

1. (a) (i) In context of ATP formation
light raises energy level of / excites electrons;
pass through carriers;
energy released;
ATP formed from ADP + P;
In context of producing reduced NADP
protons / H⁺ ions;
from photolysis / water;
electrons; max 5
- (ii) GP converted to triose phosphate / GALP;
this involves reduction;
reduced NADP provides reducing power / hydrogens;
ATP supplies energy for this reaction;
phosphate from ATP;
for production of RuBP; max 4
- (b) Membranes / (disc) shape provides large surface for light absorption;
layering of membrane allows a lot of pigment;
(permeable) membrane allows diffusion of gases / carbon dioxide;
membranes provide surface for attachment of electron / hydrogen acceptors;
stroma / matrix containing enzymes for Calvin cycle /
light-independent reactions; max 3
- [12]**
2. (a) (i) 5 3 3 6; 1
- (ii) Stroma; 1
- (iii) GP (accumulates as) cannot be converted to triose phosphate;
since this requires ATP / reduced NADP /
products of light-dependent reaction; 2
- (b) Provides protons / hydrogen ions / H⁺;
for reduction of NADP;
OR
provides electrons;
which replace those lost from chlorophyll / photosystem (I or II); 2
- [6]**
3. (a) (i) (Few species adapted to) hostile/harsh environment/colonising bare/
volcanic/fresh rock/little/no soil/water/humus; 1
- (ii) Colonisers erode rock/release minerals;
add (more) humus/increase nitrate content/organic material;
when colonisers die/decompose; max. 2

(b) More/less *competition*; 1 [4]

4. (a) Light absorbed by/strikes, chlorophyll/photosystem/PSI/PSII;
electrons excited;
pass down chain of carriers;
energy released/transferred;
producing ATP from ADP and phosphate;
reduced NADP/formed with electrons;
photolysis of water /allow light splits water;
(water) supplies protons/H⁺ ions to reduce NADP; max. 5

(b) RuBP converted to GP;
RuBP as carbon dioxide acceptor/combines with carbon dioxide;
GP converted to triose phosphate/TP/GALP;
this reaction is a reduction;
reduced NADP provides hydrogen;
ATP provides energy;
some triose phosphate/TP/GALP converted to glucose/carbohydrate;
some triose phosphate used to produce RuBP
ATP supplies phosphate for this reaction; max. 6

(c) Both processes involve:
Transfer of energy/conversion of energy from one form to another;
Use and produce ATP;
chain of electron carriers;
located on membranes;
detail of process (eg ref to chemiosmotic theory);
involve cycle of reactions;
oxidation and reduction/redox reactions involved;
and coenzymes;
processes are controlled by enzymes; max. 6
some common intermediates/GALP is common to both;

[17]

5. (a) (i) Correct answer (0.5%) awarded two marks;;
answer involving decimal point in wrong place but derived
correctly / correct working only awarded 1 mark 2

(ii) Some fails to encounter chloroplasts/chlorophyll in producers
(e.g. some absorbed by water);
reflection;
inappropriate wavelength; max. 2

- (b) Only a certain amount of light energy available / not enough energy left; respiratory loss between each trophic level / loss in faeces; 2
- (c) Incorporated in tissues of decomposers; passed on to other organisms in decomposer food chain; lost in respiration by decomposers; max. 2
- (d) (i) Excites/raises energy level of electrons; which pass to carriers/leave chlorophyll; 2
- (ii) Fall in production of triose phosphate/no more triose phosphate produced; triose phosphate production requires ATP/reduced NADP; produced during passage of electrons along electron transport chain; 3
- (e) Energy is available more rapidly because released in single reaction / does not go through as many processes; ATP releases its energy in small/manageable quantities; 2
- (f) (i) Activity / needs of cell linked to level of ATP / ADP ; link made between high level of one and low level of the other; level of ADP linked to electron transport and ATP production; 3
- (ii) Energy released as heat; because not used to produce ATP; 2

[20]

6. (a) (i) 3; 1
- (ii) Reduced NADP: to reduce GP / add H (to GP); *NOT just 'convert GP to TP'*
- ATP: supply energy; 2
NOT 'to supply phosphate' / to phosphorylate / produce energy / make energy
- (b) (i) (Radioactivity in) GP before in TP; *'It' / 'that' = ambiguous, unless qualified* 1
- (ii) RuBP becomes radioactive / RuBP is formed; 1
20s line copied from table = no marks
20s line with arrows (RuBP' (RuBP = one mark
Time comparison e.g. 15-20s re RuBP = one mark

