CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

GCE AS/A LEVEL

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9700/04

BIOLOGY
Paper 4 (Theory 2 (A2 Core))

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Question 1

(a) **1** sun leaves reach compensation point / zero gas exchange at higher light intensity;
2 rate of photosynthesis increases more rapidly in sun leaves ;
3 CO_2 uptake is greater in shade leaves (ora) at low light intensity ;
4 higher rate of photosynthesis / CO_2 uptake in sun leaves (ora) at higher light intensity ;
5 more respiration in sun leaves (ora) at zero or low light intensity;
6 CO_2 uptake levels off in shade leaves (ora) ; **3 max**

accept CO_2 uptake for photosynthesis and vice versa
accept CO_2 production for respiration and vice versa

(b) light no longer limiting ;
some other factor limiting ;
example carbon dioxide concentration / temperature / ref:chlorophyll ; **3**

(c) at low light intensity little or no effect / light (dependent reaction) limiting rate ;
at high light intensity increasing temperature will increase the rate of photosynthesis ;
ref. (effect of temperature on the rate of) enzyme controlled reactions / light independent stage ;
detail – e.g. named enzyme (RuBISCO) / ref. Calvin Cycle ;

ignore reference to sun / shade leaves **3 max**

Total : 9

Question 2

(a) cytoplasm ;
matrix in mitochondria ; **2**

(b) coenzyme ;
carries electrons / protons / hydrogen ions / hydrogen / H / 2H / H^+ ; **R** H_2
to electron transfer chain / AW ;
from glycolysis / link reaction / Krebs cycle ;
role of NAD in conversion / oxidation of triose phosphate to pyruvate in glycolysis ;
role of NAD in anaerobic respiration ; **3 max**

(c) in absence of oxygen electron transfer chain does not work ;
oxygen final acceptor at end of electron transfer chain ;
reduced NAD cannot be oxidised ; **3**

(d) aerobic respiration produces more ATP / (ora);
to produce the same amount of ATP more glucose broken down in glycolysis ;
glycolysis is the only part of respiration used / no ETC or oxidative phosphorylation ; **2 max**

Total : 10

Question 3

(a)
increases rapidly / sharply ;
to a maximum of 7.0 - 7.5 / a rise of approximately 3 ;
then falls below original value ;
recovering from 240 minutes / AW ; **3 max**

(b)
(i)
increase in glucose stimulates beta cells ;
in islets of Langerhans / pancreas ; **2**
(ii)
as glucose level drops ;
beta cells no longer stimulated / insulin secretion stops ;
Insulin is broken down ; **2 max**

(c)
secreted by alpha cells ;
when blood glucose levels low ;
cause glycogen to be converted to glucose ;
raise blood glucose ;
correct ref: negative feedback / idea that glucagons action is opposite to insulin ; **3 max**

Total : 10

Question 4

(a) parental genotype ;
gametes ;
offspring genotype ;
offspring phenotype ;
penalise once if other symbols used **4**

(b) suffer from vitamin K deficiency / require too much vitamin K ; **1**

(c) warfarin will kill rats without resistance - homozygous recessive ;
homozygous dominant rats require too much vitamin K ;
heterozygous rats most likely to survive and produce offspring ;
only 50% of offspring will be heterozygous ; **3 max**

(d) results in a different codon / triplet ;
(may) result in change of amino acid ;
different primary protein structure ;
this may result in change in protein function ;
suitable example e.g. sickle cell anaemia ; **3 max**

Total : 11

Question 5

(a) globin / protein to amino acids ;
haem to iron ;
iron stored / reused ;
residue / remainder to bile pigments / biliverdin / bilirubin ;
pass into bile ;
excreted ; **4 max**

(b) NH_2 / amino group removed ;
to ammonia ;
and keto acid / oxo produced ;
ref: ammonia to urea ; **3 max**

(c) *alternative mark schemes*

1 ethanol / alcohol ;
oxidized ; **R** broken down
to ethanal / acetaldehyde in ;
ref: respiration / fat synthesis;

OR

2 ammonia ;
combines with CO2 ;
to produce urea ;
via ornithine cycle ;

OR

3 lactate ;
oxidised ;
by dehydrogenase ;
to pyruvate ;

OR

4 hydrogen peroxide ;
to water and oxygen ;
by catalase ; **R** hormones **3 max**

Total : 10
