AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.2 ORGANISATION OF AN ECOSYSTEM (PACK 5)

SCORE	PERCENTAGE
/234	%

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

(a) any **two** from:

- (same) number of scoops / sweeps each time

  allow any idea of controlling sweeps e.g. for same time

- scoop / sweep (at same) distance from the edge of pond

  allow scoop / sweep at the same place

- scoop (at same) depth

- (same) size of net

- (same) gauge / mesh size of net

2

(b) 64

1

(c) 19 to 122

allow 122 to 19
or
103

1

(d) water fleas were not evenly spread (around the edge of the pond)

allow any description of this such as more water fleas near the vegetation

1

(e) more water fleas live near the edge of the pond

allow more water fleas live where there is vegetation

*allow converse if student's calculated answer to part **(b)** was less than 12*

1

(f) 35

1

(g) 37.5 (%)

allow 38 (%)

1

(h) there was a high(er) level of pollution (in the pond in 2016)

1

because there are no / fewer mayfly nymphs
or
because there are fewer freshwater shrimps

data must be comparative

1

allow converse for 2014

STEMUP.CO.UK

(i) any **two** from:

- famine / food insecurity
- water shortage
- landfill sites filling up
- acid rain
- deforestation / habitat destruction
- extinction of species
  or
  reducing biodiversity
- natural resources running out

ignore global warming and any water pollution references such as sewage or eutrophication

2

[12]

Q2.

(a)

Factor	Biotic	Abiotic
Diseases	✓	
Herbivores	✓	
Temp		✓
Water		✓

*allow **1** mark for 2 or 3 correct*

2

(b) (leaves block light near tree so) more light (as you move outwards)

allow low light intensity under tree
ignore Sun

1

for photosynthesis

allow less photosynthesis under the tree

1

(which) produces (more) glucose / proteins (for growth)

ignore growth
ignore food

allow molecules, cell components or other correct substances instead of proteins

if no other mark awarded allow less water / ions / minerals / nutrients under the tree

1

(c) quadrat

correct spelling only

1

light meter

allow lux meter
allow light intensity meter

STEMUP.CO.UK

allow light data logger

1

in this order

(d) 1.5(0) (m^2)

allow 15 000 cm^2

1

(e) to keep light (intensity) as similar as possible

allow the light (intensity) might change

ignore references to temperature
ignore weather
ignore Sun

1

(f) any **one** from:

- repeat (investigation) around the tree

  allow repeat in different directions

- repeat (investigation) for other trees / areas
- sample every one metre
- count the number of each species present (rather than percentage cover)

  ignore repeats unqualified
  ignore repeat at different times / days / seasons
  ignore different size quadrat
  ignore random sampling

1

(g) daisy

1

(h) as light (intensity) increased so did the percentage / cover of plants

ignore directly proportional
ignore positive correlation unqualified

1

up to 100% / maximum at 175 (arbitrary units)

ignore distance

1

(i) any pair from:

- (lack of) water / rain (1)

  because the leaves are stopping the rain
  or
  because the roots of the tree are absorbing it (1)

  allow soil moisture

- (lack of) minerals / ions (1)

  allow magnesium / nitrate / nutrients

  because the tree (roots) have absorbed them (1)

- temperature (1)

  allow too cold / cooler

STEMUP.CO.UK

because less thermal energy from the sun is reaching under the tree canopy (1)

allow 'heat' for thermal energy

allow pH / acidity (1)
because (some) fallen leaves are acidic (1)

2

ignore carbon dioxide
*do **not** accept oxygen*

[15]

Q3.

(a) one X and one Y chromosome and 9 pairs of other chromosomes

1

(b) any **three** from:

- (called) meiosis

  correct spelling only

- DNA / chromosomes replicate
  or
  DNA makes a copy
- two divisions to form 4 cells
- so only 1 set of chromosomes per cell

  allow cells are haploid
  ignore half the DNA

- (daughter cells / gametes) are all genetically different

  *if no other mark awarded allow **1** mark for forms gametes / cells which are all different*
  ***or** only happens in testes and (embryonic) ovaries*

3

(c) (meiosis will not work because) number of chromosomes cannot halve

allow chromosomes cannot form pairs
allow chromosomes cannot split up evenly

1

(d) do not use energy in reproduction

1

so more (energy) available to synthesise proteins

allow other correct molecules or cell components

1

allow converse if clearly describing diploid oysters

(e) any **two** from:

- global warming may be raising temperature of water and killing oysters
- pollutants in the water may be toxic and kill the oysters
  or
  increased acidity of the oceans is killing oysters

  allow correctly named pollutant with reason

- new competitors / triploid oysters are using up the normal food source

STEMUP.CO.UK

- new pathogens may be causing diseases
- new predators eating oysters

ignore over harvesting

2

(f) **Level 3:** A judgement strongly linked and logically supported by a sufficient range of correct reasons is given.

5–6

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

3–4

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

1–2

No relevant content

Indicative content

for:
- oysters are available to eat all year **so** eating oysters has become very popular
- cheaper to produce **so** more food for expanding population
- oysters grow faster **so** more oysters for supermarkets / restaurants or more profit for farmers
- stocks are replenished each year **so** more sustainable fishing
- they can harvest / sell all year **so** more stable and profitable for oyster farmers

against:
- carcinogen put into environment / oysters **so** may enter the food chain or cause cancer in humans
- bigger triploid oysters may outcompete the smaller native diploid oysters **so** upset balance of the ecosystem / cause extinction
- people may not buy / eat them because they have used a carcinogenic chemical **so** reduced profit for farmers / suppliers / supermarkets / restaurants
- farmers have to buy new seed oysters every time **so** more expensive

other content:
- shouldn't be eating the oysters until they are thoroughly tested
- should be looking for alternative ways to get triploid oysters
- should stop using triploid oysters until the effect on the (marine) environment is known
- would replace lost oyster beds **but** could change the ecosystem
- oysters available to eat all year **but** probably do not taste the same or have the same flavour

[15]

Q4.

(a) community

1

(b) any **one** from:
- fish
- squid

STEMUP.CO.UK

1

(c) producer

1

(d) photosynthesis needs light

1

(nearer the surface there is) more light

allow converse

*allow explanations in terms of temperature for **2** marks*

1

(e) any **one** from:

- mates
- territory

allow space

1

(f) more predation / eaten

1

by (toothed) whales

*allow **2** marks for squid (population) increases so fish (population) decreases so less food for leopard seals*

1

[8]

Q5.

