

Name: _____

3.4 Excretion	Learning outcomes:	Can you? (G,O,R)
3.4.5 Plant Excretion	<ol style="list-style-type: none"> 1. Say why plant leaves are flattened 2. Give the role of leaves as excretory organs of plants. 3. Give the role of lenticels as excretory organs of plants 	
3.4.6 The Excretory System in the Human	<ol style="list-style-type: none"> 1. Explain the role of the excretory system in Homeostasis 2. Give the function of the lungs, skin and urinary system 3. Give the location of the lungs, skin and urinary system 4. Give the excretory products of the lungs, skin and urinary system 5. Explain the need to drink water before, during and after exercising 6. Draw the structure of the urinary excretory system in humans 7. Label these parts -- kidney, ureter, urinary bladder, and urethra 8. Give the basic function of the urinary excretory system in humans 9. Explain the role of the kidney in regulating body fluids 10. Explain the role of the kidney extracting wastes and toxins from the blood and recycling valuable substances 11. Explain the terms filtration, reabsorption and secretion -- thus regulating the body fluids and chemistry of the body 12. Identification of the site of filtration and reabsorption in the cortex, medulla and renal pelvis 13. Identify the position of secretion in the kidney 14. Describe the pathway of urine from the kidney to the urethra 15. Write an essay report on Unhealthy Urinary Systems – reference to Bacterial urinary tract infections, Formation of kidney stones, Renal tubule failure, Dialysis and Kidney transplants. 	
3.4.8.H The Nephron	<ol style="list-style-type: none"> 16. Draw the Nephron and its associated blood supply 17. Explain how urine is formed 18. Why the blood is under pressure in the glomerulus 19. Why the plasma is force-filtered 20. Say what components of the plasma are not filtered and why 21. Explain the terms " Glomerular filtrate", convoluted tubule, "proximal convoluted tubule " 22. Explain what substances are reabsorbed into the blood 23. Explain how substances are reabsorbed into the blood 24. Give the roles of the Loop of Henle and the distal convoluted tubule 25. Give some of the components found in urine 26. Give the pathway for urine from the nephron to the kidney 	

Excretory system

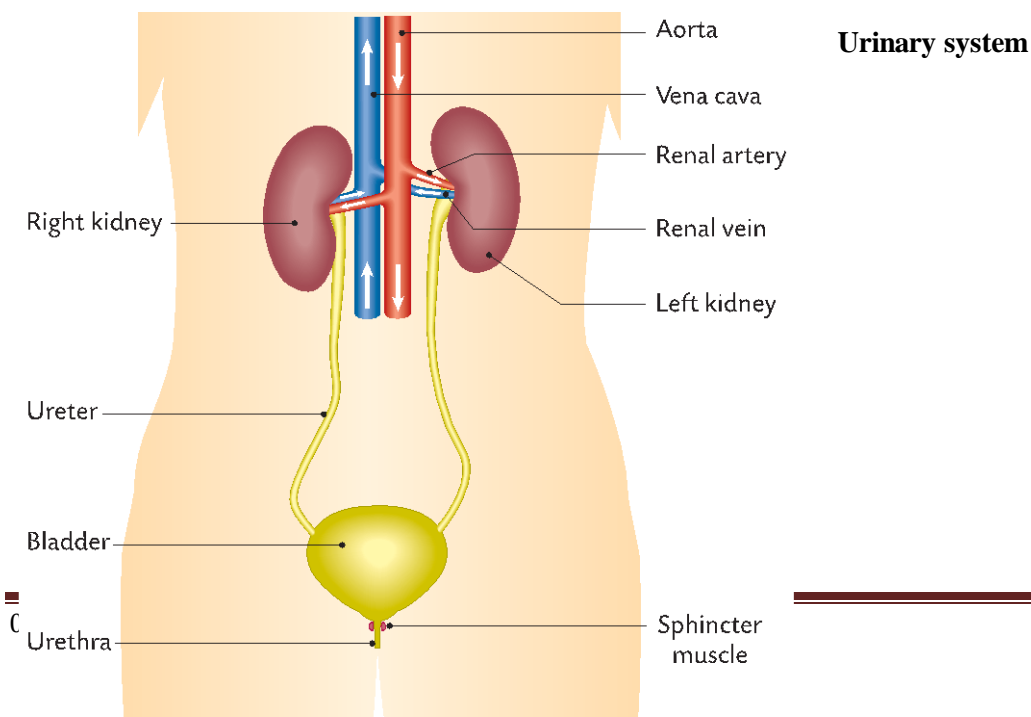
	<p>27. Explain how reabsorption of water in the collecting duct is under hormonal influence</p> <p>28. Give the full name for ADH</p> <p>29. Say what conditions stimulate ADH release</p> <p>30. Say what conditions inhibit ADH release</p> <p>31. Explain how ADH secretion [action] depends on the water content of the blood.</p> <p>32. Explain the term osmoregulation</p> <p>33. Show how osmoregulation is an example of a homoeostatic mechanism</p>	
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Excretion is getting rid of the waste products of metabolism from the body. Excretion is an important part of homeostasis. Without excretion wastes would quickly build up and interfere with the internal chemical and fluid balances of the organism.

Plants produce very little waste. Plant excretion consists mainly of carbon dioxide by night, and oxygen during the day. Store some wastes in vacuoles and lose more when dead structures fall off. Guard cells control stomatal size in leaves and are thought to be sensitive to carbon dioxide concentration. This ensures sufficient CO₂ for photosynthesis and prevents a build-up of excess CO₂. Lenticels are small pores in the stem that also carry out gaseous exchange.

Organs of excretion	Excretory products
1. Lungs	carbon dioxide and water
2. Liver	bile and excess amino acids, water and cholesterol
3. Skin	salt, water and some urea
4. Kidneys	salts, urea, water, uric acid*

*Uric acid is a nitrogenous waste produced during the breakdown of adenine and guanine. pH of urine is 6.0 and yellow due to urochrome - a pigment produced during protein metabolism



Blood, high in waste products, enters kidneys through renal arteries.

Kidneys filter out waste and reabsorb useful substances.

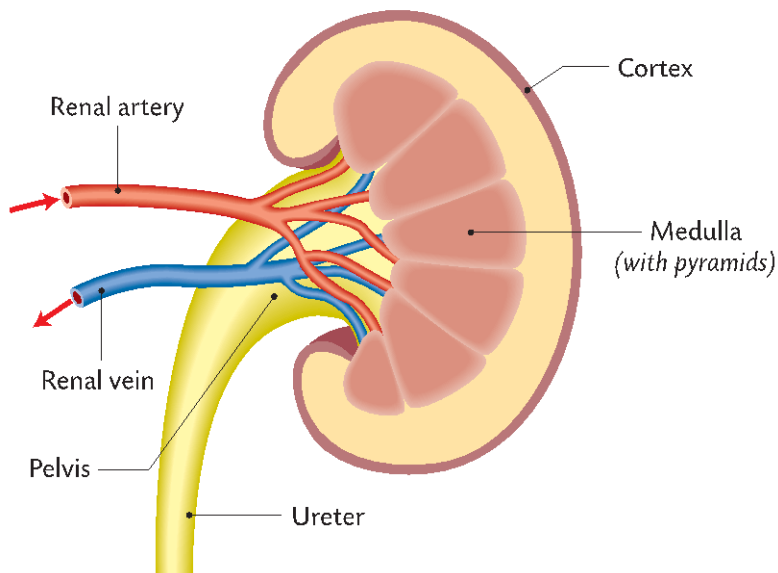
Purified blood leaves kidneys through renal veins and the urine flows from kidneys via ureters to bladder (storage) and out through the urethra.

Kidney

Location:

Back of abdominal cavity, in the “small of the back”, left kidney slightly higher than the right and both covered by a protective layer of fat.

Structure



Cortex - outer fibrous part, dark red in colour.

Medulla - inner region, bright red in colour.

Pyramids - cone-shaped areas projecting into pelvis of kidney.

Pelvis - hollow chamber, expanded head of ureter.

