MCQ Section

UNIT 14 Excretion

1. Which of the following is an example of excretion?
   a. sweat
   b. urine
   c. nasal mucus

2. Which of the following is a kidney function?
   a. filtration
   b. absorption
   c. secretion

3. The diagram shows a kidney with
   a. urine
   b. blood vessels
   c. nephrons

4. The four structures listed are part of the human excretory system.
   a. glomerulus
   b. Bowman's capsule
   c. ureter
   d. bladder

5. Which of the following statements is true about the kidneys?
   a. They produce urine by filtering blood.
   b. They regulate blood pressure by adjusting fluid levels.
   c. They store nutrients for future use.

6. When urine is formed in the kidneys, it is passed through the ureters to the
   a. bladder
   b. liver
   c. stomach

7. The kidneys are located in the
   a. middle abdomen
   b. lower abdomen
   c. upper abdomen

8. Which of the following is NOT a function of the kidneys?
   a. filtering waste products
   b. regulating blood pressure
   c. digesting food

9. The tubules in the kidneys are responsible for:
   a. producing urine
   b. reabsorbing nutrients
   c. releasing waste products into the blood

10. The term "excretion" refers to:
    a. the process of removing waste products from the body
    b. the process of absorbing nutrients into the body
    c. the process of storing food for future use

11. The kidneys remove:
     a. water
     b. carbon dioxide
     c. both water and carbon dioxide

12. The urinary system includes:
    a. kidneys, ureters, bladder, urethra
    b. liver, kidneys, spleen
    c. lungs, heart, kidneys

13. The process of removing carbon dioxide from the body is called:
    a. respiration
    b. excretion
    c. perspiration

14. The kidneys perform several functions, including:
    a. filtering waste products
    b. regulating blood pressure
    c. both a and b

15. The function of the kidneys in maintaining homeostasis includes:
    a. filtration of waste products
    b. regulation of blood pressure
    c. both a and b

16. The kidneys are located in the:
    a. pelvis
    b. abdomen
    c. thorax

17. The process by which blood is filtered is called:
    a. filtration
    b. absorption
    c. secretion

18. The term "glomerulus" refers to:
    a. the filtering unit of the kidney
    b. the structure where urine is stored
    c. the blood vessel where blood pressure is regulated

19. The nephrons are the functional units of the:
    a. liver
    b. heart
    c. kidneys

20. The process of removing excess fluids from the body is called:
    a. filtration
    b. respiration
    c. perspiration

21. The term "urate" refers to:
    a. a type of kidney stone
    b. a waste product of the body
    c. a type of mineral in the blood
7. In a kidney machine, which of the following passes from the blood to the dialysis fluid?
   A glucose  
   B plasma protein  
   C red blood cells  
   D urea
   [J00/P1/Q20]

8. The diagram shows the structures associated with a human kidney.

[Diagram of kidney with labels X, Y, Z, vena cava, aorta]

What are the relative concentrations of urea in X, Y, and Z?
   X high low high  
   Y high low low  
   Z low high high  
   D low high low
   [D99/P1/Q21]

9. The diagram represents a dialysis machine (kidney machine).

Which substances in the dialysis fluid should be at a lower concentration than in the blood?
   A amino acids and glucose  
   B glucose and salts  
   C glucose and urea  
   D salts and urea
   [D98/P1/Q20]

10. Samples of blood from the renal artery and the renal vein are analysed. What does the blood in the renal artery contain, in comparison with the blood in the renal vein?
   A less carbon dioxide and more urea  
   B more carbon dioxide and less urea  
   C less oxygen and more urea  
   D more oxygen and less urea
   [J99/P1/Q21]

11. Which substance is present at a lower concentration in the renal artery than in the renal vein?
   A amino acids  
   B carbon dioxide  
   C glucose  
   D urea
   [D98/P1/Q14]

12. Which substances are found in the glomerular filtrate in the kidneys of a mammal?

<table>
<thead>
<tr>
<th></th>
<th>glucose</th>
<th>protein</th>
<th>salts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>C</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>D</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
</tbody>
</table>

key ✓ = present  x = absent

10. A The renal artery supplies oxygenated blood at a higher concentration of urea and salts to the kidney. It supplies oxygen and nutrients to the kidney. Blood flow through the kidneys results in the formation of carbon dioxide and urea. The removal of urea and excess mineral salts which are excreted in urine. The deoxygenated blood in the renal veins has the least urea as almost all urea are removed in the kidneys.

