

**MARK SCHEME for the May/June 2012 question paper  
for the guidance of teachers**

**5096 HUMAN AND SOCIAL BIOLOGY**

**5096/22**

Paper 2 (Theory), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Page 2	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – May/June 2012	5096

- 1 (a) *correctly labelled* –  
**A** pulmonary artery ;  
**B** bicuspid valve ; (**reject** if tricuspid labelled)  
**C** semi-lunar valve (flap or space between flaps) ; [3]
- (b) (i)  $5.6 \div 70 (= 0.08) / 0.08$  ;  
0.08 dm<sup>3</sup> per beat ;  
(if no units given max 1 mark) [2]
- (ii) increased number of beats per minute / beats faster / AW ;  
increased (stroke) volume / AW ; [2]
- (c) (i) *at rest*: 1.2 (dm<sup>3</sup> per min) ;  
*during exercise*: 4.5 (dm<sup>3</sup> per minute) ; [2]
- (ii) increased need for energy ;  
increased / more, muscle contraction (in exercise) ;  
increase in / more, respiration ;  
(more) oxygen required ;  
(more) glucose required ;  
more carbon dioxide produced / needs to be removed ;  
lactic acid produced ;  
role of blood in transporting oxygen / glucose / carbon dioxide / lactic acid ;  
AVP ; [max 4]
- (iii)  $((1.5 - 0.5) \div 0.5) \times 100$  ;  
200(%) ; [2]
- (iv) increased heat released ;  
blood carries heat ;  
arterioles in skin dilate ;  
increased blood flow to sweat glands ;  
increase in sweating ;  
increased heat loss by evaporation / conduction / convection / radiation ;  
reference need to prevent body temperature rising / AW ;  
AVP (e.g. increased heat from increased respiration) ; [max 3]
- (v) rate of digestion / absorption can be reduced safely (for short period) ;  
muscles using stored energy / glycogen ;  
brain activity cannot be reduced safely / brain activity does not need to be  
increased during exercise ;  
AVP ; [max 2]

[Total: 20]

Page 3	Mark Scheme: Teachers' version	Syllabus	
	GCE O LEVEL – May/June 2012	5096	

- 2 (a) (i) movement of water into chips ;  
through a partially / semi permeable membrane ;  
from region of high water potential to one of low water potential / down a water potential gradient ;  
osmosis ; (must match the explanation given)  
diffusion ; (must match the explanation given)  
[max 3]
- (ii) chip **E** absorbed more water ;  
chip **E** had larger surface area (in relation to its volume) ;  
larger area of membrane through which water could pass by osmosis ;  
more osmosis / movement of water molecules occurred ;  
in limited time ;  
(ORA for chip **D**)  
[max 2]
- (b) haemoglobin ; (accept Hb / oxyhaemoglobin)  
[1]
- (c) osmosis occurred / water moved into / enters red blood cells ;  
cell bursts / cell membrane ruptures ;  
(because) no cell wall ;  
haemoglobin released into water (staining it pink) ;  
[max 3]  
**[Total: 9]**
- 3 (a) (i) y axis labelled gestation period / days ;  
plots correct  $\pm 0.5$  square ;  
bars neatly drawn and of same width ;  
[5]
- (ii) the smaller the body mass the shorter the gestation period / ORA ;  
the smaller the body masses the greater the difference in gestation periods / AW / ORA ;  
[2]  
**[Total: 7]**
- 4 (a) chewed (to small pieces) ;  
by teeth ;  
surface area increased ;  
accept reference to melting ;  
[max 2]
- (b) (i) emulsification / broken up into small droplets ;  
by bile ;  
[2]

Page 4	Mark Scheme: Teachers' version	Syllabus
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(ii) lipase ;  
converts fat to glycerol and fatty acids ;  
(allow max 1 mark for digestion by enzyme/chemical digestion/hydrolysis)

(iii) weight loss/less weight gain/reduces obesity;  
reduced risk of diabetes ;  
reduced risk of atherosclerosis/AW ;  
reduced risk of raised blood pressure ;  
reduced risk of cerebral haemorrhage (stroke)/coronary thrombosis ;  
AVP ;

[max 3]

[Total: 9]

5 *genotypes*: XY and XX ;  
*gametes*: X + Y (either order) X + X ; (all correct)  
*F<sub>1</sub> genotypes*: XX XY XX XY ; (all correct and correlating)  
*F<sub>1</sub> phenotypes*: female male female male ; (all correct and correlating)

[4]

[Total: 4]

6 (a) (i) reduce effects of random/experimental error/makes results more reliable ;  
reduce effect of subject variation ;  
difficulty in reading ruler/AW ;

[max 2]

(ii) female students varied in their reaction times/speed of reactions ;  
all close to 19/did not vary much ;  
AVP ;

[max 1]

(b) (i) larger bodies mean that neurone/nerve fibres have to be longer ;  
greater distance for impulses to travel ;

[2]

(ii) (despite greater distance) males had shorter reaction times/more rapid responses/more rapid hand-eye co-ordination/faster reflexes ;  
speed of conduction along nerve fibres more rapid in males ;  
speed of transmission across synapses more rapid in males ;

[max 1]

[Total: 6]

7 (a)

<u>hormonal control</u>	<u>nervous control</u>
chemical	impulse ;
transported in blood	transmitted by nerves ;
slower response	more rapid response ;
long lasting effect	short lived effect ;
usually response widespread in body	usually response is more localised ;

