

**QUESTIONSHEET 1**

(a) (i) B; (ii) C; (iii) A; (iv) E; (v) D;

5

(b) (i) sympathetic = increase;  
parasympathetic = decrease;

2

(ii)

Chemical	Effect on rate of heart beat
adrenaline	increased;
acetylcholine	decreased;
atropine	increased;
nicotine	increased;
thyroxine	increased;

5

**TOTAL 12****QUESTIONSHEET 2**

(a)

Receptor	Function	Site
Proprioceptor	senses tensions/positions/movements;	in muscles/tendons/joints;
Thermoreceptor	senses temperature of blood/body surface;	in hypothalamus/skin;
Baroreceptor	senses blood pressure;	in aortic/carotid bodies/ great veins/arches;
Osmoreceptor	senses osmotic pressure of blood;	in hypothalamus;

8

(b) (i) A: rod; scotopic/black and white vision/night vision/vision in dim light;  
B: cone; photopic/colour vision/vision in bright light;

4

(ii) X: this is the blind spot;  
where there is no room for receptors due to optic nerve fibres leaving the retina at this point;

2

Y: this is the fovea which is responsible for the best colour vision;  
thus only cones present giving great sensitivity;

2

**TOTAL 16**

**QUESTIONSHEET 3**

- (a) no relay neurone in autonomic reflex;  
visceral ganglion in autonomic reflex;  
two motor neurones instead of one (in autonomic reflex);  
controls smooth muscle rather than striated muscle/or equivalent;

**max 3**

(b)

Effect	Sympathetic stimulation	Parasympathetic stimulation
Increases cardiac output	✓	✗
Constricts pupils	✗	✓
Increases peristalsis in gut	✗	✓
Increases sweat secretion	✓	✗
Stimulates bronchoconstriction	✗	✓
Stimulates salivation	✗	✓
Causes vasoconstriction of skin arterioles	✓	✗

7

**TOTAL 10****QUESTIONSHEET 4**

- (a) a reflex that is initiated not only by the normal unconditioned stimulus but also by a second acquired conditioned stimulus;  
the animal learns to associate the second stimulus with the first and thus responds to both;  
for example, Pavlov always rang a bell when he presented food to his dogs;  
in time the dogs associated presentation of food with the ringing of the bell;  
salivation reflex was then initiated by the bell ringing even if food was withheld;

**max 4**

- (b) the sight of the product to be sold is presented with another pleasurable stimulus such as well-loved music or beautiful scenery;  
the potential purchaser then associates the product with pleasure;

**2**

- (c) short term memory lasts for only a few minutes but long term memory can last for a life time;  
STM is probably present as electrical impulses;  
in loops of neurones called 'reverberating circuits';  
LTM is probably stored chemically in forms of RNA/protein codes in synapses;

**max 3****TOTAL 9**

**QUESTIONSHEET 5**

(a) (i) to regulate the quantity of light entering the eye/pupil/to prevent dazzling/damage to retina/rods and cones; **1**

(ii) smooth/involuntary/visceral muscle; **1**

(iii) reflex action; **1**

(iv)

Feature	Effect of sympathetic stimulation	Effect of parasympathetic stimulation
radial iris muscles	contraction	no effect/relaxation
circular iris muscles	no effect/relaxation	contraction
pupil size	dilation/gets larger	constriction/gets smaller

**3**

(b) lachrymal; protease; lysozyme; disinfect; parasympathetic; conjunctiva; **6**

**TOTAL 12**

**QUESTIONSHEET 6**

(a) (i) nerve ending/sensory neurone/neurone; (not 'nerve') **1**

(ii) pressure; receptor; **2**

(iii) Any two of: joints/tendons/muscles/mammary glands/external genitalia;; **2**

(b) (i) changes pressure differences into nerve/electrical impulses; **1**

(ii) pressure distorts the capsule/lamellae;  
transmitted by lymph/fluid to nerve endings;  
causes depolarisation/sets up an action potential; **max 2**

**TOTAL 8**

**QUESTIONSHEET 7**

- (a) (i) A = cone B = rod; 1
- (ii) A is conical in shape and B is rod shaped;  
a cone synapses to only one relay neurone but several rods synapse to one relay neurone; 2
- (iii) to absorb light to prevent internal reflection/dazzling; 1
- (b) (i) rods (B) are sensitive to dim light but cones (A) are sensitive to bright light only;  
rods are sensitive to all wavelengths of visible light but cones are only sensitive to specific wavelengths (of light);  
ref to blue, green and red cones; max 2
- (ii) retinene combines with photopsins in cones in the dark/during blinking;  
to give light sensitive rhodopsin/visual purple;  
three different types of photopsin/rhodopsin/cones;  
are sensitive to red, green or blue wavelengths;  
light breaks the rhodopsin down to retinene and photopsin which causes depolarisation/sets up action potentials;  
brain analyses the pattern of impulses as different colours/shades; max 4