11. B The renal artery carries blood which supplies a high concentration of oxygen (therefore, a low concentration of carbon dioxide) and a high concentration of nutrients. The renal artery delivers blood to the kidneys. The urine carries deoxygenated blood away from the kidneys towards the heart. The blood in the renal vein has the lowest concentration of oxygen as it is removed in the kidneys and tubules by ultrafiltration and excreted in urine.
11. Which blood vessel carries blood with the lowest concentration of urea?
A. hepatic portal vein  
B. pulmonary vein  
C. renal vein  
D. vena cava

12. Blood proteins are too large to pass through the glomerulus. They are filtered through the small vessels in the Bowman’s capsule even under high pressure limits?  
A. A  
B. B  
C. C  
D. D

13. C. The blood in the renal arteries is as high as pressure. It is removed in the kidneys by filtration and excreted in urine.  
A. A  
B. B  
C. C  
D. D

14. From which of the following is urea formed?
A. fat  
B. blood  
C. protein  
D. starch

15. The diagram shows the kidney and three tubes associated with it. Which organs carry out these functions?
A. production  
B. filtration  
C. storage  
D. kidney

16. The diagram shows part of the human urinary system. Where is urea most concentrated?
A. A  
B. B  
C. C  
D. D

17. A. The kidney of a healthy person should steadily increase its content of urea in the urine.
21. The diagram shows part of the excretory system of a mammal.

What are the numbered structures?

A bladder ureter kidney urethra
B bladder urethra kidney ureter
C kidney ureter bladder urethra
D kidney urethra bladder ureter

22. The diagram shows part of the urinary system of a mammal.

What are the structures labelled X, Y and Z?

A artery vein ureter
B artery vein urethra
C artery ureter urethra
D vein artery ureter
E vein ureter urethra

23. The diagram represents the process of dialysis in a kidney machine.

Which substance would not be present in the dialysis fluid flowing in?
A glucose C urea
B salt D water

24. What happens to blood as it passes through a kidney machine?
A Carbon dioxide is removed.
B Glucose is added.
C Oxygen is added.
D Urea is removed.

25. Some of the structures in the excretory system are listed.
1 bladder
2 ureter
3 urethra

In which order does a molecule of urea pass through these structures?

<table>
<thead>
<tr>
<th>first</th>
<th>last</th>
<th>order</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 1 3 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C 2 1 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D 3 1 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

26. How is a working kidney dialysis machine similar to a healthy kidney?
A It takes sugar molecules out of the blood.
B It regulates the concentration of the blood.
C It deaminates amino acids to urea.
D It removes large molecules from the blood.

18. C Fact
19. D Fact
20. D Urea is formed in the kidneys. It then passes through the ureter into the bladder, before being discharged via the urethra.

21. C Fact
22. A The renal vein (Y) carries blood away from the kidney and the renal artery (X) carries blood towards the kidney. Z is the ureter.

23. C The sterile dialysis fluid is similar to blood plasma in that it contains a carefully regulated amount of dissolved salts and sugars but without any nitrogenous wastes.

24. D In the kidney machine, a concentration gradient is maintained between the dialysis fluid and blood plasma. Urea from the blood diffuses into the higher concentration in the blood plasma into the dialysis fluid. The dialysis fluid has a glucose concentration similar to the blood plasma to reduce the loss of glucose by diffusion to a minimum.

25. C Ureine produced by the kidney tubules is carried to the bladder by the ureter. The urine is stored temporarily in the bladder until it is removed from the body through the urethra.

