

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Ordinary Level**

## **MARK SCHEME for the October/November 2012 series**

### **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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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### Section A

- 1 (a) **A** renal artery;  
**B** renal vein;  
**C** ureter; [3]
- (b) section / cut / sliced through;  
lengthways / from top to bottom / along long axis;  
to show internal structure / specific (named) kidney structures in Fig 1.1; [max 2]
- (c) (i) they / plasma proteins / molecules, too large, to pass out / were filtered out; [1]
- (ii) (selectively) reabsorbed;  
into the blood stream;  
glucose is needed, by the body for respiration / useful substance; [max 2]
- (iii) blood sodium chloride is held constant by homeostasis;  
body (cells) needs blood of constant osmolarity / isotonicity / water potential / solute potential / 'water concentration' / 'solute concentration';  
*(ignore concentration alone)*  
excess is excreted / passed out by kidneys / removed in urine;  
depends on dietary input / meal / food eaten;  
amount of water may vary; [max 3]
- (iv) depends on dietary input / activity;  
level controlled / homeostasis / negative feedback;  
pancreas detects / monitors blood glucose concentration;  
(reference to action of) pancreatic hormone / insulin / glucagon;  
and liver;  
surplus glucose must / should be stored as glycogen; [max 3]
- (v) more protein eaten;  
more amino acids deaminated / broken down in liver; [max 1]
- (d) (i) it / membrane is selectively permeable / AW;  
provides large surface area / maximise filtration;  
for urea / excess salts;  
to cross / diffuse through; [max 2]
- (ii) prevent (glucose) loss (from body);  
equilibrium with / equal concentration to plasma / blood;  
*(accept prevents concentration gradient reject supply to patient)* [max 2]
- (iii) keep concentration gradient high / maintain correct concentration /  
concentration gradient maintained;  
remove / flush out waste / urea; [max 1]

**[Total: 20]**

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- 2 (a) (muscular) contractions of uterus;  
dilation / cervix dilates; (*accept* waters break);  
AVP × 2 e.g. abdominal / genital area pain / discomfort;  
(*ignore* dates / induction) [max 2]
- (b) waters break / amnion membrane breaks / releases amniotic fluid;  
dilation / cervix dilates;  
baby's head turns / head comes out; (*ignore* reference to body) [max 2]
- (c) placenta detaches / delivery of afterbirth / placenta;  
(*accept* tying / cutting umbilical cord); [max 1]
- [Total: 5]**
- 3 (a) genetically identical *all three of: D + F + G;* [max 1]  
genetically different *three from: H + J + K + L + E + only one of D / F / G;* [max 1]
- (b) location AVP e.g. skin / somatic cells gonads / ovary / testes;  
/ bone marrow; (*ignore* reproductive organs)
- role growth / repair / AW; gamete / sperm / ovum;  
production;
- number diploid / 46; haploid / 23; [max 6]
- [Total: 8]**
- 4 (a) (blood vessels) near / in tissues / cells / body / *accept* (named) organ or part specified; [1]
- (b) CO prevents O<sub>2</sub> uptake;  
monopolises Hb;  
less free Hb;  
where oxygen concentration low / AW; [max 1]
- (c) (heart muscle) must work harder / pump faster / higher blood pressure;  
(to pump) same amount of O<sub>2</sub> / provide tissue / cells with sufficient oxygen;  
**OR** idea that not enough oxygen getting to heart muscle / tissues; [max 2]
- (d) cigarette smoking;  
car exhausts / fossil fuels / industry;  
heating / cooking;  
incomplete combustion; [max 1]
- [Total: 5]**

Page 4	Mark Scheme	Syllabus	Paper
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5 (a) **M** arteriole / artery;  
**N** capillary;  
**P** venule / vein; [3]

(b) increased blood flow;  
near surface;  
through capillaries(/**N**); (superficial capillaries award 2 marks) (*reject* capillaries move)  
vasodilation;  
arterioles(/**M**) dilate/widen/muscle in walls relax; (*reject* capillaries become wider)  
heat lost by radiation / conduction / convection;  
less blood through shunt / shunt vessels constrict; (*reject* sweating etc) [max 4]

**[Total: 7]**

6 (a) hormones are sent via blood;  
can pass to all parts of body;  
affect more than one target organ;  
impulse passes down axon / neurone; (*ignore* nerves)  
only forms synapse with cells at end of axon / smaller target area / only glands and effectors / localised;  
nerves do not reach every part; [max 4]

(b) hormones continue to circulate;  
until excreted / broken down / diluted;  
nervous effect stops once impulse arrives; [max 2]

**[Total: 6]**

Page 5	Mark Scheme	Syllabus	Paper
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- 7 (a) any reasonable suggestion e.g.  
 easily contactable via medical authorities;  
 describe smoking accurately;  
 mortality easy to follow;  
 cause of death accurate;  
 record keeping / reporting;  
 open to scientific principles;  
 easy to trace / AW; [max 1]
- (b) (81-58) 23; [1]
- (c) smoking causes early death / ORA;  
 cancer / lung cancer smoking related diseases;  
 heart problems; [max 2]
- [Total: 4]