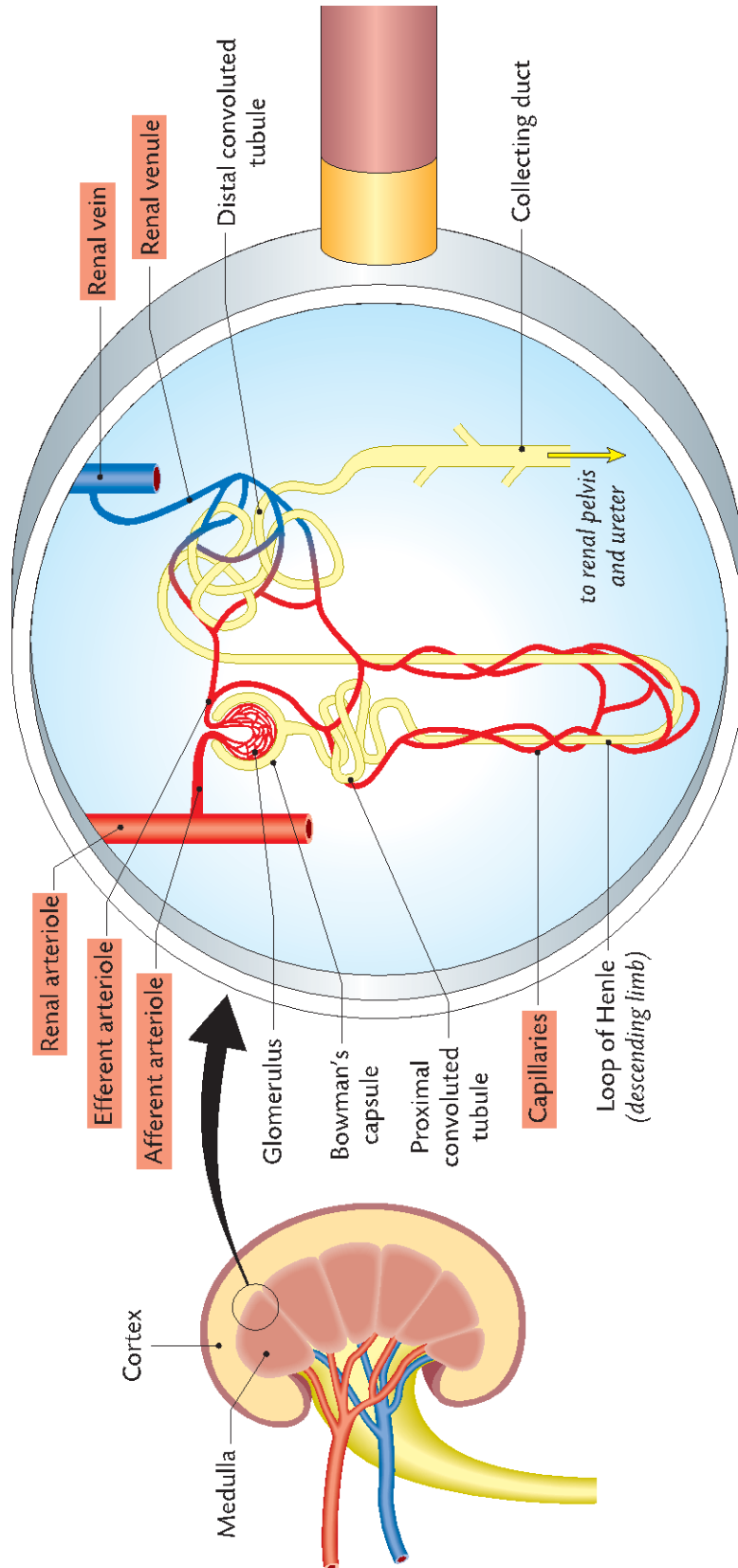
Functions - both homeostatic:

- (1) Excretion - to remove waste products i.e. urea which results from deamination of excess amino acids in the liver and excess water and salts.
- (2) Osmoregulation - the kidneys balance the water and salts composition of blood.

Nephron

Nephrons are tiny tubules in the kidney, which filter the blood ($\approx 1 \times 10^6$ /kidney).

Nephron structure:



Urine production

3 major stages:

1. Filtration:

- (a) Blood in the glomerulus capillaries is under high pressure because (i) the renal arteries branch directly from the aorta and (ii) the efferent arteriole (outgoing) is narrower than the afferent arteriole (incoming).
- (b) High pressure and large surface area of capillaries causes ultrafiltration of blood plasma through the pores in the glomerulus wall into the lumen of the Bowman's capsule, forming a liquid called the glomerular filtrate. Both walls are one cell thick. The filtrate does not contain proteins and blood cells as they are too large for the pores.

2. Selective reabsorption:

Reabsorption of useful substances e.g. water, amino acids, glucose, vitamins and salts from glomerular filtrate back into capillaries.

Different substances are reabsorbed by different methods e.g. water by osmosis and solutes by diffusion and active transport.

Proximal convoluted tubule:

All of the glucose, vitamins, amino acids, and $\approx 80\%$ salts and water are reabsorbed here.

To help reabsorption the cells of the wall of the tubule (i) contain lots of mitochondria to provide the energy for active transport (ii) have numerous microvilli to increase the surface area and (iii) the PCT is one-celled thick and long (14mm).

Loop of Henle:

An extra 5% of water is reabsorbed into blood by osmosis in the descending limb. Secretion of salt into the surrounding area by the ascending limb permits extra water reabsorption from the descending limb.

Distal convoluted tubule:

Salts (Na^+Cl^-) and water can be reabsorbed, depending on the needs of the body. Aldosterone from the adrenal cortex helps to control the amount of sodium re-absorbed

Collecting duct:

Further reabsorption of water by osmosis (due to high salt conc. in the medulla created by the loop of Henle) can occur depending on state of body - controlled by ADH - anti-diuretic hormone*.

3. Selective secretion:

Some substances pass from blood into nephron.

Proximal tubule = Hydrogen ions are secreted in response to changes in the blood plasma's pH (normal pH = 7.4), ammonium ions, drugs and poisons

Distal tubule = potassium and hydrogen ions. High levels of potassium prevents nerve impulses from travelling correctly and reduces the strength of muscular contraction.

The urine now in the collecting duct passes through the ureters to the bladder where it can be stored. It is released via a sphincter muscle into the urethra.

The **volume and composition of the urine** produced is affected by a number of factors e.g. atmospheric temperature, exercise, diet (water/salt/protein intake) etc.

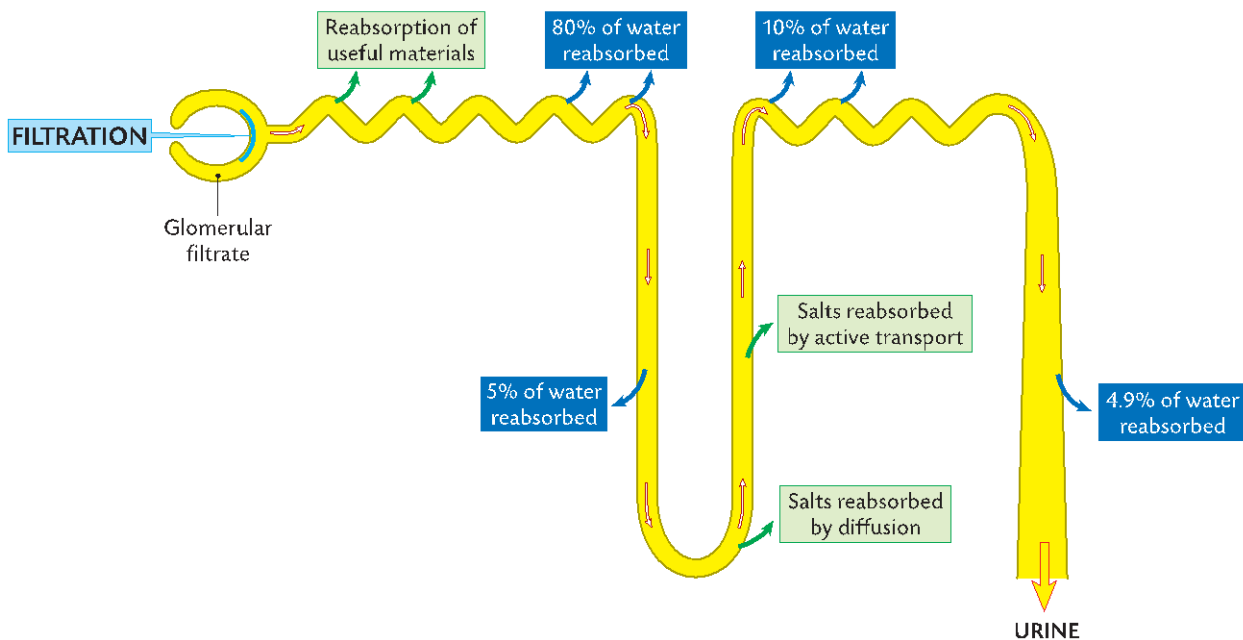
The body keeps the balance between water and dissolved solutes by balancing water gained with water lost.