26. B A concentration gradient is set up when the patient's blood, which has a higher concentration of urea and mineral salts, and the dialysis fluid surrounding the tubes. Urea and excess mineral salts diffuse from patient's blood across the selectively permeable walls of the tubes into the dialysis fluid.
27. The diagram shows the flow of blood and dialysis fluid through a kidney machine. Where would the concentration of urea be highest? A. W and X, B. X and Y, C. Y and Z, D. X and W.

28. The diagram shows part of the human urinary system. Where is urea most concentrated? A. W and X, B. X and Y, C. Y and Z, D. X and W.

29. What is an example of excretion? A. Release of adrenaline from the adrenal glands, B. Release of sweat from the sweat glands, C. Removal of carbon dioxide from the lungs, D. Removal of faeces from the alimentary canal.
Question 1

Fig. 5.1 shows a longitudinal section through the abdomen of a person (not all abdominal organs are shown) and some detail of the membrane, R, that lines the abdominal cavity.

![Diagram of abdominal cavity and membrane R]

Fig. 5.1

(a) On Fig. 5.1, name the structures labelled S, T and U. [3]
(b) Fig. 5.2 shows a method of dialysis used by patients whose kidneys have ceased to function.

![Diagram of dialysis process]

Fig. 5.2

While the fluid is in the abdominal cavity, chemicals can pass into it from the blood in the capillaries, through membrane R.

To prevent useful chemicals leaving the patient’s blood, certain chemicals may be added to the dialysing fluid before it enters the abdominal cavity.
The main metabolic waste products are carbon dioxide and water from breakdown of proteins and amino acids in liver.

**Question**

1. Name two chemicals that pass from the blood into the digestive tract.

2. State I, Structure J - liver, Structure K - stomach. Explain how these chemicals enter the digestive tract.

3. How are the products of metabolism and, for each waste product, state

4. Outline how a filtering machine works.

5. Why is the removal of wastes from the alimentary canal not considered

6. Why is the removal of excess from the alimentary canal not considered

7. To prevent the loss of glucose from the blood during diabetes.

8. Comment on answer

9. How does the blood return to lower energy produced by the body.

**Solution**

<table>
<thead>
<tr>
<th>Table</th>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidneys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exportory Ores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic Waste Products</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Explanation**

- Name of chemical – glucose
- I. Structure J - liver
- K. Structure K - stomach

**Comment on answer**

- The filtering machine works by filtering out harmful substances from the blood.
- The products of metabolism include carbon dioxide, water, and other waste products.
- The filtering machine prevents these waste products from entering the bloodstream.
(b) A diagrammatic representation of a kidney dialysis machine is shown below:

In the dialysis unit of the kidney dialysis machine, the patient's blood in the coiled cellophane tubule is bathed in a sterile dialysis fluid which collects the waste molecules. The cellophane tubule acts as a semi-permeable membrane which allows small molecules of substances to diffuse through and prevents the passage of blood cells and large proteins. The dialysis fluid contains a carefully regulated amount of dissolved salts and glucose with a composition similar to the blood plasma (without nitrogenous waste).

A concentration gradient is set up and nitrogenous wastes, excess mineral salts and other toxins diffuse from patients blood across the cellophane into the dialysis fluid. The dialysis fluid is changed regularly to remove the waste substances and to maintain the diffusion gradient between the patient's blood and the dialysis fluid. The patient's blood is led from an artery in his forearm through the coiled cellophane tube in the dialysis machine and then re-enters the body via a vein in the same arm. The blood is prevented from clotting in the machine by addition of an anti-clotting chemical. The temperature of the dialysis fluid is maintained at body temperature.

(c) Excretion is the removal of metabolic waste products which are formed in chemical reactions in the cells.

Removal of faeces (defaecation) is the removal of undigested or indigestible substances from the alimentary canal through the anus. Since faecal matter is not produced by metabolism, removal of faeces cannot be considered as excretion.