[5]

7. (a) (i) B – higher standard deviation; (*extras CANCEL*) 1
- (ii) 1st: A (*no mark*)
- 2nd: Limpets have smaller H/W / smaller mean;
Limpets have (relatively) large foot area;
Better grip on rock; 3
- (b) (i) Need representative / ‘typical’ / ‘reliable’ / ‘valid’ value / anomalies
less significant / chance variations less significant;
Random sampling overcomes bias / independent of observer;
Ignore ‘fair’ / ‘accurate’ 2
- (ii) Use of quadrat / nearest limpet to... ;
Grid / described – e.g. tape measures / walk to random coordinates;
Method of obtaining random coordinates – tables / calculator; 3
- (c) *Any six from:*
- Yellow / green OR approx. 500-600mm
1. Penetrates water better;
 2. Absorbed by phycoerythrin ;
 3. Red seaweeds have phycoerythrin;
 4. Red seaweeds photosynthesise in deep water;
- Blue AND red OR approx. 460 and 670mm
5. Penetrate water poorly;
 6. Absorbed by chlorophyll;
 7. Green have only chlorophyll;
 8. Green seaweeds can’t photosynthesise in deep water
 9. Red seaweeds have less competition from green in deeper water /
converse in shallow water; 6 max
8. (a) 1 and 3; 1
- (b) Some energy lost as heat; 1
- (c) (i) Arrow indicates between Glucose to Triose phosphate;
- (ii) Arrow indicates between Triose phosphate to Pyruvate; 2
[Note: Extra arrow cancels]
[Reject: Ambiguous labels /arrows]

[15]

- (d) 4; 1
- (e) (i) Grana/ thylakoids/ internal membranes; 1
(ii) Reduces/ reducing power/ source of hydrogen/ electrons;
Glycerate-3-phosphate to Triose phosphate/ GP to TP; 2
[Ignore: Reference to molecules]
- (f) (i) To show chloroplasts responsible for change; 1
(ii) Photolysis/ light splits water molecule/ excitation of chlorophyll:
Electrons released;
Electrons reduce DCPIP/ DCPIP becomes colourless;
So can only see (green) colour of chloroplasts/ chlorophyll; max 3
- (g) (i) Mitochondria are sites of (aerobic) respiration/ active in dark;
Reactions also release hydrogen ions/ electrons;
(Tube B) would also become green/ reduce DCPIP (if responsible);
[Reject: Colourless] [Reject.- Converse argument]
OR Tube B shows light is necessary for colour change;
Mitochondria do not have pigment to absorb light/ chlorophyll; max 2
- (ii) Only one set of results/ not repeated; 1
[Reject: Need more results]

[15]

9. (a) (Energy release) only involves a single reaction/one-step/
(energy released) in $ATP \rightarrow ADP (+P_i)$ /
energy transfer direct to reaction requiring energy; 1
[Ignore: reference to speed] [Reject: "not many steps"]
- (b) Any two from:
Need more ATP (than can be produced in photosynthesis)/not enough;
Photosynthesis cannot produce ATP in dark;
Cannot be produced in cells lacking chlorophyll/chloroplasts/
ATP cannot be transported; max 2
- (c) Glycolysis/anaerobic respiration/"fermentation";
Does not occur in mitochondria/takes place in cytoplasm; 2

[5]

10. (a) (i) CO₂ combines with RuBP/with ribulose bisphosphate;
(Product) splits in two/production of two molecules of GP/use
of RubisCo; 2
- (ii) Amount formed = amount broken down/used/reference to Equilibrium; 1
- (b) Any three from:
No ATP made (in dark);
No reduced NADP / NADPH (in dark); [*Note: NOT "NADH"*]
GP not converted (in dark);
TP not formed (in dark); max 3
- (c) (i) During day/light photosynthesis occurs;
(Photosynthesis) uses/takes in CO₂;
[*Accept: converse explanation during darkness*] 2
- (ii) Higher;
Less light/cooler/fewer leaves/CO₂ formed from soil organisms/decay
in soil/respiration in soil; 2
- (d) Wind mixes air (with surrounding air)/removes CO₂/supplies CO₂;
Introduces another variable/makes data unreliable/takes account of wind; 2
- (e) Any three from:
Detritivores/worms/woodlice/other e.g./decomposers/microorganisms/
bacteria/fungi;
Digestion/hydrolysis (of organic matter/of leaves)/decay/decomposition/
rotting;
Respiration;
Releases CO₂; max3