(a) availability of food

1

new diseases

1

(b) (sampling has been used) so not all mice / voles / owls are counted
or
some mice / voles / owls won't have been caught **or** were hidden

1

allow idea of animals (constantly) moving around

(sampling has been used) so some counted more than once

if no other marks awarded allow we don't know the sampling method used

1

(c) line rises and falls

1

rise and fall pattern is below the line for mice and voles (throughout graph)

1

rise and fall pattern is after the corresponding rise and fall for mice and voles (from first trough onwards)

1

STEMUP.CO.UK

(d) (voles decrease / drop)

(because) less mice for the owls to eat

1

(therefore) owls eat more voles

*allow for **2** marks (decrease) because they are the only / main source of food for owls*

1

or

(voles increase / rise)

(because) more food is available (1)

(because) mice are not eating it (1)

no mark for decrease / increase
mark as pairs with correct increase / decrease given

[9]

Q6.

(a) **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

5–6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

Indicative content

- lay a transect line from the edge of the sea up to the stony beach
- place a quadrat at regular intervals
- on the same side of the transect line each time
- use quadrats that don't float
- count number of each species present (in the quadrat) **or** estimate percentage cover of plant / seaweed / algae
- use a key to identify the individual species
- repeat another transect line parallel to the original / 5m further along the shore
- conduct at least three transect lines
- calculate the means for each distance up the shore

to access **level 3** the key ideas of using quadrats with transect lines and counting the number of each species need to be given to produce a valid outcome

(b) toothed wrack

STEMUP.CO.UK

1

kite / bar is longest **and** deepest / widest / thickest

*do **not** accept if incorrect organism named*
allow kite / bar has the greatest area

1

(c) any **three** from:
- more stable
- more habitats
- greater range of food sources

ignore more food unqualified

- greater interdependence
- sand / stony beach is (very) dry so plants can't grow there
- fewer temperature fluctuations

3

[11]

Q7.

(a) any **two** pairs from:
- light (intensity)
- more light means more / faster photosynthesis / glucose

1
1

- temperature
- higher temperature more / faster photosynthesis

1
1

- water
- right amount for transpiration / cell function / photosynthesis

- soil pH / ions
- needed for healthy growth

ignore 'growth' unqualified
ignore carbon dioxide and oxygen

(b) hand lens

1

moth guide

1

(c) any **one** from:
- can work gently and not disturb moths
- moths might fly away outside

1

(d) any **one** from:
- damage to eyes (from UV / bright light)
- burns from hot lamp
- diseases / pathogens from wild organisms

1

(e) any **one** from:
- wear sunglasses

or

STEMUP.CO.UK

eye protection

- wear gloves or allow lamp to cool.
- wear gloves

or

wash hands after handling moths

answer must relate to hazard

1

(f) bristles / hairs make it unpleasant to eat

or

bright colour acts as warning to predators (that it is poisonous)

1

[10]

Q8.

(a) 2 640 000 (in remaining 24 years)

1

110 000 in each remaining year

or

2.64×10^6 in remaining 24 years

1

1.1×10^5

*an answer of 1.1×10^5 scores **3** marks*

1

(b) (area of woodland =) 21 600

allow 16 800 + 4 800

or 9 000 + 12 600

or 4 800 + 4 200 + 12 600

1

518 400 (bluebells)

allow their area × 4 × 6

*an answer 518 400 (bluebells) scores **2** marks*

1

(c)

Level 3: Relevant points are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant points are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3-4
Level 1: Relevant 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	

STEMUP.CO.UK

reducing pollution • trees take in carbon dioxide • which will lower atmospheric greenhouse gases and reduce global warming (allow consequences of global warming) • trees act as noise absorbers • which will reduce noise pollution in the city • roots of trees will bind the soil • which will reduce local flooding and soil erosion • leaves on trees will trap PM2.5 / tiny particulates • which will reduce asthma/breathing difficulties of people **increasing biodiversity** • new woodlands or new trees in parks / gardens will provide new habitats • for new species of plants and animals • linking woodlands • will allow animals to move into new areas • planting many new species of trees • will provide food and shelter for new species of insects/birds • could extend the scheme • to reintroduce species of plants or animals which no longer live in that area • could protect wildlife in the area • by legislation or community projects	

6

[11]

Q9.

(a) 6

1

(b) only one species present

1

(c) (abiotic)

any **one** from:

- temperature
- exposure to the air / moisture / water / tides
- waves / wind
- rock type / substrate

1

(biotic)

STEMUP.CO.UK

any **one** from:
- competition
- predators
- food

1

(d) select location for transect at random / to be representative

1

transect / tape measure / line from top of shore / beach to sea

1

counting which species touched transect / regular use of quadrat along transect to count species

ignore repeat unqualified

1

repeat at other locations on same beach/shore

allow repeat at another time of year

or *repeat at low / high tide*

1

[8]

Q10.

(a) producer

1

(b) predators

1

(c) 1200

1

(d) 2 (years)

1

(e) there is more food for wolves

1

(f) humans hunting

1

viruses

1

[7]

Q11.

(a) (placed) randomly

allow description of placement

1

sufficient number (of quadrats) used

1

count (dandelions) in each quadrat

1

STEMUP.CO.UK

use mean number of dandelions, area of quadrat and area of field to estimate population

accept (area of field / area quadrat) × mean number of dandelions per quadrat

1

(b) (40 × 145) / 0.25 = 23 200

1

(0.42 × 23 200 =) 9744

*allow 9744 with no working shown for **2** marks*

*allow ecf from correct attempt at the previous step) × 0.42 for **1** mark*

1

(c) **Level 2 (3–4 marks):**
A detailed and coherent explanation is given. Logical links between clearly identified relevant points are made to explain why dandelion growth may be limited.

Level 1 (1–2 marks):
Discrete relevant points are made. The logic may be unclear.

0 marks:
No relevant content

Indicative content

factors that may be considered:
competition for resources including:
- light
- water
- space
- mineral ions (allow nutrients / salts / ions from the soil)

reference to why growth may be limited:
- (light) energy for photosynthesis
- water as a raw material for photosynthesis / support
- surface area exposed to light
- sugar / glucose produced in photosynthesis
- (space) to grow bigger
- (space) for growth of root system
- (mineral ions) for growth
- (mineral ions / sugar) for production of larger molecules **or** named example

4

[10]

Q12.

