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## Theme: Excretion

### S3 New Curriculum Biology-Chapter 3– Excretion in animals

#### Excretion

This is the removal of metabolic waste products from the body. Accumulation of waste products in the body poison the cells and inhibit biological process.

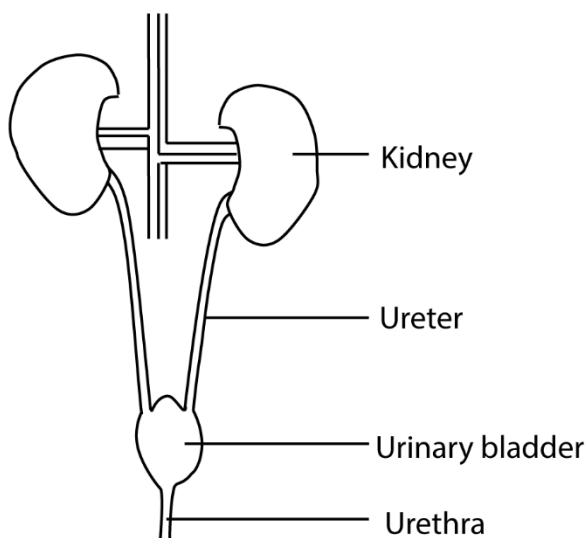
Table of excretory organs and their excretory product

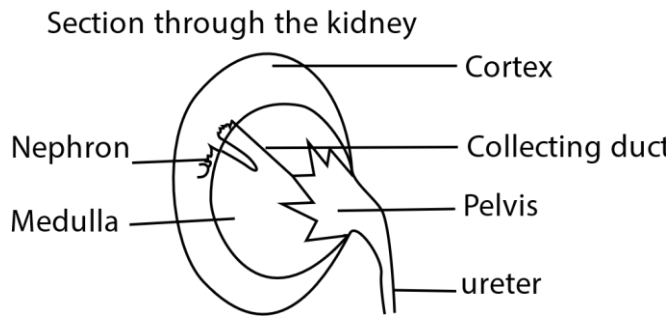
Excretory organ	Products of excretion
Lungs	Carbon dioxide
Skin	Urea, ammonia
Kidney	Urea ammonia and uric acid

The major excretory organ is the kidney

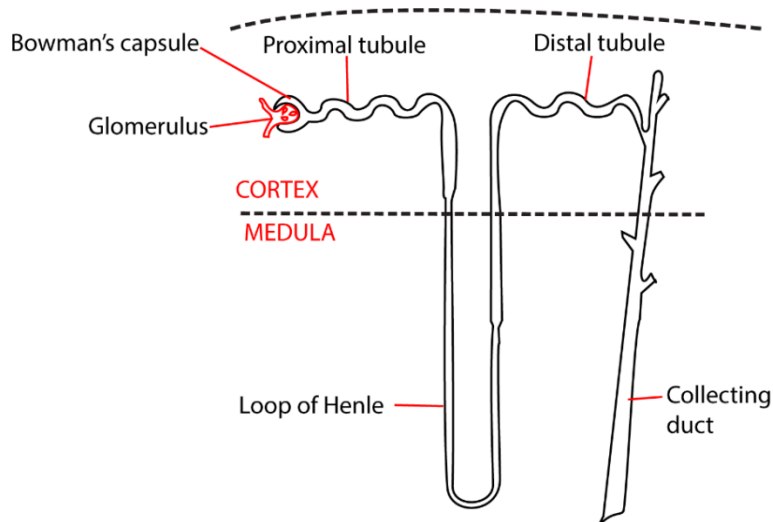
#### The kidney

The urinary system





The functional unit of the kidney is the nephron



Urine production involves three processes

**1. Filtration:**

This occurs in glomerulus into the Bowman's capsule. The filtration pressure is due to the fact that **afferent** blood vessel is bigger than the efferent blood vessel.

Small molecules like glucose, amino acids, ammonia are filtered through the pores of capillary vessels.

