OCR A-LEVEL BIOLOGY A · H420

BIOLOGY



EXAM QUESTION PACK

5.1.2 EXCRETION AS AN EXAMPLE OF HOMEOSTATIC CONTROL

SCORE	PERCENTAGE
/86	%

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Answer **all** the questions.

1. The kidneys of a healthy individual filter 178 $dm^3\ day^{-1}$ of fluid from the glomeruli into the renal capsules. However, only 1.5 $dm^3\ day^{-1}$ of urine is produced.

What percentage of the filtrate is reabsorbed back into the blood?

A 176.5
B 0.8
C 11.8
D 99.2

Your answer ☐

[1]

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2(a). **Fig. 17.1** is a diagram of the external view of a mammalian liver.

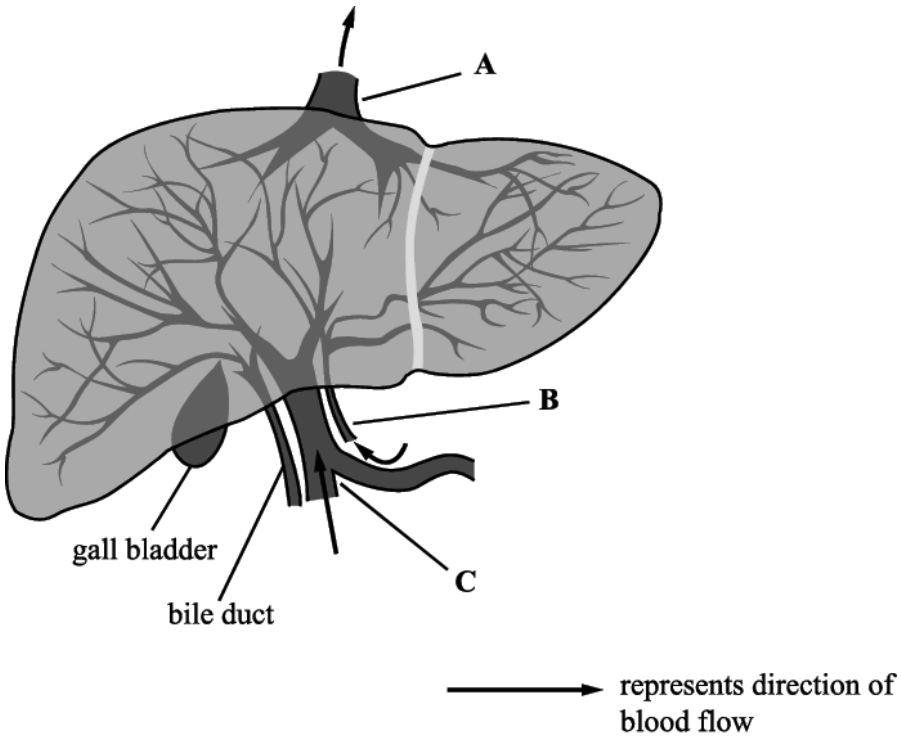


Fig. 17.1

Identify, with reasons, each of the blood vessels labelled **A** – **C** in **Fig. 17.1**.

A

B

C

---

[3]

(b). One of the main functions of the liver cells is the formation of urea by the ornithine cycle, an outline of which is shown in **Fig. 17.2**.

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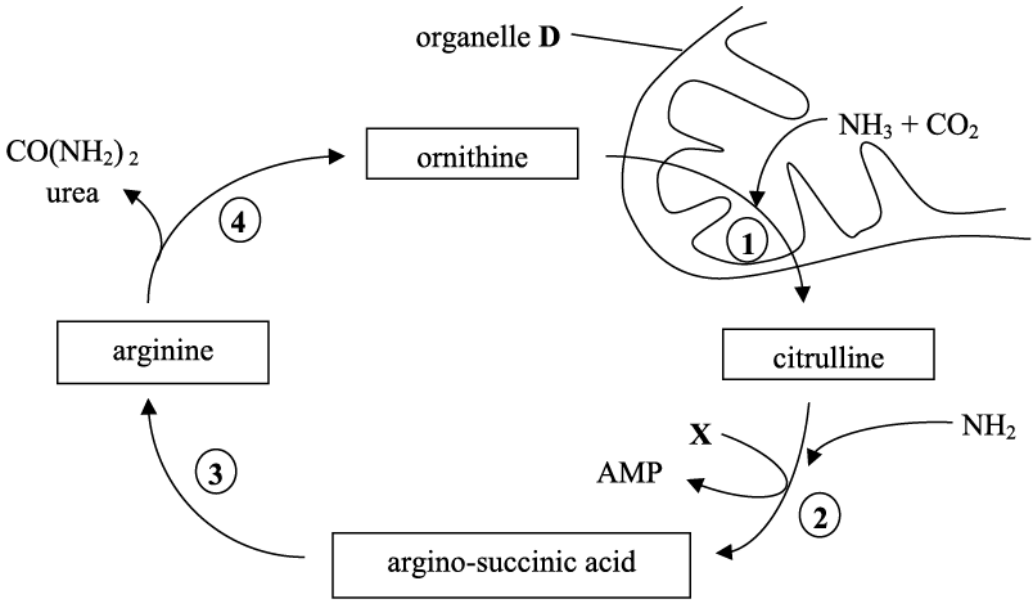


Fig. 17.2

(i) Step **1** of the cycle takes place in the organelle represented by **D**.

Identify organelle **D**.

---

[1]

(ii) During the cycle ornithine moves into organelle **D** and citrulline moves out of the organelle.

Suggest the method by which these molecules move into and out of the organelle during the cycle. Give reasons for your choice.

---

[2]

(iii) How has the ammonia that is used in step **1** been formed?

---

[1]

(iv) Identify the compound labelled **X** in **Fig. 17.2**.

---

[1]

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(c). Liver cells have a high metabolic rate. Hydrogen peroxide is a metabolic product produced in significant quantities in liver cells. It needs to be removed in order to prevent serious damage to the liver cells.

Hydrogen peroxide is detoxified by the enzyme catalase:

$$2H_2O_2 \square\ 2H_2O + O_2$$

Catalase has a very high turnover number. A single catalase molecule can catalyse the breakdown of approximately 6 million hydrogen peroxide molecules every minute. Catalase is found in peroxisomes inside the liver cells. Peroxisomes are organelles surrounded by a single membrane.

The activity of catalase was investigated in a laboratory, using chopped liver tissue and dilute hydrogen peroxide. When the chopped liver was added to the hydrogen peroxide large quantities of froth as bubbles of oxygen were produced in the liquid.

Fig. 17.3 shows the effect of increasing enzyme concentration on the rate of the reaction.

