AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.7.3 BIODIVERSITY AND THE EFFECT OF HUMAN INTERACTION ON ECOSYSTEMS (PACK 4)

SCORE	PERCENTAGE
/147	%

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Q1.

(a) food

1

mates

1

(b) any **one** from:

allow converse for late arrivals

(early arrivals)

- get more food
- get the healthiest mates

allow more likely to get a mate

- more space / material for nests
- chicks will hatch earlier and have more time to mature
- less competition
- more resources

1

(c) any **one** from:

allow correct chemical formulae

- carbon dioxide
- methane

allow water vapour, nitrogen oxides, CFCs, ozone
ignore water

1

(d) any **one** from:

- rising sea levels
- examples of climate change

e.g. flooding, drought, desertification, melting ice caps, storms / hurricanes

- extinction of some species
- habitat loss

ignore references to temperature

1

(e) burning fossil fuels

1

farming cows

1

(f) sulfur dioxide

1

[8]

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Q2.

(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

allow converse for 2014

1

(i) any **two** from:

- famine / food insecurity
- water shortage

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- 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]

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

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

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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

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]

Q5.

(a) by helping people relax in outdoor spaces

1

by reducing the noise pollution

1

(b) by making new habitats for plants and animals

1

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by providing a resting place for migrating birds

1

(c) 2 640 000
or
2.64×10^6

1

(d) 2 640 000/24 or $\frac{2.64 \times 10^6}{24}$

1

110 000
or 1.1×10^5

*an answer of 110 000 or 1.1×10^5 scores **2** marks*

*allow **1** mark for answer to part (c) divided by 24*

1

(e) the variety of different species of organisms in an ecosystem

1

(f) any **one** from:

- plant different types of plants

  allow plant wildflowers
- ask zoo to breed endangered animals for the woodlands
- reintroduction of plants or animals that no longer live in Manchester
- protect the woodland habitats

  allow sensible way to do this
- plant hedgerows on the edge of city / in parks
- not using landfill / recycling waste
- ban on cutting down trees
- sensible suggestion to reduce pollution levels

1

[9]

Q6.

(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

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*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 **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

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[11]

Q7.

(a) xylem / phloem

allow translocation / transpiration

1

(b) any **one** from:

- through tools or hands (after touching infected plants)
- in the soil
- infected plants in contact with healthy plants

1

(c) GM is faster

1

GM is less dependent on chance at fertilisation

1

(d) any **four** from:

- gene for resistance is cut out with enzymes
- placed into a vector (virus or plasmid)
- inserted into early stage of young plants
- that grow by mitosis
- plants grow with gene in most cells

points must be in correct order to gain credit

4

(e) any **two** from:

- a species is less likely to survive in changing conditions

allow named change such as new disease

- less links in food webs **or** populations become smaller and have less variation
- less likely have suitably adapted individuals

2

(f) any **one** from:

- habitat for predators of pests
- natural barrier against disease transmission / herbivores
- reduce wind damage

ignore references to cost

1

[11]

Q8.

(a) any **two** from:

- the area of ocean with sea ice has reduced since 1979
- the amount of ice follows the same pattern during a year

allow ice reduces in the summer and increases in the winter

- most ocean with sea ice in February / March
- least ocean with sea ice in September / October
- area of ocean with sea ice decreases from March to September each year
- area of ocean with sea ice increases from September to February / March each year
- decrease is greater between 1995 and 2016 compared with 1979 to 1995

allow other correct conclusions derived from the graph

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2

(b)

Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5-6
Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	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 • deforestation has reduced the number of trees on the planet • which has reduced the amount of carbon dioxide that can be removed from the atmosphere • increased combustion releases more carbon dioxide into the atmosphere • therefore there is a build-up of carbon dioxide in the atmosphere • (build up) allows short-wavelength radiation to pass into the Earth's atmosphere • and absorbs long-wavelength • causing an increase in global temperature • the increase in temperature causes ice to melt	

6

[8]

Q9.

(a) the variety of different species on Earth

1

(b) carbon dioxide

1

methane

1

(c) any **two** from:

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- drought
- flooding
- temperature change

  allow temperature increase or decrease
- rainfall change

  allow rainfall increase or decrease

2

[5]

Q10.

(a) both plots correct

1

suitable line of best fit

1

(b) allow range of 3−7 (units)

*allow ecf from line of best fit given in **03.1***

1

(c)

Advantage	Disadvantage
	✓
✓	
	✓

*allow **1** mark for 2 correct*

2

more than one tick in a row negates a mark

[5]

Q11.

(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]

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Q12.