Big molecules like proteins and blood cell are not filtered because they cannot pass through the pores of the glomerular membrane

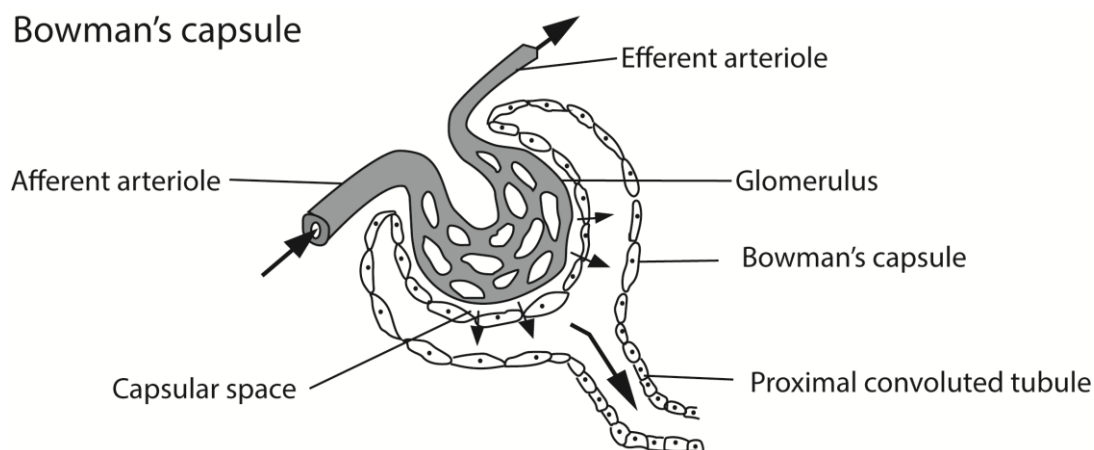
**2. Reabsorption**

Useful molecules like glucose, amino acids and water are reabsorbed from the filtrate in proximal convoluted tubules while unwanted molecules like urea are not reabsorbed. More water is reabsorbed from the loop of Henle.

### 3. Secretion

Urea and ammonia which remained in blood is removed by active transport and secreted into the filtrate.

The remaining material including urea and ammonia pass through the collecting duct to the bladder as urine



### Effect of high levels of carbon dioxide on humans

Increase in metabolic rate leads to increase in the amount of carbon dioxide produced. This carbon dioxide dissolves in blood lowering its pH. Low pH of blood affects the metabolic activities in the body.

### Kidney failure

It is a medical condition in which the kidney is not working properly. For example presence of proteins and glucose in urine indicates a problem with the kidney.

### Causes of Kidney failure

Kidney failure happens when the kidneys lose their ability to filter waste from the blood effectively. This can result from various conditions and factors, including:

#### Common Causes

- **High blood pressure:** Damages kidney blood vessels over time.
- **Diabetes:** Excess sugar in the blood can harm kidney function.
- **Severe infections:** Some bacterial and viral infections can affect kidney health.
- **Dehydration:** Lack of fluids can impair kidney function.
- **Kidney stones:** Blockages or recurrent stones may lead to kidney damage.
- **Autoimmune diseases:** Conditions like lupus or IgA nephropathy attack kidney tissue.
- **Medications and toxins:** Overuse of painkillers, antibiotics, or exposure to heavy metals can harm kidneys.

- **Urinary tract obstruction:** Enlarged prostate, tumors, or bladder issues can prevent normal urine flow.
- **Genetic disorders:** Conditions like polycystic kidney disease cause abnormal kidney growth.
- **Severe blood loss:** Reduced blood flow to the kidneys can trigger sudden failure.

### Prevention of kidney failure

Maintaining a healthy lifestyle—like drinking enough water, eating a balanced diet, controlling blood sugar and blood pressure, and avoiding harmful substances—can lower the risk of kidney failure.

### Disposal of human wastes

Proper disposal of human waste is essential for hygiene, health, and environmental protection. Here are some common methods:

#### Sanitary Disposal Methods

- **Flush toilets:** Connected to sewage systems or septic tanks for safe waste treatment.
- **Septic tanks:** Underground systems that collect and process waste in areas without sewage networks.
- **Pit latrines:** Simple dug pits used in rural areas for safe waste containment.
- **Composting toilets:** Convert waste into compost, reducing pollution and promoting sustainability.
- **Sewer systems:** Transport waste to treatment plants where harmful substances are removed before release.

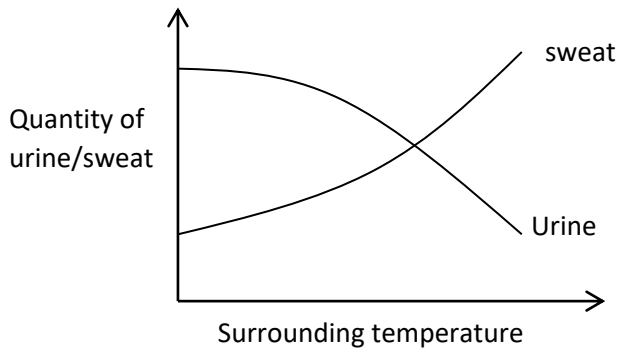
#### Waste Treatment & Recycling

- **Wastewater treatment plants:** Filter and process sewage to remove pollutants before discharging water safely.
- **Biosolid recycling:** Treated human waste can be converted into fertilizer for agriculture.
- **Incineration:** Some waste materials are burned at high temperatures to eliminate contaminants.
- **Biogas production:** Organic waste can be processed to generate energy for cooking or electricity.