(a) wolves

1

(b) moose and wolves are on different scales

1

(c) wolf population has increased so more moose are eaten

*do **not** accept there are more wolves than moose*

1

STEMUP.CO.UK

(d) any **two** from:

- (other) predators
  allow correct examples
  allow 'humans hunting moose'
- (new) pathogens
  allow diseases
- competition

2

(e) any **four** from:

- variation (within species) of antler size
  allow description relating to antlers
- (caused by) different genes
- as a result of sexual reproduction / process of meiosis / mutation
- (phenotype) most suited to environment most likely to survive and breed
  ignore natural selection unqualified
- genes for large antlers (more likely to be) passed on to next generation

4

reference to mate selection
or
fighting
or
gaining territory
or
competition for mates
or
avoiding predation

1

[10]

Q13.

(a) reduces biodiversity

1

peat is being used faster than it forms
allow peat is non-renewable

1

(b) decay / decomposition / rotting of peat

1

by microorganisms / bacteria / microbes / fungi / decomposers introduced when peat is mixed with air

1

that respire using substances in peat as reactant

1

and using oxygen that is introduced when peat is mixed with air

1

[6]

STEMUP.CO.UK

Q14.

(a) Photosynthesis

1

(b) Respiration

1

(c) **C**

1

(d) (it will) rise

1

(e) water vapour

1

methane

1

(f) Microorganism

1

[7]

Q15.

(a) Place more quadrats in the field

1

Place quadrats randomly

1

(b) 26 400

1

(c) transect

1

(d) as distance from the path increases the number of (ribwort) plants increases

1

steep rise from 0.5 to 3.0 between 2 and 4 m from path **or** numbers level off to about 4 plants from 10 m from the path

1

(e) The ribwort plants get walked on

1

[7]

Q66.

(a) (i) 214 (billion tonnes)

*allow **1** mark for reading 122 and 92 correctly*

*allow **1** mark for the correct addition of incorrect readings*

2

(ii) 18.35

allow 18.4

*do **not** allow 18.3*

1

STEMUP.CO.UK

(b) (i) (only) a small mass of carbon (dioxide) is released from burning fuels (compared to other processes)

allow the carbon (dioxide) released from other processes / respiration and decomposition is (much) greater

1

(ii) any **two** from:

- (more) plants would absorb (more) carbon (dioxide)
- (due to more) photosynthesis

an idea of more is needed at least once

- fewer animals would release less carbon (dioxide)
- (due to less) respiration (in animals).

an idea of a reduction is needed at least once

ignore references to oxygen

2

[6]

Q67.

(a) any **two** from:

- disposes of his kitchen waste
- releases nutrients for his plants
- saves him money on fertiliser
- improves soil structure.

allow will help his plants / vegetables to grow

2

(b) any **three** from:

- earthworms allow (more) air / oxygen to enter
- earthworms break wastes into small(er) pieces

accept earthworms increase surface area of wastes

- plastic sheet keeps the heap warm
- plastic sheet keeps in water
- microorganisms / bacteria / fungi cause decay / breakdown / decomposition / digestion (of waste)

allow decomposers

ignore detritivores / earthworms

- (microorganisms / bacteria / fungi) are more active / digest / breakdown materials faster in warm / moist / aerobic conditions.

*need reference to earthworms **and** sheet for full marks*

*allow decomposers rate must be linked to microorganism **and** a factor*

3

[5]

Q68.

(a) (i) microorganism / microbe

accept fungus, bacterium, decomposer, allow detritivore eg worms

1

(ii) carbon dioxide

1

STEMUP.CO.UK

nutrients

extra boxes ticked negate mark(s)

1

(b) (crops) grow slower

allow crops won't grow as well

ignore kill crops

1

Reason:
any **one** from:

- competition
- (crops get) less nutrients / space / water / light

ignore less carbon dioxide

1

[5]

Q69.

any **six** from:

*only credit release of carbon dioxide **once** when linked to a correct process*

ignore references to burning

- (plants) photosynthesise
- *(plants)* take in carbon dioxide
- *(plants)* produce carbohydrates / fats / proteins

accept produce glucose

- (carbon compounds transferred by) feeding
- respiration
- breaks down carbon compounds / carbohydrates

accept glucose

- releases carbon dioxide
- organisms die / produce wastes / *excrete*
- (which are) decomposed / decayed by microorganisms

allow broken down

allow bacteria / fungi / microbes / decomposers

- (which) release carbon dioxide

[6]

Q70.

conclusion with relevant explanation:

for microorganisms allow microbes, bacteria or fungi

<u>Conclusion</u>

as temperature increases the rate of decay increases

may refer to A, B or both

1

<u>Explanation</u>

STEMUP.CO.UK

(because) microorganisms / enzymes are more active in warmer conditions

allow microorganisms reproduce quicker

1

Conclusion

(decay of) leaves from region B was affected more by temperature / increases more rapidly with temperature

accept description of this eg below 26-28°C leaves from region B decay slower (than from region A), but above 26-28°C leaves from region B decay faster (than from region A)

1

Explanation

(because) there were different types of microorganisms on the leaves

allow (leaves from) different species of beech tree

allow difference in water content of leaves

ignore different levels of oxygen

*allow rate of decay of leaves from both regions the same at 26-28°**C** for **1** mark, if no other conclusions made*

if incorrect / incomplete conclusion ignore explanation

1

[4]

Q71.

(a) (temperature) thermometer or temperature probe / sensor

1

(oxygen concentration) oxygen probe / sensor / meter

1

(b) (i) 13 (arbitrary units)

allow values in the range 12.5 – 13.5

1

(ii) the greater the concentration of oxygen the faster the rate of decay

1

(c) line drawn below line on graph following similar pattern

line starts at 0% oxygen concentration and from 0 – 3 arbitrary units

1

(d) microorganisms / bacteria / fungi

accept any correct organism

allow decomposers / detritivores or named example e.g. worms

1

plants

allow crops or named plants

1

STEMUP.CO.UK

respiration

1

[8]

Q72.

(a) extremophiles

accept named examples eg acidophiles, thermophiles, thermophytes, halophytes

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a ' best-fit' approach to the marking.