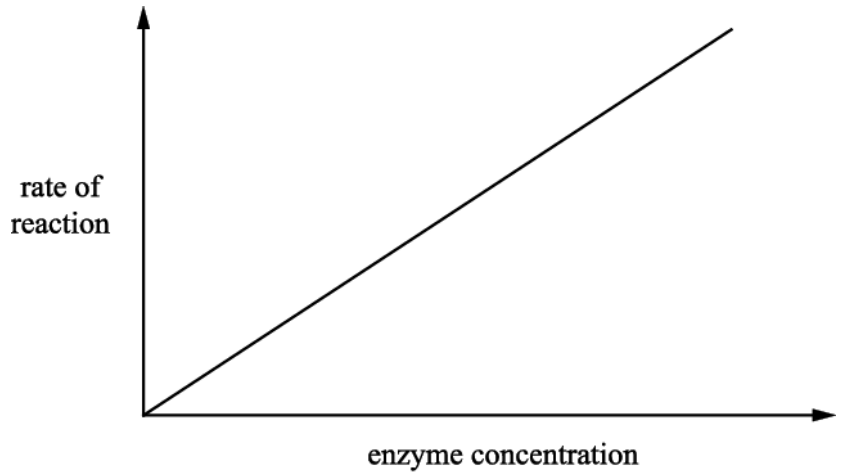


Fig. 17.3

(i) Identify **two** variables that would need to be controlled in this laboratory investigation.

1 ----------

2 ----------

[1]

(ii) How could you control **one** of the variables that you identified in **(i)** in the laboratory investigation?

----

[1]

(iii) * Using the information, deduce why and how catalase activity is regulated inside the liver cells.

[6]

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3. Part of the body's response 'fight or flight' is to run away from the threat. Prolonged vigorous exercise puts high demands on the body's metabolism.

The muscle cells require an adequate supply of oxygen for respiration. If insufficient oxygen is available, the cells must respire anaerobically.

Fig. 20.2 outlines the process of anaerobic respiration in muscle cells.

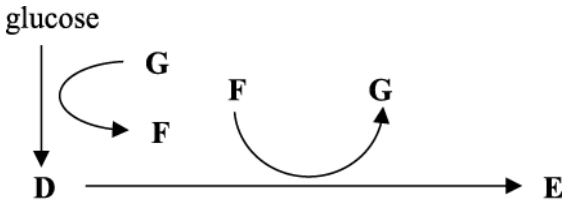


Fig. 20.2

(i) Identify the compounds labelled **D** and **E** in **Fig. 20.2**.

D

E

---

[2]

(ii) What is the role of compound **D** in anaerobic respiration?

---

[1]

(iii) Why is it important that compound **G** is formed during the reaction in which compound **D** is converted into compound **E** in anaerobic respiration?

---

[2]

(iv) Compound **E** is toxic and is removed from the muscle cell. It is transported to an organ in the body.

Which organ is compound **E** transported to **and** how does it reach this organ?

---

[1]

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4(a). Excretion is important in both animals and plants.

Table 2.1 describes some processes that occur in plants.

In Table 2.1, write **YES** or **NO** in each box in the right-hand column to indicate whether or not each statement is an example of excretion.

Process	**Is this an example of excretion?**
Flowering plants release chemicals that attract pollinators	
Excess chlorine and heavy metals are transferred to cells in the leaves. These substances are lost when leaves are shed by abscission.	
The common reed, *Phragmites australis*, releases acid from its roots to destroy competing species.	
Auxins are produced in apical cells and diffuse to the zone of elongation.	
Carbon dioxide produced in respiration diffuses out of leaves via stomata.	

Table 2.1

[2]

(b). The kidney is one of the organs of excretion in vertebrate animals.

Fig. 2.1 shows a light micrograph of a section through a kidney cortex.

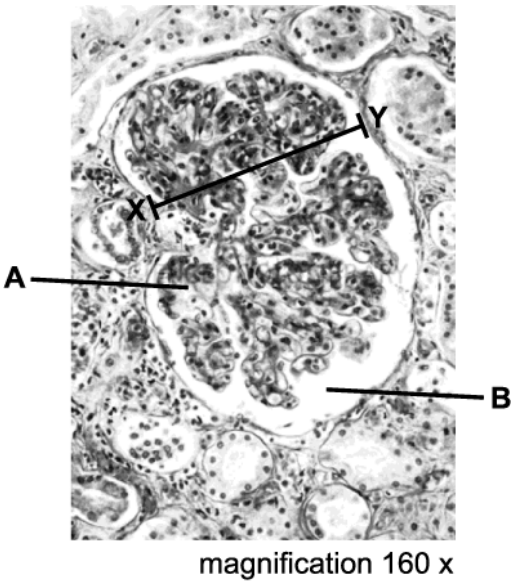


Fig. 2.1

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(i) Name the parts of the kidney labelled **A** and **B**.

A

B

---

[2]

(ii) Calculate the length of the line labelled **X** to **Y**.

Give your answer in micrometres (μm) to **two** significant figures.

Answer = _____ μm **[2]**

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(c). Sodium ions and glucose are both reabsorbed into the blood from proximal convoluted tubules (PCTs) in the kidney.

(i) A student designed an experiment to investigate the effect of temperature on the rate of glucose diffusion through dialysis tubing.

State **two** factors that would need to be controlled in this experiment.

1

2

---

[2]

(ii) Describe the structural difference between alpha and beta glucose molecules.

---

[1]

(iii) Sulthiame is a drug that inhibits the enzyme carbonic anhydrase.

Fig. 2.2 shows the role of carbonic anhydrase in the PCT of the kidney.

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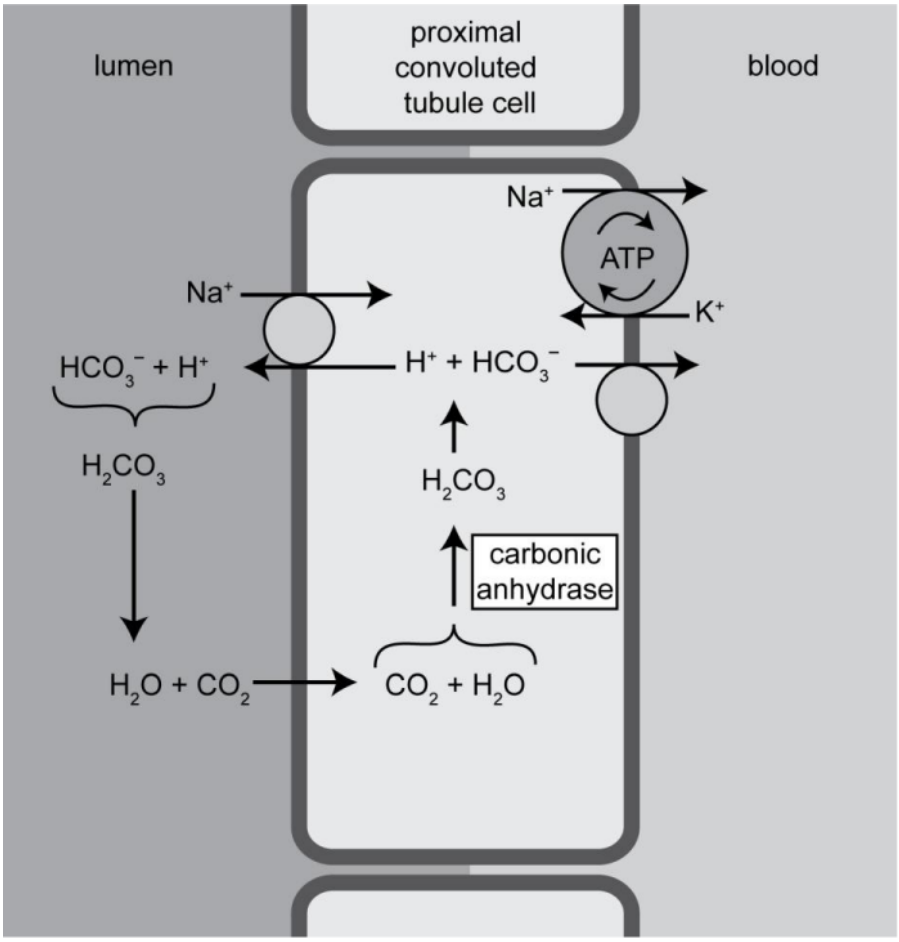