[15]

11. (a) On diagram, correctly labelled:
Light-dependent: granum/thylakoid membranes – labelled 'X'
AND
Light-independent: stroma – labelled 'Y'; 1
- (b) Any two from:
(Water) forms H⁺ /hydrogen ions and electrons/e⁻ ;
O₂/oxygen formed; [*NOT 'O', NOT 'O⁻'*]
(Light) excites electrons / raises energy level of electrons / electrons to
chlorophyll / to photosystem; max 2

- (c) (ATP) Provides energy for GP → TP / provides P for RuP/TP → RuBP;
 (Reduced NADP) Provides H / electrons for GP → TP / reduces GP to TP; 2

[5]

12. (a) Grana/thylakoids/ lamellae; 1

- (b) A = oxygen/O₂
 B = ADP and phosphate/P_i/phosphoric acid/correct formula;
 C = reduced NADP; ALLOW NADPH/NADPH₂ /NADPH + H⁺ 3

- (c) (i) Absorbs light/energy;
 Loses electrons/becomes positively charged/is oxidised;
 Accepts electrons from water/from OH⁻ ;
 Causes more water to dissociate/pulls equilibrium to the right; max 3

- (ii) Electrons raised to higher energy level/electrons excited;
 Use of electron carriers/cytochromes/acceptors;
 For production of ACT [REJECT 'energy production'] 3

- (d) (i) GP formed from RuBP + CO₂;
 GP → TP/sugar-phosphate/sugar/to RuBP;
 GP formed at same rate as it is used; 3

- (ii) No CO₂ to combine with/not enough CO₂ to combine with;
 RuBP not changed into GP/TP;
 RuBP reformed from GP/TP; max 2

[15]

13. (a) (i) chlorophyll molecule/electron gains energy/becomes (excited)/
 is raised to higher energy level;
 chlorophyll molecule loses (excited) electron/becomes
 positively charged; 2

- (ii) energy lost by electrons (is used to — drive” reaction
 between ADP and Pi.); 1

- (b) reduction/described;
 of GP to triose phosphate; 2

[5]

14. (a) Excitation of chlorophyll molecule/electrons/ energy of (pairs of) electrons raised to higher energy level;
 Electron(s) emitted from chlorophyll molecule;
 Electron(s) to electron transport chain;
 Loss of energy by electron(s) along electron transport chain;
 Energy lost by electron(s) is used to synthesise ATP;
 From ADP + Pi; max 5

“By electrons” need not be stated in each marking point if it can be reasonably inferred that the candidate is referring to electrons

- (b) Little green light reaches bottom as absorbed by surface dwellers / water;
 Red and blue not absorbed and so penetrate;
 Variation in pigments of sediment dwellers;
 Bacteria with chlorophyll at an advantage;
 As chlorophyll absorbs red and blue;
 (Survive to) reproduce in greater numbers;
 Pass on advantageous alleles/genes in greater numbers / increase in frequency of advantageous alleles in subsequent generations;
 Increase in frequency/numbers of bacteria with chlorophyll; max. 6

[11]

15. (a) 1. 5C/RuBP combines with CO₂;
 2. to form 3C compound / TP / GP;
 3. using ATP;
 4. and reduced NADP / eq;
 5. 2 molecules of 3C compound/ TP / GP form hexose;
 6. all RuBP is regenerated;
 7. 10 molecules of 3C/TP/GP form 6 molecules of 5C/RuBP; 6 max

- (b) 1. electron transport chain accepts excited electrons;
 2. from chlorophyll / photosystem;
 3. electrons lose energy along chain;
 4. ATP produced;
 5. from ADP and P_i;
 6. reduced NADP formed;
 7. when electrons (from transport chain) and H⁺ combine with NADP;
 8. H⁺ from photolysis; 6 max

- (c) 1. some hexose/biomass/eq. used in respiration; *growth cancels this point*
 2. CO₂ produced (is lost to air);
 3. some parts of the plant are eaten;
 4. some parts lost to decomposers / in leaf fall; 3 max

[15]

