AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.6.3 THE DEVELOPMENT OF UNDERSTANDING OF GENETICS AND EVOLUTION (PACK 1)

SCORE	PERCENTAGE
/281	%

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Q1.

(a) (organism) soft-bodied

allow lack hard parts / skeleton / shell

allow (organism) eaten / decayed

or

(fossil) destroyed

allow buried (very) deep
allow they are (very) small

1

(b) any **two** from:

- the fish (dies) buried in sediment / sand / mud

  allow other examples of sediments
  *do **not** accept rock(s)*

- (only) the soft parts decayed / eaten **or** the hard parts / bones did not decay or were not eaten

- mineralisation occurred

  allow description of mineralisation e.g. bones turned to stone
  allow imprinted (in the sediment)

2

(c) any **two** from:

ignore pollution

- drought
- ice age / global warming
- volcanic activity

  allow earthquakes / tsunami

- asteroid / meteor collision
- (new) predators

  allow hunters / poachers
  allow eaten

- (new) disease / named pathogen
- competition for food

  allow lack of food

- competition for mates

  allow isolation or lack of mates

- lack of habitat or habitat change

  *if no other marks awarded allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark*

2

(d) a change in a gene

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1

(e) there is variation (between members of a species)

allow mutation

1

better adapted survive

allow 'survival of the fittest'

1

(reproduce and) pass on (favourable) allele(s) / gene(s) / mutation(s) / DNA / genetic material

ignore pass on characteristic(s)

1

allow in terms of an example

[9]

Q2.

(a) Gregor Mendel

1

(b) DNA

1

(c) when the dominant allele is not present

1

(d) tt

allow homozygous recessive

1

(e)

	T	t
T	TT	Tt
t	Tt	tt

*all 3 correct = **2** marks*
*2 correct = **1** mark*
*0 or 1 correct = **0** marks*
allow tT for Tt

2

(f) circle drawn around either TT or tt on Figure 2

allow circles drawn round both

1

(g) correct ratio from part **(e)** e.g. 3 : 1

allow multiples of stated ratio
*allow 3 : 1 if no answer to part **(e)***

1

[8]

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Q3.

(a)

Classification group	Name
Class	*Mammalia*
Order	*Primates*
Family	*Lemuroidea*
Species	*catta*

*all 4 correct = **2** marks*
*2 or 3 correct = **1** mark*
*0 or 1 correct = **0** marks*

2

(b) Lemur catta

ignore capitalisation / non-capitalisation of initial letters
ignore italics / non-italics
ignore underlining / non-underlining

1

(c) carried by (favourable) currents on masses of vegetation

allow description of currents from Figure 2
ignore swimming

1

(d) isolation of different populations

1

habitat variation between lemur populations

allow examples − biotic (e.g. food / predators) or abiotic (e.g. temperature)

1

genetic variation or mutation (in each population)

1

better adapted survive (reproduce) **and** pass on (favourable) allele(s) to offspring

*allow natural selection **or** survival of the fittest **and** pass on (favourable) allele(s) to offspring*
allow gene(s) / mutation as an alternative to allele(s)

1

(eventually) cannot produce fertile offspring with other populations

allow cannot reproduce 'successfully' with other populations
ignore cannot reproduce unqualified

1

[9]

Q4.

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(a) any **one** from:
- animal / plant (dies and) body covered in sediment / mud
- bones / shells / hard parts do not decay
- minerals enter bones / parts are replaced by other materials / mineralisation
- preserved traces / footprints / burrows / rootlet traces / impressions / casts

allow covered in tar / ice

1

(b) (diameter **P** =) 60
and
(diameter **Q** =) 75

*allow **±** 1 mm*

1

(c) 150

allow ecf from (b)

1

(d) 2.5

1

(e) any **two** from:
- **Q** has fewer spirals
- **Q** has more (radial) ridges

allow stripes / etc

- **Q**'s ridges are more pronounced
- **Q** has more elongated shape

*accept **Q** is less circular / round*
allow other correct descriptions

2

(f) **Q** was found in newer rocks than **P**

1

(g) 100 million years

1

(h) any **three** from:

- flooding
- drought
- ice age

ignore pollution

*if none of these points given allow climate change / global warming / weather change / environmental change for **1** mark*

- volcanic activity
- asteroid collision

ignore pollution

*if none of these points given allow natural disaster / catastrophic event for **1** mark*

- (new) predators (allow hunters / poachers)

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- (new) disease / named pathogen
- competition for food
- competition for mates
- isolation

lack of habitat
or
habitat change

3

(i) lack of evidence
or
cannot perform experiment to find out

*do **not** accept no evidence*

allow no proof

allow no one was there to observe

1

[12]

Q5.