Water gain: drinking, eating, respiration, reabsorption in nephron.

Water loss: breathing, sweating (increased by temp. increase e.g. hot day, exercise), bleeding, tears, faeces, urine

Kidneys regulate osmosis by keeping blood and body cells at the same concentration.

Location	% water reabsorbed	Salts reabsorbed
Proximal tubule	80	Most (as well as glucose, amino acids and vitamins)
Descending limb of loop of Henle	5	None
Ascending limb of loop of Henle	0	Some
Distal tubule	10	Some
Collecting duct	4.9	None

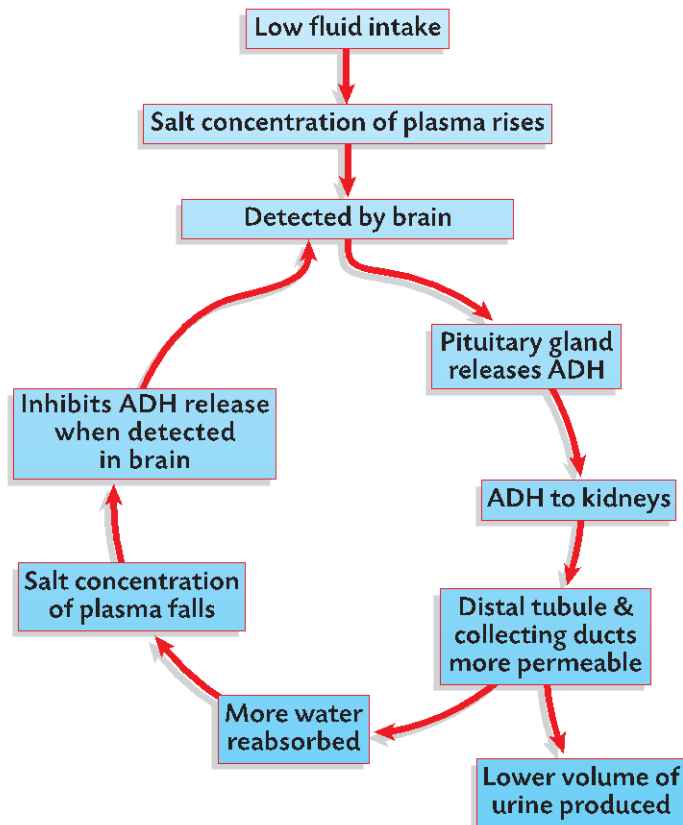


*Hypothalamus in brain measures concentration of blood plasma. If hypertonic (too salty) \Rightarrow pituitary secretes ADH. ADH increases the permeability of the distal convoluted tubule and collecting duct causing more water to be reabsorbed into the blood. Hence a small volume of concentrated urine is produced.

When plasma becomes isotonic ADH production is stopped, permeability of DCT and CD decreases, less water reabsorbed and a large volume of dilute urine is produced.

- A protein rich meal produces the same amount of urine, but a higher conc. of urea and uric acid.
- Very high levels of glucose in the blood will result in some of it being lost from the body in the urine. This indicates diabetes mellitus.
- Increase in conc. in urine of urea and salts compared to blood plasma/glomerular filtrate is due to the reabsorption of water back into the blood.
- Glomerular filtrate has more water and useful substances such as glucose and amino acids compared to urine.

32.11 Control of urine volume



KIDNEY FAILURE

Caused by infections, poisons, tumours, kidney stones, shock and blood disease.

Dialysis

Haemodialysis machines can be used as artificial kidneys.

Blood is diverted from a patient's artery through a bath of dialysing fluid and returned through a vein. Waste (urea and salt) diffuse out of the blood across a dialysing membrane made from cellophane into the fluid. This fluid contains all the nutrients but no toxins. Eventually most of the patient's blood chemistry returns to normal ranges. Procedure takes about 6 hours and needs to be done about 3 times per week. Kidney machines are expensive, clumsy and inconvenient. Serious side effects can be osteoporosis ('brittle bone syndrome') caused by bone calcium loss.

Transplant

In younger patients a kidney transplant is a better option if a suitable donor can be found. There is a shortage of donor kidneys but this could be solved in the future by the cultivation and genetic screening of human embryos.

Urinary tract infections (UTIs)

Due to presence of bacteria in urinary tract e.g. *E. coli*, *Chlamydia*, *Mycoplasma* and *Neisseria* (gonorrhoea) are sexually transmitted and both partners have to be treated.

Symptoms include:

A frequent urge to urinate;

A painful, burning feeling in the area of the bladder or urethra during urination;

feeling tired or shaky;

women feel an uncomfortable pressure above the pubic bone;

a small amount of urine is passed;
urine itself may be cloudy

A fever may mean that the infection has reached the kidneys. Other symptoms include pain in back or side below ribs, nausea or vomiting. Treatment using antibiotics and lots of fluids. Acidic drinks such as cranberry juice can be of some help.

Kidney stones

Most common type is excess calcium combining with excretory products. Yellow/brown, 2 cm in diameter.

A stone may stay in the kidney or travel down the urinary tract. It may pass out of the body unnoticed or get stuck and block the flow of urine and cause great pain.

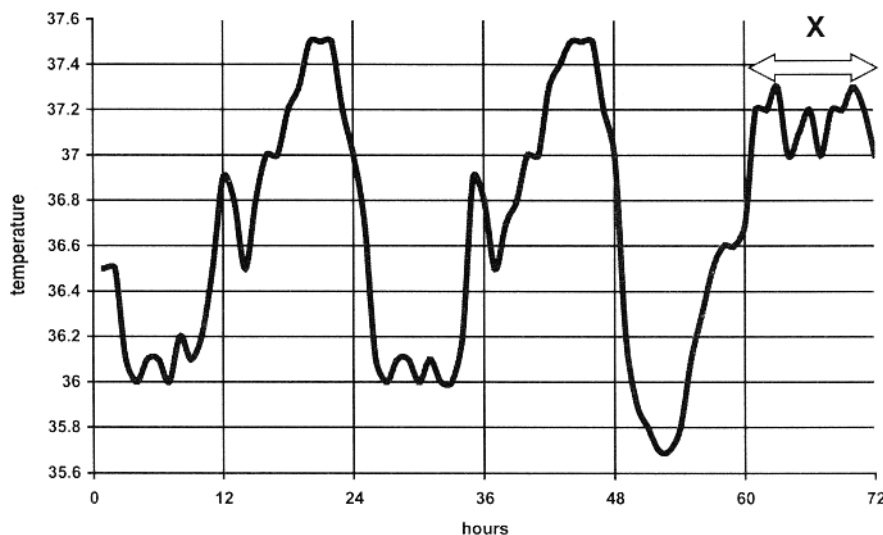
Treatment:

Surgery or shockwave lithotripsy - stone crushing using ultrasound. If prone to kidney stones drink lots of water and eat less meat.

Excretory System

SEC Sample Paper HL

6. The graph shows the variations in human body temperature over a number of days.



What was the minimum temperature recorded?

What was the maximum temperature recorded?.....

Suggest a reason for the difference between body temperature during period X and the same period on the previous days.....

.....

What is the source of the heat that keeps the body at a fairly constant temperature?

.....

State two responses that result when body temperature begins to drop.

- 1
- 2

Explain briefly how sweating assists in the shedding of excess heat

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2006 HL

6. Distinguish between the members of each of the following pairs by making a brief comment on each.

- (b) Ureter and urethra
-
-

2008 OL

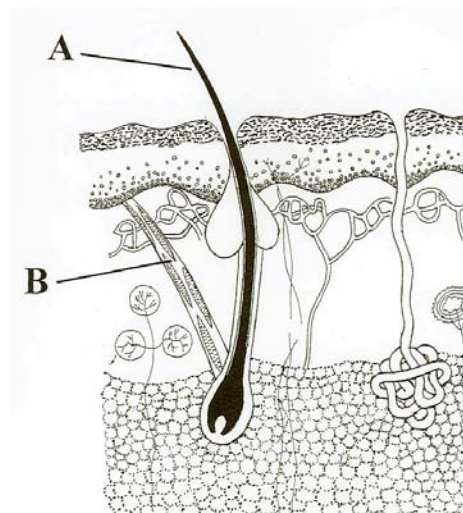
6. The diagram shows a section through human skin.