16. (a) Large surface area to collect solar energy;
transparent nature of cuticle to allow light penetration;
position of chlorophyll to trap light;
stomata to allow exchange of gases;
thin / max. surface area to volume ratio for diffusion of gases;
spongy mesophyll / air spaces for carbon dioxide store;
xylem for input of water;
phloem for removal of end products; max. 3

(b) (i) water:
provides hydrogen;
to reduce NADP;
provides electron;
to stabilise / reduce chlorophyll; max. 2

(ii) light :
excites / oxidises / removes an electron from chlorophyll /
photosystem;
photophosphorylation / ATP produced;
electron used in reduction of NADP; max. 2

(iii) Ribulose bisphosphate:
carbon dioxide acceptor;
forms GP; max. 2

(c) Enzymes are involved;
extra kinetic energy / molecules move faster;
molecules collide more often / more enzyme - substrate complexes
formed;
increased rate of diffusion of raw materials; max. 3

[12]

17. (a) (i) To avoid bias/obtain representative sample/
so that statistical tests can be applied to results; 1

(ii) Divide area with a grid/place axes at right angles;
Use random numbers/obtained by specified method;
To obtain coordinates for placing quadrats; max 2

(b) More closely related to economic/ecological effect of worms/
Information not distorted by large number of very small worms; 1

(c) Low temperatures reduce feeding/max feeding activity at 10 °C;
Enzymes relatively inactive;
Also feed less at high temperatures;
Food required for (growth and) reproduction; max 3

[7]

18. (a) (i) 2

	<i>Light dependent stage</i>	<i>Light independent stage</i>
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<i>Raw materials</i>		Carbon dioxide and ribulose biphosphate/ RuBP;
<i>End products</i>	Reduced NADP and oxygen;	

(ii) reduced NADP provides the hydrogen to change GP to TP/reduces GP; ATP provides the energy to resynthesise ribulose biphosphate/change / reduce GP /synthesise hexose; 2

(b) (i) kinetic effect / molecules move faster / more kinetic energy; more collisions; more enzyme -substrate complex formed / more binding to active site; max. 2

(ii) breaking of (correct) bonds in enzyme molecule; shape of active site changed / denaturation; substrate does not bind / attach to enzyme; max. 2

[8]

19. (a) Glycolysis/oxidation; 1

(b) Reduced NAD/NADH or other appropriate expression; ATP; 2

(c) (i) Stroma; 1

(ii) Combines with/accepts carbon dioxide; 1

[5]

20. (a) (i) Carbon dioxide taken up in photosynthesis; Temperature/light limits rate of photosynthesis; 2

(ii) No photosynthesis at midnight/CO₂ not used for photosynthesis; Smaller/no CO₂ diffusion gradient; stomata closed; max 2

(b) Woodland plants can photosynthesise at lower light intensity; 1

- (c) Thinner epidermis;
 Less light absorbed/more light passes through
 Thinner palisade;
 chloroplasts nearer leaf surface/light does not have to penetrate so far; 3

[8]

21. (a) (i) Water and carbon dioxide/H₂O and CO₂; 1
 (ii) Releases energy on breakdown/hydrolysis;
 Uses energy from other reactions to form;
 Can be readily moved/stored/broken down when needed;
 Allows energy to be released in suitable amounts; max 2

- (b) (i) RuBP + CO₂ →(2) GP; 1
 (ii) RuBP still being produced;
 But no carbon dioxide for it to react with/to form GP; 2

[6]

22. (a) 19.8%/20%; 1

- (b) (i) large amounts lost by leaching/denitrification/ammonia release/
 input from fixation/food insufficient for needs of plants/animals/ 1
 (ii) decrease, because nitrogen fixation by bacteria makes more available; 1
 (iii) nitrate/phosphate enters into the surrounding rivers /ponds;
 possible eutrophication/ excessive plant growth/algal blooms;
 high phosphate causing blue - green blooms/
 high nitrate giving blue - green blooms;
 excess plant growth exceeds supply of mineral salts;
 death and decay of plants by microorganisms/decay increases BOD;
 oxygen depletion causes death of fish/fresh water animals; max.4

[7]

