Gene control

Mark Scheme 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Inherited change
Sub Topic	Gene control
Booklet	Theory
Paper Type	Mark Scheme 1

Time Allowed : **26 minutes**

Score : **/ 21**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 **(a** **1** proteins produced (for growth) **;**

2 DNA replication **;**

3 organelles / named organelles synthesised **; A** more organelles

4 uncontrolled mitosis / **AW**
or continuous cell cycle
or cell cycle checkpoints not controlled **;**

5 (new cells) do not differentiate **; A** do not become specialised

6 loss of function (of tissue) **; A** changed function / new cells do not function as tissue of origin

7 (abnormal) mass of cells formed **;**

8 **AVP ;** e.g. no programmed cell death / apoptosis / cells immortal / cells grow independently of normal programming / no contact inhibition [max 4]

(b) travels in phloem / phloem sap / translocation **; R** in xylem
from cell to cell via plasmodesmata **;**
in symplast pathway **;**
in apoplast pathway **; R** in xylem
ref. to bacterial motility, e.g. flagella **;** [max 1]

(c) 1.1–1.13 (μm) **;;** **OR** 1.2–1.22 (μm) **;;**

$\left[\frac{13\,\text{mm}/13000\,\mu\text{m}}{11500}\right]$ $\left[\frac{14\,\text{mm}/14000\,\mu\text{m}}{11500}\right]$

one mark only for
correct formula and measurement (13 / 14 mm) but incorrect conversion
or for correct formula used with a measurement of 12 or 15 mm **2**

[Total: 7]

2 **(a** *accept Hb for haemoglobin throughout*

low(er), partial pressure / **AW**, of oxygen / O_2 **;**

high(er), partial pressure / **AW**, of, carbon dioxide / CO_2 **;**

formation of carbaminohaemoglobin **;**

carbonic acid disocciation to form, hydrogen ions / H^+ (and hydrogen carbonate ions) **;**

formation of haemoglobinic acid / binding (of Hb) with, hydrogen ions / H^+, causes release of oxygen **;** *allow HHb*

ref. to Hb affinity for oxygen **;** e.g.
Hb has higher affinity for, hydrogen ions / H^+, than oxygen **;**
reduces / lowers, affinity of Hb for oxygen

Bohr effect **;**

AVP **;** e.g. *ref. to* allosteric effects [max 3]

(b) lower, partial pressure / **AW**, of oxygen (at high altitudes) ***or*** less oxygen in inhaled air / **AW ;**

(so) percentage saturation of haemoglobin is lower **;**
A haemoglobin is less saturated
A fewer molecules of / less, oxygen combine with haemoglobin

more haemoglobin needed (so more red blood cells) **;**
A (more red blood cells) so more haemoglobin / more oxyhaemoglobin can be formed

idea of compensation **;** e.g. (to transport) same amount of oxygen to, cells / tissues **;**

ref. to (increased) secretion of, erythropoietin / EPO **;** [max 3]

(c) (i) making a (complementary) copy of, DNA**;** **A** a gene
ref. information / **AW**, for production of a polypeptide **;**

one (DNA) strand acts as a template **;** **AW**
production of (pre) mRNA **;**
detail of process **;** e.g. assembly of nucleotides
RNA polymerase [max 3]

(ii) nucleotide / base, sequence of, DNA / gene, changed / **AW ;**
A new allele (formed)

ref. to altered mRNA / **AW ;**
this may be in context of a named type of mutation
consequence on tRNA

tRNA / anticodon, with different amino acid (to ribosome) **;**
A tRNA with different anticodon

change in amino acid(s) / different amino acid sequence / change in primary structure **;**

affects, secondary structure / tertiary structure / 3D shape / function, of protein ;

ref. to one type of mutation **;**
e.g. base substitution means
deletion / insertion, leads to frameshift
ref. to premature stop codon [max 3]

(iii) *may prevent*
breaking of hydrogen bonds between, base pairs / bases / nucleotides,
(and access of RNA polymerase) **;**

attachment of, RNA polymerase (to DNA) **;**

progress / functioning, of RNA polymerase (along gene) **;**

synthesis / elongation of (pre) mRNA **;**

AVP **;** e.g. interfere with action of helicase [max 2]

[Total: 14]