

Microscopes

Mark Scheme 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Cell Structure
Sub Topic	Microscopes
Booklet	Theory
Paper Type	Mark Scheme 2

Time Allowed : 57 minutes

Score : / 47

Percentage : /100

Grade Boundaries:

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

1 (a) capillary ;

plus one of

ref. to size relative to size of red blood cell (in lumen) ; **A** small diameter / narrow lumen *if capillary correctly identified*

(wall is) one cell thick ; **A** ref. to, only one layer / only endothelium / thin endothelium

[max 2]

(b) (i) red blood cell / erythrocyte ; **A** red blood corpuscle [1]

(ii) water ; **A** plasma [1]

(iii) nucleolus ; **A** nucleus [1]

(c) *if working shown, award one mark only if measurement is incorrect*

7 (μm) ;;

one mark if correct working is shown but answer not to whole number or incorrect conversion used

39 mm / 6000 **A** ± 1 mm in measurement

[2]

[Total: 7]

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(b) (i) 2 marks for correct answer

x 30 000 ;;

(image length = 60 mm) 60 000 μ m / 2 μ m **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) nucleuscircular DNA ; **A** loopDNA not complexed with histone proteins ; **A** naked DNA(only) 70S / smaller / 18nm, ribosomes ; **A** ribosomes not attached to membranesno 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 5.0 μ m ;

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]



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- 3 (a) award two marks if correct answer (29) or (28) is given
allow ± 1 mm in reading the line
 $100\,000\ \mu\text{m} / 3\,500 = (28.57)$
or (28.29 if measured 99 mm) or (28.86 if measured 101 mm)
29 ;; **A** 28 only if 99 mm measured
award one mark if correct measurement is divided by the magnification or if answer is given to one or more decimal places [2 max]
- (b) (i) stretch / expand / lengthen, on inspiration and, recoil / shorten, on expiration ;
A alternatives for inspiration and expiration but **R** contract and relax
(stretch) to increase, surface area / volume of air, for, diffusion / gas exchange ;
(recoil) to (help), expel air / force air out ; **ignore** contract
prevent alveoli, bursting / breaking / AW ; **R** collapsing [2 max]
- (ii) *ignore moist*
correct ref. to diffusion of, carbon dioxide / oxygen ; **A** absorb / lose / AW
(many alveoli) large surface area ;
surrounded by, (many) capillaries / capillary network / AW ;
short diffusion distance (between air and blood) ;
blood maintains concentration gradient ;
epithelium / alveolar wall / AW, thin / squamous ; **A** alveolus one cell thick
A alveolus has a thin wall
R cell wall e.g. alveolar cell wall is thin
idea that very little between, epithelium and endothelium / AW ;
e.g. alveolus and capillary are close together [4 max]
- (c) (i) *assume answers are about person with emphysema, accept ora if clear*
fewer alveoli / (large) 'holes' ;
A alveolar walls broken down / fewer air sacs / alveoli burst / destroyed
less / destroyed / broken, elastic tissue / elastin ; **ignore** damaged
R no, elastin / elastic fibres
small(er) surface area ;
fewer capillaries ;
named change(s) to bronchial tissue ; e.g. enlarged goblet cells, more mucus, scar
tissue, scarred, narrow lumen in airways, inflammation, damaged / no, cilia
ref. to tar deposits ;
R collapsed lung tissue [2 max]
- (ii) shortness of breath (when exercising) / breathlessness ;
A breathing difficulty
wheezing / AW (on inspiration) ;
rapid breathing rate / hyperventilation / decreased ability to hold breath ;
R heavy breathing
chest, tightness / pain ;
cyanosis / bluish appearance to the skin / AW ; **A** pale
fatigue / tiredness / lethargy / weakness / dizziness / AW ;
coughing / coughing up blood ;
lots of mucus produced / much phlegm ;
expanded / barrel, chest ;
R ref. to oxygen concentration of the blood
R small vital capacity [2 max]

[Total: 12]

- 4 (a) **A** – nuclear, membrane / envelope ; **R** nucleus (unqualified)
B – mitochondrion ; **A** crista(e)
C – (Golgi) vesicle / (small) vacuole ; **A** lysosome [3]
- (b) (during), mitosis / meiosis / nuclear division ; ignore ‘cell division’ / phases
replicate, after / before, each division ; **A** at interphase
 move / separate, to poles ;
 assemble / organise, microtubules ;
 centre for growth of / forms, spindle fibres / for formation of spindle / AW ;
 modified centrioles found elsewhere such as in flagella / cilia ; [3 max]
- (c) (EM has) greater / higher, resolution / resolving power ; **ora**
 explanation of resolution as ability to differentiate between two points (close together) ;
 width of membranes is 7 nm (± 1) ;
 (resolution of) LM is 200 nm ($0.2\ \mu\text{m}$) and EM is 0.5 nm ($0.0005\ \mu\text{m}$) ;
A 0.5 to 1 nm ($0.001\ \mu\text{m}$)
 ref to shorter wavelength ; **ora**
 resolution is equal to half the wavelength ; [3 max]
- (d) (i) general trend described linking temperature and percentage transmission ;
A negative correlation (with link) **R** inversely proportional
 use of comparative figures (using data from both axes) to support trend ;
 between $20\ ^\circ\text{C}$ and $60\ ^\circ\text{C}$ percentage transmission decreases, from 95% to 70% ;
 between $60\ ^\circ\text{C}$ and $70\ ^\circ\text{C}$, decrease is, significant / steep / from 70% to 19% ;
 between $70\ ^\circ\text{C}$ and $80\ ^\circ\text{C}$, decrease is, less steep / more steeply than initial temperature
 range / from 19% to 6% ; [3 max]
- (ii) at (temperatures above) $60\ ^\circ\text{C}$, cell / vacuolar, membranes damaged / AW;
A tonoplast
 (membrane) proteins, denatured / altered tertiary structure ;
 increased fluidity (of membrane) / phospholipid bilayer more fluid ;
 (so) diffusion / AW, of, betalain / pigment (out) ;
 as temperature increases, rate of diffusion increases / diffusion occurs more quickly ;
 [3 max]

[Total: 15]