23. (a) 3

✓	✓	X
✓	X	✓
✓	X	X

Mark down

Hybrids between ticks and crosses are ambiguous and not acceptable

- (b) Flowering plants use water as a source of hydrogen:
Flowering plants have chloroplasts/membrane-bound organelles:
Plants release oxygen as a waste product: max 2
- [5]**
24. (a) Glycolysis;
Glucose / hexose sugar (or phosphorylated) and pyruvate (or triose phosphate / GP/PGA). 2
- (b) Light-independent reaction / Calvin cycle;
Ribulose biphosphate (RUBP) and carbon dioxide. 2
- (c) Light-independent reaction / Calvin cycle;
Glycerate-3-phosphate / TP and glucose / hexose (phosphate). 2
- [6]**
25. (a) (Radioactive) carbon dioxide is used / incorporated;
New compound(s) / intermediate(s) / names egs formed /
become labelled; 2
- (b) (i) Because stops reaction(s)/ process / pathway / enzyme action /
kills algal cells; 1
- (ii) Because reactions occur quickly
OR need to remove samples after short / precise time; 1
- (c) Q → R → S → P ; 1
- (d) Idea of cycle (or equivalent);
Compound Q is used / reformed;
*If either above present allow identification of possible Q as: G3P /
PGA / triose phosphate / GALP / RuBP
Any two from three (noting special arrangement re. third point)* 2
- [7]**
26. (a) X = grana/lamellae/thylakoid (membranes);
Y = stroma; 2
- (b) NADPH₂ / NADPH / reduced NADP / reduced coenzyme;
ATP; 2
- (c) carbon dioxide/CO₂; 1

	(d)	(i)	stroma; NOT “Y”	1	
		(ii)	production/breakdown of <u>starch</u> (or equivalent);	1	[7]
27.	(a)	(i)	reduced NADP/NADPH; ATP;	2	
		(ii)	reduced NADP reduces G3P (to sugar); ATP supplies (extra) energy for reaction;	2	
	(b)	(i)	chloroplast has (and bacterium does not)/ no cell wall; two membranes surrounding chloroplast; grana/thylakoids; starch granules;	2 max	
		(ii)	source of hydrogen/used instead of water; for light-dependent reaction/reducing NADP; source of electrons for chlorophyll/electron transport chain;	2 max	[8]

28. (a)

	Process	
	Respiration	Photosynthesis
Name of coenzyme	NAD	NADP
Stage in the process where coenzyme is reduced	<i>Glycolysis and link reaction/Krebs cycle</i>	<i>light dependent</i>
Stage in the process where coenzyme is oxidised	<i>electron transport chain</i>	<i>light independent</i>

1st column,
glycolysis and Krebs cycle/link reaction;
oxidative phosphorylation/ETC;

2nd column,
light dependent, then light independent;

3

(b) used to reduce G3P;
to sugar/triose phosphate/fructose/glucose;

2

[5]

29. (a) the more light absorbed, the greater the rate of photosynthesis;
light provides the energy for light dependent reactions / photolysis /
light independent reactions / production of reduced NADP /
exciting electrons in chlorophyll;
(do not give credit if energy is used in photosynthesis)

2

(b) count the number of bubbles / measure the volume of gas / measure the
change in pH / carbon dioxide / hydrogen carbonate ions;
(credit oxygen produced)

1

- (c) 530 – 630 nm; (any values within this range)
 limited absorption of light / (green) plants reflect green light /
 limited photosynthesis at these wavelengths of light; 2
(allow references to no light absorbed or no photosynthesis)
- (d) (i) chlorophyll excited / reduced NADP formed;
electrons from chlorophyll / reduced NADP changes the dye colour; 2
- (ii) ADP and phosphate needed to produce ATP / ATP is a product of
 the light dependent reactions;
 ADP levels are a limiting factor; 2
*(must explain the idea of limiting factors – do not credit answers
 like more ADP causes more photosynthesis)*

[9]

30. (a) (i) RuBP – 5; GP – 3; TP – 3; Glucose – 6;
(all correct = 2 marks; 3 or 2 correct = 1 mark) 2
- (ii) stroma; 1
- (iii) light-dependent reaction / (photo)phosphorylation;
(accept photolysis) 1
- (iv) 5 out of 6 / 83% / equivalent; 1
- (b) enzymes involved / not a photochemical reaction;
 slow rate of enzyme/chemical reaction at low temperature /
 less kinetic energy / fewer collisions; 2

[7]