### Section B

- 8 (a) R trachea / windpipe; (*accept* cartilage once only - see W)  
 S lungs;  
 T rib / ribcage;  
 U diaphragm;  
 W bronchus / fibrous tissue / cartilage; [5]
- (b) external intercostal muscles contract;  
 internal intercostals relax;  
 ribs move upwards;  
 ribs move outwards;  
 diaphragm contracted;  
 less curved / flatter / moves downwards / AW; [max 5]
- (c) (i) more / higher % / comparative statement;  
 (relating to) CO<sub>2</sub>; [2]
- (ii) to ensure same gas flows through tubes 1 & 2 / both tubes / equal  
 volumes of inspired and expired air / valid comparison / AW; [1]
- (iii) of CO<sub>2</sub> in atmospheric air;  
 some / small amount / 0.03% / 0.04% or quantitative comparison with  
 exhaled air e.g. 1 / 100th; [2]
- [Total: 15]

Page 6	Mark Scheme	Syllabus	Paper
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9 (a) (i) *roots*  
 nitrate;  
 in solution;  
 active uptake;  
 by root hairs;  
 symbiotic;  
 nitrogen fixation / nitrogen fixing bacteria;  
 nodules;  
 (atmospheric) nitrogen /AW;  
 (see also last 3 points below) [max 5]

(ii) *leaves*  
 carry out photosynthesis;  
 accept reference to plant as (primary) producer;  
 produce carbohydrate / sugars;  
 fix CO<sub>2</sub> / from carbon dioxide (and water); (2 marks above available in  
 equation  
 form)  
 using light energy;  
 using chlorophyll / chloroplasts;  
 (points below may be in upper section - credit once only)  
 carbohydrate / CHO combined with N / nitrates;  
 to make amino acids;  
 amino acids polymerised (into proteins); [max 5]

(b) (explain the parts carbohydrates play in human nutrition)  
 (named) sugars ;  
 starch;  
 (easily) digestible;  
 energy source;  
 energy storage;  
 glycogen;  
 indigestible;  
 cellulose / fibre / roughage;  
 convert to fat;  
 make nucleic acids;  
 AVP; e.g. (cellulose fibre) prevents constipation [max 5]

[Total: 15]

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### Section C

**10 (a)** euphoria/well being/high/(CNS) depressant (relieving tension/anxiety);  
 alert/drowsy (alternating) / narcosis;  
 mouth dry/skin flushed/pupils reduced;  
 breathing slower/muscles weaker/less desire for food/drink/sex;  
 pain killer;

addiction/dependence;  
 tolerance/greater amounts required;  
 heart/circulatory problems/pulse drops/BP drops/blood clot;  
 liver damage;  
 abscesses;  
 constipation;  
 (*ignore* withdrawal)

[max 6]

**(b)** addiction/physical dependence;  
 progression: sniffing/smoking to injecting/mainlining;  
 non sterile syringes/needles;  
 risk of infections;  
 HIV/hepatitis/fungal;  
 adulterants/contaminants/cutting agents;  
 poisoning/effects described e.g. allergy;  
 (heroin taking) becomes main activity/other activities e.g. work secondary/loose job;

kidney problems;  
 nasal effects (broken, dilated blood vessels) if sniffed;

uncertain purity/strength;  
 may lead to overdose;

contact with pushers/criminals;  
 financial difficulties;  
 leading to criminal activity/fights/stealing;  
 family breakdown;

[max 6]

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- (c) used as painkiller / analgesic / not recreational;  
only on prescription / following medical examination / from pharmacy;  
purified / reputable manufacturers only;  
defined / restricted quantity;  
single use needles / needle exchange programs; also syringes  
treatment "tapered" to avoid dependence;  
or restricted to terminal conditions;

registered addict programme;  
medicines to reduce addiction / substitutes e.g. methadone;  
(theoretically) less addictive / habit-forming;  
*accept* reference to cold turkey withdrawal symptoms (sickness, sweating,  
muscle pains, hallucinations);

[max 3]

**[Total: 15]**

**11 (a) days 0 – 40**

primary response;  
artificial immunity;  
active immunity;

lag before / day 0 – 6 / slowly / takes time;  
(eventual / day 7 – 16) increase in antibody concentration / titre;  
gradual decrease in antibodies;  
but not down to zero / some antibodies remain in blood;  
(vaccine contains) antigen on / from surface of pathogen ;  
weakened / attenuated strain;  
detected by wbc;  
antibody produced;  
by lymphocytes / B cells;  
memory cells produced;

*day 40 onwards*

secondary response;  
no lag / immediate / quicker response ;  
higher levels of antibodies;

memory cells recognise / respond;  
same antigen in pathogen *accept* reference to booster;  
causes antigen-antibody reaction;  
memory cells divide;  
to make more lymphocytes / B cells;  
antibody attaches to antigen;  
neutralises it / targeted by phagocytes;  
causing immunity;

[max 12]



(b) see diagram below

lag;  
 rise; (but below half of full height)  
 fall but not to touch x-axis;

[3]

[Total: 15]