- (a) Name parts **A** and **B**.

A

B

- (b) Place **X** on the diagram to show where sweat reaches the skin surface.
- (c) Apart from water, name **one** other substance which is found in sweat
- (d) Describe briefly **one** way by which the skin helps to retain heat in cold conditions.

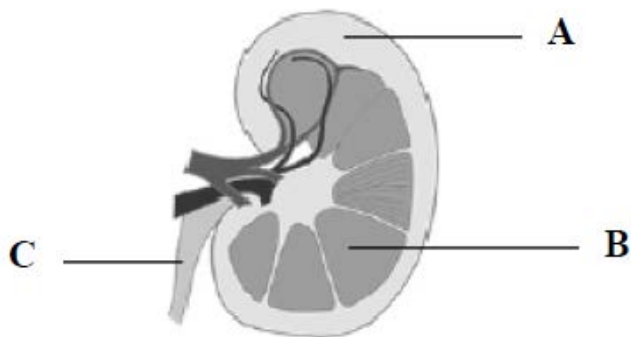


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2013 OL

6. The diagram shows a vertical section through a human kidney.



- (a) Name the parts labelled A, B and C.
- A
- B
- C
- (b) Name the organ that is attached to the kidney by part C.....
- (c) Name **one** substance excreted by the kidneys.....
- (d) Name the site in the kidney where filtration takes place.....
- (e) Suggest **one** possible treatment for kidney failure.....

2004 HL

- 12.** (a) What is homeostasis? State the role of the kidneys in homeostasis. (9)
- (b) (i) Draw a labelled diagram of a nephron. Include blood vessels in your diagram.
- (ii) Filtration and reabsorption are vital processes that take place in the nephron. Describe how each of these processes occurs. (27)
- (c) Answer the following questions in relation to human body temperature.
- (i) What is the source of the heat that allows the body to maintain a constant internal temperature?
- (ii) State two ways in which the body is insulated against loss of heat.
- (iii) Describe the ways in which the body responds when its internal temperature rises above the normal level.
- (iv) Describe briefly the hormonal and nervous responses that occur when internal body temperature drops.

(24)

[Answer](#)

2006 HL

- 13.** (b) Use your knowledge of the human vascular and excretory systems to answer the following.
- (i) Explain the terms, plasma, glomerular filtrate.

- (ii) Explain why red blood cells are normally absent from glomerular filtrate.
- (iii) The concentration of glucose is the same in plasma and glomerular filtrate.
Why is this?
- (iv) Why is glucose normally absent from urine?
- (v) Following a period of heavy exercise an athlete may produce only a small volume of concentrated urine.
Explain this observation and give an account of the process that concentrates the urine.

(27)

[Answer](#)

2007 HL

15. (c) (i) What is homeostasis? Note one reason why it is important in the human body.
- (ii) Draw a diagram of a section through human skin to show two structures involved in temperature regulation. Label each of these structures.
- (iii) For one of the structures that you have labelled in your diagram briefly describe its role in temperature regulation.
- (iv) What is meant by an ectotherm?

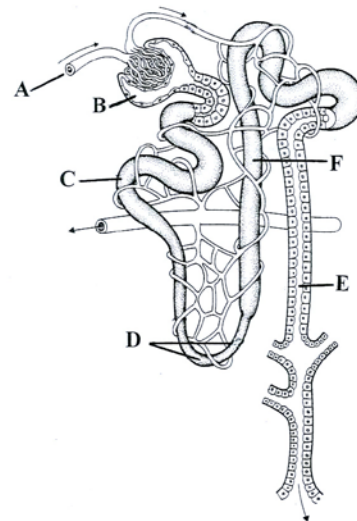
(30)

[Answer](#)

2008 HL

- 13 (a) (i) What is meant by excretion?
- (ii) Urea and carbon dioxide are excretory products of the human body.
In the case of each product name a substance from which it is derived.
- (b) The diagram shows the structure of a nephron and its associated blood supply.

(9)



- (i) Name the parts A, B, C, D, E and F.
- (ii) From which blood vessel is A derived?
- (iii) Where in the kidney is B located?
- (iv) Give the part of the nephron in which each of the following takes place:
 - 1. filtration,
 - 2. reabsorption of amino acids.
- (v) Give **two** features of the nephron that aid filtration.
- (vi) Name a group of biomolecules in the blood which are too large to pass through the filtration system of the nephron.

(27)

- (c) (i) Suggest **two** situations which may result in a drop in the water content of the blood.
- (ii) When the water content of the blood drops a hormone is released.

- Name this hormone and the endocrine gland from which it is secreted.
- (iii) Give a precise target area for this hormone. How does the hormone reach the target area?
- (iv) Explain the role of the hormone at its target area, when the water content of the blood is low.
- (24)

[Answer](#)

2010 HL

15. Answer any **two** of (a), (b), (c).

(30, 30)

- (c) Suggest a biological explanation for **each** of the following observations:
- (i) As long as a baby feeds regularly from its mother's breast (or if a breast pump is regularly used) the milk will continue to flow.
 - (ii) Doctors are reluctant to prescribe antibiotics to patients suffering from common cold-like symptoms.
 - (iii) A person who has suffered from constipation may be advised to increase the amount of wholegrain cereal in her/his diet.
 - (iv) After a long session of heavy exercise, an athlete's urine is likely to be concentrated and low in volume.
 - (v) A person's fingers may turn white when exposed to low temperature for a period of time.

[Answer](#)

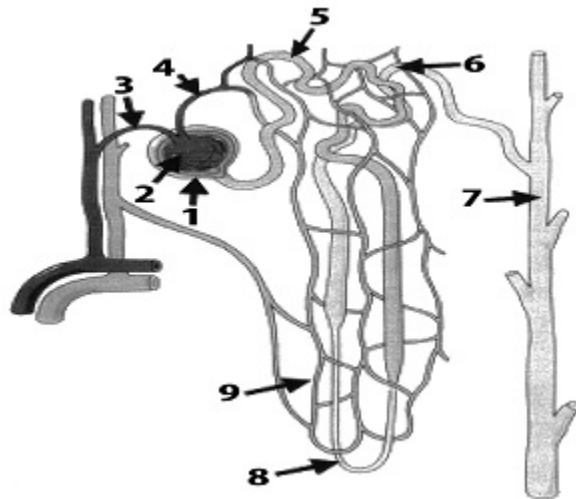
2011 HL

12. (a) (i) What is meant by the term *excretion*?
- (ii) Mention **one** method of excretion in flowering plants.

(9)

- (b) (i) Draw a large labelled diagram of a vertical section through a human kidney. Label the following parts of your diagram: cortex, medulla, pelvis.
- (ii) Indicate clearly on your diagram where re-absorption takes place.
- (iii) 1. Name the blood vessel that supplies blood to a kidney.
2. From which blood vessel does the blood vessel referred to in (iii)1 arise?
- (iv) In which cavity of the body are the kidneys located?
- (v) Name **one** substance, other than water, excreted in the urine.
- (vi) Give a feature of the kidney which indicates that it is an exocrine gland.

(27)



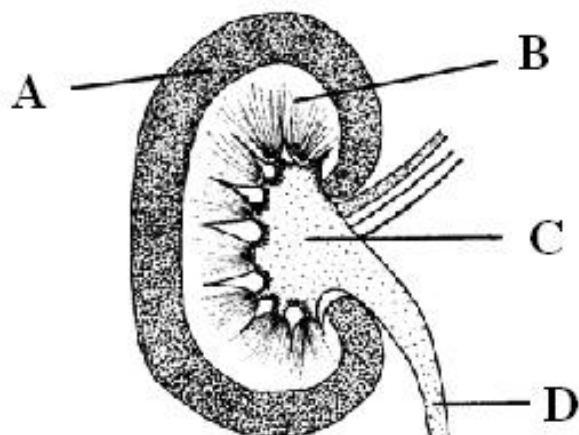
- (c) (i) The diagram above shows the structure of a nephron and its associated blood supply.
1. Name the parts numbered 1 to 6.
 2. Indicate clearly by number where filtration takes place.
 3. Name the hormone associated with changing the permeability of the structure at 7.
- (ii) A sample of urine was found to contain protein.
1. Would you consider this to be normal?
 2. Explain your answer.
- (iii) A sample of urine was found to contain glucose.
1. Would you consider this to be normal?
 2. Explain your answer.
- (24)**

[Answer](#)

Ordinary Level

SEC Sample Paper OL

15. (a) The diagram shows a vertical section through a human kidney.