(a) less sweating so less water loss

1

(as) no / little water available in desert

1

(b) (fat store) can be metabolised / respired to water

1

(little urine…) conserve water

1

(hard mouth) not damaged by spines on plants / on food
or
not damaged by hard / dry food

1

(c) dromedary / *C.dromedarius*
and bactrian / *C. bactrianus*

no mark for the names, but must be identified

because
same genus

ignore 'both are Camelus'

1

(d) any **two** from:

- the fossil record
- oldest fossils in N. America
  or
- newer fossils in S. America / in Asia / in Africa

*allow numbers for ages (45 Mya **and** 3 Mya / 6 Mya)*

- chemical / DNA analysis of living species

allow radioactive dating of fossils

2

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(e) isolation of separate camel populations by sea
or
by mountains

1

habitat variation / described between populations
allow examples – biotic (e.g. food / predators) or abiotic

1

genetic variation / mutation in each population

1

45 million years is sufficient time to accumulate enough mutations

1

natural selection
or
better adapted survive to reproduce

1

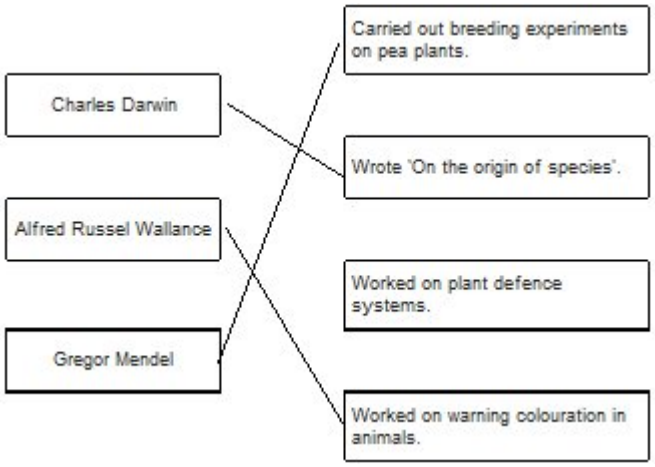
pass on favourable allele(s)
allow gene(s)

1

[14]

Q6.

(a)



3

(b) a gene
allow allele

1

(c) 4

1

(d) correct derivation of children's genotypes

1

identification of children with cystic fibrosis (dd)

1

0.25

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allow ecf
allow ¼ / 25% / 1 in 4 / 1:3

1

*do **not** accept 1:4*

(e) heterozygous

1

[9]

Q7.

(a) (Jean Baptiste) Lamarck

allow phonetic spelling

1

(b) (snake is) covered in sediment / mud
or
sinks into the mud

1

(then) the soft parts decay / are eaten
or
bones / hard parts do not decay

1

(so) minerals enter bones
or
bones are replaced by minerals

1

(c) **Level 3 (3–4 marks):**
A detailed and coherent explanation is provided. Logical links between clearly identified, relevant points explain how the rat snake evolved through the process of natural
selection.

Level 2 (1–2 marks):
Simple statements made, but not precisely. The logic is unclear.

0 marks:
No relevant content.

Indicative content

statements:
- there are lots of different colours of snakes
- some shades of green are closer to the colour of the environment (in Japan) than others
- survivors (in each generation) will breed and produce offspring

explanations:
- different colours are controlled by different genes / alleles / are caused by mutations
- being green means they are best suited to grassy / green environments
- being green means they are camouflaged
- those that are camouflaged best will be able to catch more food
- those that are camouflaged best will be able to avoid being eaten

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- survivors' offspring will inherit the genes / alleles / mutation for the shade of green colouration

additional examiner guidance:
- allow converse points relating to the Texas rat snake if they clearly identify the reasons why this snake was at an evolutionary disadvantage, ie more likely to be caught and eaten by a predator
- a good level 2 answer will clearly link survival and breeding to the passing on of the advantageous genes / alleles / mutations and link the idea of colour (AO2) to a correct explanation of its significance for survival

4

(d) any **one** from:
- changes to the environment
- new predators
- new diseases
- new (more successful) competitors
- catastrophic event / described event

1

[9]

Q8.

(a) three billion

1

(b) mutation(s)

1

breed / reproduce

in this order only

allow pass on their genes

1

[3]

Q9.

