

Mark schemes

Q1.

- (a) (overall) increase (in concentration of CO<sub>2</sub>) 1
- (overall increase) by 54 (arbitrary units)  
*allow in range 45 to 65 (arbitrary units)*
- or  
from 364 to 418 (arbitrary units)  
*allow from 357 to 422 (arbitrary units)*  
*allow other correct data* 1
- peaks and troughs  
*allow description* 1
- each cycle is 1 year
- or  
variation per cycle is 8 to 16 (arbitrary units)  
*allow multiples such as 5 cycles every 5 years*  
*allow answer in range 8 to 16 (arbitrary units)* 1
- (b) combustion 1
- allow a named example such as burning (named) fuels*  
*or driving cars*  
*or power stations*  
*ignore factories unqualified*
- deforestation 1
- allow a description*  
*allow human activities that decrease carbon dioxide concentration such as tree-planting or growing crops*  
*if no other mark awarded allow respiration for 1 mark*
- (c) Level 2: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account. 3-4
- Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1-2

No relevant content

0

Indicative content

- (higher CO<sub>2</sub> concentration causes) global warming
- plants photosynthesise faster
  - due to more CO<sub>2</sub>
  - due to higher temperature
- temperature rise causes changes in rainfall patterns or extreme weather conditions such as storms
- less rainfall causes desertification
  - many plant species die out
  - many animal species lack food and die
  - other (drought-adapted) plants become more common
- more rainfall causes flooding
  - loss of habitat
  - may lead to extinction
- temperature rise melts (polar) ice caps or glaciers
  - causes flooding
  - loss of habitat
  - may lead to extinction
- changes in animal / bird migration patterns / times or changes in distribution of animals

[10]

Q2.

(a)

$$\frac{6.0}{1.6}$$

*allow a range of 5.9 to 6.1 for 6.0*

1

3.75

*do not accept if a unit is given  
if no other marks awarded, allow a correct answer using a value of 5.8 or 6.2 for 1 mark*

1

(b)

$$\frac{2.5 - 1.6}{50}$$

*allow*

$\frac{0.9}{50}$	1
0.018 (billion per year)	1
(c) suitable extrapolation line drawn on the graph. <i>allow straight extrapolation</i>	1
reading taken at 2050 from student's line <i>allow a tolerance of <math>\pm \frac{1}{2}</math> small square</i> <i>allow 1 mark for 10 billion if no extrapolation drawn</i>	1
(d) fewer fish caught or limit the number of fish caught <i>allow a method of doing this, eg</i> <i>increase mesh size or do not catch young fish</i>	1
(remaining fish) can reproduce <i>allow more fish (survive to) reproduce</i>	1
(e) Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4-6
Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-3
No relevant content	0
Indicative content	
human land use	
<ul style="list-style-type: none"> <li>• increasing population requires more food</li> <li>• crops / livestock for food</li> <li>• farming crops for biofuels</li> <li>• peat use as compost</li> <li>• peat use as fuel</li> <li>• increased use of pesticide / insecticide / herbicide / fertilisers</li> <li>• use of free-range / organic methods increases land use (for same yield)</li> </ul>	
link to biodiversity	
<ul style="list-style-type: none"> <li>• deforestation</li> <li>• monocultures</li> <li>• loss of hedgerows to make fields larger</li> <li>• loss of habitat</li> </ul>	

- consequence of loss of habitat e.g. (change in) migration
- fertiliser run off polluting water
- use of pesticide / insecticide / herbicide reduces insects / plants
- which damages food chains
- more soil erosion

link to atmospheric pollution

- more carbon dioxide (from farm animals / machinery)
- more methane (from cows)
- climate change or global warming
- example of impact on biodiversity
- acid rain
- desertification

Answers referring to only land use or only biodiversity are level 1

(f) golden rice has improved nutritional value

1

(g) any one from:

- gene may contaminate / enter other breeds / species
- reduction / extinction of population of wild / traditional rice
- reduction / extinction of population of flowers / insects
- high cost of seeds

*allow decrease in biodiversity*

- may have too much vitamin A (in diet)

*allow decrease in gene pool*

*allow may harm (human) health*

*allow may cause side effects (on humans)*

*ignore references to religious beliefs*

*ignore may harm humans unqualified*

1

[16]

Q3.