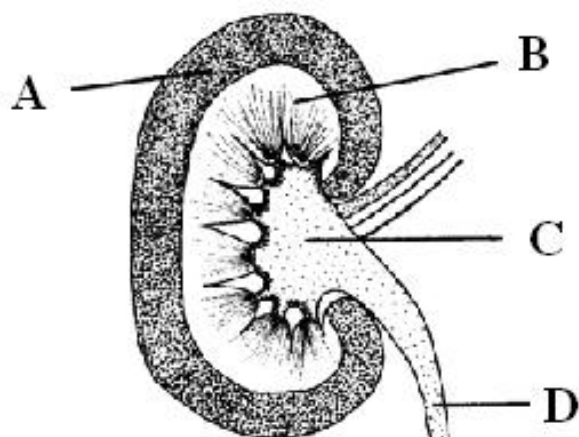


- (i) Name the parts A, B, C, D.
- (ii) To what structure does D link the kidney?
- (iii) Where does filtration occur in the kidney?
- (iv) Filtration ensures that cells and valuable substances are not lost from the body when urine is being formed. Name **two** of these substances or cells.
- (v) Suggest a treatment that may be used for a person whose kidneys are not carrying out their normal functions.
- (vi) Name an organ in the human body, other than the kidney, in which excretion takes place.

[Possible Answer](#)

2005 OL

14. (a) The diagram shows a section through a human kidney.



- (i) Name A, B, C, D.
- (ii) To what structure does D connect the kidney?
- (iii) Filtration is an essential process in the formation of urine. In what part of the kidney does it take place?
- (iv) Reabsorption of useful substances takes place in the kidney. In what part does this occur?
- (v) Name an excretory substance present in urine.

Excretory system

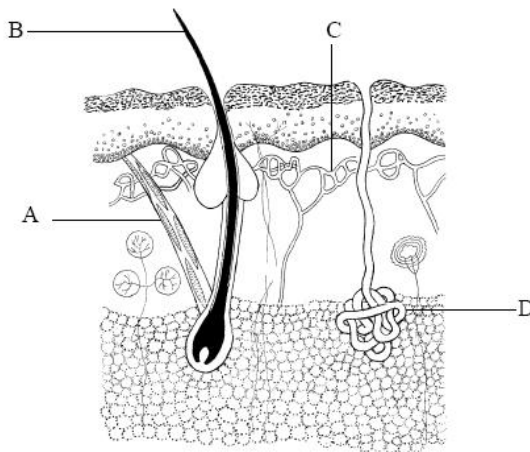
- (vi) Name an excretory organ in the human body other than the kidney. Name a substance, other than the one you have named in (v), excreted by this organ. (30)

[Answer](#)

2006 OL

15. Answer **any two** of (a), (b), (c). (30,30)

- (a) The diagram shows a vertical section through human skin.

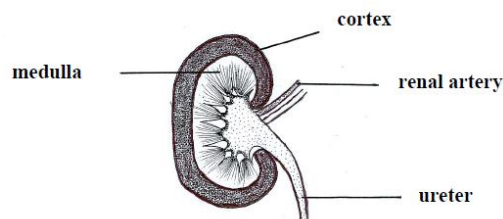


- Identify parts A, B, C and D on the diagram.
- The human being is an endotherm. What does this mean?
- What is the main source of body heat in endotherms?
- Describe the role of D in relation to body temperature.
- What happens to the small arteries (arterioles) in the skin when the external temperature drops?

[Answer](#)

2007 OL

14. (b) (i) What is meant by excretion?
- (ii) Name **two** products excreted by the human.
- (iii) Name **one** organ of excretion, other than the kidney, in the human body.
- (iv) What is meant by osmoregulation?
- (v) Study the diagram of a section through the kidney and answer the following questions.
- Where does filtration of blood take place?
 - Where does reabsorption of salt take place?
 - To what organ does the ureter link the kidney?
 - To which main blood vessel does the renal artery link the kidney?

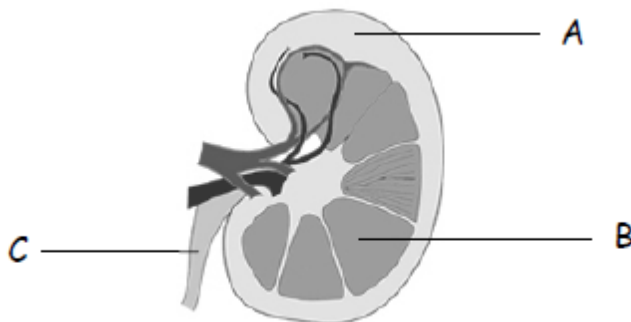


- (vi) Name the fluid present in the ureter.

[Answer](#)

2009 OL

14. (b) The diagram shows a vertical section through a human kidney.



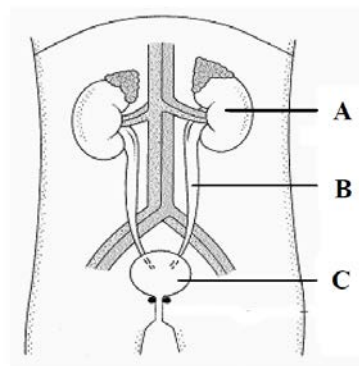
- (i) Name the parts labelled A, B and C.
- (ii) Which organ is attached to the kidney by part C?
- (iii) In which of the three labelled parts does filtration of the blood occur?
- (iv) Explain the term *excretion*.
- (v) Name **two** substances excreted by the kidneys.
- (vi) Give **two** other excretory organs in the human body.

[Answer](#)

2011 OL

14. Answer any **two** of (a), (b), (c)
(30,30)

- (c)
 - (i) Explain the term *excretion*.
 - (ii) Name **two** substances excreted by the kidneys.
 - (iii) The diagram shows the human urinary system. Name the parts labelled A, B and C.
 - (iv) Name the parts of the kidney in which each of the following takes place:
 1. Filtration
 2. Reabsorption.
 - (v) Name **one** other excretory organ in the body.

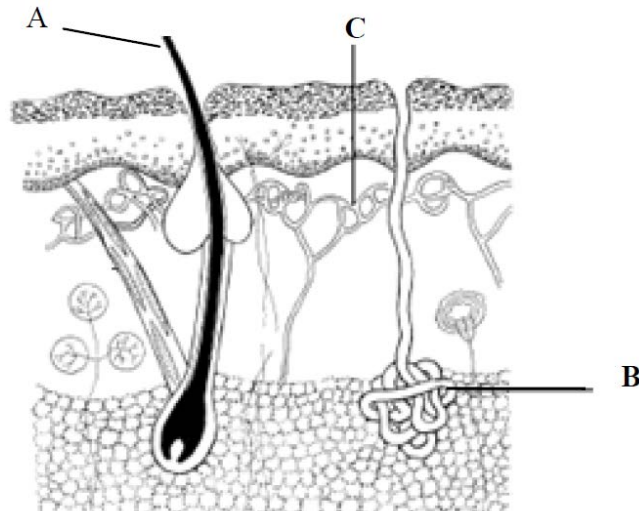


[Answer](#)

2012 OL

15. Answer any **two** of the parts (a), (b), (c).
(30, 30)

- (a) The diagram shows a section through human skin.



- (i) Name the parts labelled A, B, and C.
- (ii) The skin is one of the excretory organs in humans.
Name **one** substance excreted by the skin.
- (iii) List **two** other functions of the skin.
- (iv) Name another organ of excretion **and** state **one** substance it excretes.
- (iv) What is meant by the term *homeostasis*?
- (vi) The human being is an endotherm. What does this mean?