(a) any **two** from:
- larger / longer / thicker
  *allow examples eg fewer toes **or** bones fused*
- fewer (bones in total)
  allow smaller surface area touching the ground
- fewer bones touching the ground

2

(b) (i) large(r) surface / area in contact with the ground

or

low / less pressure on ground

1

(so) less likely to sink into mud / ground

or

(so) could run fast(er)

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allow easy / easier to escape predators

1

(ii) variation (in size / number / arrangement of bones)

allow mutation(s) (in size / number / arrangement of bones)

1

(and) those with large(r) / few(er) bones more suited to running **or** run faster (on harder / drier ground)

1

these survive **and** breed

allow ref to offspring for breed

1

(so) genes / DNA (for larger / fewer bones) passed on

allow alleles passed on

1

[8]

Q10.

(a) (i) reduced photosynthesis

ignore growth

*do **not** allow need light for respiration*

1

(ii) less food (for animals) **or** less oxygen (for animals)

allow loss of habitat

1

(iii) any **two** from:

accept 2 physical factors or 2 biological factors or one of each for full marks

examples of physical factors, eg

- flooding
- drought
- ice age / temperature change

  ignore pollution
- volcanic activity

examples of biological factors, eg

- (new) predators (allow hunters / poachers)
- (new) disease / named pathogen
- competition for food
- competition for mates
- cyclical nature of speciation
- isolation
- lack of habitat or habitat change

*If no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark*

2

(b) (i) 3

1

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(ii) fossils

ignore bones, remains, fossil fuels

1

(c) (i) 65 million years ago

1

(ii) 17

allow ecf

1

(iii) fossil record incomplete
or
some fossils destroyed

accept not enough evidence

or

cannot perform experiment to test

1

[9]

Q11.

(a) reference to interbreeding

1

successfully between Island types

allow ref. to production of fertile offspring

allow ref. to DNA analysis / comparison for 1 mark

ignore ref. to grey fox

1

(b) (i) (two ancestral populations) separated / isolated (by geographical barrier / sea)

1

and genetic variation (in each population) **or** different / new alleles **or** mutations occur

1

under different environment / conditions

allow abiotic or biotic example

allow different selection pressures

1

natural selection occurs **or** better adapted survived to reproduce

1

so (favourable) alleles / genes / mutations passed on (in each population)

ignore they adapt to their environment

1

(ii) any **one** from:

- continued to mate with one another
- few beneficial mutations (between island varieties)
- similar conditions on each island so similar adaptations/features fit

1

[8]

Q12.

(a) organisms that reproduce together to form fertile offspring

1

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(b) (i) fossils of **P** and **Q** in same stratum / layer / level / height

1

(ii) earlier − fossil in deeper layer / further down

1

(iii) the fossils of animals **S** and **T** have many features in common, but **T** is more complex that **S**

1

the fossil of animal **S** was found in a deeper layer of rock than the fossil of animal **T**

1

(c) (i) **X** has white tail / shorter tail

*allow other points eg **X** has furrier tail / smaller feet / is furrier*

or

***W** has sharper claws / **W** has larger claws*

1

(ii) two (ancestral) populations separated / isolated (by geographical barrier / by canyon / river)

1

genetic variation (in each population) / different alleles / different genotypes / (different) mutation(s)

1

different environmental conditions / example described

allow abiotic or biotic example

1

the better adapted survive / natural selection occurs

allow survival of the fittest
ignore they adapt to the environment

1

so (different / favourable) alleles / genes passed on (in each population)

1

eventually two types cannot interbreed successfully

allow to produce fertile offspring

1

(iii) any **two** from:

- environments similar / described
  allow example, e.g. similar predator(s) / food / climate
- therefore similar adaptations / features / phenotypes suit
  accept suitable named feature
- original ancestor already well adapted
  ignore reference to not enough time for evolution.

2

[14]

Q13.

(a) selection

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1

(b) (i) 4

1

(ii) ground finch / lives on the ground

1

(only) eats seeds

*allow eg eats seeds on / from the ground for **2** marks*

1

(c) Lamarck

1

[5]

Q14.

(a) microorganism / bacteria / virus / fungus that causes (infectious) disease

1

(b) reduce / stop use of (current) antibiotics

1

(reduce / stop use) for non-serious / mild / viral infections

allow ensure course is completed

allow use of variety of antibiotics

1

(c) (i) 40 °C

1

(ii) any **one** from:

- microorganisms grow / reproduce / work / act faster
- results / product acquired sooner

1

[5]

Q15.

