胞的共同特征

所有细胞（除少许例外）都含有三种组成部分：

细胞膜：将细胞内容物包裹起来的一层薄薄的“皮肤”，它控制着可溶物进入和排出细胞的过程。

细胞质：细胞的内容物（除了细胞核）。它由水和可溶物组成。它也含有一些小的结构（细胞器），化学反应在其上发生。

细胞核：细胞的“控制中心”。它含有遗传物质（DNA），DNA载有控制细胞结构和活性的信息（红血球细胞不含细胞核）。

植物细胞特征

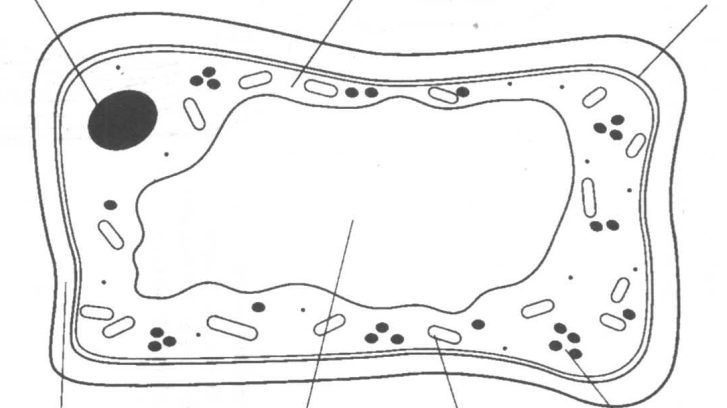
细胞壁：刚性的细胞壁由纤维素组成，它能给细胞提供支撑。因此，植物细胞形状上都相当规则。水及可溶物能通过有渗透性的细胞壁。

