Homeostasis in mammals

Mark Scheme 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Homeostasis
Sub Topic	Homeostasis in mammals
Booklet	Theory
Paper Type	Mark Scheme 2

Time Allowed : **55 minutes**

Score : **/ 46**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 1. norm concentration of blood glucose is 80 - 120 mg 100cm^{-3} ; (A within range)

2. ß cel of, Islets of Langerhans / pancreas, detect increase ;
3. ref. $^{+}$ channels close / role of Ca^{2+} ;
4. secrete insulin
5. ref. glycogenesis
6. increased uptake of glucose (by cells)
7. increased use of glucose in respirati / glucose converted to fat ;
8. ref. negative feedback / described [4 max]

[Total: 4]

2 **(a** 1. action potential / depolarisation, reaches presynaptic membrane ;
2. calcium (ion) channels open / presynaptic membrane becomes more permeable to Ca^{2+} ;
3. Ca^{2+} flood into presynaptic neurone ; **R** membrane
4. this causes vesicles of (neuro)transmitter to move towards presynaptic membrane ;
5. ref. acetylcholine / ACh ;
6. vesicle fuses with presynaptic membrane / exocytosis ;
7. ACh released into synaptic cleft ;
8. ACh <u>diffuses</u> across (cleft) ;
9. ACh binds to receptor (proteins) / AW ;
10. on postsynaptic membrane ; **R** neurone
11. proteins change shape / channels open ;
12. sodium ions rush into postsynaptic neurone ; **R** membrane
13. postsynaptic membrane depolarised ;
14. action potential / nerve impulse ;
15. AVP ; e.g. action of acetylcholinesterase [9 max]

(b) 16. ensure one-way transmission ;
17. receptor (proteins) only in postsynaptic, membrane / neurone ; *ora*
18. vesicles only in presynaptic neurone ; *ora*
19. ref. adaptation ;
20. increased range of actions ;
21. due to interconnection of many nerve pathways ;
22. ref. inhibitory synapses ;
23. involved in memory / learning ;
24. due to new synapses being formed ;
25. AVP; e.g. summation / discrimination [6 max]

[Total:15]

Question 3

15 when blood glucose levels low ;
16 glucagon released from alpha cells (in pancreas) ;
17 (acts on) liver (cells) ;
18 breakdown of glycogen to glucose ;
19 use of fatty acids in respiration ; **R** fats
20 production of glucose from other compounds / fats / amino acids / gluconeogenesis ;
21 liver releases glucose into blood ;
22 glucose levels rise / return to normal ;
23 switching off glucagon secretion ;
24 antagonistic to insulin ;

6 max

Total : 6

4 1 (homeostasis is) maintenance of, constant / stable, internal environment ;

2 irrespective of changes in external environment ;

3 negative feedback ;

4 *ref. to* input / stimulus ;

5 receptor detects change in parameter ;

6 action taken by effector / response / AW ;

7 restoration of, norm / set point / AW ;

8 *ref. to* fluctuation around the norm ;

9 example of homeostasis ; [max 6]

[Total: 6]

5 **(a)**

	initial effect of event on blood concentration of		
event	**glucose**	**insulin**	**glucagon**
meal containing sucrose	**increase**	**increase**	**decrease**
meal containing only protein	**no effect**	**no effect**	**no effect ;**
fasting	**decrease**	**decrease**	**increase ;**
exercising	**decrease**	**decrease**	**increase ;**
meal containing starch	**increase**	**increase**	**decrease ;**

[4]

(b) 1. affects liver cells ; **R** muscle cells / liver and muscle cells
2. promotes glycogenolysis / AW ;
3. promotes use of fatty acids in respiration ;
4. promotes gluconeogenesis / AW ;
5. results in rise in (blood) glucose concentration ;
6. back to, norm / set point ;

[3 max]

[Total: 7]

6 **(a)** 1 removal / elimination, of waste products ;

2 of metabolism ;

3 (which are) toxic ;

4 (or) substances excess (to requirements) ; [2 max]

(b) 1 homeostasis / AW ;

2 change in water potential ;

3 detected by (osmo)receptors ;

4 in hypothalamus ;

5 response via effector ;

6 ADH released ;

7 effect on collecting duct ;

8 return to, norm / set point ; [4 max]

(c) 1 blood diverted away from skin ;

2 less sweating ;

3 more water retained in body / high water potential in body ;

4 less water reabsorbed from collecting duct / AW ; [2 max]

[Total: 8]