2004 HL Sample Q6

6.	(a)	min 35.7	3
	(b)	max 37.5	3
	(c)	period of exercise/ illness/ anxiety	3
	(d)	metabolic reactions/ in liver	3
	(e)	shivering/ blood vessels in skin constrict/ hairs rise/ sweating stops/ metabolism increases <i>Any 2</i>	3+2
	(f)	sweat evaporates (causing body temperature to lower).	3

2006 HL Q6

6.			5(2+2)
	(b)	ureter: from kidney or to bladder urethra: from bladder or to outside	

2008 OL Q6

6.				2(7)+3+2+1
	(a)	A = hair B = muscle		
	(b)	Location of X (opening of sweat duct)		
	(c)	urea/ salt/ named salt/ lipids/ hormones		
	(d)	(erect) hair / hair traps air/ arteriole contracts (and keeps blood warm) / pores close / adipose (tissue)/Goose pimples		

2013 OL Q6

6.				6(3) + 2
	(a)		A = Cortex B = Medulla/ Pyramid C = Ureter	(3 pts)
	(b)		Bladder	(1 pt)
	(c)		Urine/ Urea/ Water/ Salt	(1 pt)
	(d)		Cortex/ Bowman's capsule/ glomerulus/ 'A' if correctly named in (a)	(1 pt)
	(e)		e.g. Dialysis/ transplant	(1 pt)

Section C
Homeostasis**2004 HL Q12**

12.	(a)		Maintaining (a constant) internal environment or described Role of kidneys: Maintaining salt balance or explained / Maintaining water balance or explained / [Note: Osmoregulation = 2 points]	3 3 3
	(b)	(i)	Diagram of nephron Diagram of blood supply labels	3, 0 3, 0 3(1)
		(ii)	Filtration: Blood in arteriole / under pressure/ plasma (accept blood) or small molecules or named from (or in) glomerulus /in or into (Bowman's) capsule	

Excretory system

			/large molecules or named or cells or named cells cannot pass any three Reabsorption: Substance (or named) from (or in) tubule (or named part or from filtrate) / / into blood / active transport / diffusion / osmosis / mention of hormonal control any three	3(3) 3(3)
	(c)	(i)	Source: respiration or named site e.g. muscle, liver, kidney, brain or named food e.g. carbohydrate or named	3
		(ii)	Two methods of insulation: fat (adipose tissue) / (trapped) air or hair	2(3)
		(iii)	When temp high: vasodilation (or explained) / (secretion of) sweat / hairs lie flat or less air trapped any two	2(3)
		(iv)	Response when temp drops: receptor (or detection) / receptor in skin / receptor in medulla or brain / shiver / generates heat / hairs stand up or goose bumps / air trapped / vasoconstriction (or explained) / increased metabolic rate or increased respiration / any relevant comment on named hormone e.g. thyroxine increases metabolic rate or increases respiration any three	3(3)

2007 HL Q15(c)

	(c)	(i)	<i>Homeostasis:</i> maintenance / of constant internal environment or two named factors constant <i>Reason:</i> allows normal metabolic activities or example or keeps temperature suitable for enzyme reactions	2(3) 3
		(ii)	diagram [top layer, hair follicle or sweat gland + 1 other] labels [sweat gland, hair, arteriole, fat] [allow temperature receptor]	3, 0 2+1
		(iii)	temperature drop / hair erects / traps air as insulator [or opposite] or temperature drop / arteriole constricts / keeps heat [or opposite] or temperature rises / sweat produced / sweat evaporates causing cooling or fat / insulates / from outside or inside	3(3)
		(iv)	body temperature varies / with environmental temperature [allow 'cold-blooded' or explained for 3 marks]	2(3)

2009 HL Q15(c)

15.	(c)			Any three 3(4+3+3)
		(iii)	Maintenance of / constant internal environment / example how / example why (Example = pH, solute concentrations or examples of such solutes, temperature, water)	

2012 HL Q15(c)

15.	(c)	(i)	<i>homeostasis:</i>	Maintenance of a constant internal environment	3
		(ii)	<i>diffusion:</i> <i>osmosis:</i>	movement of substances with (along) a concentration gradient or explained movement of water through a selectively permeable membrane from a high water concentration to a low concentration	3 3

Excretory system

			<i>active transport:</i>		movement of molecules against a concentration gradient or movement of molecules using energy	3	
		(iii)	1.	Absorption of glucose or release of glucose or heat generation		3	
			2.	Excretion of water or excretion of CO ₂ or release of heat		3	
			3.	Excretion of water or reabsorption of water or excretion of salts (or ions) or reabsorbtion of salts (or ions)		3	
		(iv)	Too hot: Sweat / dilation of blood vessels / hair flat Too cold: Constriction of of blood vessels / hair stands up Insulation by (subcutaneous) fat <div><i>Any three</i></div>				3(3)

2012 OL Q15(a)

15.				2(5)+2(4)+6(2)
	(a)	(i)	A = Hair B = Sweat gland C = Blood vessels	(3 pts)
		(ii)	EG. Sweat	(1 pt)
		(iii)	EG. Protection / Melanin production	(2 pts)
		(iv)	EG. Kidney / Urine	(2 pts)
		(v)	Maintaining constant internal conditions	(1 pt)
		(vi)	Produces heat (internally) or warm blooded	(1 pt)

Gaseous exchange in plants

2008 HL Q14(a)

14.	Any two of (a), (b), (c)			(30, 30)
	(a)	(i)	Stomata light or CO ₂ or potassium ions (K) or wind or turgidity of guard cells or water availability or high temperature	3 3

2006 OL Q14(a)

14.	ANY TWO OF (a), (b), (c).			
	(a)			5(5)+3+2
		(i)	A = terminal or apical bud B = leaf scar C = scale, girdle or growth scar D = lateral or axillary bud [Allow "bud" once only] any two correct answers	
		(ii)	Growth region or region of mitosis	
		(iii)	Bud or cambium or under bark or stem tip	

Excretory system

		(iv)	Award marks for candidates who attempt this question	
		(v)	Transport/ support/ displays flower or leaf or fruit / photosynthesis / reproduction / gaseous exchange / storage / perennation any two	

2007 OL Q15(b)

	(b)			6, 3, 0 for diagram + 2(6)+4(3)
		(i)	diagram (epidermis or cuticle, rectangular cells, air spaces) labels (stoma, guard cell)	
		(ii)	controls stomatal size [allow controls passage of gas or water vapour]	
		(iii)	carbon dioxide/ oxygen/ nitrogen/ water vapour [allow maximum of 3 marks if air alone mentioned]	any two
		(iv)	diffusion or passive transport	

Section C – Excretory system

2004 HL Q12

12.	(a)		Maintaining (a constant) internal environment or described Role of kidneys: Maintaining salt balance or explained / Maintaining water balance or explained / [Note: Osmoregulation = 2 points]	3 3 3
	(b)	(i)	Diagram of nephron Diagram of blood supply labels	3, 0 3, 0 3(1)
		(ii)	Filtration: Blood in arteriole / under pressure/ plasma (accept blood) or small molecules or named from (or in) glomerulus /in or into (Bowman's) capsule /large molecules or named or cells or named cells cannot pass any three Reabsorption: Substance (or named) from (or in) tubule (or named part or from filtrate) / / into blood / active transport / diffusion / osmosis / mention of hormonal control any three	3(3) 3(3)

2006 HL Q13

13.				
	(a)	(i)	marrow or named bone e.g. skull/ribs/long bones/sternum	3
		(ii)	no nucleus / haemoglobin / shape comment / size comment / / no mitochondria / carries oxygen or CO ₂ any two	2(3)
	(b)	(i)	<i>plasma</i> : liquid part of blood <i>glomerular filtrate</i> : (plasma) that has entered Bowman's capsule or has left the glomerulus or plasma less proteins	3 3
		(ii)	too big (to pass into Bowman's capsule)	3

Excretory system

		(iii)	(glucose) small or passes through	3
		(iv)	reabsorbed or explained	3
		(v)	sweating or water loss or dehydration / blood volume drops or concentration increases / detected by receptors / brain alerted / ADH secreted / from pituitary / (stimulates) reabsorption of water/ in distal tubule or collecting duct <i>any four</i>	4(3)