(award marks if points are made as comparatives)

[max 3]

(b) oestrogen repairs / makes uterus lining thicker ;  
 more vascular / AW ;  
 stimulates pituitary to produce LH ;  
 inhibits FSH production ;

progesterone makes uterus lining ;  
 even thicker ;  
 prevents lining breaking down ;  
 inhibits production of FSH / LH ;

ready for implantation if fertilisation has occurred ; (in either)

oestrogen levels rise first during cycle ;  
 progesterone levels rise as oestrogen levels fall ;

no fertilisation, falling progesterone levels result in menstruation ;

(accept points when made on diagrams)

[max 7]

(c) *first stage*

muscle ;  
 of uterus wall ;  
 contracts ;  
 rhythmically ;  
 cervix dilates ;  
 amnion ruptures / amniotic fluid released / AW ;

[max 3]

*second stage*

baby pushed out ;  
 of vagina ;

[max 1]

*third stage*

placenta detaches from uterus wall ;  
 placenta expelled (via vagina) ;

[max 1]

[part (c) max 5]

[Total 15]

Page 6	Mark Scheme: Teachers' version	Syllabus
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- 8 (a) (i) *Plasmodium* ;
- (ii) female ;  
 (anopheles) mosquito ;  
 bites/sucks blood of human ;  
 injects anticoagulant into blood/idea of preventing clotting/AW ;  
 contains pathogens ;

[max 4]

(b) effect **must** be linked to correct control method, max 1 per box

<u>control method</u>	<u>effect</u>
screens on doors / windows ; sleeping nets ; protective clothing ; clothing with long sleeves / examples ; insect repellents on skin ; AVP ;	prevents adult mosquito injecting pathogen ; prevents adult mosquito acquiring pathogen from infected human ;
use of insecticide sprays ;	kills adult mosquitoes so that they cannot bite and transmit pathogen ;
drain stagnant water ;	prevents completion of mosquito life cycle ; eggs / larvae / pupae have nowhere to develop ;
spray oil on stagnant water ;	larvae / pupae die from lack of oxygen ;
introduce fish ( <i>Gambusia</i> sp) to stagnant water ;	fish eat eggs / larvae / pupae ;
introduce <i>Bacillus thuringiensis</i> to stagnant water ;	bacterium kills the larvae ;
treat infected people with drugs ;	reduce reservoir of infection ;
release of sterile males ;	no viable offspring ;

AVP ;

[max 10]

[Total: 15]

9 (a)

	inspired air	expired air
oxygen	20%	16%
carbon dioxide	0.03%	4%
water vapour	usually less humid	saturated / more moist
temperature	usually below / cooler than body temperature	body temperature / 35.8 °C – 37.7 °C

(allow comparatives)

[max 3]

- (b) (i) diaphragm muscle relaxes ;  
 becomes dome shaped ;  
 pushed up by abdominal organs ;  
 abdominal muscles contract ;  
 external intercostals muscles relax ;  
 rib cage moves down and in (gravity acting on weight of rib cage) ;  
 volume of thorax / chest cavity / lungs decreased ;  
 pressure inside thorax increased (below atmospheric pressure) ;  
 air pushed out of lungs to equalise pressures ;  
 assisted by recoil of elastic tissue in lungs / alveoli walls ;

[max 7]

- (c) causes adrenaline release ;  
 increase in heart rate ;  
 blood vessels contract / constrict ;  
 blood pressure raised ;  
 fatty acids / AW increase in blood ;  
 (fatty) deposits in artery wall / atherosclerosis ;  
 platelets clump ;  
 narrows / blocks arteries ;  
 thrombus / clot formation ;  
 coronary / cerebral thrombosis / AW ;  
 arteriosclerosis / hardening of artery wall ;

[max 5]

[Total: 15]

10 (a)

<u>feature</u>	<u>artery</u>	<u>vein</u>
wall	thick	thin ;
muscle / elastic tissue	thick layer	little present ;
endothelium / lining	convoluted	not convoluted ;
lumen	narrow	wide ;
semi-lunar valves	absent	frequent ;
direction of blood flow	away from heart	towards heart ;
blood pressure	high or fluctuating	low or steady ;
blood type	oxygenated (usually)	deoxygenated (usually) ;

[max 6]

*arteries* thick muscular wall to withstand high blood pressure ;  
 elastic tissue to even out pressure fluctuations ;  
 convoluted endothelium to accommodate changes in lumen size ;  
 lumen narrow as blood flow rapid ;

*veins* thin wall as blood pressure is low ;  
 wide lumen as blood flow is slow ;  
 semi-lunar valves to prevent backflow ;

[max 4]

[part (a) to a max 8]

(b) microscopic in size / size given in micrometres ;  
 walls one cell thick ;  
 cells very thin / squamous ;  
 pores between cells ;

[max 2]

(c) (i) bathes cells / environment for cells ;  
 provides the cells with oxygen ;  
 provides the cells with nutrient chemicals ;  
 removes carbon dioxide that cells pass to it ;  
 movements by diffusion ;

[max 3]

(ii) drains into lymph vessels / capillaries ;  
 passes along lymphatic vessels / system ;  
 passes through lymph glands / nodes en route ;  
 returns to blood stream ; (but not this on its own)

[max 2]

[Total: 15]

[Total for paper: 100]