31. (a) adding CO₂ decreases pH / makes more acid
 OR removing CO₂ increases pH / makes more alkaline;
*(credit anywhere but do not credit this mark if stated that oxygen is
 an alkaline gas)*
 rate of photosynthesis > rate of respiration in **A**;
 respiration only in **B**;
 rate of photosynthesis = rate of respiration in **C**; 4
- (b) (i) shows that indicator alone does not change colour in light; 1
- (ii) so that all tubes receive same amount of heat 1

[6]

32. (a) (i) pigment reflects/does not absorb green or yellow or orange;
pigment absorbs blue or violet;
pigment absorbs red; 1
(accept correct wavelengths instead of colours)
(any 2 for 1 mark)
- (ii) light (energy) absorbed by chlorophyll;
raises energy level of electrons / electrons are excited/emitted;
ATP formed; 3
- (b) more wavelengths / colours absorbed;
more (efficient) photosynthesis can occur at these depths / low light intensities
or
more (efficient) photosynthesis can occur when some wavelengths are not
present; 2 [6]
33. (a) electrons;
from chlorophyll / photolysis; 2
- (b) (i) RuBP combines with carbon dioxide to produce 2 x GP; 1
(ii) less used to combine with carbon dioxide /
less used to form glycerate 3-phosphate; 1
- (c) (i) used in photosynthesis allows detection of products; 1
(ii) ATP and reduced NADP not formed;
GP is not being used to form RuBP / is being formed from RuBP; 2
(iii) used in respiration / formation of starch / cellulose; 1 [8]
34. (a) ✓ ✓ x;
x x ✓;
✓ ✓ ✓
✓ x x 4
- (b) (i) pyruvate/succinate/any suitable Krebs cycle substrate; 1
(ii) ADP and phosphate forms ATP;
oxygen used to form water / as the terminal acceptor; 2

- (iii) Y X W Z;
order of carriers linked to sequence of reduction / reduced
carriers cannot pass on electrons when inhibited; 2

[9]

35. (a) (i) Some carbon dioxide will be produced in respiration;
Used in photosynthesis; 1 max

- (ii) Rate of increase of photosynthesis decreases/curve flattens;
Something other than carbon dioxide concentration/temperature/
Light becomes limiting; 2

*Q answers which describe the rate of photosynthesis decreasing
should not be awarded credit*

- (b) Link establishes between carbon dioxide concentration, photosynthesis
and yield of grain;
Link established between carbon dioxide and global warming;
As curve starting to flatten (at current carbon dioxide) concentrations
Increase in yield may not be very large;
Other factors/named factor linked to higher carbon dioxide
concentration/temperature might have adverse effect;
Harvest will be earlier as identified stages become shorter;
Although not significant as already at higher temperatures; 4 max

[7]

36. (a) Glycolysis;
Glucose and pyruvate/pyruvic acid; 2

- (b) Light-independent reaction;
Ribulose biphosphate/RuBP and carbon dioxide; 2

- (c) Light-independent reaction;
Triose phosphate and glucose/hexose; 2

*Q Do not accept sugar or carbohydrate as alternative for
glucose*

[6]

37. (a) 1 Sample of ground beetles captured and counted (a);
 2 Released and second sample captured;
 3 Count total number of beetles (B) and number marked (b);
 4 Total population (A) estimated from the relationship $\frac{a}{A} = \frac{b}{B}$;
 5 Detail of method e.g. pitfall trap/marketing with tippex;
 6 Refinement to ensure greater accuracy e.g. large number/
 marking in position such that does not affect survival; 5 max

- (b) 1 Mowing prevents growth of woody plants;
 2 By cutting off growing point;
 3 The longer the interval between mowing, the further succession
 can progress;
 4 With frequent mowing diversity of plants will be less;
 5 Fewer insect inhabitants/niches available; 5

Q Since this is an ecological question, use of appropriate ecological terminology is expected. Credit such terms as producer, consumer, habitat, and niche. Do not credit inappropriate terminology such as “places” to live and “fighting for food”.

- (c) 1 Higher carbon dioxide concentration at night/during darkness;
 2 Photosynthesis only takes place during light;
 3 Photosynthesis removes carbon dioxide and respiration adds
 carbon dioxide;
 4 Respiration taking place throughout 24 hours;
 5 Quantitative consideration such as that in plants overall
 photosynthetic rate greater than respiration rate;
 6 Human effect such as additional carbon dioxide from heavy
 daytime traffic/street lighting could prolong photosynthesis; 5 max

[15]