0 marks
No relevant content

Level 1 (1 – 2 marks)
Either a difference **or** a reason is given.

Level 2 (3 – 4 marks)
A difference is given **and** an attempt to suggest reason(s) for the difference.

Level 3 (5 – 6 marks)
A difference is given **and** suitable reasons, which add value, to explain the difference.

Difference

- food chain near hydrothermal vent begins with bacteria
- food chain near surface of the sea begins with seaweed
  allow no seaweed at the bottom of the sea
- use different energy sources
- producers (in the two chains) are different
  allow limpets eat different foods
  accept bacteria / limpets / crabs (in the 2 areas) are different (species)
  or
  have different adaptations
  or
  have evolved differently

examples of scientific points made in the response

- seaweed is an alga
  allow plant
- seaweed absorbs light / energy from sun
- for photosynthesis
- to make glucose / sugar/ carbohydrate / food

STEMUP.CO.UK

allow chemical energy

- no light at bottom of sea
  allow no sun (light)
- plants can't survive in the dark / conditions at the bottom of sea
  allow descriptions of conditions e.g. harsh
- bacteria are extremophiles
  allow thermal energy or 'heat'
- bacteria need different energy source / use chemical energy
- to make carbohydrate / food

6

[7]

Q73.

(a) microorganisms / bacteria / fungi
allow correct named organisms
allow detritus feeders / decomposers / worms

1

break down / digest / feed on (dead organisms)
accept use carbohydrates / glucose
allow decomposes
ignore decay / rot

1

(and release carbon dioxide when they) <u>respire</u>
*do **not** allow respiration if linked to leaves / dead organisms*

1

(b) any **two** from:

- the higher the temperature the faster the rate of decay
  allow faster / more carbon dioxide for faster rate of decay
- the higher the oxygen concentration the faster the rate of decay
  allow faster / more carbon dioxide for faster rate of decay
- the rate increases faster (with increasing oxygen concentration) at 20 °C
  (than 15 °C)

2

[5]

Q74.

A – respiration
ignore breathing

1

B – feeding / eating
allow consumption / ingestion / feeds
ignore nutrition / food

STEMUP.CO.UK

*do **not** accept digestion*

1

C – photosynthesis

1

D– combustion / burning

1

[4]

Q75.

(a) 36 (%)

36 (%) gains two marks

accept answers in range 32 (%)–42 (%)

*if answer incorrect give **1** mark for evidence of estimating number of squares as being 8–10.5*

2

(b) (i) Greater plantain most abundant on path / walked area

*for **2** marks a correct statement must be made for each plant.*

1

Ribwort plantain most abundant away from path / on the field / grass / on area not walked on

accept answers in terms of quadrat number / start and finish

*accept for **1** mark where number of one plant high, number of other plant low*

ignore figures

1

(ii) *if no position given max 1 mark*

for Greater plantain numbers higher on path

accept converse statements

Greater plantain grows flatter / lower to ground / is shorter

ignore surface area

1

(so) will be damaged less by trampling /will not be pulled out
or
for Ribwort plantain numbers higher in field

Ribwort plantain has tall leaves or is taller

allow tall stems

to obtain more light
or for photosynthesis

ignore Sun

ignore references to nutrients

ignore competition unless qualified

1

(c) *answers must refer to named plantain(s) to gain credit*

STEMUP.CO.UK

Greater plantain would grow better on football pitch / area 1

accept converse argument

1

(since) more trampling on pitch

*if **no** other marks gained, allow **1** mark for more plantains in area 2 <u>because</u> they will not be affected by human activity / example*

1

[8]

Q76.

plants absorb CO_2 for photosynthesis

ignore carbon

1

all organisms / any named organism respire(s) and release(s) CO_2

ignore breathing

ignore carbon

1

any **four** from:

- carbon compounds / named compound made by plants
- plants eaten by animals
- dead organisms / faeces are decomposed / decayed

  allow broken down
- by bacteria / microorganisms
- dead plants and animals (may) form fossil fuels
- when (fossil) fuels are burnt they release CO_2 into the air

4

[6]

Q77.

(a) They produce substances that help plants grow

1

They reduce landfill

1

(b) Plenty of oxygen

1

Warm conditions

1

[4]

Q78.

(a) (i) photosynthesis

STEMUP.CO.UK

allow phonetic spellings

1

(ii) respiration

allow phonetic spellings

ignore breathing / decay

1

(b) any **two** from:

- burn / use less fossil fuels
  or
  reduce industrial processes
  or
  use cars less

  allow cycle / use buses / walk / trains / public transport

  allow stop for reduce in all cases

- reduce deforestation

  accept named example

  or
  plant more trees

  allow plants

- use alternative sources of energy

  accept solar / wind / nuclear / hydroelectric / wave / tidal / geothermal

  ignore renewable / biomass

- trap CO_2 in sedimentary rocks / underground / under sea
  or
  carbon capture / CCS

- rear less cattle / animals

  allow eat less meat

  allow <u>reduce</u> growth of human population

  ignore reduce the human population

2

[4]

Q79.

(a) Both birds arrive earlier to the UK than they used to

extra ticks negate mark

1

After 1970 the order that the two birds arrive in the UK reversed

1

(b) any **one** from:

- climate change

  accept named climate change eg global warming / dimming

  allow change in temperature qualified

  ignore change in weather

STEMUP.CO.UK

- change in food availability
  ignore availability of plants
- change in genes / mutation
  allow birds evolving / natural selection
  ignore adapted
- change in predation (pressure)

1

[3]

Q80.

reduces landfill

accept reduces pollution from burning wastes
ignore less waste unqualified

1

scheme self-financing
or
produces compost / fertiliser which can be sold

1

produces nutrients / fertiliser / minerals (ions) for plants

allow returns / recycles nutrients into soil
ignore helps plants grow

1

[3]

Q81.

read 'the gas' or 'it' as carbon dioxide

(plants) photosynthesise

1

(plants) absorb <u>carbon dioxide / CO_2</u> (from the air)

allow take in / use <u>carbon dioxide / CO_2</u> (from the air)

1

(overall) <u>more carbon dioxide / CO_2</u> is being released into the air than is being removed

*allow 470 (billion tonnes) released **but / and** 450 (billion tonnes) taken in*

1

(by) <u>respiration</u> (by all organisms / any named organism)

ignore breathing
ignore carbon

1

(and) combustion / burning

ignore carbon

1

(so) amount of <u>carbon dioxide / CO_2</u> in air is increasing

STEMUP.CO.UK

allow 20 (billion tonnes) of <u>carbon dioxide / CO_2</u> added to air each year

1

[6]

Q82.

