RECOGNISING ACHIEVEMENT

JANUARY 2003

ADVANCED GCE UNIT

MARK SCHEME

MAXIMUM MARK: 90

Syllabus / Component: 2805/05

Options in Biology:
Mammalian Physiology and Behaviour

Paper Set Date: 30/01/03

ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
   You are advised to destroy all draft versions.

2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks (½) should never be used.

3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

   x = incorrect response (errors may also be underlined)
   ^ = omission mark
   bod = benefit of the doubt (where professional judgement has been used)
   ecf = error carried forward (in consequential marking)
   con = contradiction (in cases where candidates contradict themselves in the same response)
   sf = error in the number of significant figures

4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.

5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.

6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)

7. Strike through all blank spaces and / or pages in order to give a clear indication that the whole of the script has been considered.

8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader / Principal Examiner for guidance.

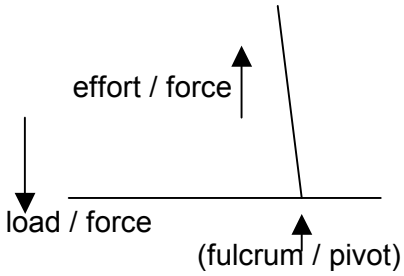
Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit ____ = (underlining) key words which **must** be used to gain credit ecf = error carried forward AW = alternative wording A = accept R = reject ora = or reverse argument

Question			Expected Answers	Marks
1	(a)		**A** = mucosa ; **A** gastric, pits / glands **B** = submucosa ; **C** = smooth muscle / longitudinal AND circular muscle / muscularis externa ; **D** = serosa / connective tissue ;	**4**
	(b)		**P** pointing to peptic / chief cells in gastric gland ;	**1**
	(c)	(i)	ref to protease / protein digesting ; (inactive enzyme) prevents autodigestion / AW ; only converted to pepsin when food is present ; only converted when, HCl / acid, is present in the stomach ;	**max 2**
		(ii)	pepsinogen molecule is cleaved / part of molecule removed ; hydrolysis / breaking, a peptide bond ; uncovers active site ; converted / hydrolysed / catalysed, by HCl / acid ; autocatalytic / catalysed by, protease / pepsin ;	**max 2**
	(d)	(i)	(sucrose solution) 0.5 hours ; (protein) 2 hours 30 min - 2 hours 35 min ; **A** 2.5 hours **R** 2.30 hours	**2**
		(ii)	sucrose is in solution / protein is solid ; need to digest large molecules / ora ; small surface area of protein so will take longer to digest ; solid requires more mechanical digestion ; ora no sucrase / no sucrose digestion / no carbohydrate digestion in the stomach ; therefore sucrose passes straight, through stomach / into duodenum / into small intestine ; protein digestion starts in the stomach ; with pepsin ; AVP ; e.g. ref to churning	**max 4**

[Total: 15]

Question			Expected Answers	Marks
2	(a)	(i)	**F** ganglion (cell) / sensory (neurone) ; **G** bipolar (cell) ; **H** cone ; **I** rod ;	**4**
		(ii)	clearly to synaptic knob / end bulb / button / bouton ;	**1**
		(iii)	neurotransmitter / transmitter substance / named e.g. (glutamate / ACh) ;	**1**
	(b)	(i)	**R** blind spot / optic nerve / optic disc ; **S** yellow spot / fovea ;	**2**
		(ii)	none at, R / blind spot ; none / few, at S / in fovea ; evenly distributed over the rest ; more rods than cones (on rest of retina) ;	**max 3**
		(iii)	**1** (resolution is) ability to see two, points / lines, as separate ; **2** visual acuity / ability to see detail ; **3** high concentration of cones / few or no rods / only cones / AW ; **4** cones have individual (neural) connections / AW ; **5** cones very close together ; **6** rods share neurones / convergence at ganglia / AW ; **7** AVP ; e.g. least distortion, ref to visual axis **8** AVP ;	**max 3**
	(c)		pupil small at high light intensity to prevent damage to retina ; detail about bleaching of pigments ; pupil large at low light intensity to allow maximum light to enter the eye; radial muscles contract (increasing pupil diameter) ; ora ref to thresholds of receptors ; *control – answered from low light or high light (ora below)* few, rods / cones, stimulated so few impulses in sensory neurones ; ora more impulses in sympathetic neurones ; ora AVP;	**max 3**
				[Total: 17]

Question			Expected Answers	Marks
3	(a)		five digits ; *idea* of forelimb composed of certain pattern of bones (1 – 2 – 5) (humerus, ulna, radius, wrist bones and hand bones) ;	**max 1**
	(b)		*If no animal mentioned assume it is armadillo, ora for rabbit* large, olecranon process / X, on ulna ; A description relatively shorter (bones of), fore-arm / upper arm ; larger claws ; relatively thicker bones ; four (developed) digits ; A *idea* of vestigial digit hand is a larger proportion of limb ; plantigrade / stands on its hand ; AVP ; AVP ; **R** refs to scapula	**max 3**
	(c)		large surface area for muscle, attachment / insertion ; greater length for, leverage / force multiplier ; allows greater force for digging ;	**max 1**
	(d)		ball and socket ; hinge ; sliding / gliding ;	**3**
	(e)	**1**	bones act as levers ;	
		2	fulcrum / pivot ;	
		3	muscles supply, effort / force ;	
		4	load is weight on the hand ;	
		5	3rd order lever ;	
		6	moveable joint / synovial joint ;	
		7	small movement of the biceps causes large movement of the load / distance multiplier ;	
		8	biceps (muscle) contracts ;	
		9	tendons + qualification in context ;	
		10	insertion / origin ;	
		11	ref flexion; e.g. raising the, forearm / radius ;	
		12	ref other flexor muscles / brachialis ;	
		13	antagonistic muscles / triceps, relax ;	
		14	diagram showing lever action ;	
		15	AVP ;	