Fig. 2.2

Using the information in Fig. 2.2, what can you conclude about the likely effect of sulthiame on the reabsorption of sodium ions in the PCT?

---

[3]

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(d). The measurement of kidney filtration rate provides an indication of the health of the kidneys.

A filtration rate of below 60 $cm^3\ min^{-1}$ for three consecutive months or more is a sign of chronic kidney disease.

A patient was found to have the following kidney filtration rates:

Month 1: 54.00 $cm^3\ min^{-1}$

Month 2: $4.85 \times 10^{-5}\ m^3\ min^{-1}$

Month 3: 1.12 $cm^3\ s^{-1}$

Month 4: $9.70 \times 10^{-7}\ m^3\ s^{-1}$

Do these results suggest the patient has chronic kidney disease?

Explain your conclusion using the information given.

---

[2]

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5(a). Most excess amino acids are metabolised in the liver, resulting in products that are relatively harmless to the body.

The figure outlines the first step in the metabolism of amino acids in the liver.



(i) State the name given to this reaction.

---

[1]

(ii) Identify the toxic product of the reaction.

---

[1]

(b). Complete the following passage by inserting the **most suitable** word or term.

The figure shows the first step in the metabolism of amino acids in the liver. The next step involves a series of reactions known as the _____ cycle. The toxic product X enters the cycle together with _____, resulting in the formation of the final nitrogenous product _____ The nitrogenous product is transported to the _____ and then via the ureter to the _____ where it is stored as _____ before leaving the body.

[6]

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6. One role of the liver is detoxification. Detoxification includes the breakdown of drugs such as paracetamol.

(i) Fig. 4.1 is a diagram that represents the structure of part of a liver lobule.

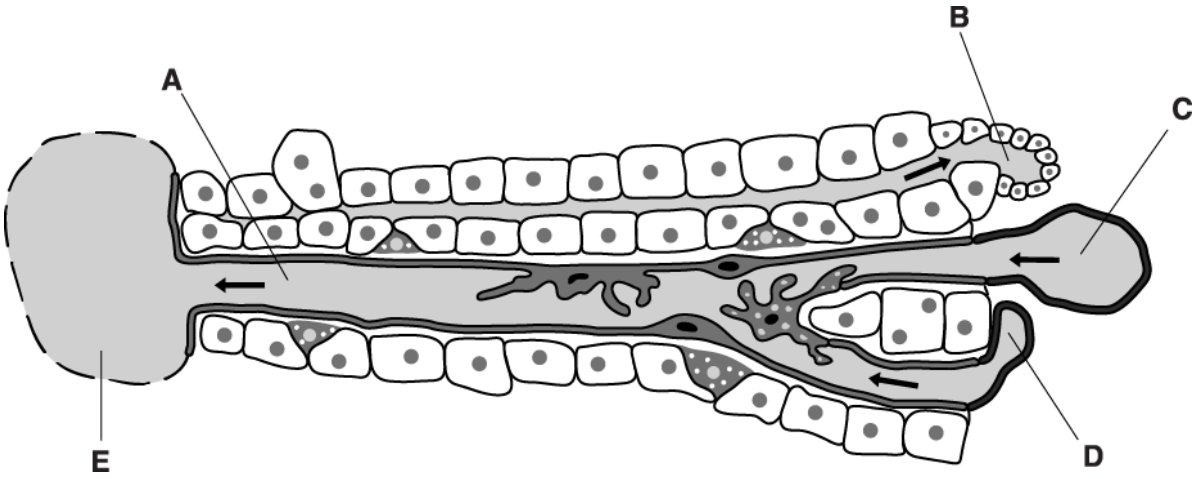


Fig. 4.1

Identify the parts labelled **A** to **E**.

A

B

C

D

E

---

[5]

(ii) During detoxification, paracetamol is metabolised in the liver cells as follows:

- approximately 90% is combined with two chemicals, sulfate and glucuronide, and excreted
- approximately 5% is oxidised by the P450 enzyme system, which produces NAPQI

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- the NAPQI is then metabolised using another compound called glutathione.

Once the sulfate and glucuronide reserves in the liver are used up, the P450 system takes over completely. However, continued metabolism of paracetamol will result in high concentrations of NAPQI accumulating in the liver cells, causing cell death.

Suggest a reason for the accumulation of high concentrations of NAPQI in the liver cells.

---**[1]**

(iii) The liver has considerable powers of regeneration, even if a high proportion of its cells are damaged.

Name the liver cells that can lead to this regeneration **and** the type of cell division that they carry out.

name of liver cells

---

type of cell division

---

[1]

7(a). Fig. 6.1 is a diagram that represents the nephron in a mammalian kidney.

