Structure of transport tissues

Mark Scheme 3

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in plants
Sub Topic	Structure of transport tissues
Booklet	Theory
Paper Type	Mark Scheme 3

Time Allowed : **64 minutes**

Score : **/ 53**

Percentage : **/100**

Grade Boundaries:

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

1 **(a** (light microscope) observe living cells / cells would be killed (with EM) **;**
vacuum used in electron microscope **;**
(light microscope) can have water on slide (to allow cells to move) **;** ora
AVP **;** e.g. more readily available for use
organisms move in response to light [max 2]

(b) **(i)** (part of / used in synthesis, of) chlorophyll (molecule) **;**
R gives chlorophyll green colour

in translation / joining of large and small subunits (of ribosomes) **;**

enzyme, cofactor / activator / described **;** *idea of role in enzyme catalysis*
A correctly named enzymes e.g. DNA polymerase

AVP **;** e.g. stabilizing, cell wall / proteins / nucleic acids / membranes
important in energy transfers / ATP synthesis
DNA, synthesis / replication
ref. to role in, light absorption / capture (for photosynthesis) [max 1]

(ii) *any two from*
1 good solvent / polar (for substances needed by the organism) **;** AW
2 transparent / allows light through, (for photosynthesis) **;**
3 liquid over wide range of temperatures **;**
4 high specific heat capacity **; A** description
5 high latent heat of vaporisation **;**
6 ref. to density **;** e.g. ice / solid, less dense than, water / liquid
circulation bringing nutrients to surface
7 ref. to low viscosity for locomotion **;** [max 2]

(c) *assume multicellular organisms unless stated, then accept ora*
1 small, surface area to volume ratio / SA:V **;**
A as organisms increase in size, SA:V decreases
2 ref. to (larger size means) long distances (to reach, cells / tissues) **;**
3 diffusion, too slow / insufficient / unable to satisfy needs **;**
4 transport system decreases time to supply cells **;**
5 require, bulk / mass, flow **;**
6 ref. to transport system means efficient supply (to cells) of nutrients / named / assimilates / water **; A** brings supplies close to cells (for transfer) [max 4]

(d) **1** mass flow **; A** pressure flow
2 sucrose / solutes / assimilates / sugars, decreases, water potential / Ψ**;**
A more negative / lowers, water potential
A for water potential **A** solute potential
3 water enters (sieve tubes) by osmosis **;**
4 (water enters) down water potential gradient **;**
5 (increased volume) increase in / high(er), hydrostatic pressure **;**
ref. to hydrostatic required once only in mp 5 or mp 7or mp 8
6 unloading / removal, of sucrose / AW, at the sink / named sink **;**
7 lowers hydrostatic pressure / low pressure at sink **;**
8 movement is, down pressure gradient / from high to low (hydrostatic) pressure **;** [max 5]

[Total: 14]

2 **(a** **(i)** *non-self*
foreign / **AW ;** **A** ref. to epitope(s) **I** pathogen / organism

antigen
macromolecule / (glyco)protein / carbohydrate / polysaccharide / oligosaccharide **;**
stimulates / **AW**, an immune response / production of antibodies **;**
A results in formation of antigen-antibody complexes
A other described events in an immune response [max 2]

(ii) antibody / immunoglobulin / IgG, on cell surface / on cell membrane **;**
(act as) receptors **;**
ref. to antigen-binding / **AW ;**
(shape) specific / complementary, to antigen **;** [max 2]

(b) **(** DNA / gene transcribed / mRNA using DNA as template / **AW** **;**
A transcription unqualified
idea of mRNA associating with ribosome(s) **;**
ref. to tRNA with specific amino acid (carried to ribosome) **;**
pairing / **AW** of codons on mRNA with anticodons on tRNA **;**
formation of peptide bonds (between adjacent amino acids) **;**
antibody / protein / polypeptide(s), enters RER / moves to Golgi body **;**
ref. to forming, secondary / tertiary structure **;**
antibody / protein / polypeptide(s), modified / processed / glycosylated / formation of quaternary structure / formation of disulphide bond(s) in Golgi (body / apparatus / complex) **;** **I** *ref. to* packaging [max 4]

(ii) vesicles move to cell / surface / plasma, membrane (via cytoskeleton) **;**
R secreting vesicles unqualified
vesicles fuse with cell (surface) membrane / exocytosis **;** **R** active transport
movement of vesicle / exocytosis requires energy *or* ATP / is active **;** [max 2]

(c) memory cells **;** **A** form immunological memory **I** 'gives immunity'
remain / stay in circulation / blood / lymphatic system **;**
R 'last a long time / long lived' unqualified
for <u>second</u>ary response **;**
fast(er) response when exposed again to same pathogen / same antigen **;**
A fast(er) clonal selection / fast(er) clonal expansion
A divide quickly / rapidly
A long(er) lasting response
to form plasma cells (and more memory cells) **;**
more antibodies produced / higher concentration of antibodies **;**
R if in context of memory cells
to prevent person feeling ill / to prevent symptoms **;** [max 3]

