



## 2003 Human Biology Higher

### Marking scheme

#### Section A

1.	C	11.	D	21.	D
2.	A	12.	D	22.	A
3.	C	13.	B	23.	B
4.	C	14.	C	24.	C
5.	B	15.	B	25.	A
6.	A	16.	A	26.	B
7.	C	17.	D	27.	A
8.	A	18.	D	28.	C
9.	A	19.	D	29.	C
10.	C	20.	D	30.	B

## Answers to Higher Human Biology - 2003

(Brackets indicate not essential. Solidus / indicates alternative)

### 1. Cells

- (a) A cell/plasma membrane  
B rough endoplasmic reticulum (rough ER)  
C Golgi body/apparatus
- (b) (i) phagocytosis/endocytosis  
(ii) B transports proteins/protein synthesis  
C packages/prepares/processes proteins/enzymes
- (c) (digestive) enzymes
- (d) 1:700
- (i) The number/proportion of white cells would increase.
- (ii) biconcave shape/flattened disc (1)  
provides large surface area for absorption (and/or release) of oxygen *or*  
makes it more flexible and able to pass through small capillaries (1)

### 2. Dissociation

- (a) (i)

<i>Partial pressure kPa</i>	<i>Percentage saturation of haemoglobin</i>	
	<i>37°C</i>	<i>38°C</i>
18	<b>90</b>	<b>90</b>
6	<b>60</b>	<b>40</b>
<b>change</b>	<b>30</b>	<b>50</b>

- (ii) Working muscles will be warmer (1)  
which results in greater loss of oxygen from haemoglobin (1)  
More oxygen needed for increased rate of respiration (1) *any two*
- (b) Oxygen is diffusing/moving (from alveoli) into the blood.

### 3. Thalassaemia

- (a) Anne - Hb<sup>A</sup> Hb<sup>A</sup> Philip - Hb<sup>A</sup> Hb<sup>B</sup> Charles - Hb<sup>B</sup> Hb<sup>B</sup>
- (b) 50%
- (c) Bone marrow Liver/spleen

### 4. Enzyme structure

- (a) (i) amino acid  
(ii) Q - peptide/covalent  
R - hydrogen
- (b) (i) To prevent them digesting body cells.  
(ii) minerals/vitamins/other enzymes/co-enzymes/hydrochloric acid

#### 4. Enzyme structure (continued)

(c)

<i>Factor</i>	<i>Type of change</i>	<i>Effect on enzyme structure</i>
high temperature	<b>denaturation</b>	alters active site
<b><math>\alpha</math> <math>\beta</math> <math>\gamma</math> or X rays, radioactivity, UV light, mustard gas, colchicine</b>	mutation	<b>alteration in amino acid sequence</b>

#### 5. Respiration

(a) (3C) Pyruvic acid (6C) Citric acid/tricarboxylic acid/TCA

(b) *line drawn between pyruvic acid and the hydrogen/CO<sub>2</sub> exit(X)*

(c) matrix of mitochondrion

(d)

<i>Product</i>	<i>Fate</i>
<b>X = Carbon dioxide</b> [CO <sub>2</sub> ]	diffuses out of cell/ diffuses into the ( <i>any one</i> ) blood/carried by blood to the lungs/breathed out/
<i>Hydrogen</i>	picked up by an acceptor/NAD carried to cytochrome system/chain ( <i>any one</i> ) combines with oxygen (to make water)

#### 6. Liver

(a) Bile

(b)

<i>Blood supply</i>	<i>Name of blood vessel</i>	<i>Deoxygenated or oxygenated blood</i>
from aorta	<b>hepatic artery</b>	<b>oxygenated</b>
from gut	<b>hepatic portal vein</b>	<b>deoxygenated</b>
to vena cava	<b>hepatic vein</b>	<b>deoxygenated</b>

(5 or 4 correct - 2 marks; 3 correct - 1 mark)

(c) liver → amino acids → urea → kidney      *All correct - 2    3 or 2 correct - 1  
1 correct - no marks*

(d) Insulin, glucagon or adrenalin

#### 7. Urease

(a) Volume of sample  
Temperature  
Starting pH  
Time for experiment to take place  
Size/type of tablet/mass of urease

## **7. Urease (continued)**

(b)

<i>Fluid</i>	<i>Ammonium carbonate concentration g/litre</i>
<b>B</b>	0.16
<b>C</b>	16.7
<b>A</b>	0.52