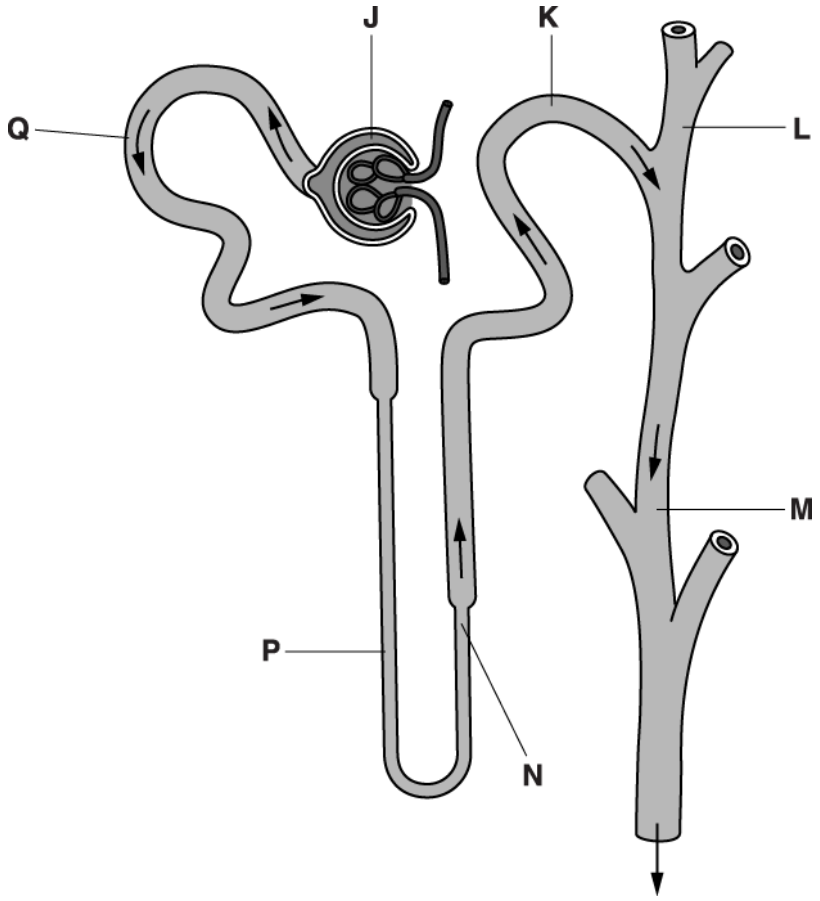


Fig. 6.1

Use the letter or letters from Fig. 6.1 to identify:

(i) the region or regions where glucose is selectively reabsorbed into the blood capillaries

---------- **[1]**

(ii) the region or regions present in the cortex

---------- **[1]**

(iii) the region or regions where podocytes are located.

---------- **[1]**

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(b). The desert kangaroo rat, *Dipodomys deserti*, lives in dry and hot conditions. It excretes a very small volume of urine relative to its size.

The loops of Henle in the kidneys of these mammals are longer than those found in mammals of a similar size that do not live in desert conditions.

Explain how the longer loop of Henle is able to assist the desert kangaroo rat in preventing excessive water loss.

---**[2]**

8. The main forms of renal replacement therapy (RRT) use dialysis. Most patients receiving dialysis have haemodialysis using a dialysis machine. However, the number of people receiving another form of dialysis, peritoneal dialysis, is increasing.

Fig. 4.2 represents the procedure of peritoneal dialysis. Some of the key points of this procedure are listed below.

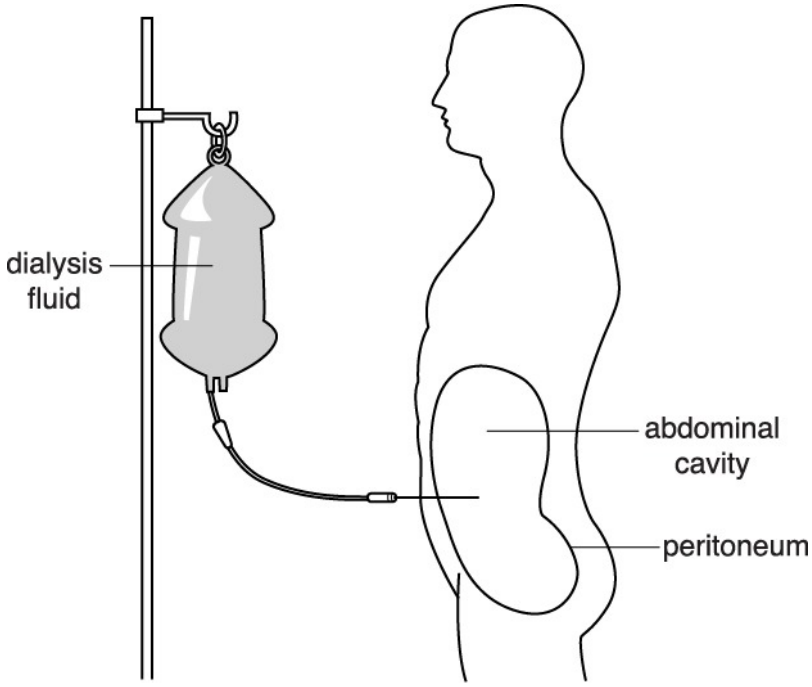


Fig. 4.2

- The peritoneum is a membrane that lines the abdominal cavity and is well supplied with blood capillaries.
- The peritoneum acts as a surface across which waste can be removed.
- The dialysis fluid, containing the sugar dextrose, fills the abdominal cavity.
- The fluid remains in the abdominal cavity for 4 to 6 hours.
- The fluid is then drained from the abdominal cavity and thrown away.
- The procedure usually needs to be done four times each day.

(i) How might the peritoneum differ in its **function** from the artificial membrane in a dialysis machine used in

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haemodialysis?

[1]

(ii) Why does the dialysis fluid used in peritoneal dialysis contain dextrose solution rather than water alone?

[2]

(iii) Suggest why patients receiving peritoneal dialysis usually need to have the peritoneal dialysis fluid replaced four times a day, but those receiving haemodialysis only need treatment three times a week.

[2]

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9. The following passage describes the use of alternative substrates in respiration. Complete the passage by writing in the missing words.

Glucose is not the only substrate that can be used for respiration in cells. Fats are hydrolysed to fatty acids and glycerol during digestion. Glycerol is converted to _____, which can then be decarboxylated to produce an acetyl group which is combined with coenzyme A and can then enter the _____ cycle. Fatty acids are also converted to acetyl coenzyme A. Proteins need to be converted into amino acids which must then be deaminated in the _____ . The resulting molecule can then be converted to pyruvate which enters the _____ reaction. Because energy is required for these processes, the respiration of protein gives a lower yield of _____ than the respiration of carbohydrates.

[5]

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10(a). Fig. 19.1 is a diagram of a nephron from a mammalian kidney.

