Mark scheme

Excretion and homeostasis

Biology 0610 · Questions from Paper 3 and Paper 4

Total marks

97

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
5	5	10	9	10	9	9	10	16	14	**97**

Question 1 [5]

1	(a)	<table><tr><th>function</th><th>letter</th></tr><tr><td>helps to prevent dehydration of the body</td><td>B</td></tr><tr><td>detects changes in the external temperature</td><td>H;</td></tr><tr><td>dilates when body temperature rises</td><td>E;</td></tr><tr><td>prevents most heat loss from the body</td><td>F;</td></tr><tr><td>produces a fluid to help the body lose heat</td><td>G;</td></tr></table>	[4]	No mark for B
	(b)	**X–** hair;	[1]	
			[Total: 5]	

Question 2 [5]

2	homeostasis; brain; vasodilation; sweat; evaporation;	[5]	
		[Total 5]	

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Question 3 [10]

3 (a)

name	letter
urethra ;	G
kidney	A ;
bladder ;	E
renal artery	C ;
ureter ;	D

[5]

(b) (i) liver ; [1]

(ii) (excess) amino acids / proteins ; [1] **A** polypeptides / peptides / peptones

(iii)

blood plasma	urine
more glucose / glucose present	glucose absent ;
less urea	**ora** ;
less salts	**ora** ;
less water / more concentrated urine	**ora** ;

max [3]

[Total: 10]

Question 4 [9]

4 (a)	1. less in (renal) vein/ORA; 2. (kidney) removes/excretes/filters urea; 3. from blood (plasma); 4. in capillaries/glomerulus; 5. not all removed/not reabsorbed;	[max 3]	**A** – drop in urea concentration Any three – 1 mark each.
(b)	1. fall in oxygen concentration; 2. rise in carbon dioxide concentration; 3. respiration (in kidney); 4. aerobic; 5. oxygen used up (from blood); 6. carbon dioxide produced/added (to blood);	[max 3]	**I** – refs to the blood vessels Any three – 1 mark each.
(c)	1. drop in glucose concentration; 2. kidney removes/filters glucose; 3. then concentration rises; 4. as glucose is reabsorbed (into blood); 5. none lost in urine; 6. final concentration lower than original/OWTTE; 7. as some is used in respiration/for energy;	[max 3]	**A** – accept ref to some in urine of diabetics Any three – 1 mark each.
		[Total: 9]	

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Question 5 [10]

5	(a)	(i)	homeostasis; [1]	**I** – specific examples
		(ii)	1 allows constant metabolic rate/OWTTE; 2 allows enzymes to work (at constant rate); 3 reduces risk of denaturing/destroying them; 4 mammal independent of external temperature/can function in wide range of environments/OWTTE; *any two – 1 mark each* [2]	**A** – gives optimum temperature for enzymes
	(b)	(i)	37.4; [1]	
		(ii)	widening of/relaxing of blood vessels/arterioles/muscles in arterioles; [1]	**A** – capillaries are widened
		(iii)	**X** placed on any point along downward curve; [1]	**A** – just before peak
		(iv)	1 vasodilation allows more blood to flow; 2 through surface capillaries/blood vessels; 3 more heat loss occurs; 4 by radiation; 5 by convection; 6 so body temperature falls; *any four – 1 mark each* [4]	
			[Total: 10]	

Question 6 [9]

6	(a)	**1** **2** **3** **4**	removal from the body / organism / cell **R** 'excreted from body' poisons / toxins / harmful substances named example OR waste products / of metabolism / respiration / deamination / chemical reactions in cells or in the body substances in excess (of requirements) / AW	[max 3]	**Ig** faeces, egestion, defecation, digestion AW **A** 'substances that cause harm' / 'harmful' *toxic waste products of metabolism / AW = 2 marks* ***ignore*** *routes from body* Mpt 3. **A** named examples, e.g. CO_2, urea, salt, named ions, amino acids

(b)

process that occurs in the kidney tubule	letter from Fig. 2.1
filtration of blood	**H**
reabsorption of most of the solutes in the filtrate	**C**
water is absorbed by osmosis to determine the concentration of urine	**G**
unfiltered blood returns to the renal vein	**D / E**

[4]

component	blood	filtrate	urine
red blood cells	✓	×	×
white blood cells	✓	×	×
plasma proteins	✓	×	×
glucose	✓	✓	×
urea	✓	✓	✓
salts	✓	✓	✓
water	✓	✓	✓

one mark for the filtrate column

one mark for the urine column

[2]

[Total: 9]

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Question 7 [9]