2007 HL Q15(c)

	(c)	(i)	<i>Homeostasis</i> : maintenance / of constant internal environment or two named factors constant <i>Reason</i> : allows normal metabolic activities or example or keeps temperature suitable for enzyme reactions	2(3) 3
		(ii)	diagram [top layer, hair follicle or sweat gland + 1 other] labels [sweat gland, hair, arteriole, fat] [allow temperature receptor]	3, 0 2+1
		(iii)	temperature drop / hair erects / traps air as insulator [or opposite] or temperature drop / arteriole constricts / keeps heat [or opposite] or temperature rises / sweat produced / sweat evaporates causing cooling or fat / insulates / from outside or inside	3(3)
		(iv)	body temperature varies / with environmental temperature [allow 'cold-blooded' or explained for 3 marks]	2(3)

2008 HL Q13

13.	(a)	(i)	elimination of waste products of metabolism or explained	3
		(ii)	Urea: protein or amino acid carbon dioxide: carbohydrate or named example or fat or named example of fat or fatty acids	3 3
	(b)	(i)	A = arteriole B = Bowman's capsule C = proximal tubule D = Loop of Henle E = collecting duct F = distal tubule or Loop of Henle	6(1)
		(ii)	renal artery or renal arteriole	3
		(iii))	*cortex	3
		(iv)	1. Bowman's capsule or glomerulus or B 2. proximal tubule or C	3 3
		(v)	large surface area / porous capillary walls/ (lining) one cell thick / efferent arteriole narrower than afferent arteriole or arterioles in arteriole out or arteriole to capillary network NB not more than one arteriole point.	2(3)
		(vi)	proteins or named group of proteins	3
	(c)	(i)	infection / hot conditions or perspiration or exercise / high salt intake / low water intake / diuretic(s)	2(3)
		(ii)	*ADH (vasopressin) *pituitary	3 3
		(iii))	distal tubule or collecting duct in the blood	3 3
		(iv)	(makes walls) <u>more</u> permeable (resulting in) <u>more</u> absorption of water	6

2010 HL Q15(c)

15	©	(iv)	Water lost by exhaling (or by sweating) / less water in blood / ADH secreted / causes collecting ducts (or distal tubes or kidney) / to reabsorb water <i>Any two</i>	2(3)
		(v)	Arterioles / constrict / less blood (in fingers) / heat loss minimised <i>Any two</i>	2(3)

2011 HL Q12

12.	(a)	(i)	Eliminating waste Made in the body	3 3
		(ii)	Diffusion or leaf fall or transpiration or through lenticels (or through stomata)	3
	(b)	(i)	Diagram: Labels: <i>cortex, medulla, pelvis</i>	3, 0 3(2)
		(ii)	Position of reabsorption indicated	3
		(iii)	1. *Renal artery 2. *Aorta	3 3
		(iv)	*Abdominal (cavity) or *Abdomen	3
		(v)	Urea or salt or uric acid	3
		(vi)	Has ducts or does not produce hormones	3
	(c)	(i)	1. 1 = Bowman's capsule; 2 = glomerulus; 3 = afferent arteriole; 4 = efferent arteriole; 5 = proximal (convoluted) tubule; 6 = distal (convoluted) tubule; 2. *1 or *2 or *1 and 2* 3. Anti-diuretic hormone or ADH or vasopressin	6(1) 3 3
		(ii)	1. *No 2. Protein molecules too big (to pass into the filtrate) <i>Note: 'Yes' correctly qualified (e.g. low level or pregnancy) for 6m</i>	3 3
		(iii)	1. *No 2. Glucose (in the filtrate should have been) reabsorbed	3 3

2004 OL Sample Q15 (a)

15.	(a)	(i)	A – cortex, B- medulla (pyramid), C – pelvis, D – ureter	4(3)
		(ii)	Bladder	3
		(iii)	In the cortex. (A)/ nephron/ glomerulus/ Bowman's capsule	3

Excretory system

		(iv)	Glucose/ amino acids/ vitamins/ red blood cells/ white blood cells Any two	2(3)
		(v)	Put on a dialysis (kidney) machine	3
		(vi)	Lungs / skin / liver Any one	3

2005 OL Q14(a)

14.	Any two of (a), (b), (c).			
	(a)	(i)	A = cortex B = medulla/pyramid C = pelvis D = ureter	4(3)
		(ii)	bladder	3
		(iii)	cortex (A) / nephron /glomerulus / Bowman's capsule	3
		(iv)	cortex (A) /medulla (B) /nephron/convoluted tubule / loop	3
		(v)	urea /water /salt	3
		(vi)	skin/lungs / liver water/carbon dioxide/urea / salt / bile /sweat (not mentioned in (v))	3 3

2006 OL Q15(a)

15.	ANY TWO OF (a), (b), (c).			
	(a)			7(4)+2(1)
		(i)	A = (erector) muscle B = hair C = capillaries [allow blood vessels or arterioles or arteries or venules or veins] D = sweat gland	
		(ii)	Has constant body temp. or warm blooded or can regulate temp.	
		(iii)	Carbohydrate (or named) or lipid or respiration or liver or muscle or food or metabolism	
		(iv)	Sweat / evaporates/ heat lost	
		(v)	Contract	

2007 OL Q14(b)

	(b)			6+2(5)+7(2)
		(i)	getting rid of waste products	
		(ii)	carbon dioxide/ urine (urea or uric acid or urate)/ water/ sweat/ bile/ salt	any two
		(iii)	skin or lungs or liver	

Excretory system

		(iv)	balancing salt or water concentration	
		(v)	1. cortex [allow Bowman's capsule] 2. medulla [allow cortex or Loop of Henle or convoluted tubule] 3. bladder 4. aorta	

2009 OL Q14(b)

	(b)			11 +3 +8(2)
		(i)	A = Cortex B = Medulla / Allow Pyramids C = Ureter	
		(ii)	Bladder	
		(iii)	A / Cortex	
		(iv)	Getting rid of waste (products of metabolism)	
		(v)	Water / Salts / Urea - if urine than 1(3) only Any two	
		(vi)	Skin / Lungs / Liver Any two	

2011 OL Q14(c)

14.	(c)	(i)	Getting rid of waste / made in the body	2(7) + 8(2) (2 Pts)
		(ii)	Urea/water/salt / urine	(2 Pts)
		(iii)	A = kidney; B = ureter; C = bladder	(3 Pts)
		(iv)	1. Cortex 2. Medulla or Cortex	(2 Pts)
		(v)	Lungs/skin/liver	(1 Pt)

2012 OL Q15(a)

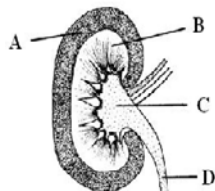
15.				2(5)+2(4)+6(2)
	(a)	(i)	A = Hair B = Sweat gland C = Blood vessels	(3 pts)
		(ii)	EG. Sweat	(1 pt)
		(iii)	EG. Protection / Melanin production	(2 pts)
		(iv)	EG. Kidney / Urine	(2 pts)
		(v)	Maintaining constant internal conditions	(1 pt)
		(vi)	Produces heat (internally) or warm blooded	(1 pt)

3.4.6 The Excretory System in the Human

Examination Questions

SEC Sample Paper OL

15. (a) The diagram shows a vertical section through a human kidney.

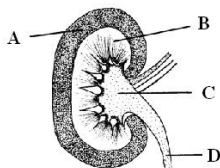


- (i) Name the parts A, B, C, D.
- (ii) To what structure does D link the kidney?
- (iii) Where does filtration occur in the kidney?
- (iv) Filtration ensures that cells and valuable substances are not lost from the body when urine is being formed. Name **two** of these substances or cells.
- (v) Suggest a treatment that may be used for a person whose kidneys are not carrying out their normal functions.
- (vi) Name an organ in the human body, other than the kidney, in which excretion takes place.

(30)

2005 OL

14. (a) The diagram shows a section through a human kidney.

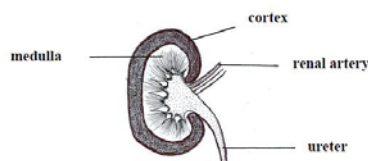


- (i) Name A, B, C, D.
- (ii) To what structure does D connect the kidney?
- (iii) Filtration is an essential process in the formation of urine. In what part of the kidney does it take place?
- (iv) Reabsorption of useful substances takes place in the kidney. In what part does this occur?
- (v) Name an excretory substance present in urine.
- (vi) Name an excretory organ in the human body other than the kidney. Name a substance, other than the one you have named in (v), excreted by this organ.

