The gas exchange system and Smoking

Mark Scheme 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Gas exchange and smoking
Sub Topic	The gas exchange system and Smoking
Booklet	Theory
Paper Type	Mark Scheme 2

Time Allowed : **65 minutes**

Score : **/ 54**

Percentage : **/100**

Grade Boundaries:

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

1 **(a (i)** spermatagonium – 2n
primary spermatocyte – 2n
secondary spermatocyte – n
spermatids – n
spermatozoan – n **;;**

all five correct for two marks
three or four correct for one mark [2]

(ii) (spermatogonium to primary spermatocyte) growth / mitosis **;**

(spermatid to sperm) <u>maturation</u> **;** [2]

(iii) *any 1 from*

provide nutrients for sperm(atid) **;**

protect sperm from attack from immune system **;**

regulation of, sperm production / FSH **;**

AVP **;** e.g. removes excess cytoplasm during sperm maturation / guides sperm to centre of tubule [max 1]

(b) FSH ;

(hormone) given to stimulate follicle development ;

GnRH agonists / GnRH receptor antagonists ;

to prevent, LH surge / ovulation ;

human chorionic gonadotrophin ;

(hormone) given to stimulate maturation of oocytes ;

(mature oocytes) collected from ovaries (just before ovulation) ;

ref. use of, fine tube / needle / ultrasound ; [max 4]

(c) **(i)** FSH (alone) / FSH + testosterone, increases development (of spermatids into, spermatozoa / elongated cells) ;

testosterone (alone) has very little effect ;

FSH + testosterone causes greatest increase of development ;

use of, comparative / manipulated, figures ; [4]

(ii) (reduction is very small so) may be, insignificant / random / due to chance ;

(some cells) may have died ; [max 1]

(iii) temperature, similar to testes / in range 30 °C to 35 °C / lower than core ;

spermatozoa production, will not proceed at 37 °C / at high temperature ; [2]

[Total: 16]

2 **(a** **R** CO_2 diffusion is a consequence of transpiration
stomata open(ings) to allow carbon dioxide in **;**
carbon dioxide required for photosynthesis **;**
ignore ref. to oxygen
water <u>vapour</u> diffuses out through stomata **;**
A water if evaporation (from mesophyll walls) described
A water as a gas [3]

(b) **1** both show, little / low / lowest, transpiration, at night / 22.00 to 24.00 / 00.00 to 04.00 **;**
2 both, increase to / peak, at mid day / 12.00 **;**
3 ref. to second peak at 16.00 **;**
4 both, dip / decrease, at 14.00 **;**
5 transpiration (always) lower for trees at exposed site / ora **;**
6 both decrease from 16.00 **;**
for mps 1–4 and mp 6, allow a description at one site only
R if contradictory description given for the other site
7 comparative data quote to support above marking points **; ;**
8 to compare the transpiration rate at two locations at the same time
or transpiration rate at one location at different times
to award data marks arbitrary units (au) must be used at least once [max 5]

(c) *identification of the following features*
1 stomata close (for longer), during the day / when hot / when dry **;**
2 stomata in pits / sunken stomata **;**
3 stomata only on lower surface of the leaf **;**
4 hairs / trichomes **;**
5 low number of / few(er) / less, stomata (per unit area) **;**
ignore 'less open stomata'
6 thick(er) cuticle**;**
7 reflective cuticle (on upper epidermis) **;**
8 thick(er) epidermis / more than one layer of epidermal cells **;**
9 curled / rolled / AW, leaves **;** [max 3]

[Total: 11]

3 **(a** ref. to mutation(s) **;**
in context of initiating uncontrolled mitosis OR as a consequence of uncontrolled mitosis
proto-oncogenes convert to oncogenes / oncogenes switched on / tumour suppressor genes switched off **;**
(cell division is by) mitosis **;**
formation of, tumour / mass of (unspecialised) cells **;**
no response to (extracellular / intracellular) signals to control mitosis / AW **;**
no contact inhibition / AW **;**
no cell death / no apoptosis **;**
immune system does not recognise the cells as foreign and destroys them **;**
A reference to, not non-self / self
metastasis / described **;** [max 3]

(b) **R** way in which cancer develops / epidemiological evidence
A beagles for dogs

1 tar painted on skin of, mice / rabbits / rats / (small) mammal, led to development of (cancerous / malignant) tumour **;**
2 dogs that smoked (plain) cigarettes developed, cancer / tumour **;**
3 dogs that smoked filter-tipped cigarettes did not develop cancer / tumour **;**
A developed precancerous changes
4 control group / dogs, which did not smoke and did not develop, cancer / tumour **;**
5 AVP **;**
e.g. evidence from any other named mamm
e.g. inhaling substances from, tar / tobacco 3]