Level 3 (5–6 marks):
A full explanation is given that is coherent and logically structured, linking effect of increase in carbon dioxide to climate change and effects on biodiversity.

Level 2 (3–4 marks):
An attempt is made to link the effects of rising carbon dioxide levels to climate change and biodiversity. The logic may be inconsistent at times but builds towards a coherent explanation.

Level 1 (1–2 marks):
Discrete relevant points made. The logic may be unclear and attempts at reasoning may not be consistent.

0 marks:
No relevant content.

Indicative content

- rise in carbon dioxide increases atmospheric temperature / causes global warming
- global warming causes extreme weather patterns
- such as rise in sea levels
- increased or decreased rainfall
- frequency of storms / droughts
- rise in sea levels means habitats will change due to flooding
- rise in sea levels could increase salt in soil
- increased rainfall will increase water levels
- severity of storms / droughts could affect photosynthesis
- consequences of changes are loss of or damage to habitats
- which will affect animal and plant distributions
- by increasing migration or species dying off
- which decreases biodiversity

[6]

Q63.

(a) number of (cress) seeds that grew

1

(b) (i) 35 (%)

1

(ii) <u>sulfur dioxide</u> reduces the growth of seeds

allow SO_2 for sulfur dioxide

accept <u>sulfur dioxide</u> reduces the germination of seeds

*do **not** allow sulfur dioxide prevents the growth of seeds*

ignore references to sodium metabisulfite (solution) or water

1

[3]

Q64.

(a) (i) at X = 5

*both needed for **1** mark*

at Y = 3

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1

(ii) any **one** from:

allow converse answers

answer must be comparative

- more oxygen at X
- less pollution / sewage at X

allow cleaner

- better quality (water) at X

allow less harmful

1

(b) not enough oxygen (at Y)

allow less oxygen at Y than X

*do **not** allow there isn't any oxygen*

1

[3]

Q65.

(a) (sensor used by Group 2) had lower <u>resolution</u>

accept converse answers

allow poor / worse <u>resolution</u>

allow (sensor used by Group 2) only measured to whole numbers

ignore reference to sensitivity / precision / accuracy

1

(b) microorganisms / bacteria (in water / from sewage)

ignore references to plants

1

<u>used up</u> oxygen

must be linked to microorganisms

1

during respiration

1

(c) freshwater louse

*correct organism **and** reason needed for mark*

allow louse / lice

number of organisms changes little

1

[5]

Q66.

(a) They produce substances that help plants grow

1

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They reduce landfill

1

(b) Plenty of oxygen

1

Warm conditions

1

[4]

Q67.

(a) (i) photosynthesis

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]

Q68.

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(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

- 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]

Q69.

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]

Q70.

(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

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(b) any **two** from:

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

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

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

2

[4]

Q71.

(a) because the traditional method of extraction produces large amounts of solid waste

1

because the traditional method of extraction would cause atmospheric pollution due to the release of carbon dioxide / sulphur dioxide

1

(b) (i) because iron is cheap
accept because iron is much more abundant than copper

1

(ii) iron is more reactive than copper

1

therefore iron displaces copper from solutions of its salts / copper sulfate solution

1

[5]

Q72.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

No relevant content.

0 marks

There is a brief description of a positive and a negative environmental impact involved with one or more methods used to reduce the amount of plastic bags sent to landfill.

Level 1 (1–2 marks)

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There is some description of both positive and negative environmental impacts involved with at least 2 methods used to reduce the amount of plastic bags sent to landfill.

Level 2 (3–4 marks)

There is a clear, balanced and detailed description of both a positive and a negative environmental impact of using each of the 3 methods used to reduce the amount of plastic bags sent to landfill.

Level 3 (5–6 marks)

examples of the points made in the response

Reuse:
Reuse means less bags used so:

Positive environmental impact

- Saves raw materials/crude oil
- Saves energy
- Cuts down on CO_2 emissions
- Less global warming

Negative environmental impact

- Could cause litter
- Could still be sent to landfill

Recycle:
Bags can be recycled so:

Positive environmental impact

- Used to make new plastic bags / objects
- Saves raw materials / crude oil
- Saves energy compared to producing plastic bags from crude oil
- Cuts down on CO_2 emissions
- Less global warming

Negative environmental impact

- Collection point sites cause an eyesore / litter problem
- Transportation to recycling plant releases carbon dioxide / causes global warming

Burn:
Bags can be burned so:

Positive environmental impact

- Could provide energy for heating buildings

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- Could provide energy for generating electricity

Negative environmental impact

- Increases CO_2 emissions
- Increases global warming
- Could release toxic gases
- Does not conserve raw materials / crude oil

[6]

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Q1.