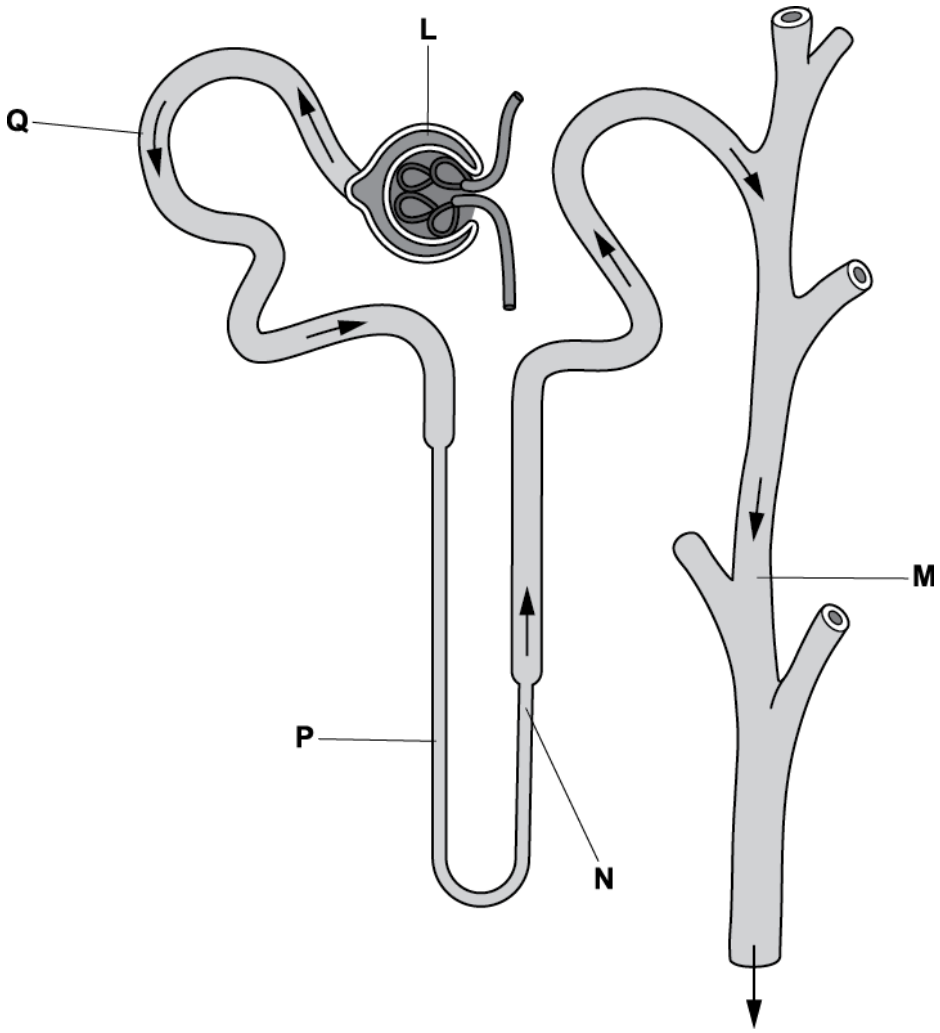


Fig. 19.1

Which letter or letters label areas of the nephron which are directly affected by ADH?

_____ **[1]**

(b). A scientist investigated the effect of different types of food on the rate of urine production in adults.

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- The subjects were given one food type for a period of three hours.
- After this, their rate of urine production was measured for the following three hours.
- Over the 6 hours of the procedure they consumed a controlled volume of water.

Fig. 19.2 is a graph of the results.

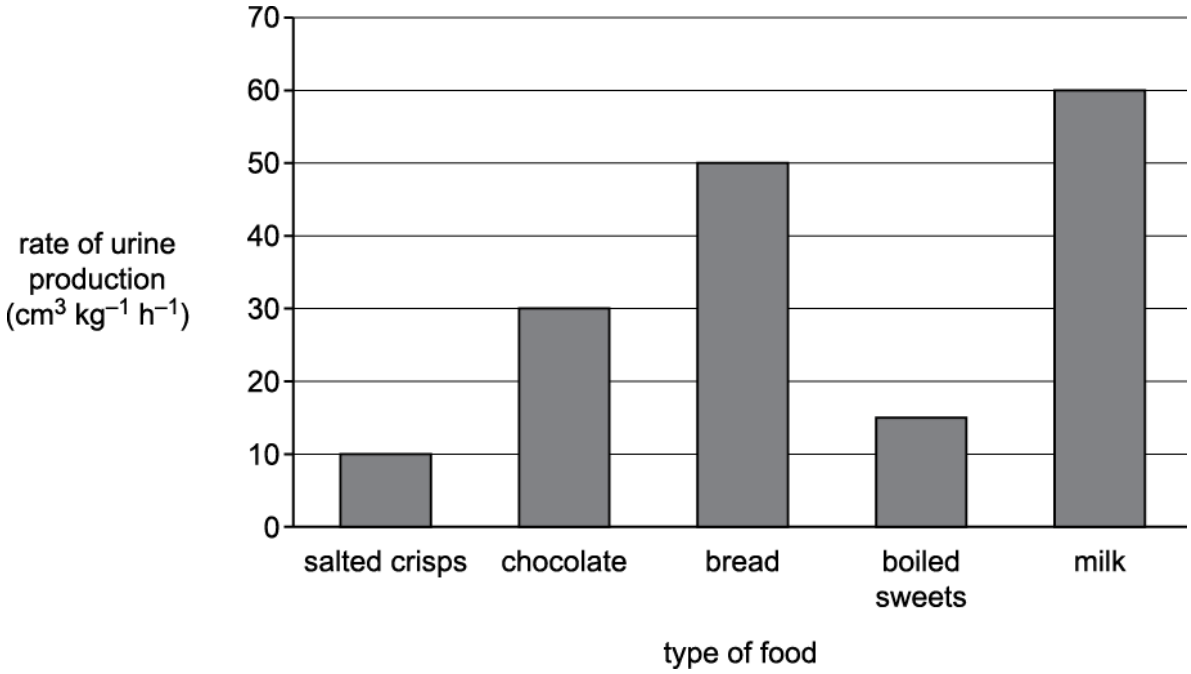


Fig. 19.2

Explain, with reference to Fig. 19.2, why some foods affect urine production.

[4]

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(c). Fig. 19.3 is a light microscope image of kidney tubule cells.

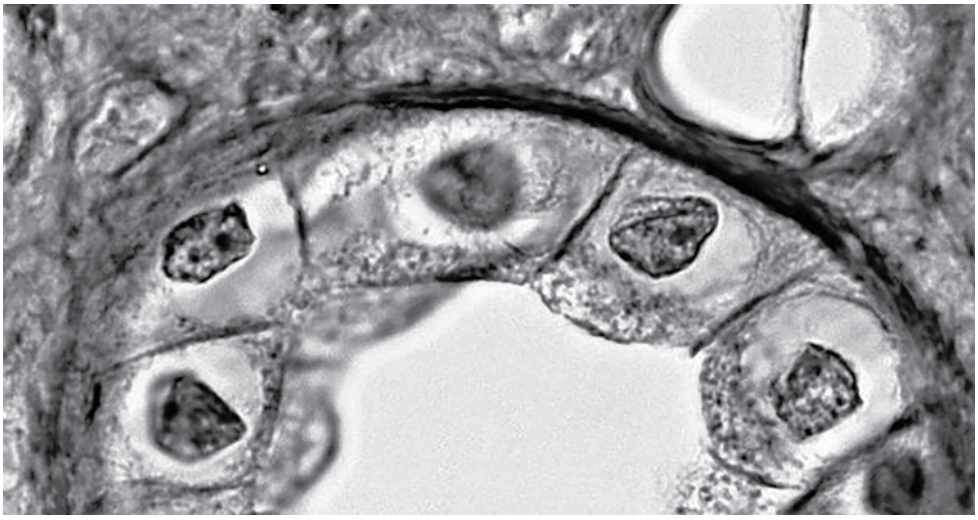


Fig. 19.3

(i) State **three** structures within the tubule cells that are **not** visible in this image.

