Mark schemes

Q1.

(a) (overall) increase (in concentration of CO_2)

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

allow a named example such as burning (named) fuels

***or** driving cars*

***or** power stations*

ignore factories unqualified

1

deforestation

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*

1

(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_2 concentration causes) global warming
- plants photosynthesise faster
  - due to more CO_2
  - 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.

allow straight extrapolation

1

reading taken at 2050 from student's line

allow a tolerance of ± ½ small square

*allow **1** mark for 10 billion if no extrapolation drawn*

1

(d) fewer fish caught **or** limit the number of fish caught

*allow a method of doing this, eg increase mesh size **or** do not catch young fish*

1

(remaining fish) can reproduce

allow more fish (survive to) reproduce

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

- increasing population requires more food
- crops / livestock for food
- farming crops for biofuels
- peat use as compost
- peat use as fuel
- increased use of pesticide / insecticide / herbicide / fertilisers
- use of free-range / organic methods increases land use (for same yield)

link to biodiversity

- deforestation
- monocultures
- loss of hedgerows to make fields larger
- loss of habitat

- 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:

- growing crops / biofuels
  allow farming / agriculture
- grazing animals
- building houses
  allow other correct examples – eg building roads
- quarrying / mining
- dumping waste

1

(d) there is less photosynthesis

the trees are burned

1
1

(e) increase

1

(f)

*an answer of 270 scores **2** marks*

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

- displaced animals can move to adjacent areas
- where suitable habitat is found **or** where the trees have not been cut down

- seeds return to deforested area
- from other (forested) areas

- plants / trees begin to grow back
- so provide food / shelter / nest sites / suitable habitat for animals

- animals return to re-growing area
- from other (forested) areas

- sufficient time for regeneration

- 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_2
  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 × 1000

allow 1.4×10^4

1

(e)

an answer of 2.625×10^4 ***or*** 2.63×10^4 ***or*** 2.6×10^4 *scores* ***4*** *marks*

an answer of 26250 scores ***3*** *marks*

allow ecf from part ***(d)***

(volume of pond =) 1.875 **or** 2.5 × 1.5 × 0.5

an incorrect answer for one step does ***not*** *prevent allocation of marks for subsequent steps*

1

14 000 × 1.875

allow ecf from part ***(d)***

1

26250

1

2.625×10^4

allow 2.63×10^4 ***or*** 2.6×10^4

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_2 parallels) overall increased temperature (e.g. by 0.4 (°C))
- CO_2 traps (long-wave) radiation / IR / heat

against the theory:

- in some years (e.g. 1960–1977) temperature falls (while CO_2 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

2

allow points made using examples

[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

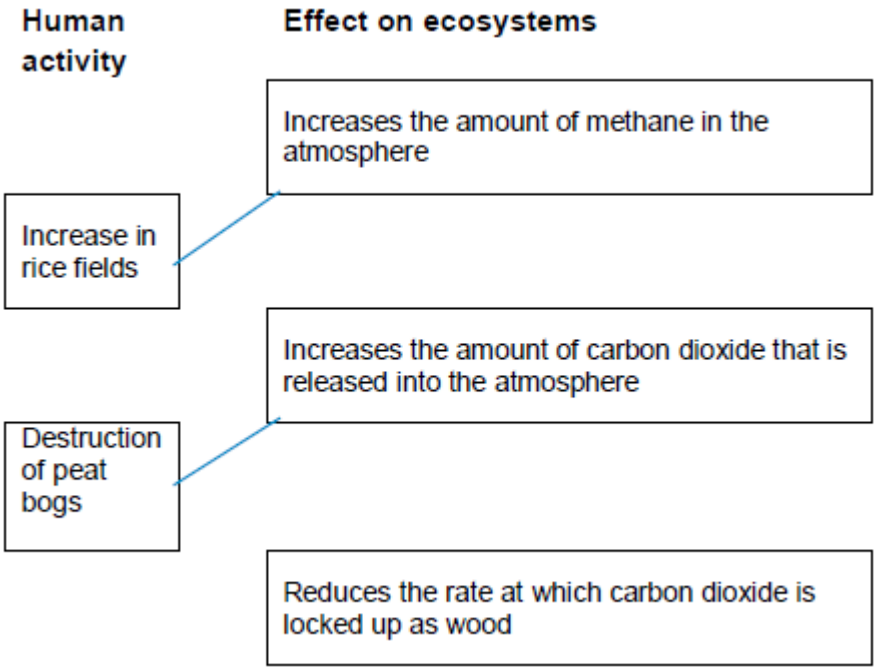
(e) any **one** from:
- breeding programmes (for endangered species)
- regeneration (programmes)

- 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]