ANSWERS & MARK SCHEMES

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) lachrimal; 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) retinine 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 retinine 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 <u>antagonistic</u> 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 musles 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/β-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_2 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_2 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