液泡：大的、永久性的液泡含有水和可溶性物质（细胞液）。它帮助维持细胞内的压力。

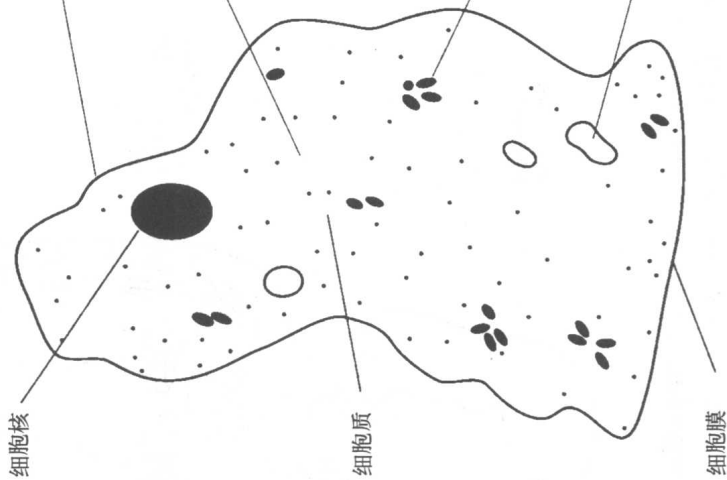
叶绿体：它们含有光合作用所需的叶绿素和酶，存在于绿色植物的细胞里。

储存的食物（淀粉）：光合作用产生葡萄糖（糖）。葡萄糖被转化成淀粉并储存在细胞质中。

植物细胞



动物细胞



动物细胞特征

不规则的形状：动物细胞没有刚性的细胞壁，因此它们的形状是不规则的。

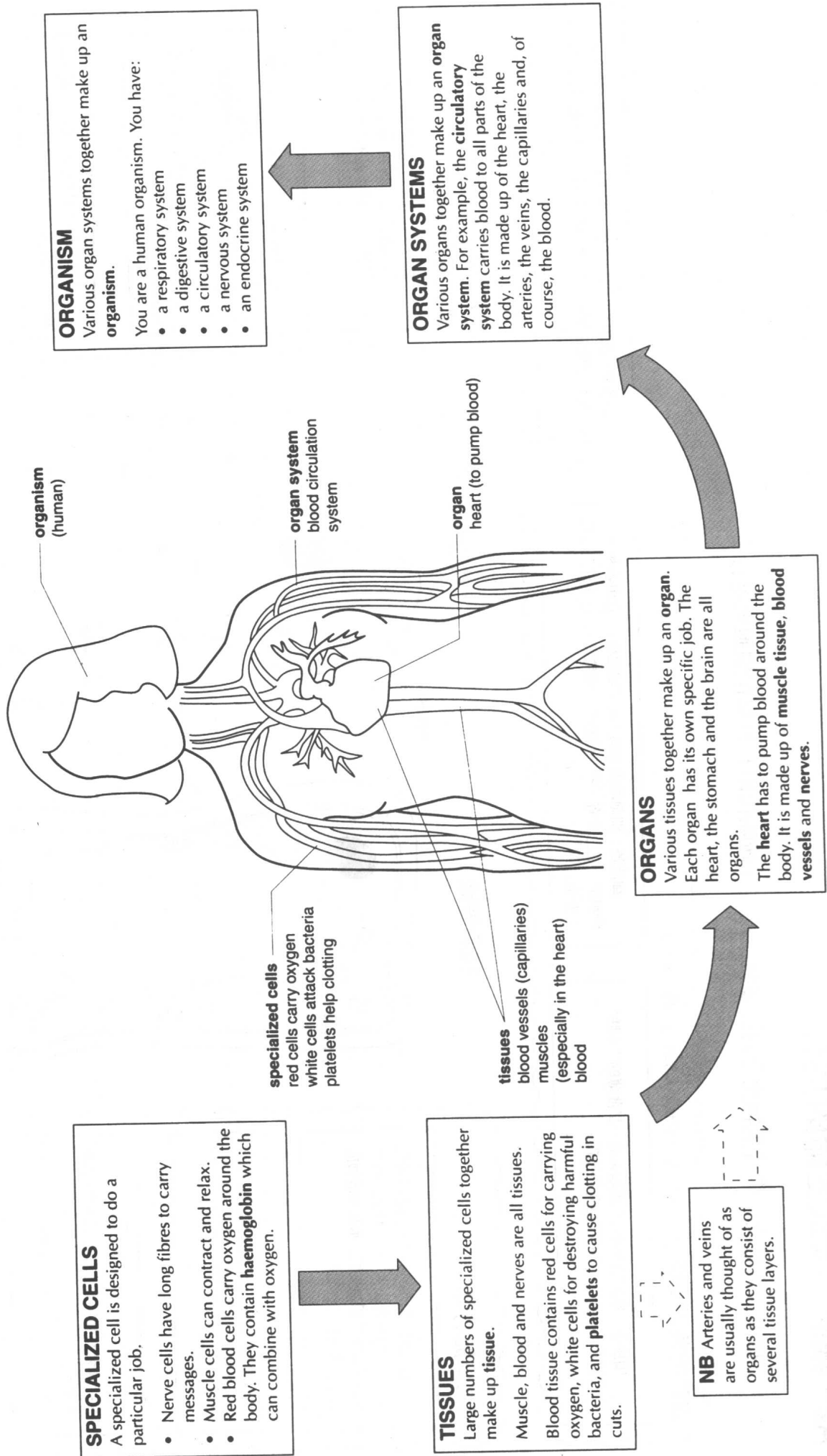
较浓的细胞质：动物细胞比植物细胞含有更多的可溶性物质和细胞器。例如，动物细胞含有较多的称为**线粒体**的棒状结构，呼吸作用就在其上发生，这就是它们能为快速运动迅速释放大量的能量的原因。