(a) Raphus

1

(b) any two from:

- humans hunted / killed / ate the dodo or dodo easy to catch
- humans ate / collected eggs
- humans ate the dodo's food
- animals brought by humans ate dodo / eggs

*allow examples – eg cats / dogs / pigs / rats*

- diseases introduced by humans or by imported animals
- humans destroyed dodo's habitat / nests

*allow deforestation*

2

(c) any one from:

<ul style="list-style-type: none"> <li>• growing crops / biofuels <i>allow farming / agriculture</i></li> <li>• grazing animals</li> <li>• building houses <i>allow other correct examples – eg building roads</i></li> <li>• quarrying / mining</li> <li>• dumping waste</li> </ul>	1
(d) there is less photosynthesis	
the trees are burned	1
	1
(e) increase	1
(f)	
<i>an answer of 270 scores 2 marks</i>	
9 × 30	1
270	1
(g) Level 2: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3-4
Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1-2
No relevant content	0
Indicative content	
<ul style="list-style-type: none"> <li>• displaced animals can move to adjacent areas</li> <li>• where suitable habitat is found or where the trees have not been cut down</li> <li>• seeds return to deforested area</li> <li>• from other (forested) areas</li> <li>• plants / trees begin to grow back</li> <li>• so provide food / shelter / nest sites / suitable habitat for animals</li> <li>• animals return to re-growing area</li> <li>• from other (forested) areas</li> <li>• sufficient time for regeneration</li> <li>•</li> </ul>	

- old growth area is a source of recolonising organisms

[13]

Q4.

(a) primary consumer

1

(b) correct shape: 4 tiers with largest at bottom and smallest at top

1

correctly labelled:

dragonfly / nymph

+ hydra

+ daphnia

+ algae

*in this order*

*or allow:*

*3rd-order or tertiary consumer or apex / top predator or (trophic level) 4*

*2nd-order or secondary consumer or (trophic level) 3*

*1st-order or primary consumer or herbivore or (trophic level) 2 producer or (trophic level) 1*

*allow for 2 marks inverted pyramid if correctly labelled*

1

(c) any one from:

(Daphnia biomass smaller because)

- non-digestible parts (of algae) or lost in faeces

*ignore waste*

- not all absorbed
- lost in urine / urea
- used in respiration or lost as carbon dioxide / CO<sub>2</sub>

*allow excretion*

*allow (to supply energy) for movement /*

*warmth*

*allow used to supply energy*

- algae not all eaten or eaten by other organisms
- some algae decompose

1

(d)

*an answer of 14 000 scores 2 marks*

14

1

14 000

*allow evidence of an incorrectly calculated mean  $\times 1000$*

- allow  $1.4 \times 10^4$*  1
- (e) *an answer of  $2.625 \times 10^4$  or  $2.63 \times 10^4$  or  $2.6 \times 10^4$  scores 4 marks*  
*an answer of 26250 scores 3 marks*  
*allow ecf from part (d)*
- (volume of pond =) 1.875 or  $2.5 \times 1.5 \times 0.5$   
*an incorrect answer for one step does not prevent allocation of marks for subsequent steps* 1
- $14\ 000 \times 1.875$   
*allow ecf from part (d)* 1
- 26250 1
- $2.625 \times 10^4$   
*allow  $2.63 \times 10^4$  or  $2.6 \times 10^4$*  1
- (f) increased (growth / reproduction of) algae 1
- (more algae so) more food for Daphnia  
*allow fertiliser toxic to Hydra (1) (so)*  
*fewer Daphnia eaten (1)* 1
- (g) (Hydra have) less food 1
- because (graph shows) fewer Daphnia (with more fertiliser)  
*allow other valid suggestions, eg*  
*fertiliser toxic to Hydra (1)*  
*or*  
*fertiliser causes growth of algae (on surface) which block light and so die and decay*  
*or*  
*eutrophication (1)*  
*(decay / eutrophication) uses up oxygen*  
*(so lack of oxygen for Hydra) (1)* 1

[14]

Q5.

(a)

1960 – 1977	1977 – 2003	2003 – 2015
-------------	-------------	-------------

trend in carbon dioxide concentration		increasing	increasing	1
trend in air temperature	decreasing	increasing	constant / decreasing	1

*allow synonyms e.g. level / goes up / goes down*

- (b) traps heat / energy or (long-wavelength / IR) radiation  
*do not accept light / UV*

or  
less loss of heat

*allow stops (some) heat escaping  
do not accept stops all heat escaping*

or  
insulates

*ignore greenhouse effect  
ignore reference to ozone layer*

1

- (c) Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3-4

Level 1: Relevant points are made. They are not logically linked.

