CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2002

GCE Advanced Level

MARK SCHEME

MAXIMUM MARK : 50

SYLLABUS/COMPONENT :9700 /4

BIOLOGY
(STRUCTURED QUESTIONS (A2 CORE))

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Question 1

(a)
thylakoid (membrane) / lamellae ;
in grana ; **2**

(b)
source of energy ;
to excite electrons ;
for synthesis of ATP (from ADP) ;
and reduced NADP / NADPH / $NADPH_2$ / $NADPH^+$;
ref. photolysis (of water) ; **2 max**

(c)
1 electron lost from photosystem II / non cyclic has PSII and PSI / cyclic has only PSI ;
2 replaced by electron from water in noncyclic ;
3 ref. to photolysis of water / oxygen produced in noncyclic ;
4 non cyclic produces reduced NADP / NADPH / $NADPH_2$ / $NADPH^+$;
5 excited electron returns to chlorophyll / photosystem 1 in cyclic ;
6 electron not taken from hydroxyl ion / water in cyclic; **4 max**

(d)
idea that paraquat can be used to kill weeds around growing crop ; **1**

Total : 9

Question 2

(a)
ratio of volume / moles / amount of carbon dioxide evolved to volume of oxygen absorbed in respiration ; **1**

(b)
depends on substrate ;
greater than 1 some anaerobic respiration / ref. to a anaerobic respiration ;
carbohydrate 1 / protein 0.9 / fat 0.7 ;; *2 out of 3*
ref. to other metabolic processes using oxygen / produce carbon dioxide ; **2 max**

(c)
time / allowed to equilibrate ;
record level of fluid in manometer ;
change in known time / ref. time ;
repeat ;
open clip and reset level ;
ref units ;
ref to boiled seeds as a control ;
as soda lime absorbs carbon dioxide given off ;
ref. to calculation ; **4 max**

(d)
remove soda lime ;
repeat experiment / ref. to comparison ;
ref. to whether manometer rose or fell ;
ref. to calculation ; **2 max**

(e)
ref effect of temperature on <u>enzymes in respiration</u> ;
ref. <u>named</u> effect of temperature eg increased collisions / kinetic energy / more substrate molecules with activation energy ;
ref. to $Q_{10} = 2$ **2 max**

Total : 11

Question 3

(a)
channel (proteins) ;
ref. gated ;
Na^+ K^+ / cation pump / carrier protein ;
diffusion down electrochemical gradient ; **2 max**

(b)
(i) Na^+ in ;
cause depolarization / figures –60mV to +40mV ;
ref. action potential ; **2 max**

(ii) K^+ out ;
restores resting potential / repolarisation : **2**

(c)
acts as an insulator ;
action potential cannot fire in part of axon covered by myelin sheath / only at node of Ranvier ;
Na^+ / K^+ cannot pass across
jumps from node to node / ref. saltation / ref. to local circuits;
speeds up impulse transmission ; **3 max**

(d)
frequency of impulses ; **1**

Total : 10

Question 4

(a)

(i) formation of glomerular filtrate / ultrafiltration / pressure filtration ;
(soluble) molecules / water, urea, glucose in plasma forced into nephron / kidney tubule ; **2**

(ii) removing reabsorbed molecules ;
water / glucose ; **2**

(iii) removing water ;
from / reabsorbed by collecting ducts ;
ref. to maintain water potential gradient (in medulla) **2 max**

(b)
permeability can be varied ;
correct ref. to ADH ;
if (blood) water level / potential is low more water reabsorbed ;
if (blood) water level / potential too high little / no water reabsorbed ; **3 max**

(c)
diet has to be regulated carefully when not on the machine ;
risk of infection ;
limited mobility when on machine / ref. to time on machine ;
ref. to expense ;
difficulty of finding veins / damage to veins ;
AVP ; **2 max**

Total : 11

Question 5

(a)

correct parental genotype ;
correct gametes ;
correct genotypes of offspring ;
correct phenotypes of offspring linked to genotypes; **4**

RrBb x RrBb

RB Rb rB rb | RB Rb rB rb

	RB	Rb	rB	rb
RB	RRBB	RRBb	RrBB	RrBb
Rb	RRBb	RRbb	RrBb	Rrbb
rB	RrBB	RrBb	rrBB	rrBb
rb	RrBb	Rrbb	rrBb	rrbb

Round yellow	Round green	Wrinkled yellow	Wrinkled green
RRBB RRBb RrBB RrBb	RRbb Rrbb	rrBB rrBb	rrbb

(b)

wrinkled seeds homozygous / double recessive ;
round yellow seeds variety of different genotypes / may be heterozygotes ;
round yellow seeds some do breed true / homozygous dominant; **3**

(c)

probability of as large a deviation as 0.47 is between 0.9 and 0.95 ;
indicating a close fit to the expected results / they do not differ statistically from the expected result ;
2

Total : 9