(c) *similarities*
1 all (named) countries, increase and decrease / reach a peak and decrease **;**

differences
2 peaks / AW, have occurred at different years in at least two countries **;**
3 all maximum mortality rates are different **;**
4 any comparative, data quote / calculation, with units given at least once **;**
e.g. dates and mortality rates for at least two countri
e.g. mortality rates for one country at two different dat [max 3]

accept a range or a single figure within the ranges given

countries	**peak mortality rate**	**year**
USA	53	1984–1990
Spain		1993–1997
Finland		1970–1973
UK	72–	1970–1975
Hungary		1996–2000

[Total: 9]

4 **(a** *Mycobacterium, tuberculosis / bovis* **;** 1

(b) **(i)** *2 marks for correct answer*
x 30 000 **;;**
(image length = 60 mm) 60 000μm / 2μm **A** 59 / 61 mm (29 500 / 30 500)
1 mark if incorrect answer e.g. not converted correctly, but measurement and method correct [2]

(ii) *any 3 relevant e.g.*
DNA not surrounded by, nuclear, envelope / membrane **;** AW
A no (true) nucleus
circular DNA **;** **A** loop
DNA not complexed with histone proteins **;** **A** naked DNA
(only) 70S / smaller / 18nm, ribosomes **;** **A** ribosomes not attached to membranes
no double membrane-bound organelles**;** **A** no, mitochondria / chloroplasts
absence of named organelle **;** e.g. Golgi apparatus, ER / RER / SER
if previous mp not given, **A** no membrane-bound organelles
capsule / slime layer **;**
very small diameter / 0.5 to 5.0μm **;**
cell wall of, murein / peptidoglycan **;**

examples of other relevant points
pili / pilus **;**
no 9+2 microtubule arrangement **;**
flagellum not covered by cell surface membrane **;**
presence of plasmids **;** [max 3]

(c) **(i)** *any 1 relevant e.g.*
ref. (BCG) vaccine / vaccination programme **;**
improvements in housing conditions / less overcrowding (housing) / better ventilated homes **;** **R** better standards of living *unqualified*
earlier detection / mass, chest X-ray / screening **;** *i.e. in preventing spread*
improvements in diet (leading to better immune system) / AW **;**
improved awareness of, transmission / AW **;** **R** better education unqualified
contact tracing / explained **;**
ref. testing / treating, cattle / milk **;** [max 1]

(ii) *any 3 relevant e.g.*
development of antibiotic resistance (by organism) **;** **A** drug resistance
R immunity
ref. impact of HIV infection **;**
higher rate of immigration from countries with high incidence / AW **;**
increase in tourism to countries with high incidence **;**
reduced surveillance leading to undetected cases (and hence spread) **;**
(detected cases, MDR) unwillingness / AW, to maintain drug regimen / AW **;**
ref. to vaccination programmes no longer taking place **;**
ref. to poor / overcrowded, housing (in cities) / AW **;** *must be in context of developed countries* [max 3]

(d) (i) binding of tRNA prevented **;**
(so) no anticodon-codon binding **;**
peptide bond formation prevented **;**
mRNA attachment prevented **;**
inhibition of enzymes involved in translation **;**
ribosome movement along mRNA, hindered / prevented **;**
inhibits association of large and small subunits / AW **;** [max 2]

(ii) *mammalian cell*
cell surface membrane impermeable **;**
degraded, before entry into / within, the cell **;**
broken down by enzymes **;**
eukaryotic / 80S (22nm) / larger / different, ribosomes / ribosome structure **;** [max 1]

[Total: 13]

5 **(a** ref. to coronary arteries **;** *in correct context*
makes platelets sticky, so causing blood to clot **;**
increases risk of thrombosis in, coronary arteries / arteries to heart (muscle) **;**
leading to plaque / atheroma / atherosclerosis / AW **;**
increases heart rate **;**
increased blood pressure **;**
damage to, tunica intima / endothelium /endothelial lining / arterial lining **;** [max 4]

(b) *any one valid statement for 1 mark*

agree
less addicted to smoking cigarettes so fewer smoked **;**
fewer smoked, so reduced risk of smoking-related diseases **; A** named disease
fewer smoked so reduced risk from, (effects of) tar / carbon monoxide **;**

disagree as people may smoke more
may smoke more to, increase their nicotine levels / satisfy need for nicotine / AW **;**
more smoked, so increased risk of smoking-related diseases **; A** named disease
may smoke more so increased risk from, (effects of) tar / carbon monoxide **;**

AVP **;** *for either agree or disagree*
e.g. disagree as may still smoke and there are still other carcinogenic chemicals such as t
[max 1]

[Total: 5]