(a) the birds now arrive earlier (in the UK)

must imply both species of birds

1

the Sand martin (now) arrives before the Barn swallow
or
the Barn swallow (now) arrives later than the Sand martin
or
arrival time of the two birds has reversed

1

(b) any **two** from:

- warmer in UK <u>earlier</u> (in year)
  or
  colder abroad <u>earlier</u> (in year)
  allow too hot / cold abroad <u>earlier</u> (in year)
  ignore global warming

- insects / food appears <u>earlier</u> (in year in UK)
  or
  shortage of insects / food abroad <u>earlier</u> (in year)
  accept feasible reference to competition for food

- new genes / mutation
  allow evolution / natural selection
  ignore adapted
  ignore pollution

2

[4]

STEMUP.CO.UK

Q1.

(a) Students had to give two variables that needed to be controlled to make the method given valid. Most marks were achieved for reference to the same number of sweeps or use of the same size net. 47% of students achieved the mark.

Many students were incorrectly focused on ensuring that the water tray contained the same amount of water, or that the tray needed to be cleaned after each sweep. Others wanted the sweeps to be done at different sites and / or by different people at a different pond.

(b) 78% of students correctly calculated the mean value of water fleas at the pond edge.

(c) The range of the results was correctly answered by 73% of students. It was more common to see 103 as the answer rather than 19 to 122.

(d) 13% of students offered a creditworthy explanation as to why such a wide range of results was found. There were many references to the relative lack of experience of different students doing the test, being rushed and fleas flying away before being counted. There were also a number of criticisms given of the method used which was also not creditworthy.

(e) 42% of students were able to give the conclusion about the distribution of water fleas in the pond using the pupils and teachers mean value. However, many answers identified the relative accuracy of the people carrying out the sweeps at the different sites, or the effect of disturbance, or time of day and where the Sun was shining.

(f) The change in the number of bloodworms between two dates was answered correctly by 89% of students.

(g) Most students made an attempt to calculate the number of shrimps in the pond in 2016 as a percentage of those in the pond in 2014. However, there was a wide range of incorrect answers. 27% of students gave a correct answer.

(h) Students found this question challenging. They were required to make a conclusion about the change in the level of pollution in the pond between two dates using the data provided in two tables. In order to substantiate this, there needed to be a reference to the decrease in either mayfly nymphs or shrimps.

Many students did not make it clear that the level of pollution had risen. Often they cited a rise in bloodworms or water snails which was insufficient. Others simply relayed the change in numbers at low, medium and high levels of pollution which did not demonstrate the use of all the data and hence was not creditworthy.

(i) Students were asked to suggest two problems caused by the rapid increase of the human population. 44% of students achieved at least one mark, with clear references to ‘food insecurity’ and ‘water shortage’. The ideas ‘species extinction’ and ‘deforestation’ were also prevalent, although a number of students failed to achieve full marks due to stating both ‘deforestation’ and ‘habitat destruction’ as separate points.

Marks were missed by vague references to pollution, resources running out and burning fossil fuels. Other very vague responses included more people,

STEMUP.CO.UK

overcrowding, more waste (litter, plastic), lack of birth control, more animals being killed to feed people and lack of houses or employment.

Q2.

Foundation

(a) 70% of students achieved at least one mark. The most confusion appeared to be whether diseases / herbivores were biotic or abiotic.

(b) Most students achieved one mark for identifying the importance of more light as one moves further away from the tree, with a significant number gaining the second mark for the link to photosynthesis. There were, however, a good number of responses only referring to Sun which was not creditworthy.

Very few (less than 1%) got maximum marks for stating production of proteins/glucose. Many students referred to food being made which was insufficient. It was common for students to make two creditworthy points about 'light' and 'less water / minerals', but only achieving the single mark on offer

(c) This question asked for the name of two pieces of equipment that would have been used.

- Quadrat was the most popular correct answer, although some missed out on the mark for incorrect spelling.
- Light meter was rarely encountered. Answers often referred to ammeters, voltmeters and light sensors, solar panels and arbitrary measurers.

27% of students achieved at least one mark.

(d) This calculation was very difficult for students, with 3% answering correctly. They were asked for the total area sampled. Many attempted to calculate the area of the circle in the diagram. It was also quite common to see answers for area of a quadrat multiplied by 5 rather than by 6.

(e) Students were asked to suggest a reason why the investigation was done as quickly as possible on the same day. 28% of students referred to the idea of light intensity being controlled. However, many gave insufficient answers about the Sun, weather or temperature being the same.

This question was often approached from two perspectives, both of which were creditworthy with a reference to light. Either, why it was done as quickly as possible or why it was done on the same day.

(f) There was a huge variety of suggestions about how the investigation could be improved. 17% of students identified sampling at a smaller distance or repeating under another tree.

Popular misconceptions seen referred to extending the transect, using a bigger quadrat or repeating the investigation at a different time. One particularly popular response seen was to do it more slowly. This had clearly been derived from the stem of the previous question. There were also a number of responses which simply suggested repeating it which were insufficient.

(g) This question asked students to identify which plant species would only grow at high light intensity. 42% of students were able to give 'daisy'. The most popular incorrect answer was clover, possibly because it was the species with the highest percentage

STEMUP.CO.UK

coverage at high light intensity.

(h) Students were asked to make a conclusion about the relationship between light intensity and the total percentage cover of plants. 24% students achieved the first mark point but the second one was rarely seen.

The two most popular incorrect responses were those that only referred to number of plants rather than cover or percentage and those who stated the relationship the wrong way around e.g. ‘as percentage cover increases so does the light intensity’.

(i) Students were asked to suggest another factor which may have caused the results obtained. Generally many students gave water, minerals and a few gave temperature as a correct factor. However, very few responses then linked the factor to how the tree would cause the results and subsequently, the second mark was awarded much less often. Common misconceptions for the factor mark were carbon dioxide and moisture. Trampling was also seen but was not creditworthy. 5% of students achieved full marks.