1

2

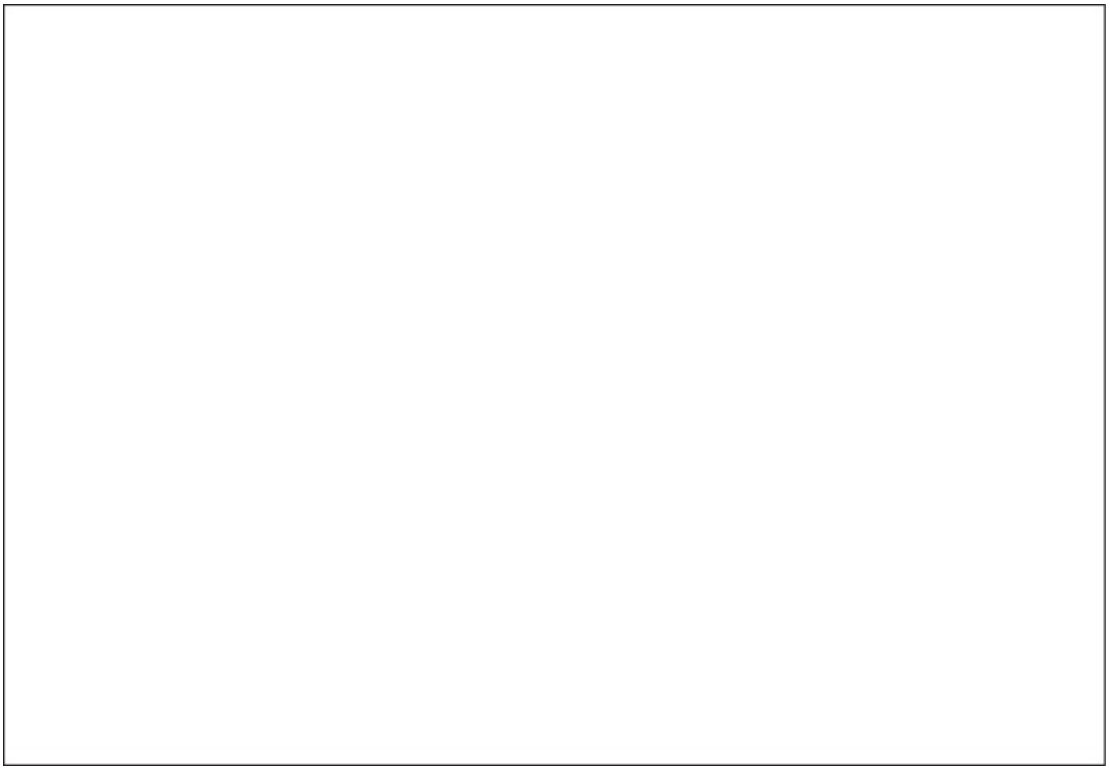
3

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[3]

(ii) Draw **one** of the cells from Fig. 19.3 in the space below.

Label your diagram to show any visible features.



[4]

11(a). One very popular indoor bonsai tree is the Sago palm, *Cycas cirinalis*. It is common for domestic pets to chew and accidentally ingest poisonous leaves from *C. cirinalis*.

C. cirinalis leaves contain the toxin cycasin, which causes liver damage in dogs.

Fig. 22 shows slides of normal liver tissue from a dog and liver tissue damaged by cycasin.

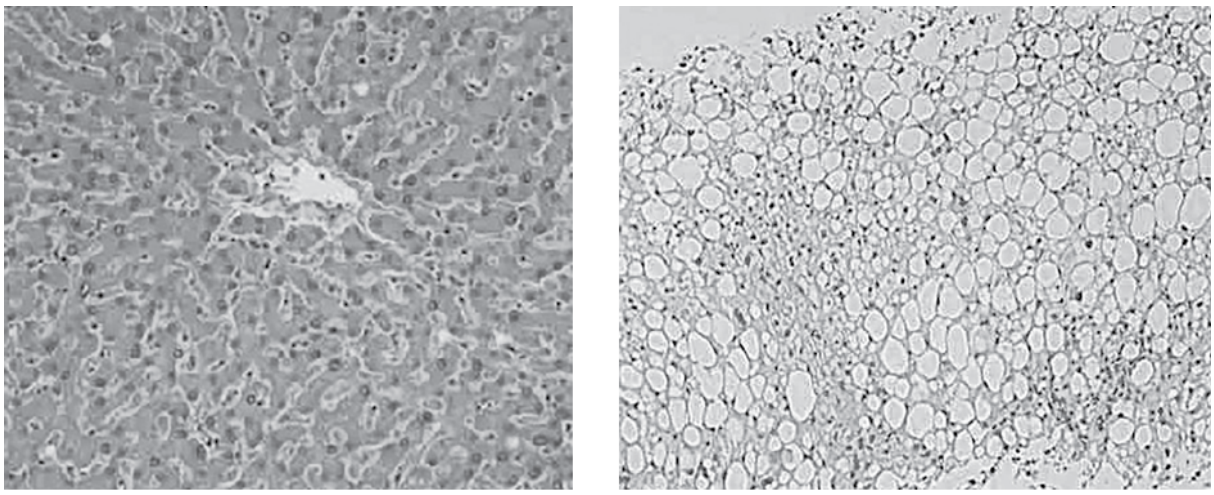


Fig. 22

Describe **two** ways in which the liver tissue damaged by cycasin is different from normal liver tissue.

1

2

---

[2]

(b).

(i) Another result of cycasin poisoning can be kidney damage. Increasing numbers of pet owners in the USA and Asia are using dialysis to treat animals with damaged kidneys.

There are two types of dialysis: peritoneal dialysis and haemodialysis. Both of these dialysis methods remove waste from the blood.

- Peritoneal dialysis occurs within the abdominal cavity and uses active transport as well as diffusion.
- Haemodialysis involves a dialysis machine and relies on simple diffusion.

Explain why peritoneal dialysis can use active transport and diffusion while haemodialysis relies on diffusion alone.

[2]

(ii) Suggest **one** advantage and **one** disadvantage of a kidney transplant compared to dialysis.

advantage

disadvantage

[2]

(c). Cancer of the bladder or kidneys can now be detected using a simple procedure.

Suggest a non-invasive method that could be used to test for these cancers.