(a) This question was generally very well answered. 57% of students achieved both marks and it was rare to encounter a student who did not achieve at least one mark.

Some students only ticked one box, so it is worth reiterating that reading the question stem is of utmost importance. The number of boxes to tick in multiple choice questions is given in bold font.

(b) Students were given a straightforward statement that, 'Birds that arrive early might survive better than birds that arrive late'. They were then asked to give one reason for this. 60% of students identified early arrivals having access to more food, better choice of mates, nesting sites and less competition for resources. There were obvious clues in the list given in part **(a)**, which students may well have picked up on.

Those students who did not gain the mark generally did not 'add value' to their response and simply stated, 'they would get food', which was insufficient. The most common incorrect answers related to temperature or being 'better adapted'.

(c) Students were asked to name one greenhouse gas. 71% of students correctly named 'methane' or 'carbon dioxide', with a few also gaining credit for the use of correct chemical formulae. Some students, however, wrote the 2 as a superscript and so were not awarded the mark. Incorrect answers of carbon monoxide and water were fairly common.

(d) This question was generally well understood with 41% of students achieving a mark for identifying one other effect of global warming. The common answers were sea levels rising, melting ice caps, flooding, extinction and habitat loss. Quite a few students managed to put two or three answers into the one mark e.g. as the ice caps were melting, this caused the sea levels to rise which resulted in flooding and often habitat loss.

There were, many vague answers such as acid rain, weather changes, temperature changes, ice melting and crop growth being affected. These were insufficient to gain credit.

(e) This question asked students to identify two human activities that cause global warming. Burning fossil fuels was usually identified but turning off lights or using too much water was often selected as the second response.

(f) This question asked which gas in the atmosphere causes acid rain. Many students selected carbon monoxide, a small number ozone, but 58% of students did select sulfur dioxide.

Q2.

(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

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

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

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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.

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) 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.

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(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'.

Q63.

(a) The dependent variable in the investigation was the number of seeds that grew in each bag. A reference to both number, e.g. amount, and to seeds was required. Incorrect responses generally mentioned control variables or referred to the water and sodium metabisulfite solutions.

(b) (i) Only a quarter of the students correctly calculated the percentage of seeds that grew. Quite a lot came up with an answer of 20% by dividing the mean value by the sum of the number of seeds that grew.

(ii) Once again students struggled to give a conclusion. The stem of the question made clear that the investigation was to find out how sulfur dioxide gas affects the growth of cress seeds. Many students simply referred to growth with the water or growth with the sodium metabisulfite solution and did not add any value. They had to refer to sulfur dioxide in their answer. Some said that sulfur dioxide stopped the seeds growing, which was incorrect.

Q64.

(a) (i) Many students totalled all the invertebrates sampled, rather than the number of different species.

(ii) Many students said there are more invertebrates at X, and did not answer the question which asked for a comment about the water at points X and Y. The question clearly asked for a comparison of the water at X and Y, but many just said there was a lot of sewage at Y. Some said there were different levels of oxygen in the water, but didn't say where there was more or less. Some came up with illogical suggestions, such as the water was deeper at Y or there was more water at X. It appeared that most students had not looked at the whole table, so did not relate the invertebrates to the level of oxygen in the water.

(b) The question asked students to use information from the table to suggest why no Dragonfly nymphs were found at Y. The answer had to refer to oxygen levels. Many said Dragonfly nymphs needed medium-high oxygen levels, but did not go on to say that the oxygen level at Y was too low. If students said there was no oxygen at Y they did not gain the mark. Many said the water at Y had sewage in it, or was polluted, but this did not relate to information in the table.

Q65.

(a) Many students had not read the question carefully and said the differences in the readings were either due to different sensors being used, or because one of them was faulty. Both of these ideas were mentioned in the question. Responses mentioning the resolution of the meters were rarely seen, although precision, accuracy and sensitivity were often mentioned, but these were ignored. Students should be made aware of the definitions given in the glossary. Students who answered correctly usually said Group 2's sensor rounded the reading to a whole

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number

(b) Although most students said that point Z was just below a sewage pipe, they did not go on to say the sewage would contain microorganisms. Many thought chemicals in the sewage would reduce the oxygen levels. Some students said point Z was furthest from the trees which produce oxygen and therefore there would be less oxygen at point Z.

(c) The concept of indicator organisms appears to be poorly understood. The most common response was bloodworm, which is the most suitable indicator of oxygen concentration. Many of those who gave freshwater louse as their choice did not clearly explain why so did not gain a mark.

Q66.

(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.

Q67.

(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.

Q68.

(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.

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Q69.

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.

Q70.

(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.

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