Higher

(a) 86% of students were able to identify two or three factors that were biotic or abiotic, with about 64% identifying all four correctly.

(b) Most students noted that light increased as you moved away from the tree. However, a much lower number related light to photosynthesis and fewer still could link to glucose for growth, although some answered with ‘providing food’. There were students who mixed up photosynthesis and respiration.

(c) Many students identified a quadrat and most of these could spell it correctly. Much fewer identified the light meter, with solar panel and light dependent resistor (LDR) as the most common wrong answers. ‘Lightometer’ was seen but unless this was qualified as a mobile phone app it did not gain credit. Similarly a ‘light sensor’ was only correct if linked to a data logger.

(d) Most students attempted a calculation, with 15% answering correctly. Some students were able to correctly calculate the area of one quadrat as 0.25 m^2 but then multiplied by either ten or five instead of the six sites sampled.

(e) A wide variety of answers were seen suggesting that students understood that light intensity could change during the day. Provided the idea was clear credit was awarded.

(f) The many students who just wrote ‘repeat the investigation’ did not gain credit. However 38% of students knew that this would only improve validity if it was in a different direction or for a different tree. Sampling every metre was also a correct common response.

(g) 74% of students identified ‘daisy’. A number of students wrote more than one answer and so lost the mark under the list rule. Clover was a common incorrect answer, possibly because that was the species with the highest percentage cover at high light intensity rather than the species which **only** grew at high light intensity.

(h) The first straightforward mark point for increasing light intensity showing an increased percentage cover of plants was stated by 62% of students although some incorrectly inferred that it was the percentage cover of plants causing the increased light intensity.

Only the most mathematically astute students were able to note that a maximum of

STEMUP.CO.UK

100% cover was seen from 175au of light for the second mark. A number of students did not read the question carefully enough and gave detailed descriptions of what was happening for each species instead.

(i) While 69% of students were able to identify a factor for one mark, often seen and credited within the reason section, very few were able to explain this in terms of the tree. Instead students gave very general reasons for why the factor was needed by plants. Many students wrote about the carbon dioxide level under a tree changing which is not the case.

Q3.

As expected with this question being higher demand, students generally achieved lower marks. Some excellent answers were seen where students were able to access knowledge from different parts of the specification as well as use information from the question stem and their own wider reading to express complex concepts.

(a) This was not a straightforward knowledge question as students needed to use logical thinking as well as knowledge of chromosomes to work out the correct alternative. 50% of students arrived at the correct response. Many realised that there would be one X and one Y chromosome but their maths let them down when they computed that only eight more pairs would be needed.

(b) A large number of students understood meiosis was the type of cell division and many students could not spell it correctly. Being able to understand the differences in mitosis and meiosis is crucial as is being able to correctly spell all keywords. 28% of students achieved two or three marks.

(c) Students seemed to struggle with the idea that meiosis created four daughter cells from the two divisions, although they did tend to identify that the cells would be haploid. Many just stated the cells would be not identical rather than being genetically different.

The majority of students found it difficult to transfer their knowledge of humans and their 23 pairs of chromosomes to oysters with ten pairs and so their answers were confused. 19% of students achieved the mark here.

(d) While students were able to note that triploid oysters didn't spend time reproducing, very few related this to energy. Many went down the route of not needing time to look for a mate. The few that did identify energy and reproduction (6% of students) rarely linked the energy available to synthesising proteins, and instead going with vague references to 'growth' which is insufficient at this level.

(e) Students had the idea that global warming, pollutants, competition or predators could be involved, but rarely gained credit as they did not express this with the necessary high demand biological detail required to explain how it would lead to a reduction in population.

Key points were generally missing such as toxic pollutants and new predators or pathogens. Some students mentioned disease but did not relate it to pathogens. 3% of students achieved full marks.

(f) This 'extended response' question was targeted at grades 6–9. Many students were able to access level 1 (43%) and level 2 (27%). It served its purpose of allowing the higher-attaining students to perform well, while not discouraging lower-attaining students from answering, and very few students made no attempt.

STEMUP.CO.UK

It was felt that students engaged with the opportunity to have an opinion about ideas on whether supermarkets and restaurants should be allowed to stock a product which may have a link to a carcinogen.

Q4.

(a) 45% of students knew that the term community is all the organisms in an ecosystem.

(b) 53% of students could identify a secondary consumer from the food web.

(c) 78% of students could identify that algae are producers.

(d) Few students applied their knowledge of algae to the need for light for photosynthesis. 32% of students achieved any credit for their answer. The question had included a prompt that algae photosynthesise. Many students referred to algae being safe from predators near the surface, or sometimes even, nearer the prey of algae near the surface.

(e) Most students could recall that animals compete for mates or territory.

(f) 59% of students could interpret the food web. Common mistakes involved reading the arrows on the food web the incorrect way, such as fish eat seals.

Q5.

(a) 75% of students achieved both marks for this question. ‘Availability of food’ was the most common correct answer.

(b) 62% of students were unable to give a creditworthy answer to this question. The question is about the accuracy of the data for the one woodland, so saying ‘do more woodlands’ was incorrect. The ideas of animals hiding so not being counted, or being counted twice were the most common acceptable answers.

(c) This question had a mark available at all levels of demand. 87% of students achieved at least one mark, with the easiest mark for ‘the line goes up and down’ being given by most. The second mark was for a line where all peaks and troughs were below those of the prey line. The final and most difficult mark achieved by 6% of students was for showing that the line drawn was slightly after the prey line.

(d) 53% of all students achieved at least one mark for this question. Of the incorrect responses a significant number of students stated that voles eat mice.

Q6.

(a) This ‘extended response’ question was designed to test concepts and skills acquired during the performance of a Required Practical Activity. Students struggled to write a logical and clear account. Many did not seem to remember the correct terms so wrote of a ‘metal wire thing’ and ‘Punnett squares’. Students often did not make the meaning of ‘along the shore’ clear.

Many students gave a reasonable account of the use of quadrats but did not answer the question regarding distribution and abundance across the shore.

The question did differentiate between students well. 32% of students accessed Level 2 and 7% achieved five or six marks. However, a large proportion of students received no marks: 13% of students did not make an attempt, and 24% gave responses that couldn’t be credited with any marks.