---**[1]**

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1			D	1	
			Total	**1**	
2	a		**A** hepatic vein as blood leaving liver (1) **B** hepatic artery as blood entering liver through narrow vessel (1) **C** hepatic portal vein as blood (from gut) entering liver through branched vessel (1)	3	
	b	i	mitochondrion	1	**ALLOW** mitochondria.
		ii	*either* facilitated diffusion (1) conversion of ornithine into citrulline creates concentration gradients **or** (molecules are not lipid soluble so) require protein channels to cross membrane (1) ***or*** active transport (1) ornithine and citrulline need to be moved into and out of **D** more quickly than would be met by diffusion (1)	2	
		iii	deamination / removal of NH_2 group from amino acid (1)	1	
		iv	ATP (1)	1	
	c	i	*two from* pH temperature substrate / hydrogen peroxide concentration (1)	1	Two answers required for 1 mark. **DO NOT ALLOW** an answer that includes mass of liver / enzyme concentration.
		ii	*pH* take pH reading / ensure hydrogen peroxide is same pH for all enzymes concentrations tested (1) *temperature* use liver tissue and hydrogen peroxide at room temperature / same temperature for all enzyme concentrations tested (1) *substrate concentration* use same concentration and volume of hydrogen peroxide for all enzyme concentrations tested (1)	1	

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Question			Answer/Indicative content	Marks	Guidance
		iii	* **Level 3 (5–6 marks)** Deduction includes coherent interpretation of the evidence, clearly linking all ideas to explain why and how activity is regulated. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Deduction includes clear use of some evidence to support conclusion but ideas may not be clearly linked for both how and why. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** A simple deduction about how or why based on a limited interpretation of the evidence. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.	6	**Relevant points include:** *Why* • large quantities of hydrogen peroxide and high turnover number of catalase would mean vigorous reaction and lots of oxygen produced very quickly. *How* • isolation of catalase in peroxisomes • released in small quantities • cells can limit expression of catalase • this effectively limits enzyme concentration and therefore reduces reaction rate • cells have no control over temperature or substrate concentration so enzyme concentration is the only method of control.
			Total	**9**	

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Question			Answer/Indicative content	Marks	Guidance
3		i	**D** pyruvate (1) **E** lactate (1)	2	
		ii	is a hydrogen acceptor / removed hydrogen from reduced NAD	1	
		iii	*two from* for glycolysis to take place, NAD / **G**, is needed (1) there is a limited amount of NAD in the cell (1) formation of, NAD / **G**, allows, glycolysis to continue / some ATP to be formed (1)	2	
		iv	liver **and** in the blood	1	Both required for 1 mark.
			Total	**6**	

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Question			Answer/Indicative content	Marks	Guidance
4	a		NO YES NO NO YES (1)(1)	2	ALL CORRECT = 2 marks 3 CORRECT = 1 mark **ALLOW** correct placement of ticks and crosses in the boxes, if clear and unambiguous
	b	i	A = Glomerulus (1) B = Bowman's capsule (1)	2	**ALLOW** capillary (network)
		ii	190 (1)(1)	2	**AWARD ONE MARK** for: 0.03 or 3 / 160
	c	i	initial / AW, glucose concentration (on both sides on the membrane) (1) volume of solution (1) length / diameter, of dialysis tubing (1) type / brand, of dialysis tubing (1)	2	
		ii	*alpha glucose* H above ring / OH below ring, on, carbon 1 / C1 **ORA** (1)	1	**ALLOW** a suitable annotated diagram
		iii	*(less reabsorption because)* *idea of* fewer H^+ ions in PCT cells (1) less / no, co-transport / facilitated diffusion, of Na^+ ions, into cells / from lumen (1) less / no, active transport of Na^+ ions into, blood (1)	3	
	d		Conclusion: No because month 3 is above 60 cm^3 min^{-1} (1) Month 2: 48.5 cm^3 min^{-1} Month 3: 67.2 cm^3 min^{-1} Month 4: 58.2 cm^3 min^{-1} (1)	2	The second mark is for 3 correct calculations
			Total	**14**	

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Question			Answer/Indicative content	Marks	Guidance
5	a	i	deamination;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** deanimation
		ii	ammonia / $NH_{3;}$	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** ammonium / NH_4^+ **Examiner's Comments** Most candidates answered both parts of the question correctly.
	b		ornithine; carbon dioxide / CO_2; urea / $CO(NH_2)_2$; kidney / nephron / renal tubule / glomerulus; bladder; urine;	6	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** If formula used, must be correct **IGNORE** water / H_2O / ATP **IGNORE** other named part of the nephron e.g. Bowmans capsule / loop of Henle / etc **DO NOT CREDIT** gall bladder **Examiner's Comments** It was not uncommon to award full marks here. Occasionally candidates just suggested water rather than carbon dioxide while liver, gall bladder and waste were incorrect suggestions for the final three gaps.
			Total	**8**	

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Question			Answer/Indicative content	Marks	Guidance
6		i	**A** sinusoid; **B** (branch of) bile duct; **C** (branch of) hepatic portal <u>vein</u>; **D** (branch of) hepatic artery / arteriole; **E** (branch of) hepatic / central, <u>vein</u>;	5	**Mark the first answer on each prompt line**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **B DO NOT CREDIT** canaliculus **C IGNORE** inter lobular **but DO NOT CREDIT** intra lobular **D IGNORE** inter lobular **but DO NOT CREDIT** intra lobular **E IGNORE** intra lobular **but DO NOT CREDIT** inter lobular **Examiner's Comments** This was answered well, showing good factual recall. Full marks were commonly awarded. Most confusion arose between C and D - the hepatic portal vein and hepatic artery. Common errors were to describe B including the term 'canaliculus' and D including the term 'portal'. A few candidates gave answers which included references to the pancreas or kidney, despite the question referring clearly to ‘part of a liver lobule’.

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Question			Answer/Indicative content	Marks	Guidance
		ii	**1** because there is not enough <u>glutathione</u> / <u>glutathione</u> has run out; **2** enzyme catalysing glutathione reaction is, working at V_{max} / inhibited / in short supply; **3** the NAPQI cannot, cross the cell (surface) membrane / leave the cell / leave (named) organelle;	1 max	**2 DO NOT CREDIT** in context of P450 system **3 IGNORE** ref to excretion **Examiner's Comments** This question was good at differentiating between those candidates who had really read and absorbed the stimulus material and those who had either been confused by it or who had paid only cursory attention to the detail. Good answers appreciated the fact that there might not be enough glutathione and some excellent answers included more than one correct suggestion. Misconceptions included thinking that glutathione is actually formed from NAPQI rather than being used in its metabolism and that sulphate and glucuronide run out rather than the glutathione. A few candidates focused on the toxicity of NAPQI or described a lack of NAD.
		iii	hepatocytes **<u>and</u>** <u>mitosis</u> / <u>mitotic</u> (division);	1	**CREDIT** (liver) stem cells / hepatic cells **IGNORE** liver cells unqualified **DO NOT CREDIT** Kupffer cells **ONLY CREDIT** correct spelling for mitosis / mitotic **Examiner's Comments** This question was well answered, although some incorrectly referred to Kupffer cells, meiosis and cell differentiation. Incorrect spelling of mitosis was not credited, but some candidates had obviously been taught to clearly print when giving terms that could be confused.