(d) **W** – cytokinesis / cytoplasmic division / cell divides into two **;**
I cell division
R mitosis / telophase

Z – (semi-conservative) replication (of DNA) **;**
I S phase / interphase of cell cycle
R copying of DNA
R protein synthesis
R if replication is given in any other phase of the cell cycle [2]

(e) 1 breathing in / inhale smoke / 'second hand' smoke / sidestream smoke **;**
A passive smoking
I exposed to smoke
2 (tobacco smoke contains) carcinogen(s) **;**
3 causes mutation / described **;**
e.g. change to / alters / damages, DNA **R** if in wrong type of cell
4 leads to uncontrolled cell division / mitosis / growth **;**
5 forming a tumour / mass of cells **;**
6 correct ref. to (proto-)oncogenes / tumour suppressor genes **;**
e.g. formation of oncogenes / mutation of tumour suppressor genes / 'switching off' tumour suppressing genes

mutation of correct named gene = 2 marks
e.g. mutation of tumour suppressor ge

P53 (gene) mutates = 2 marks [max 3]

[Total: 18]

3 **(a** **A =** nucleus **;** **R** nucleolus **R** nuclear **R** nuclei

B = chloroplast **;** **A** chloroplasts

C = vacuole **;** **A** vacuoles **A** large / central / **AW**, vacuole [3]

(b) *<u>both</u> must be correct*

microvillus / microvilli
centriole / centrioles
cilium / cilia
flagellum / flagella

any <u>two</u> structures for one mark ;
A lysosome(s) [1]

(c) **1** apoplast = cell wall (and intercellular spaces) (pathway) **;**
A between cell walls
R if cell wall <u>and</u>, cytoplasm / vacuole / plasmodesmata
R if linked to osmosis / facilitated diffusion / active transport

2 symplast = cytoplasmic (pathway) **;** **R** if facilitated diffusion / active transport
reference to only cytoplasmic / not including vacuoles

mps 1 and 2 allow one mark only if no ref. to terms apoplast and symplast e.g.cell wall v cytoplasmic pathw

symplast

3 osmosis, linked to passage across membranes **;** *must be in correct context*

4 detail of membranes involved **;** *either* tonoplast / vacuolar membrane *or* cell (surface) membrane of, 'first cell' entered directly from xylem / **AW**

5 via plasmodesmata **;** *ignore ref. to mechanism*

6 (includes) vacuolar pathway / (through) vacuoles **;**

apoplast

7 non-living pathway **; ora**

8 *ref.* greater volume / higher rate / less resistance / **AW ; ora**
A faster / fastest **R** amount *for volume*

9 *ref. to*, hydrogen bonding / adhesion, to cell walls **;** [max 4]

(d) (i) (maintain) turgor / turgidity / prevents flaccidity / prevents plasmolysis **;**
A provides support for cell **R** provides support for plant
A pushes chloroplast to edge (of cell)

(reactant in) photosynthesis **;**

hydrolysis (reactions) **; A** named reaction that involves hydrolysis solvent
A (medium) for cell, / metabolic / chemical, reactions (to take place)
R *if in context of outside cell or entering cell or as a transport medium* [max 2]

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AVP ;
e.g. stabilizing, cell wall / proteins / nucleic acids / membranes **;**
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DNA, synthesis / replication **;**
ref. to role in, light absorption / capture (for photosynthesis) **;** [max 1]

[Total: 11]

4 **(a** water moves <u>down</u> water potential gradient ; **A** high(er) to low(er) water potential / less negative to more negative water potential
apoplast pathway / through cell walls ;
symplast pathway / through, plasmodesmata / cytoplasm ;
evaporation ;
from <u>spongy</u> <u>mesophyll</u> <u>cell</u> <u>walls</u> ;
into (substomatal / intercellular) air space ;
diffusion of water vapour ; **A** diffusion of water if evaporation used in correct context elsewhere
through stomata ; [4 max]

(b) *explanation must correctly relate to structure before marks can be awarded*
any three from the following six pairs
either
cellulose, cell wall / lining ;
allows adhesion of water ;
or
<u>thick</u> (cellulose) cell wall ;
prevents collapse / idea of providing support (under tension) ;

either
lignin ;
waterproofing / prevents water loss ;
or
lignin ; **A** rings / spirals / thickening / AW (of walls)
prevents collapse / idea of providing support (under tension) ;

no cytoplasm / lack of contents / hollow / empty lumen ; **R** dead
less resistance to / unimpeded / uninterrupted / unhindered / ease of / AW, flow / AW ;
A greater volume per unit time / faster rate **R** continuous, smooth

lack of end walls / continuous tube ;
less resistance to / unimpeded / uninterrupted / unhindered / ease of / AW, flow / AW ;
R continuous, smooth

pits / pores ; **R** holes
lateral movement / movement around air bubbles / supplies (water) to (surrounding), cells / tissues ;

wide / large diameter / large lumen ;
so large volume of water can be transported ; [6 max]

[Total: 10]