STEMUP.CO.UK

(b) 69% of students achieved one or two marks here. ‘Dog whelk’ was the most common incorrect answer. A significant number of students appeared to interpret ‘most abundant’ as ‘least common’. Many students who gave ‘toothed wrack’ said ‘because there were more of them’ without explaining how the diagram showed that.

(c) 7% of students scored any marks in this high demand question. A commonly seen answer was ‘greater biodiversity because more things live there’.

Q66.

(a) (i) Just over a third of the students gained full marks for this question. 1 mark could be gained for correctly reading 122 and 92 from the graph. Incorrect readings that were correctly added together could also gain 1 mark. This highlights the importance of showing working for all calculations, no matter how simple the calculation may appear to be.

(ii) Some students attempted to write out the number in full, or in standard form, but could only gain the mark if they had deleted billion from the answer line. There were some avoidable errors made, such as writing 1.835 instead of 18.35. Others divided 5 by 3.67 instead of multiplying the numbers together.

(b) (i) Students were instructed to use information given in the graph to suggest why some scientists do not think that burning fuels is the main cause of carbon dioxide in the atmosphere. Many said that respiration and decomposition released more carbon than burning fuels to gain the mark. If figures were quoted, a comparison was needed. Some students gave confused responses about photosynthesis, which did not answer the question which was about burning and the release of carbon dioxide.

(ii) Students had to suggest how eating less food from animals and eating more food from plants could reduce the amount of carbon dioxide in the atmosphere. Credit could not be gained just for mentioning respiration or photosynthesis alone. Clear statements as to whether these processes would occur more or less were needed, and how this would affect the amount of carbon dioxide absorbed or released. Many students linked in to the idea of decomposition of dead organisms, which was ignored. Some spoke about carbon dioxide being produced by the meat production processes, or from cooking the meat, which was also ignored. Others focused their responses on oxygen, which did not answer the question.

Q67.

(a) The question asked why a compost heap is useful to the chef, not how it is important environmentally. Most students said that the compost heap would provide nutrients for the chef’s plants or would help his plants grow. A few also said that it would dispose of his fruit peelings. References to saving money on fertiliser or improving soil structure were rarely seen.

(b) To gain full marks references to both earthworms and the plastic sheet had to be attempted. Many students gained at least 1 mark for saying that the plastic sheet trapped heat or moisture. A few thought that it prevented air or sunlight reaching the compost heap. Although students attempted to explain how the earthworms helped to speed up the decay process, only a few mentioned that they would allow more air to enter the soil, or that they would break the wastes into smaller pieces. Just saying that they would break down the wastes was insufficient, and suggested that they did not fully understand the term ‘decay’. Many students gave responses linked to faeces from the earthworm providing nutrients. Few students made any reference to

STEMUP.CO.UK

microorganisms in their response. A lot of students repeated information given in the question and focused their entire response on the fact that the worms were not being eaten by the birds.

Q68.

(a) (i) Almost half of the students said microorganisms or bacteria to gain the mark. Other acceptable answers that were seen included: fungi, decomposers, flies and worms. Some students had not read the question carefully and did not name an organism; instead they said enzymes, light, oxygen, alkenes or feeding. There were quite a few references to carbon dioxide, carbon or the carbon cycle. A number of students did not attempt this question.

(ii) Almost all students gained at least 1 mark and over half of the students gained both marks.
"Nutrients" was the most common correct response, and the most common distractor was "Oxygen".

(b) Some students thought the crops would grow faster because the manure would contain nutrients.
They had not read the question carefully, which asked for the effect of weeds on the growth of crops. Some thought the weeds would kill the crops, which was not allowed; a reference to slowing the growth rate was required. Quite often students did not gain the mark for describing the effect of weeds on the growth of crops, but they did give a correct reason. Usually students said that the weeds would take up the crops' space or light.

Q69.

The question was generally well answered and discriminated very well with the full range of marks being awarded in roughly equal proportions. Students answered the question in a variety of ways. Some described processes in a food chain, talking mainly about feeding and decomposition, whilst other, more able students, gave a full description beginning with photosynthesis. Some less able students did not restrict their responses to the woodland community and described the burning of fossil fuels in power stations, removal of timber to make paper, humans burning trees and carbon dioxide being absorbed in the oceans.

Marks were frequently missed when students referred to plants and animals breathing, rather than respiring. Confused statements such as "Plants and animals give out carbon dioxide during photosynthesis", or "Carbon dioxide is given out during respiration and photosynthesis" meant that marks were lost. Students need to organise their answers logically, for example by referring to photosynthesis and respiration as separate ideas.

Q70.

Two conclusions were asked for, each with an explanation. Surprisingly few students made the simple conclusion that the rate of decay increases with temperature, and when this was stated very few went on to give an explanation. Having two lines on the graph seemed to confuse many. Most students attempted to compare regions A and B, but they usually did not mention temperature, but just talked about the lines going up slower or faster, so did not gain the mark. Some confused rate and time, stating the time for the leaves to decay would be longer at higher temperatures, which was incorrect. Others thought there were more leaves at higher temperatures.

STEMUP.CO.UK

Q71.

(a) Most students gained a mark for thermometer, but a variety of unusual suggestions were made for measuring the oxygen concentration. An oxygen probe, oxygen sensor or oxygen meter was needed. Oxygen detector was a common answer which was insufficient.

(b) (i) The vast majority of students correctly read the graph and gave an answer of 13 arbitrary units.

(ii) Although the question was well answered by most students, others did not clearly state what was changing. They just said as the percentage increased the arbitrary units increased, which was not creditworthy. Students should use the information as it is written on the graph to avoid making errors. Several students thought that increasing the concentration of oxygen decreased the rate of decay.

(c) A third of the students correctly drew a line representing the rate of decay at a lower temperature, but others drew a line above that for 20 °C. Some started their line on the x-axis, or drew a line that followed the pattern of the printed curve, but then showed the line dropping down towards the end. Neither of these gained credit. Some students had multiple lines visible – this may have been because they drew the lines in pen and so could not erase errors. Whilst text should always be written in black ink, graphs can be drawn in pencil.

(d) Many students gained a mark for either stating that microorganisms or bacteria break down dead organisms, or for saying the products of decay helped plants to grow. Some students said that the carbon dioxide was a product of photosynthesis or combustion of fossil fuels. Although carbon dioxide is a product of combustion this did not answer the question, which was about decay processes. Students should always read the stem of each question carefully.