Question 3

Explain how the blood system carries a named waste product from the liver to the kidneys. [4]

Solution

Urea is produced in the liver during the deamination of amino acids. It is carried in the blood as a dissolved substance in the plasma. It is carried in the renal artery to the kidney.
### Question 4

Fig. 2 shows a diagram of a kidney and associated structures. The table lists the percentages of certain components found within structures B and C.

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration/%</th>
</tr>
</thead>
<tbody>
<tr>
<td>urea</td>
<td>0.03</td>
</tr>
<tr>
<td>glucose</td>
<td>0.10</td>
</tr>
<tr>
<td>amino acids</td>
<td>0.05</td>
</tr>
<tr>
<td>salts</td>
<td>0.72</td>
</tr>
<tr>
<td>proteins</td>
<td>8.00</td>
</tr>
</tbody>
</table>

### Table 1: Concentration of Components in Structure B

- **A**: Inferior Vena Cava
- **B**: Renal Vein
- **C**: Ureter

### Fig. 2

- **A**: The heart is the primary pump in the cardiovascular system.
- **B**: The renal vein carries blood from the kidneys to the vena cava.
- **C**: The ureter transports urine from the kidneys to the bladder.

### Solution

1. (a) The renal vein
2. (b) The renal vein carries blood from the kidneys to the vena cava.
3. (c) The renal vein carries blood from the kidneys to the vena cava.
4. (d) The renal vein carries blood from the kidneys to the vena cava.
5. (e) The renal vein carries blood from the kidneys to the vena cava.
6. (f) The renal vein carries blood from the kidneys to the vena cava.

### Common Error

- **(a)** Students tend to list functions of kidney which are not shown in the table.
(d) (i) The concentration of urea in the urine would increase. This is because meat contains a large proportion of proteins, which are broken down to amino acids in the small intestine. Excess amino acids are deaminated in the liver and converted to ammonia and then to urea. The urea is transported to the kidneys to be removed in the urine.

(ii) The concentration of glucose would increase. Without sufficient insulin, glucose cannot be converted to glycogen for storage, or utilised by the tissue cells in tissue respiration. The blood glucose concentration rises and some glucose is subsequently lost in the urine.

**Question 5**

(a) Define the term *excretion*. [2]

(b) What part is played in excretion by (i) the lungs, and (ii) the kidneys? [5]

(c) Explain how a kidney machine helps a person whose kidneys have ceased to function. [5]

**Solution**

(a) Excretion is the process by which metabolic waste products (e.g. urea, carbon dioxide and water) are removed from the body of an organism.

(b) (i) The lungs excrete carbon dioxide and water vapour from the body in the expired air.

(ii) The kidneys excrete excess mineral salts, nitrogenous waste products (urea, creatinine and uric acid) and excess water in the urine.

(c) Blood is drawn from an artery in the patient’s arm and is allowed to flow through the tubing in the dialysis machine. The tubing, which has selectively permeable walls, is bathed in a specially controlled dialysis fluid. Urea and other waste products diffuse out of the tubings into the dialysis fluid. The filtered blood is then returned to a vein in the patient’s arm. In this way, the dialysis machine acts as a substitute kidney and helps remove waste products which would otherwise have accumulated in the body.
and the urine becomes more concentrated.

More water enters the blood, so that the blood concentration is kept constant. 

- The ADH pressure via the blood reaches the kidney.

- The blood pressure is released into the blood (from the primary glomeruli) near

- The glomeruli form the water necessary to maintain the concentration of the blood.

- The urine is formed.

Besides sweating, other means of keeping the body temperature within its limits also help to maintain the level of water and salts in the body. Depending on the diet, there is likely to be more than the body needs, so the kidneys remove whatever is in excess. 

- The nails

- The hair

- The skin

- The sweat

(1) An increase in production of sweat by sweat glands and evaporation of water

- The skin

- The nails

- The hair

(2) An excess of protein and blood capillaries near sutures of the skin

So that more heat from blood can be lost to the surroundings by radi-