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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

MARK SCHEME for the October/November question paper

9700 BIOLOGY

9700/04 **Paper 4**
maximum raw mark 60

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UNIVERSITY of CAMBRIDGE
International Examinations

Question 1

(a) matrix of mitochondria ; **[1]**

(b)(i) 3 sites labeled ;; *deduct one mark for each additional or missing label*

(ii) 5 sites labeled ;; **[3 max]**

(c) reduced NAD ;
ref. to ETC ;
oxidized / give up hydrogen ; **[3]**

(d) ref. to substrate level phosphorylation;
no proton gradient involved ;
no ATP synthase ;
no ETC ; **[1 max]**

Total [8]

Question 2

(a) correct parental genotypes ;
correct gametes ;
correct genotypes of offspring ;
correct phenotypes linked to genotypes ; **[4]**

(b) yellow shrunken homozygous ;
double recessive ; **[2]**

(c) (381 x 3/16) = 71 (36/71) = 0.507;
(381 x 1/16) = 24 (9/24) = 0.375 ;
1.80 ; **[3]**

(d) greater than 0.5 ; allow ecf **[1]**

(e) difference from expected not significant ; allow ecf
because greater than 0.5 ;
ratio phenotype is 9:3:3:1 ;
(the small) observed differences are due to chance ; **[2 max]**

Total [12]

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Question 3

(a) RQ = volume of carbon dioxide given off / volume of oxygen taken up ; **[1]**

(b)(i) 18 H_2O ;
18CO_2 ; **[2]**

(ii) 18/26 ;
= 0.7 ; 2 marks for correct answer **[2]**

(iii) fatty acid A lipids / triglycerides / fat / oil ; **[1]**

(c) less C-C bonds ;
less C-H bonds ;
more oxygen ; **A** O **R** O_2 **[2 max]**

Total [8]

Question 4

(a) most birds that survive drought years have larger beaks ;
because they have been able to feed on larger seeds ;
these characteristics are inherited ;
after drought years mainly birds with large beaks remain to breed ; **[3 max]**

(b) abundance of smaller seeds in drought free years ;
large beaks and bodies no longer at an advantage ;
smaller bodies and beaks selected / survive to reproduce ;
ref. smaller birds produce more offspring / require less food ;
ref. to competition in normal years ;
ref. to overproduction of offspring ;
extreme phenotypes unfit ;
ref. to very small birds unable to open any seeds ;
avp ; **[3 max]**

(c) ref. isolation of islands ;
ref. different environmental conditions / selection pressures on different islands ;
ref. adaptive radiation ;
ref. stabilizing selection ; **[2 max]**

Total [8]

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Question 5

(a) restriction (endonuclease) enzyme ;
named example e.g. EcoR1 ;
specific sequence of bases ;
ref. to sticky ends / exposed bases ; **[3 max]**

(b) ref. to complimentary base pairing ;
of sticky ends ;
ligase ;
formation of phosphodiester bond ; **[3 max]**

(c) identical to human insulin (ref. to bovine / porcine insulin used previously) ;
ref. to possible immune response ;
easier to extract ;
pure / uncontaminated ;
regular production not dependent on livestock ; **[2 max]**

Total [8]

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Question 6

(a) *Describe how the structure of a dicotyledonous leaf is related to its functions in photosynthesis.* *[8]*

(b) *Discuss the effects that variations in carbon dioxide concentration and light intensity have on the rate of photosynthesis.* *[7]*

(a) thin / flat to give large surface area to volume ratio ;
held at right angles to sun to allow max. light absorption ;
ref. to arrangement of cells in palisade mesophyll ;
ref. to spongy mesophyll large surface area for CO_2 uptake / gaseous exchange ;
ref. to stomata / guard cells and entry of CO_2 ;
ref. to moist surfaces ;
ref. to xylem and supply of water / mineral ions ;
and support ;
ref. to phloem and translocation of products of photosynthesis ;
ref. to cuticle on upper surface ;
avp ; **[8 max]**

(b) *carbon dioxide* 0.03% ;
most likely limits / major limiting / implied low in atmosphere ;
increase in carbon dioxide concentration and increase in rate ;
during day when light and warm ;
ref. to variations in conc. e.g., within canopy / at soil surface ;
avp ;

light intensity
ref. to wavelengths of light ;
light saturated below full sun ;
idea of limiting and saturation, with other key factor limiting ;
light and stomatal aperture ;
and temperature of leaf ;
day length and season / morning and evening ;
high light and damage to pigments ;
ref. to light exciting electrons in chlorophyll ;
avp ; **[7 max]**

Total [15]

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Question 7

(a) *Explain the source and importance of removing nitrogenous waste products from the body.* *[6]*

(b) *Describe how the kidney removes metabolic wastes from the body.* *[9]*

(a) deamination;
ref. to ornithine cycle ;
ref. to not all urea / produced each day / always some present ;
ref. to urea ;
ref. to creatinine and uric acid ;
and ammonium ions ;
produced in liver ;
continuously / from excess amino acids ;
toxic ;
if allowed to accumulate ;
ref. to potential damage to tissues ;
ref. to not all urea / that produced each day ; **[6 max]**

(b) ultrafiltration ;
of blood in glomerulus ;
forming filtrate in Bowman's capsule ;
of kidney tubule ;
soluble molecules ;
including urea ;
and ammonium ions pass into filtrate ;
concentrated by removal of water (in collecting ducts) ;
ref. to formation of ammonium ions in distal convoluted tubule ;
from ammonia and protons ;
ref. to removal of metabolic water (as a waste product) ;
and osmoregulation ;
by collecting ducts ;
ref. formation of urine ;
ref. to distal convoluted tubule excrete excess acid ; **[9 max]**

Total [15]

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