Q72.

(a) A few students gained a mark for correctly stating that extremophiles can survive in extreme conditions. The most common incorrect responses were bacteria and microbes. Extremists was another common response.

(b) Most students attained Level 1 or Level 2. The difference given was usually that the food chain at the hydrothermal vent started with bacteria, or the food chain at the surface started with seaweed. Many explained the difference by saying there was no light at the seabed, so plants couldn't grow there. This moved the response into Level 2, but a Level 3 response had to add value – not just quote information given in the question. Some added value by explaining that plants need light to photosynthesise.

Q73.

(a) Some students made a reasonable attempt to answer this question and gained a mark for saying that decay was brought about by microorganisms, bacteria or a correctly named organism. Some went on to say the microorganisms broke down or fed on the dead organisms, although a lot only referred to decay which was given in the question so was not creditworthy. Respiration was frequently mentioned in relation to the release of carbon dioxide, but if students said it was the leaves or dead organisms that respired the mark could not be gained. Some students gave detailed descriptions of photosynthesis in relation to carbon dioxide and oxygen, but did not answer the question which required carbon dioxide to be linked to the decay process.

STEMUP.CO.UK

(b) One of the marks for this question was at standard demand, which was demonstrated in the responses. Many students only gave one conclusion, which was usually that increasing the amount of oxygen increased the rate of decay. Some students did not use the information in the graph to make conclusions. Many said that as the rate of decay increased more carbon dioxide was produced per hour without reference to an independent variable. A surprising number of students thought that increasing the temperature increased the amount of oxygen supplied to the leaves.

Q74.

The carbon cycle is a new topic for this specification, which was reflected in few students gaining top marks. Many responses used words from Question (b) about variation and evolution. Pollution or decay was seen frequently for D, combustion. The most common correct responses were either photosynthesis or respiration. As a process was asked for, an answer such as 'food' was not enough for the feeding mark.

Q75.

(a) This type of question had not been set before but almost a quarter of the students gained full marks. The range of acceptable answers for two marks was 32%–42%. Students were awarded one mark if they gave an acceptable number of squares covered by the plant (acceptable range 8–10.5), but failed to calculate the percentage correctly.

(b) (i) This question required a description of the distribution of the two species and quite a lot of students gained both the available marks. Students awarded one mark generally described the distribution of only one of the species, or said 'where the number of one plant is high the number of the other plant is low'.

(ii) This question asked students to suggest reasons for the distributions they had described in part (b)(i). Consequently, the majority of students failed to make suggestions and merely again described the differences in the distribution. The most common adaptation given was that Ribwort plantain is taller, but these students had difficulty in articulating why this was an advantage. Less than a tenth of students gained both marks.

(c) Almost half of the students gained a mark for stating that there would be more plantains in the football field because of lower human influence, however there were few two mark answers seen.

Q76.

It was encouraging to see many excellent answers gaining five or six marks. Failure to gain full marks was usually due to not using the technical terms photosynthesis or respiration, or giving confusing accounts of decay and fossilisation. Most students were able to gain at least one mark for this question.

Q77.

STEMUP.CO.UK

(a) The majority of students realised that large-scale composting schemes would reduce landfill, but fewer knew that they produce substances that help plants to grow. Quite a lot of students thought it would reduce the amount of household rubbish. Only a few students ticked the wrong number of boxes.

(b) The majority of students gained one mark with over a third attaining both marks. The most common correct answer was that warm conditions are needed to decompose organic waste.

Q78.

(a) (i) Almost two-thirds of students were able to identify photosynthesis as the process used to remove carbon dioxide from the air.

(ii) Fewer students were able to identify respiration as the process by which all organisms release carbon dioxide.

(b) There were many suggestions students could have made to reduce the amount of carbon dioxide in the atmosphere, but the majority used the picture in the question for ideas. Plant more trees and burn less fuels were common answers. Some listed several suggestions for burning less fuels, such as walk, use cars less and reduce industrial processes, but there was only one mark for these. Many said use renewable energy sources, but this on its own was not enough for the mark as burning biomass would release carbon dioxide. A specific example was needed, such as solar or wind power. The majority of students were able to score at least one mark for this question.

Q79.

(a) Almost half of students gained two marks, with very few students not scoring anything.

(b) Climate change was a common correct answer, but a change in the weather was ignored. Some students referred to changes in temperature, but these had to be qualified, for example, ‘it’s warmer earlier in the UK’. Food availability or competition for food was often stated for a mark.

Q80.

Most students said industrial composting schemes would reduce landfill, but only a few said the compost could be sold. The third marking point needed a reference to nutrients or fertiliser being produced, as well as a reference to plants or soil. Over half of students gained at least one mark, with a tiny proportion achieving maximum marks.

Q81.

The majority of students made a good attempt to answer this question. Many gained marks for stating the processes shown on the diagram, namely photosynthesis,

respiration and combustion. A few linked the processes to an incorrect direction of carbon dioxide transfer, so negating the mark. Others demonstrated a good understanding of the carbon cycle and described the processes of decomposition and fossilisation, which did not gain credit as these processes were not shown on the diagram. Students found it a little more difficult to gain the marks for explaining the effects of the processes on the mass of carbon dioxide in the air. A comparison of the amount absorbed and released was required for one mark, and an overall conclusion that the amount in the air is increasing for the last mark. Just over a tenth of students scored five or six marks.

Q82.

(a) A large number of students had not read the information given in the question, or the axes on the graph, and did not realise that the graph was showing arrival dates. Many students thought the graph was showing changes in the population sizes of the two birds. Many students gave confusing statements about increasing or decreasing arrival dates and some thought the birds did not stay as long in the UK. Clear statements about changes in migratory patterns were lacking with many just giving arrival dates of the birds in a specific year. Less than half of students were given at least one mark.

(b) Many students just said ‘for food’. This was not enough to gain the mark as they had to say food was available earlier in the year (in the UK). Quite a lot of students gained the mark for a correct reference to competition with the Barn Swallow for food. Changes in temperature also had to be explained fully, for example, warmer earlier in the year (in the UK). References to global warming and climate change on their own were ignored. Very few students mentioned a mutation or change in genes as a reason for the change in migration pattern. Most students did not gain any credit for this question.

STEMUP.CO.UK