**TOTAL 10****QUESTIONSHEET 8**

- (a) A = cornea; B = iris; C = pupil; D = lens; E = ciliary muscle; F = sclerotic; G = choroid;  
H = fovea/yellow spot; I = blind spot; J = optic nerve; K = retina; 11
- (b) refraction by cornea/aqueous humour/vitreous humour forms image on retina;  
lens enables fine adjustment to obtain a clear/sharp image;  
for near vision ciliary muscles contract thus reducing pull/tension on suspensory ligaments;  
elastic lens thus becomes thicker so has more focussing/converging power;  
for distant vision ciliary muscles relax thus pulling suspensory ligaments;  
(elastic) lens thus pulled to become thinner with less focussing/converging power;  
ref to autonomic control of ciliary muscles/sympathetic for distant vision/parasympathetic for near vision; max 5
- (c) ref to antagonistic iris muscles regulating diameter of pupil;  
in bright light, radial (iris) muscles relax and circular muscles contract;  
thus pupil smaller so less light enters;  
in dim light, radial muscle contract and circular muscles relax;  
thus pupil widens and more light enters;  
ref to autonomic control/sympathetic stimulates dilation of pupil/parasympathetic stimulates constriction of pupil; max 4
- (d) the fovea/yellow spot is the most sensitive part of the retina/contains a high density of cones for colour vision/does not contain rods;  
blind spot does not contain rods or cones/photoreceptors/all room taken up by optic nerve fibres (leaving the retina); 2

**TOTAL 22**

**QUESTIONSHEET 9**

- (a) A = malleus/hammer; B = incus/anvil; C = stapes/stirrup; D = tympanic membrane/ear drum;  
E = fenestre ovalis/oval window; F = fenestre rotunda/round window; **6**
- (b) (i) transducer changes one form of (signal) energy into another form;  
ear changes sound energy/air pressure changes into electrical energy/nerve impulse; **2**
- (ii) sound waves directed by pinna into the (external) ear canal;  
ear drum vibrates in sympathy with sound waves/in relation to frequency/amplitude;  
vibrations transmitted/amplified by middle ear ossicles/malleus + incus + stapes;  
cause fenestre ovalis/oval window to vibrate;  
this causes pressure waves in fluid/perilymph of cochlea;  
energy of these is released by sympathetic vibrations of fenestre rotunda/round window; **max 5**
- (b) maintains (balance of) air pressure in middle ear cavity;  
by opening to pharynx/throat;  
pressure changes caused by movements of ear drum and windows thus compensated for; **max 2**

**TOTAL 15****QUESTIONSHEET 10**

- (a) decreases cardiac output/reduces frequency of heartbeat/reduces force of contraction of cardiac muscle (thus allowing heart to rest);  
stimulates gastric secretion so that (energy containing) food can be digested;  
stimulates pancreatic/intestinal secretion so that food can be digested;  
promotes glycogen synthesis in liver/insulin release by islets of Langerhans/ $\beta$ -cells;  
increases motility of stomach/intestines causing better mixing/absorption of food;  
stimulates bile release/contraction of gall bladder to enhance digestion; **max 5**
- (b) pupils dilate;  
cardiac output raised/heart rate increases/force of beat increases;  
arterioles to skin and viscera contract diverting blood to muscles/lungs/heart muscle;  
arterioles to heart muscle/lungs/skeletal muscles dilate to enable faster flow of blood;  
breathing becomes faster and deeper/bronchioles dilate, improving O<sub>2</sub> uptake;  
more liver glycogen converted to glucose to supply more energy;  
adrenalin release promoted to enhance sympathetic effects;  
energy using non-essential muscular movements/secretions of gut are suppressed; **max 5**

**TOTAL 10**

**QUESTIONSHEET 11**

- (a) (i) iris; sclerotic; 2
- (ii) cornea; aqueous humour; lens; vitreous humour; 4
- (iii) rods; cones; melanin containing retinal epithelium; (allow 1 mark for 'retina' unqualified) 3
- (iv) rods; cones; 2
- (b) (i) pinna; external ear canal; 2
- (ii) ear drum/tympanic membrane; ossicles/named ossicles; oval window/fenestre ovalis; 3
- (iii) ossicles/named ossicles (act as a lever system);  
ear drum and oval window (area of ear drum much larger/22x larger than oval window so energy magnified 22x); 2
- (iv) ear drum (sound waves/air pressure waves to mechanical vibrations);  
cochlea/basilar membrane/organ of Corti (pressure waves to electrical); 2

**TOTAL 20****QUESTIONSHEET 12**

- (a) (i) sympathetic stimulation increases the frequency of the heart beat;  
by increasing the signal/output frequency of the sino-atrial node/accept alternative wordings if clear;  
and by reducing the delay of impulse passage through the atrio-ventricular node;  
also increases the force of contraction of the cardiac muscle;  
increases coronary blood flow/dilates coronary arteries/arterioles, thus improving blood supply to cardiac muscle; **max 4**
- (ii) parasympathetic/vagal stimulation reduces frequency of heart beat;  
by suppressing/reducing signal/output frequency of sino-atrial node;  
and by increasing delay of impulse passage through atrio-ventricular node;  
decreases force of contraction of the cardiac muscle;  
decreases coronary blood flow/constricts coronary arteries/arterioles since heart muscle does not need to work as hard; **max 4**
- (a) voluntary nervous system can stimulate muscular movements/activity of skeletal muscles/physical activity;  
resulting increased CO<sub>2</sub> concentration in blood stimulates cardiac output;  
voluntary nervous system can be conscious of stress which can result in adrenaline secretion;  
adrenaline will increase cardiac output; **max 2**

**TOTAL 10**