储存的食物（糖元）：碳水化合物以糖元的形式储存在动物细胞中。

液泡：动物细胞可能含有一些小的、临时性的液泡，它们用于消化或排泄过量的水。

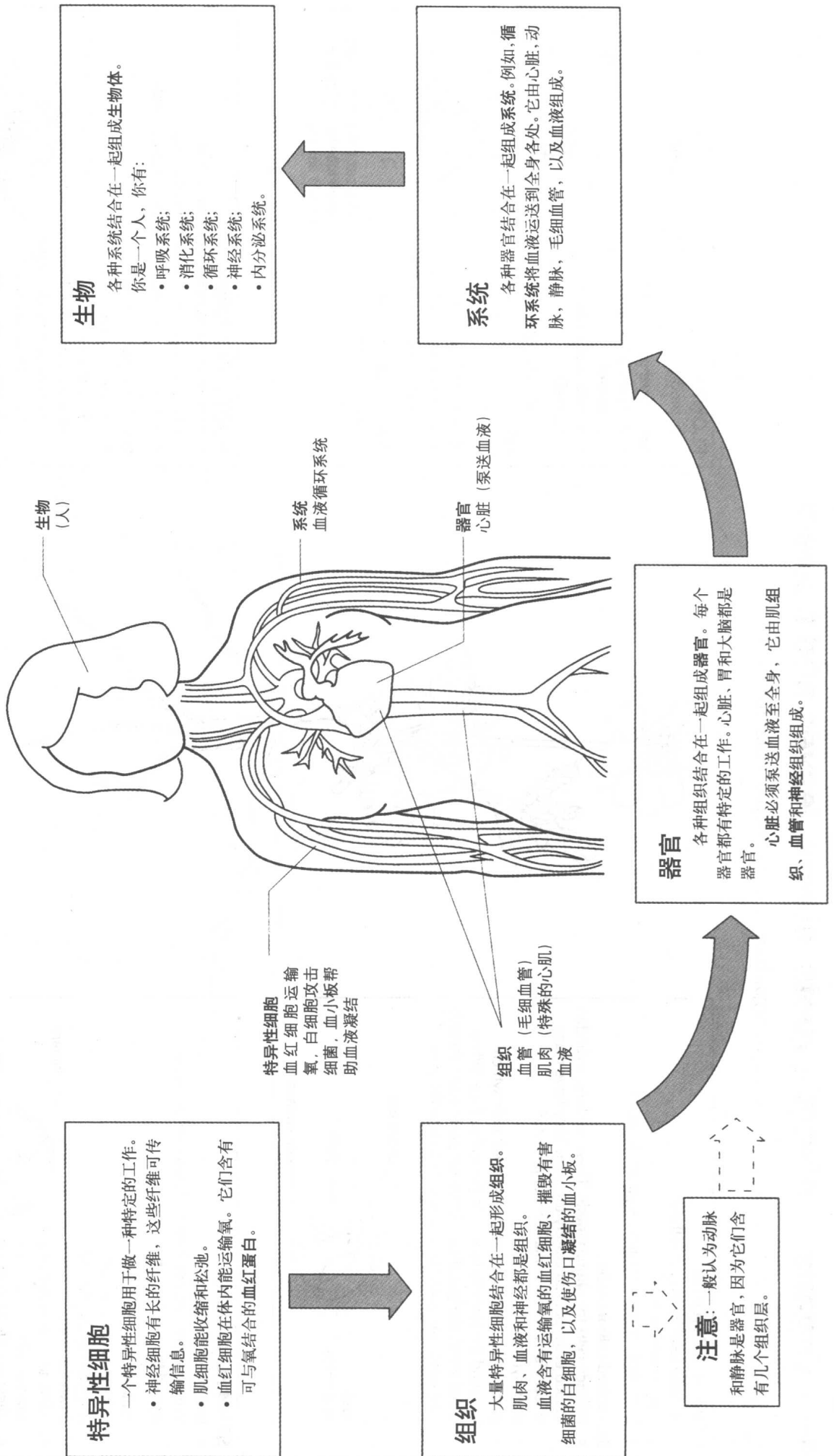
A3 – Cells, tissues, organs and organ systems

Multicellular plants and animals contain many different types of cell. Each type of cell is designed for a particular function. Cells are organized to form tissues, organs, and organ systems. In a healthy **organism**, all the systems work together.



A3-细胞、组织、器官及系统

多细胞植物和动物含有许多不同类型的细胞，每种类型的细胞都有一种特定的功能。细胞组成组织、器官及系统。在一个健康的生物中，所有的系统协同工作。



A4 – Organs in plants – roots, stems, leaves and flowers

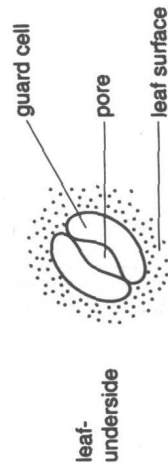
The organs in plants contain specialized cells organized to carry out particular functions.