(30)

2007 OL

14. (b) (i) What is meant by excretion?
- (ii) Name **two** products excreted by the human.
- (iii) Name **one** organ of excretion, other than the kidney, in the human body.
- (iv) What is meant by osmoregulation?
- (v) Study the diagram of a section through the kidney and answer the following questions.
- Where does filtration of blood take place?
 - Where does reabsorption of salt take place?
 - To what organ does the ureter link the kidney?
 - To which main blood vessel does the renal artery link the kidney?



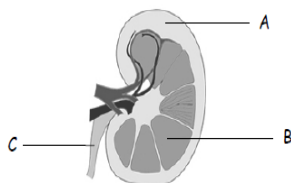
- (vi) Name the fluid present in the ureter.

2009 OL

7. (a) (ii) Give **one** way in which water is lost from the body.

2009 OL

14. (b) The diagram shows a vertical section through a human kidney.



- (i) Name the parts labelled A, B and C.
(ii) Which organ is attached to the kidney by part C?
(iii) In which of the three labelled parts does filtration of the blood occur?
(v) Name **two** substances excreted by the kidneys.

2004 HL

12. State the role of the kidneys in homeostasis. (9)

2006 HL

6. Distinguish between the members of each of the following pairs by making a brief comment on each.

- (b) Ureter and urethra

2006 HL

13.

- (b) Use your knowledge of the human vascular and excretory systems to answer the following.
- (i) Explain the terms, plasma, glomerular filtrate.
 - (ii) Explain why red blood cells are normally absent from glomerular filtrate.
 - (iii) The concentration of glucose is the same in plasma and glomerular filtrate.
Why is this?
 - (iv) Why is glucose normally absent from urine?
 - (v) Following a period of heavy exercise an athlete may produce only a small volume of concentrated urine.
Explain this observation and give an account of the process that concentrates the urine.

(27)

2008 HL

- 13 (a) (i) What is meant by excretion?
(ii) Urea and carbon dioxide are excretory products of the human body. In the case of each product name a substance from which it is derived. (9)

2010 HL

H 3.4.8 The Nephron as a Unit of Kidney Function

2004HL

12.

- (b) (i) Draw a labelled diagram of a nephron. Include blood vessels in your diagram.

- (ii) Filtration and reabsorption are vital processes that take place in the nephron. Describe how each of these processes occurs. (27)

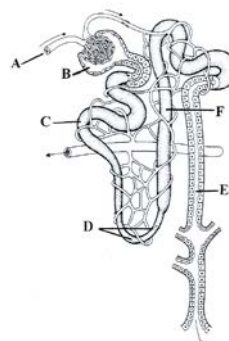
2006 HL

13. (b) Use your knowledge of the human vascular and excretory systems to answer the following.
- Explain the terms, plasma, glomerular filtrate.
 - Explain why red blood cells are normally absent from glomerular filtrate.
 - The concentration of glucose is the same in plasma and glomerular filtrate. Why is this?
 - Why is glucose normally absent from urine?
 - Following a period of heavy exercise an athlete may produce only a small volume of concentrated urine. Explain this observation and give an account of the process that concentrates the urine.

(27)

2008 HL

13. (b) The diagram shows the structure of a nephron and its supply.



associated blood

- Name the parts A, B, C, D, E and F.
 - From which blood vessel is A derived?
 - Where in the kidney is B located?
 - Give the part of the nephron in which each of the following takes place:
 - filtration,
 - reabsorption of amino acids.
 - Give **two** features of the nephron that aid filtration.
 - Name a group of biomolecules in the blood which are too large to pass through the filtration system of the nephron.
- (27)
- Suggest **two** situations which may result in a drop in the water content of the blood.
 - When the water content of the blood drops a hormone is released. Name this hormone and the endocrine gland from which it is secreted.
 - Give a precise target area for this hormone. How does the hormone reach the target area?
 - Explain the role of the hormone at its target area, when the water content of the blood is low.

(24)

2010 HL

15. (c) Suggest a biological explanation for **each** of the following observations:
- After a long session of heavy exercise, an athlete's urine is likely to be concentrated and low in volume.

SEC Marking Scheme

2005 OL

14. (a) (i) A = cortex B = medulla/pyramid C = pelvis D = ureter 4(3)
- bladder 3
 - cortex (A) / nephron / glomerulus / Bowman's capsule 3
 - cortex (A) / medulla (B) / nephron / convoluted tubule / loop 3
 - urea / water / salt 3
 - skin/lungs / liver 3
 - water/carbon dioxide/urea / salt / bile / sweat (not mentioned in (v)) 3

2004 HL

12. (a) Maintaining (a constant) internal environment **or** described 3

Role of kidneys: Maintaining salt balance **or** explained / 3

Maintaining water balance **or** explained / 3

[Note: **Osmoregulation** = 2 points]

- (b) (i) **Diagram** of nephron 3, 0

Diagram of blood supply 3, 0
labels 3(1)

(ii) Filtration:

Blood in arteriole / under pressure/ plasma (accept blood) **or** small molecules **or** named from (**or in**) glomerulus /in **or** into (Bowman's) capsule /large molecules **or** named **or** cells **or** named cells cannot pass

any three 3(3)

Reabsorption:

Substance (or named) from (**or in**) tubule (or named part or from filtrate) /
/ into blood / active transport / diffusion / osmosis / mention of hormonal control

any three 3(3)

2006 HL

- 13.** (b) (i) *plasma*: liquid part of blood **3**
glomerular filtrate: (plasma) that has entered Bowman's capsule
or has left the glomerulus **or** plasma less proteins **3**
- (ii) too big (to pass into Bowman's capsule) **3**
- (iii) (glucose) small **or** passes through **3**
- (iv) reabsorbed **or** explained **3**
- (v) sweating **or** water loss **or** dehydration / blood volume drops **or**
concentration increases /detected by receptors / brain alerted /
ADH secreted / from pituitary / (stimulates) reabsorption of water/
in distal tubule **or** collecting duct **any four 4(3)**

H 3.4.8 The Nephron as a Unit of Kidney Function

2004 HL

- 12.** (a) Maintaining (a constant) internal environment **or** described **3**
Role of kidneys: Maintaining salt balance **or** explained / **3**
Maintaining water balance **or** explained / **3**
[Note: *Osmoregulation* = 2 points]
- (b) (i) **Diagram of nephron 3, 0**
Diagram of blood supply 3, 0
labels 3(1)
- (ii) **Filtration:**
Blood in arteriole / under pressure/ plasma (accept blood) **or** small molecules **or**
named from (**or in**) glomerulus /in **or** into (Bowman's) capsule /large molecules **or**
named **or** cells **or** named cells cannot pass **any three 3(3)**
Reabsorption: Substance (or named) from (**or in**) tubule (or named part or from filtrate) /
/ into blood / active transport / diffusion / osmosis / mention of hormonal control
any three 3(3)
- (c) (i) **Source:** respiration **or** named site e.g. muscle, liver, kidney,
brain **or** named food e.g. carbohydrate or named **3**
- (ii) **Two methods of insulation:** fat (adipose tissue) / (trapped) air **or** hair **2(3)**
- (iii) **When temp high:** vasodilation (or explained) / (secretion of) sweat /
hairs lie flat **or** less air trapped **any two 2(3)**
- (iv) **Response when temp drops:** receptor (or detection) / receptor in skin /
receptor in medulla **or** brain / shiver / generates heat / hairs stand up
or goose bumps / air trapped / vasoconstriction (or explained) / increased
metabolic rate or increased respiration / any relevant comment on named
hormone e.g. thyroxine increases metabolic rate or increases respiration

any three 3(3)

2006 HL

- 13.** (b) (i) *plasma*: liquid part of blood **3**
glomerular filtrate: (plasma) that has entered Bowman's capsule
or has left the glomerulus **or** plasma less proteins **3**
- (ii) too big (to pass into Bowman's capsule) **3**
- (iii) (glucose) small **or** passes through **3**
- (iv) reabsorbed **or** explained **3**
- (v) sweating **or** water loss **or** dehydration / blood volume drops **or**
concentration increases / detected by receptors / brain alerted /
ADH secreted / from pituitary / (stimulates) reabsorption of water/
in distal tubule **or** collecting duct *any four* **4(3)**