7	(a)	homeostasis / negative feedback ;	[1]	
	(b) (i)	insulin ;	[1]	
	(ii)	liver / muscle / pancreas ;	[1]	
	(iii)	glycogen ;	[1]	
	(c)	*Symptoms:* fatigue / AW ; thirst / AW ; increased urination / glucose in urine / fruity breath / ketosis / flushed face; weight loss / nausea / vomiting / abdominal pain / hunger ; blurred vision / glaucoma ; behavioural changes / confusion / faint / unconscious / coma(tose) / dizzy / rapid breathing / deep breathing ; slow (wound) healing / poor circulation ; *Treatment:* insulin ; by injection / insulin pump ; regular blood glucose tests ; regular meals / controlled diet ;	[max 5]	max 3 from either section **A** weakness **I** death **A** meal plan / healthy eating / monitoring carbohydrates / avoid sugary foods, drinks and fruit juices / eat complex carbohydrates / intake of sugar if blood sugar concentration is too low
			[Total: 9]	

Question 8 [10]

8	(a) (i)	eaten / absorbed, a (sugary / high carbohydrate) meal / AW ; (secretion / effect, of) adrenaline ; (secretion / effect, of) glucagon ; dehydration / loss of water ;	max [1]	
	(ii)	used in respiration ; (named) exercise / physical activity ; hungry / fasting / starvation ; (secretion / effect, of) insulin ;	max [1]	
	(iii)	liver ; muscle ; kidney ; testes ;	max [2]	
	(b)	**1** pancreas / islets of Langerhans, detects increase in glucose concentration ; **2** (pancreas / islets) secretes / produces, insulin ; **3** transported in, blood / plasma ; **4** liver / muscle / cells, convert glucose to glycogen ; **5** ref to, enzymes (converting glucose to glycogen) ; **6** homeostasis / negative feedback ;	max [3]	
	(c)	water, diffuses out of (red blood cells) ; through, partially permeable membrane ; by osmosis ; down water potential gradient / from high water potential to low water potential ; (red cells) decrease in volume / shrink / crenated / AW ;	max [3]	

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Question 9 [16]

9 (a)		**A –** hair **;** **B –** (temperature) receptor **;** **A** (sensory) nerve ending **C –** sweat gland **;** **D –** fat (cell) **;**	[4]	**R** follicle **A** neuron **R** nerve **A** fat layer / fat tissue / adipose / lipid **R** 'fat droplet'
(b)		*marking points are linked 1 + 2, etc.*		**NB** if structures in (a) labelled incorrectly allow *ecf*
		*hair / **A***		
	1	raises hair + traps air **;** **A** ORA		**if** structure is not on the mark scheme, but correct and appropriate function is given, allow **one** mark (*ecf*)
	2	air is (good) insulator **;**		
		*temperature receptor / **B***		(**BUT** if unqualified letters are used must link to what is given in (a))
	3	detects change in temperature **;**		*e.g.* ***D** is an artery/blood vessel in (a) – ✗*
	4	impulses to the, CNS / brain / spinal cord **;**		***D** vasodilates if too hot in (b) – ✓*
		*sweat gland / **C***		
	5	secretes / produces, sweat + evaporates from surface of skin **;** ORA		
	6	heat lost from the body / blood cooled / AW **;** ORA		**R** 'signals/messages' in MP 4
		*fat / **D***		
	7	insulator **;**	[max 4]	

(c)		*mark **(i)** and **(ii)** together to max 5*		
(i)	**1**	(vaso)constriction **;**		**R** vasoconstriction of veins/capillaries
	2	shunt / AW, opens **;**		**Do not accept** 'capillaries move away' / AW *or* ref to muscles in capillaries
	3	less blood flows through the capillaries **;**		
	4	blood diverted away from, skin / surface **;**		
(ii)	**5**	*idea that* blood distributes heat **;**		
		less heat loss		
	6	by radiation **;**		
	7	by convection **;**		
	8	accept by conduction (to the air) **;**	[max 5]	
(d)	**1**	change in, body / skin, temperature **;**		**I** ref**.** to external temperature changes
	2	acts as a stimulus **;**		
	3	to keep temperature , constant / at 37 °C / within limits / near set point / at the norm / AW **;**		**A** correct ref**.** to homeostasis
	4	corrective / opposite / AW, action by the body **;** e.g. qualified ref to sweating / vasodilation / vasoconstriction / AW **;**	[max 3]	the example needs to show how it brings about the corrective action
			[Total: 16]	

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Question 10 [14]

10(a)	removal of waste products of metabolism ; and substances in excess (of requirements) ;	**2**	
10(b)	carbon dioxide ;	**1**	**A** water (vapour)
10(c)	**P** - cortex ; **Q** - ureter ; **R** - medulla ;	**3**	
10(d)	*any six from:* 1 **X** contains blood ; 2 *ref. to* filtration (between **X** and **Y**) ; 3 proteins / blood cells / large molecules, too big to, be filtered / enter **Y** ; 4 **Y** contains, glucose, water, urea **and** ions ; 5 **Z** contains no glucose ; 6 (all) glucose has been reabsorbed (into the blood) ; 7 **Z** contains excess, water / ions ; 8 (some) water / ions, reabsorbed (into the blood) ; 9 **Z** contains high(er), concentration / AW, of urea ; 10 **Z** contains urine ;	**6**	
10(e)	deamination / removal of nitrogen-containing part (to form urea) ; assimilation / conversion to **or** synthesis of proteins ; AVP ;	**2**	

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