LEAF FUNCTIONS:

- to make food by photosynthesis
- to store food as starch
- to control the rate of water loss from the plant

Specialized cells include:

- **palisade cells for photosynthesis.** These are long, cylindrical cells, packed closely together. They have many **chloroplasts** which contain chlorophyll for photosynthesis.
- **guard cells.** These are 'sausage-shaped' cells which surround the stomata (pores) in the leaf surface. When full of water, the guard cells open the pore: when there is little water, the guard cells shrink and close the pore.

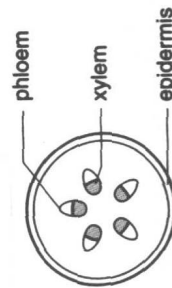


STEM FUNCTIONS:

- to support the plant
- to transport water, nutrients and dissolved minerals around the plant

Specialized structures include:

- phloem to carry amino acids and sugars up and down the stem
- xylem to carry water and mineral salts up the stem
- xylem vessels have strong, thick walls for support in woody plants



FLOWER FUNCTION:

- to produce seeds by sexual reproduction

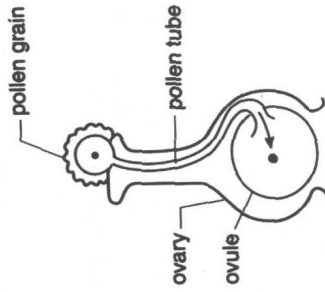
Specialized parts include:

- male sexual organs (stamens)
- female sexual organ (carpel)

The stamen's anther produces **pollen** which contains the male sex cells.

In the carpel, the ovary produces the **ovule** which contains the female sex cell.

When fertilized, the ovule turns into a seed.



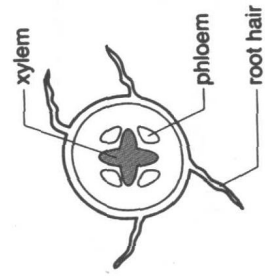
male sex cell moves down pollen tube to fertilize the female sex cell

ROOT FUNCTIONS:

- to support the plant by anchoring it in the soil
- to take in nutrients and water from the soil
- to store food as starch in the winter (some plants only)

Specialized parts include:

- long, thin root hairs for taking in water and dissolved mineral salts
- xylem vessels to take water and minerals up the plant
- phloem vessels to take nutrients to the growing tips of the roots



A4-植物的器官：根、茎、叶和花

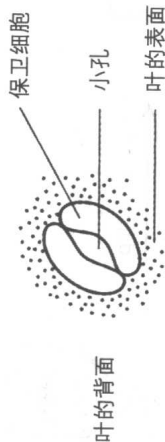
植物的器官由组织在一起的特异性细胞构成，以完成特定的功能。

叶的功能：

- 通过光合作用合成食物。
- 以淀粉的形式储存食物。
- 控制水从植物中丢失的速度。

特异性细胞包括：

- 进行光合作用的**栅栏细胞**。它们是长的、圆柱状细胞，紧密地堆积在一起。它们含有许多**叶绿体**，叶绿体中含有光合作用所需的**叶绿素**。
- **保卫细胞**。它们是“香肠”状的细胞，环绕着叶表面的**气孔（小孔）**。当有充足的水时，保卫细胞打开气孔；当水很少时，保卫细胞收缩并封闭气孔。

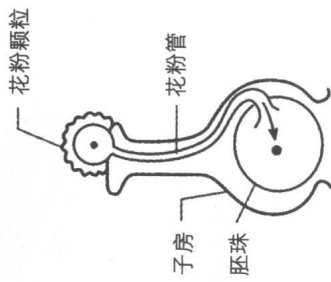


花的功能：

- 通过有性繁殖产生种子。

特异性部分包括：

- **雄性器官（雄蕊）**；
 - **雌性器官（心皮）**。
- 雄性花蕊的另一种产物花粉含有**雄性细胞**。
- 在心皮中，子房产生的**胚珠**含有**雌性细胞**。受精后，胚珠变为**种子**。