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Question			Answer/Indicative content	Marks	Guidance
			Total	**7**	

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Question			Answer/Indicative content	Marks	Guidance
7	a	i	**Q**;	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram. **Examiner's Comments** Most candidates accessed 2/3 marks here. The most common error was to reverse the positions of the cortex and medulla. Almost all answers correctly followed the instruction to use letters rather than the names of the relevant parts of the nephron.
		ii	**Q and J and K and L;**	1	**All 4 letters required for the mark.** **If additional letters given, = 0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram. **Examiner's Comments** Most candidates accessed 2/3 marks here. The most common error was to reverse the positions of the cortex and medulla. Almost all answers correctly followed the instruction to use letters rather than the names of the relevant parts of the nephron.

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Question			Answer/Indicative content	Marks	Guidance
		iii	**J**;	1	**Mark the first answer**. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** named region as question requires candidates to identify the relevant regions from the diagram. **Examiner's Comments** Most candidates accessed 2/3 marks here. The most common error was to reverse the positions of the cortex and medulla. Almost all answers correctly followed the instruction to use letters rather than the names of the relevant parts of the nephron.
	b		**1** more (sodium and chloride) ions pumped, out of ascending limb / into medulla; **2** builds up greater water potential gradient; **3** allows, reabsorption / removal, of *more* water from, collecting duct / M;	2	**1 CREDIT** active transport / AW, for 'pumped' **IGNORE** salts / diffusion **2 ACCEPT *even more*** negative water potential in medulla (than other mammals) **Examiner's Comments** This question was a good discriminator. Most candidates had a good idea of the role of the loop of Henle but they found it less easy to clearly communicate the significance of the loop being 'longer' in the desert mammal. There was often imprecise use of terminology - selective reabsorption of water / movement of salts / greater concentration gradients etc. Reabsorption of water often centred on the descending limb or distal convoluted tubule rather than on the collecting duct as urine formation was often thought to have been completed before this part was reached. The main reasons for marks not being awarded were for not clearly stating locations or using correct comparative terms - more / even more / greater etc.
			Total	**5**	

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Question			Answer/Indicative content	Marks	Guidance
8		i	it can perform, active transport / facilitated diffusion;	1	**IGNORE** ref to structural features e.g. channel proteins **Examiner's Comments** Very few candidates gained a mark here although the majority did give the question careful thought. The word 'function' was emboldened in the question but some still went on to answer in terms of structure e.g. with references to channel proteins. Others discussed blood supply, counter-current mechanisms, differences in permeability and the different procedures of dialysis.
		ii	1 *idea that* (dialysis is replicating function of kidney and) part of kidney's function is to remove (excess) water from blood; 2 (dextrose / sugar) reduces, water potential / Ψ (of dialysis fluid) **or** (dextrose / sugar, solution) has a lower, water potential / Ψ (than water); 3 water moves from blood (into dialysis fluid) by osmosis **or** prevents water moving into the blood (from dialysis fluid) by osmosis; 4 (if it was water alone) cells would, swell / burst;	2 max	**IGNORE** ref to the use of dextrose rather than glucose **IGNORE** ref to ions **Examiner's Comments** This challenging question was hard to access for many candidates. Most who scored marks realised that dextrose would affect water potential, but then did little with this information such as relating this to removal of water from the blood or cell damage. Candidates need to use the term 'osmosis' when describing the movement of water. Incorrect answers referred to the presence of dextrose to feed the cells in the abdomen or to ensure there was not too much sugar lost due to kidney failure.

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Question			Answer/Indicative content	Marks	Guidance
		iii	1 peritoneal dialysis can remove less (named) waste (than haemodialysis); 2 *idea that* in haemodialysis dialysis fluid is constantly, refreshed / changed (but not in peritoneal dialysis); 3 haemodialysis uses counter-current flow; 4 *idea that* haemodialysis maintains concentration gradient **or** in peritoneal dialysis the concentration gradient, reduces / is lower; 5 (in peritoneal dialysis) the fluid reaches equilibrium with the blood;	2 max	**IGNORE** ref to 'cleaning' blood 1 **ora** e.g. haemodialysis is more, efficient / effective, at removing (named) waste **Examiner's Comments** There were some excellent answers that showed good appreciation of how haemodialysis is able to maintain optimal concentration gradients. Many candidates, however, found this even more challenging. Many referred to the differences in convenience or volume of fluid but failed to expand on the idea. Some were distracted by the abdomen and referred to removing waste from only part of the body.
			Total	**5**	
9			pyruvate ☐ Krebs ☐ liver ☐ link ☐ ATP ☐	5	**ALLOW** citric acid / tricarboxylic acid / TCA
			Total	**5**	

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Question			Answer/Indicative content	Marks	Guidance
10	a		**M** ☐	1	
	b		salted crisps **AND** boiled sweets reduce water potential of blood (because of high sugar / salt content) ☐ osmoreceptors in hypothalamus, detect change in water potential in blood / cause increased release of ADH ☐ ADH causes production of aquaporins in collecting duct so more water is reabsorbed (into capillaries) ☐ bread / milk / chocolate, increase water potential of blood ☐ causes reduced ADH release ☐	4 max	**IGNORE** descriptions of graph
	c	i	ribosomes ☐ mitochondria ☐ (rough / smooth) endoplasmic reticulum ☐ Golgi apparatus ☐ vesicle ☐ centriole ☐	3 max	**IGNORE** organelles not present in this cell, e.g. flagellum / chloroplast
		ii	<u>one</u> cell drawn **AND** clear continuous lines ☐ correct proportions ☐ uses ≥50% of area provided ☐ *labels:* label lines drawn with a ruler to correct feature ☐ cell membrane **AND** nucleus **AND** cytoplasm ☐	4 max	**DO NOT ALLOW** more than one cell **DO NOT ALLOW** ragged lines / any shading **ALLOW** if it is clear which cell the candidate has attempted to draw **IGNORE** any annotations not mentioned here **DO NOT ALLOW** arrow heads
			Total	**12**	

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Question			Answer/Indicative content	Marks	Guidance
11	a		(large) gaps / holes, in tissue / between cells ☐ cell death ☐ *idea that* usual structure of liver tissue is not present ☐	2 max	 e.g. sinusoids not present, etc.
	b	i	peritoneal wall is made up of living cells ☐ (so) produces ATP to carry out active transport ☐ dialysis membranes, only allow diffusion / cannot do active transport ☐	2 max	
		ii	*advantage:* does not require repeated dialysis **OR** diet less limited **OR** better quality of life / no longer chronically ill ☐ *disadvantage:* *idea of* difficulty finding donor organ **OR** risks of surgery **OR** risks from, organ rejection / long term immunosuppressant drugs ☐	2	**ALLOW** ORA
	c		test urine ☐	1	
			Total	**7**	

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