1-2

No relevant content

0

Indicative content

for the theory:

- (overall increased CO<sub>2</sub> parallels) overall increased temperature (e.g. by 0.4 °C)
- CO<sub>2</sub> traps (long-wave) radiation / IR / heat

against the theory:

- in some years (e.g. 1960–1977) temperature falls (while CO<sub>2</sub> is rising)
- many (large and small) erratic rises and falls in temperature
- overall correlation does not necessarily mean a causal link other (unknown) factors may be involved in temperature change

to access level 2 there must be evidence both for and against the theory and use of data from the graph

- (d) burning of (fossil) fuels

*allow e.g. coal / oil / gas  
allow driving cars*



*allow any activity which leads to burning  
fuels – e.g. using central heating  
ignore power stations unqualified  
ignore burning / fires unqualified  
ignore deforestation*

1

(e) photosynthesis

*allow full description or full equation  
allow a symbol equation which is not  
balanced*

1

(f) any two from:

- (some) plants grow faster / higher yield
- loss of habitat
- migration or change in distribution\*
- extinction\*

*\*if neither is given allow alters  
biodiversity for 1 mark*

*allow (in terms of extinction) death due  
to e.g. lack of water / food or increased  
disease*

*ignore death unqualified*

*allow points made using examples*

2

[11]

Q6.

(a)  $(140 + 240 + 380 + 450 = )$  1210

1

(b) the local people decided to farm cattle

1

a company starts growing plants for biofuels

1

(c) carbon dioxide

*in this order only*

1

photosynthesis

1

(d) animals and birds migrate because there is less food

1

more habitats are destroyed

1

(e) any one from:

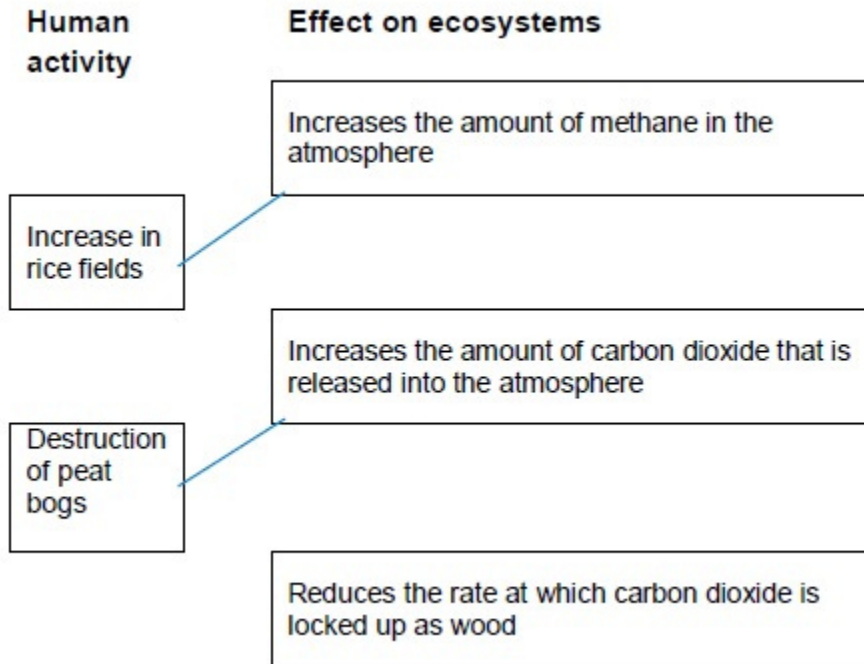
- breeding programmes (for endangered species)
- regeneration (programmes)

- reintroduction of field margins / hedgerows
- awareness raising with politicians / public
- recycling

1

[8]

Q7.



(a)

*extra lines from left cancels mark*

2

- (b) (i) any two from:
- (to provide land) for farming / agriculture
  - (to provide land) for quarrying
  - (to provide land) for building
  - to provide wood for building materials
  - to provide fuel
  - to provide paper

2

- (ii) any two from:
- changes in earth's climate, ie droughts, flooding, hurricanes  
*ignore temperature rise*  
*allow ice caps melt*
  - rise in sea levels
  - reduce biodiversity
  - change in migration patterns
  - may change distribution of species
- ignore acid rain and the ozone layer and forest fires*

2

[6]

Q8.

- (a) (i) forest at the edges (of the island) has been removed  
*allow centrally the forest remains* 1

an appropriate area on the island is identified eg south east or bottom right 1

- (ii) any two from:  
• (to provide land) for farming / agriculture  
• (to provide land) for quarrying  
• (to provide land / wood) for building  
• *allow to provide timber*  
• to provide fuel  
to produce paper  
*allow forest fires* 2

- (b) any two from:  
• decreased biodiversity  
• loss of habitats  
• increased carbon dioxide (concentration)  
• global warming  
*allow effects of global warming eg flooding / rise in sea level*  
*allow soil erosion* 2

[6]