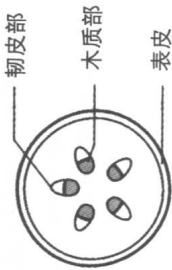
雄性细胞向下沿着花粉管移动以便与雌性细胞授精

茎的功能：

- 支撑植物。
- 在植物体内输送水、养分和可溶性的矿物质。

特异性结构包括：

- 韧皮部沿着茎干上输送**氨基酸和糖**。
- 木质部沿着茎干上输送**水和矿物质**。
- 木本植物的**木质部**导管有**厚实的壁**提供支撑。

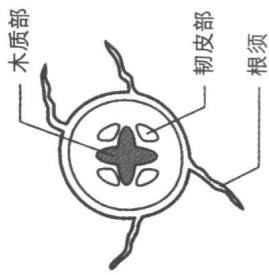


根的功能：

- 把植物固定在土壤中以支撑住植物体。
- 从土壤中吸取**养分和水**。
- 在冬季以**淀粉**的形式储存**养分**（只有一些植物有此功能）。

特异性部分包括：

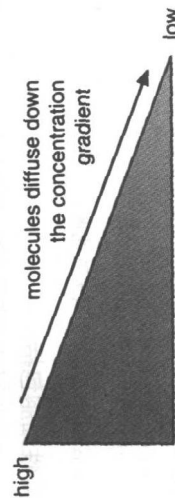
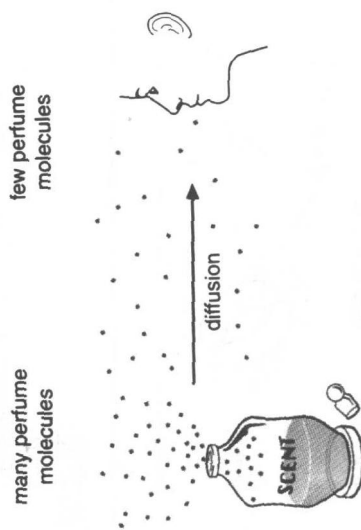
- 长而薄的根须可吸取**水及可溶性的矿物质**。
- 木质部导管向上为植物输送**水和矿物质**。
- 韧皮部导管吸取**养分**供根尖的生长发育。



A5 – Diffusion, osmosis, and active transport

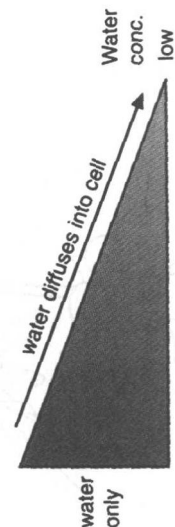
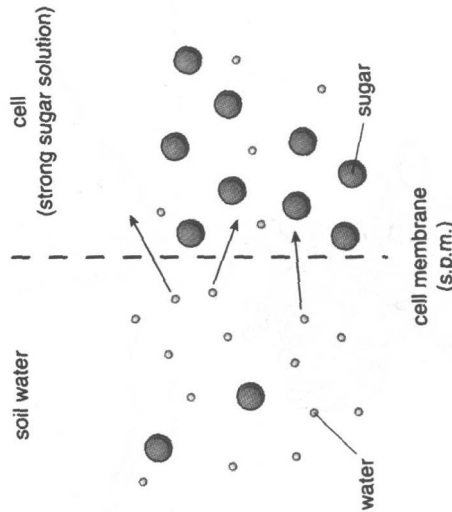
These are the three main mechanisms that living things use to move substances in and out of cells.

DIFFUSION: the movement of particles from a region of high concentration to one of low concentration.
 Diffusion takes place because all the particles in gases and liquids are constantly moving. Small, light particles diffuse more quickly than large heavy ones. Diffusion is faster at high temperatures.