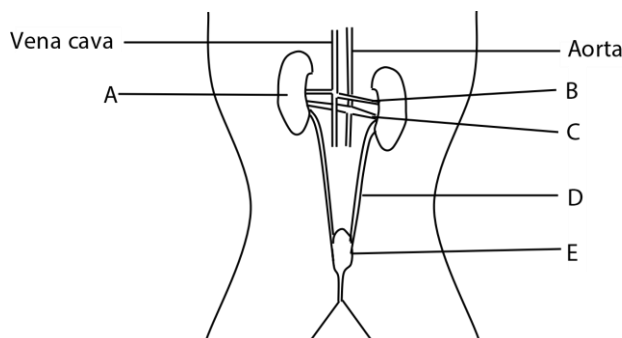
Improper waste disposal can lead to pollution and disease outbreaks. Sustainable solutions ensure cleaner environments and improved public health.

**Revision questions**

- Why do flowering plants possess simpler excretory organ than those found in mammals?
  - describe how mammalian urine is formed
  - What part is played by the mammalian skin in excretion.
- The graph shows the variation in the amount of sweat and urine with temperature in humans



- How does the increase in temperature affect
    - Urine production
    - Sweat production
  - Explain your answer in (a)(i) and (a)(ii) above
    - Explanation for (a)(i)
    - Explanation for (a)(ii)
  - State three conditions under which human pass out concentrated urine
  - A part from sweating, state three other response by mammal to over heating
3. Figure 4, below shows a mammalian urinary system



- Name parts A-F
  - .....
  - .....
  - .....
  - .....
  - .....

- (b) Briefly explain why the concentration of urea in B is less than that in C.  
 .....
- (c) What is the function of E?  
 .....
- (d) A sample of urine was found to contain sugar
- (i) Suggest the type of sugar likely to be in urine sample:  
 .....
- (ii) What hormone is likely to be deficit in a person from whom the urine sample was taken:  
 .....
- (iii) Name the disease that the person is likely to be suffering from:  
 .....
- (e) Another individual was passing out a lot of urine but without sugar and complaining of thirst most of the time.
- (i) Suggest a hormone that is deficient in this individual:  
 .....
- (ii) Name the organ which produces the hormone referred to in (e)(i) above.  
 .....

**Suggested answers**

- 1 (a)
- Most of plant wastes are gaseous (oxygen from photosynthesis and carbon dioxide from respiration) and are lost by diffusion through stomata.
  - There is very little accumulation of toxic wastes e.g. nitrogenous wastes because plants are inactive
  - Excess water passes to the exterior via similar routes and is eliminated by processes of guttation (droplet exudation) and transpiration (evaporation of water from plant surfaces).
  - Plants use waste plants (oxygen for respiration and carbon dioxide for photosynthesis)
  - The plant wastes are stored in cellular vacuoles, and lost in leaves that fall off. Some other waste products are stored in the xylem, like resins and gums.

(b) Urine production involves three processes

**(i) Filtration:**

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**(ii) Reabsorption**

Useful molecules like glucose, amino acids and water are reabsorbed from the filtrate in proximal convoluted tubules while unwanted molecules like urea are not reabsorbed. More water is reabsorbed from the loop of Henle.

**(iii) Secretion**

Urea and ammonia which remained in blood is removed by active transport and secreted into the filtrate.

The remaining material including urea and ammonia pass through the collecting duct to the bladder as urine

(c) During sweating a person loses metabolic wastes like urea and ammonia

2. (a) (i) Increase in surrounding temperature lowers urine production  
(ii) Increase in surrounding temperature increases sweat production.  
(b) (i) Increase in temperature increases the amount of water lost in sweat leaving less water to be lost urine  
(ii) High temperature provided heat of vaporization that increases the amount of sweat produced.
- (c) - After excessive vomiting  
- When he takes in excessive amount of salt  
- After excessive diarrhea  
- After excessive sweating
- (d)  
- Lowering of hair  
- Superficial vasodilatation  
- Reduction of metabolic rate
3. (a)  
A. Kidney  
B. Renal vein  
C. renal artery  
D. ureter  
E. bladder  
F. urethra
- (b) because urea and other waste products are removed by the kidney  
(c) temporary storage of urine  
(d)(i) glucose  
(ii) insulin

- (iii) diabetes mellitus
- (e) (i) antidiuretic hormone (ADH)
  - (ii) Pituitary

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