(c) Take more samples/repeat experiment

## **8. Body temperature**

(a) Hypothalamus

- (b)
- 1 shivering
  - 2 vaso-constriction
  - 3 pilo-erection/hair erection
  - 4 increased metabolic rate
  - 5 reduced sweating (*any two*)

(c) Process/mechanism brings about a return/rise of temperature to normal (1)  
Once increase has occurred the process/mechanism is switched off (1)

(d) Babies have a higher surface area to mass ratio than adults  
*or* Correct calculation of SA/MASS ratios (1)  
So babies lose relatively more heat (through their skin) (1)

## **9. Brain size**

(a) 400 - 800

(b) 1400 and 75%

(c) (i) cerebrum/cerebral hemispheres  
(ii) corpus callosum (iii) limbic system/hippocampus

## **10. Neurones**

(a) **A** dendrites **B** axon

(b)

<i>Feature</i>	<i>Somatic</i>	<i>Autonomic</i>
type of control (conscious/unconscious)	<b>conscious/voluntary</b>	<b>unconscious/involuntary</b>
example of target muscle	<b>any skeletal muscle eg biceps, triceps, calf muscle, thigh muscle</b>	uterine muscle
example of neurotransmitter	<b>acetylcholine</b>	noradrenaline

(3 rows correct - 2 marks; 2 rows correct - 1 mark)

(c) (1) increase (2) inhibits/slows/diverts blood away (3) vasoconstriction

(d) Antagonistic

## **11. Nitrogen cycle**

(a)

<i>Label</i>	<i>Type of bacteria</i>	<i>Process in nitrogen cycle</i>
G	<b>nitrogen fixing</b>	trap atmospheric nitrogen
J	nitrifying	<b>convert ammonia to nitrate</b>
K	<b>denitrifying</b>	convert nitrate to nitrogen gas

*(4 correct - 2 marks    2 or 3 correct - 1 mark)*

- (b) increased plant/algal growth (1)  
increasing decomposition *or* increase in population of bacteria (1)  
decrease in oxygen leads to death of animals (1)

## **12. Measles**

(a)

	<i>Year</i>	<i>Number of cases</i>
Highest	1976	12200
Lowest	1999	300

*1 mark for layout of table and 1 mark for correct data in table*

- (b) An increase in vaccination rate/introduction of vaccination programme  
(c) 0.2

## **13. Carbon**

- (a) *One mark for labelled axes and one mark for correct plot of 5 bars.*  
(b) 181 years  $\pm$  1 year (*units necessary*)  
(c) *any number between 15 and 16 years acceptable*  
(d) change in rainfall/change in temperature *or* global warming/higher wind speeds  
(*any two, but must refer to climate change, not ice melt or sea level change or flooding*)



**2A Describe the influence of hormones on the testes.**

1. Pituitary produces FSH
2. FSH promotes sperm production
3. Sperm are produced in the seminiferous tubules
4. Pituitary produces LH (ICSH)
5. LH stimulates testosterone production
6. in the interstitial cells
7. Testosterone stimulates sperm production
8. Testosterone influences the production of semen/prostate gland/seminal vesicles
9. Higher levels of testosterone inhibits LH/FSH
10. This is negative feedback
11. This ensures levels of testosterone are kept within normal range/constant **8**

*Relevance - for example, mention of two or more of the following will lose this mark:* **1**  
Oestrogen, progesterone, influence of hormones on female or mention of influence of hormones on other aspects of male non-sexual development. Any hormone unrelated to functioning of testes.

*Coherence:* Proper paragraphing, sequencing, sentence structure. (threshold 5) **1**

**2B Describe the events which take place in the first half of the menstrual cycle**

1. Cycle starts with menstruation
2. Breakdown of lining of uterus/endometrium
3. Pituitary gland secretes FSH
4. which stimulates growth of follicle
5. Follicle/ovary produces oestrogen
6. Oestrogen stimulates repair of endometrium/uterus lining
7. Oestrogen also stimulates production of LH
8. LH is produced by pituitary gland.
9. LH brings about ovulation
10. Rising levels of oestrogen inhibit FSH production
11. This is negative feedback **8**

*Relevance - for example, mention of two or more of the following will lose this mark:* **1**  
Progesterone, corpus luteum, pregnancy, secondary sexual characteristics, irrelevant hormones, eg prolactin and oxytocin.

*Coherence:* Proper paragraphing, sequencing, sentence structure. (threshold 5) **1**

[END OF MARKING INSTRUCTIONS]