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## **A2 Biology OCR**

# **Unit F214: Communication, Homeostasis and Energy**

## **Module 3.1 Photosynthesis**

## **Answers**

1. **A** - stroma ; **A** ribosome  
**B** - (outer/ inner) membrane / (chloroplast) envelope ; **R** cell membrane  
**C** - thylakoid / lamella ; **A** lamellae  
**D** - granum / granal stack ; **A** grana **A** thylakoid stack

[4]

2. (primary) act as reaction centres/where electrons are excited;  
 (accessory) other part of photosystem/antenna unit/surround reaction centre;  
 (accessory) absorb different wavelengths of light (not absorbed by primary);  
 (accessory pigments) transfer energy to primary pigments;  
 names of primary (chl a, P680, P700) and accessory pigment  
 (chl b, carotenoid);

max 2

[2]

3. (i) light absorbing/AW;  
 ref to excited electrons/AW;  
 used in light dependent stage;  
 ref. to location; e.g. chloroplasts, thylakoids,  
 photosystems, grana, lamellae  
 AVP; e.g. (long) hydrocarbon chains,  
 different pigments absorb different wavelengths.

max 3

- (ii) high absorption of, wavelengths 450 – 480 nm/  
 blue region of spectrum;  
 high absorption of, wavelengths 660 – 710 nm/  
 red region of spectrum;  
 low absorption of, wavelengths 500 – 620 nm/  
 green region of spectrum;

*for each marking point accept single figure in range.*

*If candidate gives range it*

*must fall within the range on the mark scheme.*

*only penalise lack of units once.*

max 2

[5]

4. (a) (i) chlorophyll; *treat refs to a and b as neutral* 1  
 (ii) electron carrier / cytochrome / protein / electron acceptor / ferredoxin /  
 plastoquinone; 1

(b) hydrogen ions are moved into the thylakoid space by action of electron carriers;

higher concentration of / more, hydrogen ions / protons reduces the pH;

**R** *hydrogen, H*

**A** *hydrogen ions produced in lumen*

hydrogen ions, move / diffuse, down concentration gradient;

across / through, (thylakoid) membrane / from lumen to stroma;

through ATP synthetase / synthase / protein channel / stalked particles;

generates ATP;

AVP; e.g. ref. to by chemiosmosis

ref. to an electrochemical gradient / proton motive force

max 4

[6]

5. **1** non-cyclic photophosphorylation;  
**2** ref to photosystems 1 and 2 being involved; **A** *PS1 and 2/P700 and P680*  
**3** excited electrons emitted/AW;  
**4** ref to electron acceptor molecules;  
**5** (electrons pass along) chain of, electron carriers/ETC/cytochromes;  
**6** occurs in, thylakoid membranes/grana/lamellae;  
**7** sets up a, proton/H<sup>+</sup>/hydrogen ion/pH gradient; **A** *proton pump idea*  
**8** ref to ATP synth(et)ase; **A** *ATPase, stalked particle*  
**9** ref to, proton motive force/flow of protons;  
**10** chemiosmosis;  
**11** formation of ATP;  
**12** movement of electrons from PS2 to PS1;  
**13** ref to photolysis;  
**14** movement of electrons from water to PS2;  
**15** cyclic photophosphorylation;  
**16** PS1 only;  
**17** AVP; e.g. named electron acceptors, named electron carriers, ref. to water splitting enzyme, ref to position of photosystems.(PS1 intergranal membrane and PS2 grana)

max 8

**QWC – clear well organised using specialist terms;**

1

[9]

6. 1 occurs in stroma;  
 2 a series of enzyme-controlled reactions;  
 3 carbon dioxide fixed by RuBP;  
 4 carboxylation;  
 5 enzyme is Rubisco;  
 6 (unstable) 6C intermediate;  
 7 forms (2 molecules) of GP;  
 8 forms TP;  
 9 using ATP (linked to point 8);  
 10 reduction step;  
 11 using reduced NADP;  
 12 ref to either ATP or NADP red coming from light dependent reaction;  
 13 (most of) TP regenerates RuBP;  
 14 rearrangement of carbons to form pentose sugars;  
 15 ATP required, for phosphorylation / ribulose phosphate to ribulose biphosphate;  
 16 AVP; e.g. TP can be used to form, lipids / amino acids / hexose sugars / suitable named example max 7

**QWC – legible text with accurate spelling, punctuation and grammar;** 1

[8]

7. (i) light intensity; 1  
 (ii) some other factor becomes limiting;  
 carbon dioxide or temperature (linked to point 1); 2

[3]

8. 1 denaturing of enzyme;  
 2 change in shape of active site;  
 3 named photosynthetic enzyme;  
 4 less photolysis;  
 5 less ATP produced;  
 6 named step in Calvin cycle which is affected; **A** step described  
 7 increase in rate of respiration;  
 8 respiration occurring at faster rate than photosynthesis;  
 9 temperature compensation point;  
 10 increased rate of transpiration;  
 11 stomatal closure;  
 12 less carbon dioxide uptake;  
 13 AVP; e.g. ref to photorespiration 4  
 max

[4]