

Suggested Answers for 4E BIOLOGY PRELIM 2019

Paper 1

¹DDCDC

⁶ABCCA

¹¹DDBAC

¹⁶BAABA

²¹BDAAA

²⁶DBDDD

³¹ADABC

³⁶ACCBD

Paper 2

- 1 a i** P – plasma membrane
Q – (large/central) vacuole
ii R - salt solution
- b** partially permeable (membrane) ;
water molecules can pass through ;
other substances (e.g. salt) + cannot pass through ;
- 2 a** gamete / egg / ovum / sperm correctly named and labelled ;
zygote correctly named and labelled ;
- b** uterus / womb / endometrium ;
- c** both child A and B are sons/boys ;
any 2 of:
zygote has X and Y sex chromosomes ;
undergoes mitosis (to form two embryos) ;
embryos / cells / twins are identical ;
- d** progesterone levels increase ;
oestrogen levels remain low ;
growth / development of placenta / uterus lining ;
production / maturation of ovum / egg inhibited ;
- 3 a i** any 3 of:
at both temperatures Y reaches maximum uptake at lower carbon dioxide concentration ;
comparisons for rate of uptake at one temperature + data quoted ;
e.g. maximum for Y at 90–100 ppm + X at 310–320 ppm at 25 °C
e.g. maximum for Y at 60–70 ppm + X at 480–500 ppm at 10 °C
gradient for uptake of Y is higher than for X ;
rate of / gradient, for uptake by Y is higher than for X at 25 °C (at all carbon concentrations) ;
rate of uptake by Y at 10 °C is higher than for X up to 250 ppm ;
rate of uptake by X at 10 °C is higher than Y above 250 ppm ;
any other valid point ;

- ii $34 \mu\text{g} / \text{m}^2 / \text{h}$ at atmospheric CO_2 concentration ;
10 parts per million ;
 - b rate of CO_2 uptake corresponds/proportionate to rate of photosynthesis ;
(data quoted) increasing CO_2 concentration until 330ppm increases rate of uptake of CO_2 ;
 CO_2 is limiting factor because P/s rate changes with varying CO_2 conc **OR** CO_2 conc is not limiting factor above 330ppm because p/s rate remains the same ; max2
- 4
- a $26 - 1 = 25 \mu\text{g} / \text{min} / \text{cm}^2$ leaf surface
 - b B + lower rate of transpiration throughout the day
 - c lack of (available) water (in environment) ;
(spines) reduce surface area ;
reduce transpiration / evaporation / water loss ;
 - d
 - i stoma(ta) / guard cell(s) ;
 - ii none / fewer on leaves ;
(serves as) passage of O_2 / CO_2 / water vapour / gas exchange ;
for respiration / photosynthesis / transpiration ; max2
- 5
- a axes labels + appropriate scales ;
correct bar representation + labels ;
 - b
 - i $\text{T1} - \text{Q}$, $\text{T2} - \text{P}$, $\text{T3} - \text{R}$ 1 correct – 1m, 3 correct – 2m
 - ii transports / carries urine + from kidneys to (urinary) bladder ;
 - c (protein in diet) digestion of protein to form amino acids ;
deamination of amino acids in liver ;
- 6
- a CO_2 + is a (waste) product of aerobic respiration ;
removed from blood / body + lost / removed / exhaled from lungs ;
 - b (thinner barrier) results in faster/greater gas exchange / diffusion ;
more oxygen supplied / more carbon dioxide removed ;
 O_2 for / CO_2 produced from (aerobic) respiration ;
increased (rate of) respiration (to release more energy) ;
muscles (for flying) ; max3

c insufficient supply of O_2 + for aerobic respiration / (increased) rate of uptake of O_2 in muscles ;

glucose + converted to lactic acid ;

(to continue) release energy (for movement) ;

d (walls of) right ventricle ;

(have) thinner muscle ;

(results in) less forceful contractions ;

extensive branching of capillary network (in the lungs) ;

7 a i axes + labels ;

appropriate scale + graph more than 50% of grid ;

correct points plotted ;

smooth curve / point to point graph ;

ii $3.5 - 7.5 = -4.0$ mmol per dm^3 ;

-4.0 mmol per dm^3 / $(240 - 60)$ min = 0.0222 mmol per dm^3 / min ;

iii increased blood glucose results in / brings about increased blood insulin / AW ;

decreased blood glucose results in / brings about decreased blood insulin / AW ;

[reject increase(decrease) in blood insulin results in increase(decrease) in blood glucose]

iv 190 (approximate, must fit trend of candidate's graph)

b destroyed / broken down / AW + by liver;

products removed / reabsorbed; max2

8 a W has clear area + X no clear area ;