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[Total: 15]

Question	Expected Answers	Marks
4 (a)	A *conditional throughout*	
	1 dogs salivate to, other stimuli / e.g. of other stimulus ;	
	2 same time of day ;	
	3 dogs were hungry ;	
	4 dogs kept behind screen ;	
	5 could not see experimenter ;	
	6 used bell before conditioning to show no increase in salivation ;	
	7 before conditioning there is an unlearned reflex to salivate ;	
	8 unconditioned stimulus + qualification e.g. meat powder ;	
	9 unconditioned response + qualification e.g. salivation ;	
	10 use of bell described ; (= bell, before food)	
	11 conditioned stimulus + qualification ;	
	12 conditioned response + qualification e.g. salivation without meat powder ;	
	13 use of revolving drum explained ;	
	14 time between trials ;	
	15 several sessions / repeats ;	
	16 different dogs ;	
	17 AVP ; e.g. use of tube to collect saliva / correct ref to learning	
	18 AVP ;	**max 8**
	QWC – legible text with accurate spelling, punctuation and grammar	**1**
(b)	*max 4 for either nervous or hormonal*	
	1 reflex action / involuntary ;	
	2 (taste) receptors ;	
	3 nerve impulse from receptor, to brain / CNS ;	
	4 autonomic (NS) ;	
	5 parasympathetic (nerves / NS) ;	
	6 vagus nerve ;	
	7 acetylcholine ;	
	8 stimulates gastric gland (to secrete gastric juice) ;	
	9 (stimulates cells to) secrete <u>gastrin</u> ;	
	10 stretching of stomach (wall) ; (is stimulus)	
	11 chemical action of food on stomach (lining) ; (is stimulus)	
	12 nerve impulse to gastric gland cells ;	
	13 (gastrin) passes in blood ;	**max 5**

[Total: 14]

Question			Expected Answers	Marks
5	(a)	(i)	glycolysis ;	1
		(ii)	glycerol + three fatty acids ; condensation reaction ; formation of ester bond / described ;	max 2
		(iii)	smooth ER ; **A** SER	1
	(b)	(i)	lipids / fats, are not, water soluble / soluble in plasma ; as they are hydrophobic / non polar ; *idea* central core of fat ; *idea* coating of protein ; protein, hydrophilic / polar / water soluble ; AVP ;	max 3
	(c)	1	(triglycerides are) hydrolysed / broken down, to fatty acids ;	
		2	(stored in) adipose tissue ;	
		3	lipolysis / ref lipase ;	
		4	fatty acids are transported in the bloodstream ;	
		5	enter the liver ;	
		6	are broken down / catabolised into fatty acyl CoA ;	
		7	in cytoplasm (of hepatocytes) ;	
		8	fatty acyl CoA enters mitochondrion ;	
		9	β-oxidation / to form 2 carbon fragments ;	
		10	to form acetyl CoA ;	
		11	(acetyl CoA) enters Krebs cycle ;	
		12	during aerobic respiration ;	
		13	liver may form, ketone bodies / acetoacetate / β-hydroxybutyrate ;	
		14	exported / enter circulation ;	
		15	for other tissues to use as a respiratory substrate ;	
		16	glycerol enters glycolysis (part-way) ;	
		17	enters, link reaction / Krebs ;	
		18	any two points about the ETC ;;	
		19		
		20	energy dense / described ;	
		21	highly reduced state of, lipids / fatty acids ;	
		22	one complete turn of Krebs for each 2C from fatty acid ;	
		23	AVP ; e.g. bound to albumin, fate of acetoacetate in tissues	max 8
			QWC – clear, well organised using specialist terms;	1
				[Total: 16]

Question		Expected Answers	Marks
6	(a)	cerebral hemispheres / cerebrum / hippocampus / cerebral cortex / fore brain / AW ;	1
	(b)	shrivelled brain cells ; fewer brain cells ; shorter dendrites ; fewer dendrites ; tangles / tau, (inside cells) ;	max 2
	(c)	confusion / forgetfulness ; memory loss ; difficulty in speaking ; difficulty in, reading / writing ; difficulty understanding language ; inability to learn ; wandering / getting lost ; dementia ; loss of control of voluntary muscles ; incontinence ; anxiety ; aggression ; coma ; AVP ; e.g. persecution, hallucination, failure to recognise people AVP ; **R** personality change unqualified	max 3
	(d)	stimulates clone of, lymphocytes / B cells ; antigen is abnormal part of β amyloid ; immune system acts against, a body protein / not foreign substance ; antibodies ; attach to β amyloid ; ref specificity ; removed by, white blood cells / phagocytes ; (the antibodies cross the blood brain barrier) AVP ;	max 3
	(e)	control ; to check that the injection itself was not the cause of any change/AW ; mice may improve for other reason ; placebo ;	max 2
	(f)	*accept any two sensible suggestions, for example* nerve impulse fails to reach end of presynaptic neurone ; calcium channels fail to open ; acetylcholine not made (in end of neurone) ; vesicles cannot fuse with presynaptic membrane / no exocytosis ; acetylcholine not broken down in synapse / no recycling of component of acetylcholine ; AVP ; AVP ;	max 2
			[Total: 13]