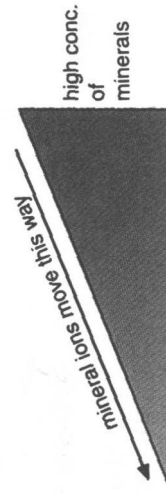
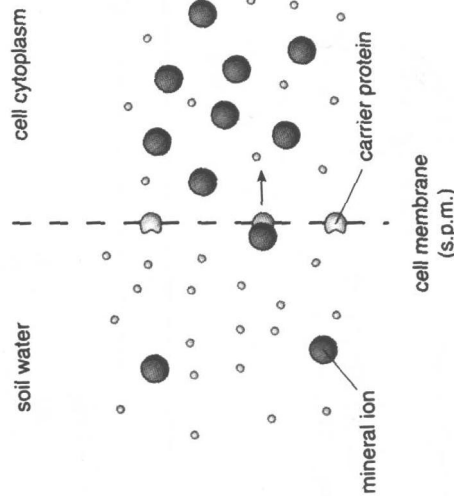
In the air sacs of the lungs, oxygen molecules diffuse into the blood where the concentration of oxygen is low. Carbon dioxide molecules diffuse from the blood into the lungs. Carbon dioxide is then exhaled.

OSMOSIS: the diffusion of water across a selectively permeable membrane (s.p.m.).
 Osmosis takes place because the water molecules can easily pass through the s.p.m.. Large molecules (e.g. glucose) try to diffuse the other way but they are not able to pass through the cell membrane.



Water from the soil moves into the root hair cells of a plant by osmosis. Sugar molecules in the plant cells cannot diffuse out because the cell membrane is permeable to water but not to sugar molecules.

ACTIVE TRANSPORT: the movement of molecules from a region of low concentration, across a selectively permeable membrane, to a region of high concentration. Because this is against the concentration gradient, some extra energy is needed. This comes from respiration.

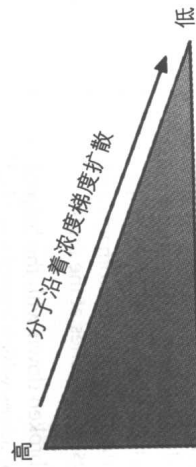
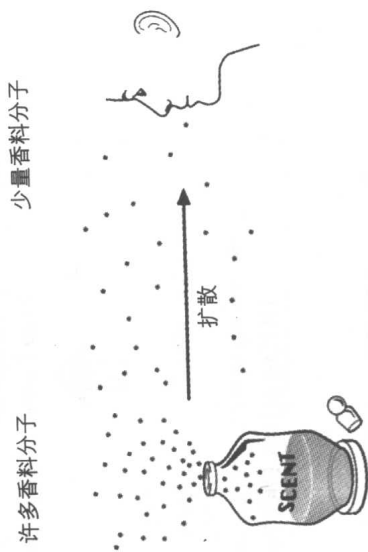


To get mineral ions into the root cells, the plant has to move them across the cell membrane. The mineral ion binds to a special carrier protein in the membrane which changes shape and then carries the molecule into the cell. This needs energy.

A5- 扩散、渗透和主动运输

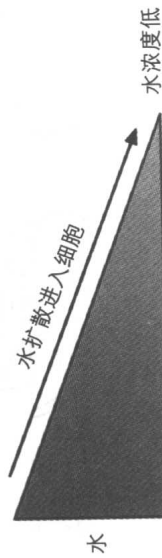
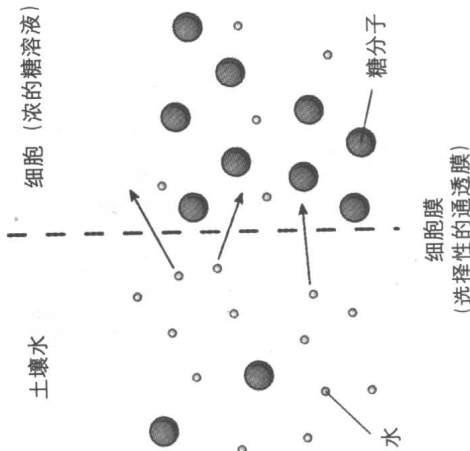
物质进出生物体的细胞有三种主要的机制。

扩散: 粒子从高浓度区域向低浓度区域移动。因为气体和液体中的所有粒子都在不停地运动, 故扩散能够发生。小的、轻的粒子比大的、重的粒子扩散得快; 高温时, 扩散得更快。