(for disc W)

(bacteria) killed around W / not killed around X ;

(bacteria has) gene ;

(or) mutation ;

(that is) resistant (to antibiotic) ;

(resistant bacteria) survive ;

(resistant bacteria) reproduce ;

(and) pass on resistance to next generation / offspring ;

(for disc X)

antibiotic (solution) not strong / concentrated enough

OR incorrect antibiotic (for the bacteria) ; max 5

- b** named example of (artificially selected) animal / plant e.g. golden rice / sheep / cow ;
reason named e.g. is economically important ;
human / farmer (selects plant / animal) (vs natural forces) ;
to breed together / cross breed ;
over several generations / repeated ; max 4

9E

- a** plants / leaves / producers ;
trap / absorb light ;
(convert light energy) into chemical energy OR make carbohydrate / glucose / sugar / starch ;
(plants) are eaten / is food + by/for herbivores / carnivores / consumer ;
(plants / photosynthesis) uses + carbon dioxide ;
(plants / photosynthesis) produces + oxygen ;
respiration + uses glucose / uses oxygen / produces carbon dioxide ;
provide a habitat for other living organisms / use of plants by humans ; max 6
- b** in palisade mesophyll layer / cells / tissue ;
spongy mesophyll layer / cells / tissue ;
more chloroplasts in palisade ;
none in epidermis / xylem / phloem / vein ;
(palisade cells) near leaf surface / (sun)light / to absorb more or most sunlight ;
rapid rate of photosynthesis ;
(chloroplasts present in) guard cells ;
(involved in) controlling stomata ; max 4

a

(mitosis)	(meiosis)
chromosome number maintained / diploid	chromosome number halved / haploid ;
identical offspring / clones	non-identical offspring ;
e.g. of where it occurs – plant or animal / in bacteria;	in gonads / testes / ovaries / anthers ;
(for) growth / repair	to produce gametes / sex cells ; correctly named gamete e.g. egg / sperm ;
(involved in) asexual reproduction	sexual reproduction ;
2 new cells produced	4 new cells produced

max 5

b two genes involved / one gene per polypeptide ;

(for each gene) one DNA strand in the DNA molecule + is template ;

(for the) synthesis of mRNA ;

transcription ;

mRNA moves (from the nucleus) to cytoplasm ;

(mRNA) attaches to a ribosome ;

ribosome moves along mRNA ;

translation ;

amino acids are linked ;

to form a polypeptide or protein molecule ;

max 5

PAPER 3

- 1 a table with correct headings and units;
correct surface total surface areas;
correct time taken calculated;
at least 2 timings for each test tube + 3 calculated values for time taken;
- b i labelled axes + appropriate scale + graph more than 50% of given grid;
correct points plotted;
line of best-fit + no extrapolation beyond plotted points;
- ii bigger s/a vol. ratio – faster diffusion rate
- c i determination of end point subject to colour judgement;
accuracy of block size ;
clumping effect of blocks on surface area etc. ;
any other valid point; e.g. active transport, etc. any 2
- ii use a mould to cut agar
stir contents of test tube
any other valid point
- d living cell has cell membrane ;
cytoplasm present ;
uneven shape ;
accept any other valid point
- e correct apparatus (can be indicated in diagram) ;
same size blocks of agar ;
different temperatures ;
range of temperatures stated e.g. 10 °C, 20 °C, 30 °C, 40 °C, 50 °C;
record data / plot graphs ;
at least one other variable stated e.g. better method of block production ;
repeat experiment ;
any other valid point ; max 6

- 2 a leaves of shoot D at an angle +
leaves of shoot E dropped near to stem/wilting/facing down;
leaves of shoot D firm to touch +
leaves of shoot E limp/withered/shrivelled/dried up/crinkly;
- b More blue sections in shoot D than shoot E ;
correct calculations ;
- c transpiration/evaporation/capillary action;
- d water lost at faster rate in D;
greater leaf surface area in D than E;
guard cells flaccid/stomata closed in E;
- e cut end of E may be dried up / damaged xylem on cut surface;
blue dye absorbed by both shoots + same treatment for both shoots;
- f length of shoot;
size of leaves;
number of leaves;
same mass; max 3
- 3 a measurement of length of stoma
working;
answer;
- b clear outline + realistic shape + no shading;
larger than specimen;
chloroplasts;
thicker inner walls;

SUPERVISOR'S RESULTS

	T1	T2	T3
surface area / cm ³	1x1x6 = 6	0.5x0.5x6x8 = 12	[(0.5x1x4)+(1x1x2)] x 2 = 8
start time	0:07	0:12	0:19
end time	6:34	1:55	2:30
time taken / s	387	103	131