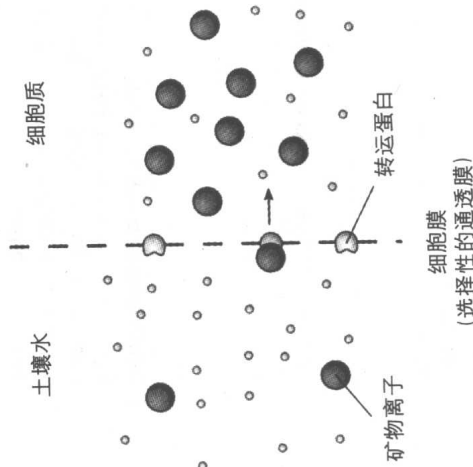
在肺的空气囊泡里, 氧分子扩散进入氧浓度低的血液中, 二氧化碳分子从血液扩散进入肺里, 二氧化碳就被呼出。

渗透: 是水通过选择性的通透膜 (s. p. m.) 的一种扩散方式。因为水分子能容易地穿过选择性的通透膜, 故渗透能够发生。大的分子 (如葡萄糖) 试图扩散到另一边, 但它们不能穿过细胞膜。



水通过渗透从土壤进入植物的根须细胞。植物细胞中的糖分子不能扩散出去, 因为细胞膜对水是通透的, 而对糖分子是不通透的。

主动运输: 分子穿过选择性的通透膜, 从低浓度区域向高浓度区域移动。由于这种运动逆着浓度梯度, 需要提供额外的能量。它由呼吸作用产生。



为了将矿物离子吸收进根细胞, 植物必须使它们穿过细胞膜。矿物离子与膜上的特殊转运蛋白结合, 转运蛋白构象改变并将矿物离子运到细胞内, 这个过程需要能量。

A6 – Human digestive system

Digestion is the breaking down of large food molecules into small ones so that they can be absorbed into the bloodstream.

THE DIGESTIVE SYSTEM

Food is digested in the **alimentary canal**. This is a long tube which starts at the mouth, runs through the stomach and intestines and finishes at the anus.

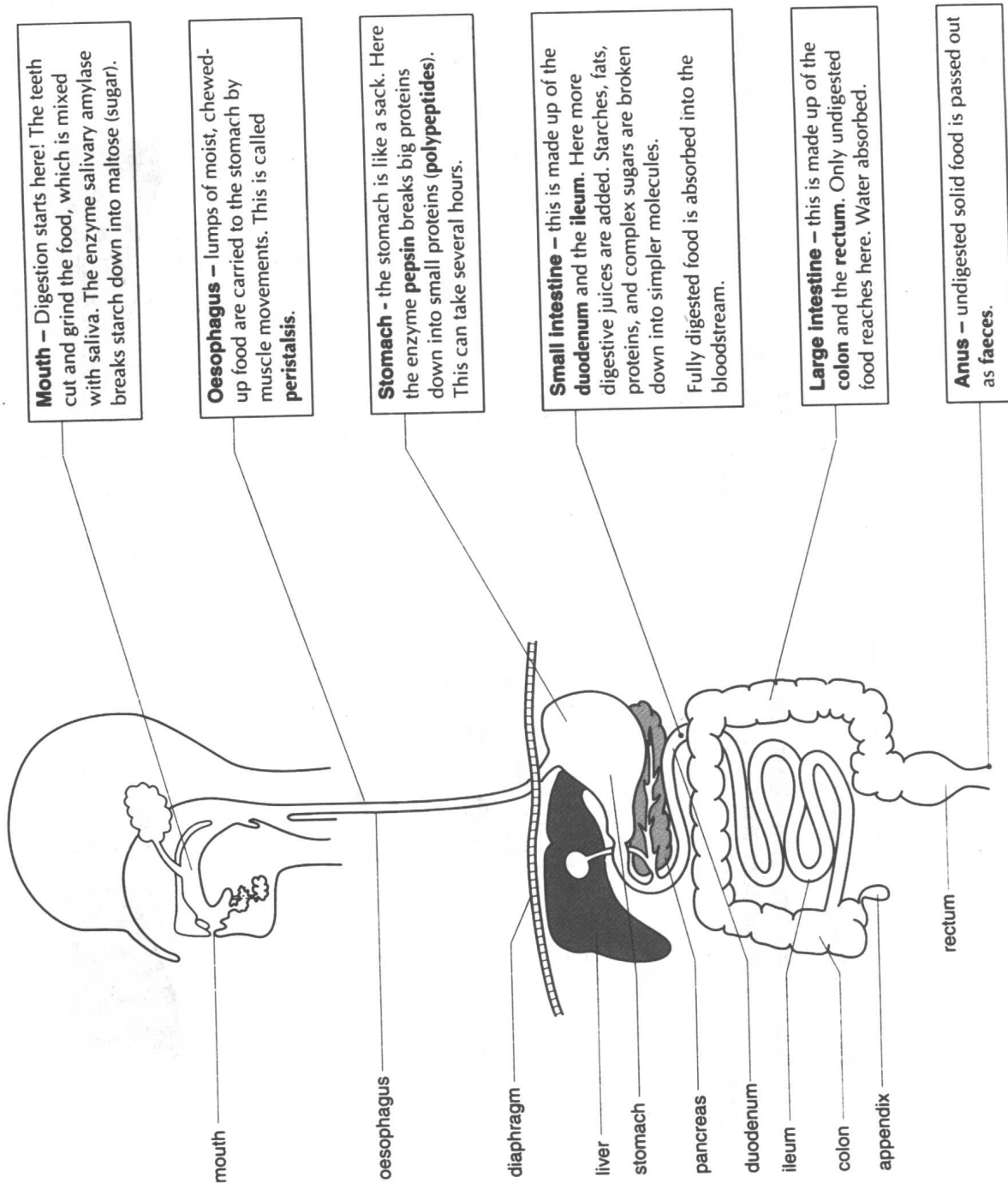
Food is broken down with the help of digestive juices which contain special chemicals called **enzymes**.

The digestive system is the alimentary canal plus all the organs which secrete digestive juices into it.

DEALING WITH FOOD

There are four stages in the way we deal with food:

- 1 **Ingestion** – getting food into the body ('eating')
- 2 **Digestion** – breaking complex food molecules down into smaller molecules
- 3 **Absorption** – absorbing small molecules from the alimentary canal into the bloodstream so they can be transported around the body
- 4 **Egestion** – getting rid of food which could not be digested (e.g. dietary fibre) by passing it as faeces



Mouth – Digestion starts here! The teeth cut and grind the food, which is mixed with saliva. The enzyme salivary amylase breaks starch down into maltose (sugar).

Oesophagus – lumps of moist, chewed-up food are carried to the stomach by muscle movements. This is called **peristalsis**.

Stomach - the stomach is like a sack. Here the enzyme **pepsin** breaks big proteins down into small proteins (**polypeptides**). This can take several hours.

Small intestine – this is made up of the **duodenum** and the **ileum**. Here more digestive juices are added. Starches, fats, proteins, and complex sugars are broken down into simpler molecules. Fully digested food is absorbed into the bloodstream.

Large intestine – this is made up of the **colon** and the **rectum**. Only undigested food reaches here. Water absorbed.

Anus – undigested solid food is passed out as **faeces**.

A6- 人类消化系统

消化是将大的食物分子分解为小的分子，以便能被吸收到血流中。

消化系统




食物在消化道里消化。这是一根从嘴开始，穿过胃、肠，到达肛门的长管。

食物在消化液的作用下被分解。消化液含有称为酶的特殊化合物。

消化系统包括消化道及向其中分泌消化液的所有器官。

食物的处理

我们吃进的食物要经过四个过程：

- 1 吞咽 - 使食物进入体内（“吃”）。 
- 2 消化 - 将复杂的食物大分子分解为较小的分子。 
- 3 吸收 - 将小分子从消化道里吸收到血液里以便带到全身各处。 
- 4 排泄 - 将食物中不能被消化的部分（如纤维）通过粪便排出。