(a) (i) any **two** from:

- trapped / held (since sticky)
- engulfed / covered by resin

allow engulfed / covered by amber

- prevented decay.

2

(ii) any **two** from:

- animal / plant (dies and) body covered in sediment / mud

ignore ref to rock

allow covered in tar / ice

- bones / shells / hard parts do not decay
- minerals enter bones / parts are replaced by other materials / mineralisation
- preserved traces / footprints / burrows / rootlet traces / impressions / casts.

2

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(b) (i) New technology provides more valid evidence.

1

(ii) any **three** from:
examples of physical factors, e.g.

accept 3 physical factors or 3 biological factors or some of each for full marks

- flooding
- drought
- ice age / temperature change.

ignore pollution

examples of biological factors, e.g.
- (new) predators (allow hunters)
- (new) disease / named pathogen
- competition for food
- competition for mates

competition must be qualified
- cyclical nature of speciation
- isolation
- lack of habitat or habitat change.

***if no other answers given allow** natural disaster / weather change / catastrophic event / environmental change / climate change for **1** mark*

3

[8]

Q16.

(a) (i) any **two** from:

- (dead) animal buried in sediment

  allow imprint in mud
- hard parts / bones do not decay **or** soft parts do decay

  allow (one of) the conditions for decay is missing − accept example, eg oxygen / water / correct temperature / bacteria
- mineralisation (of hard parts / bones)

  allow replacement by other materials

2

(ii) any **two** from:

- conditions not right for fossilisation

  ignore references to soft-bodied
- geological activity has destroyed fossils / has destroyed evidence

  allow a named / described example − eg vulcanism / earth movements / erosion
- fossils not yet found

  allow description of why not yet found

2

(b) any **four** from:

- separation / isolation (of different populations)

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- different environmental conditions (between locations)
- mutation(s) occur **or** genetic variation (within each population)
- better adapted survive **or** natural selection occurs

  allow 'survival of the fittest'

  ignore animals adapt to their environment

  ignore reference to stronger survive
- favourable alleles passed on (in each population)

  allow genes for alleles
- eventually different populations unable to breed successfully with each other

  allow unable to produce fertile offspring

4

[8]

Q17.

(a) (i) 3.15 : 1

*accept 3.147:1 **or** 3.1 : 1 **or** 3 : 1*

*do **not** accept 3.14 : 1*

Ignore 705:224

1

(ii) any **two** from:

- fertilisation is random **or** ref. to chance combinations (of alleles / genes / chromosomes)
- more likely to get theoretical ratios **or** see (correct) pattern **or** get valid results if large number

  allow ref. to more representative / reliable

  *do **not** allow more accurate **or** precise*

  ignore fair / repeatable
- anomalies have limited effect / anomalies can be identified

  accept example of an anomaly

2

(b) (i) in sequence:

Homozygous
Homozygous
Heterozygous

All 3 correct = 2 marks

2 correct = 1 mark

1 or 0 correct = 0 marks

2

(ii) genetic diagram including:

Parental genotypes: **Nn** and **Nn**

allow other characters / symbols only if clearly defined

1

or

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Gametes: **N** and **n + N** and **n** derivation of offspring genotypes: **NN Nn Nn nn**

allow genotypes correctly derived from candidate's P gametes

1

identification: **NN** and **Nn** as purple **and nn** as white

allow correct identification of candidate's offspring genotypes but only if some F_2 are purple and some are white

1

(c) any **two** from:

- did not know about chromosomes / genes / DNA **or** did not know chromosomes occurred in pairs

  ignore genetics
- had pre-conceived theories

  eg blending of inherited characters

  ignore religious ideas unless qualified
- Mendel's (mathematical) approach was novel concept

  allow his work was not understood or no other scientist had similar ideas
- Mendel was not part of academic establishment

  allow he was not considered to be a scientist / not well known / he was only a monk
- work published in obscure journal / work lost for many years
- peas gave unusual results cf other species

  allow he only worked on pea plants
- Mendel's results were not corroborated until later / 1900

2

[10]

Q18.

(a) any **three** from:

- parts of organisms have not decayed

  accept in amber / resin

  allow bones are preserved
- conditions needed for decay are absent

  accept appropriate examples, eg acidic in bogs / lack of oxygen
- parts of the organism are replaced by other materials as they decay

  accept mineralised
- or other preserved traces of organisms, eg footprints, burrows and rootlet traces

  allow imprint or marking of organism

3

(b) (i) teeth for biting (prey)

must give structure + explanation

1

claws to grip (prey)

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accept sensible uses

1

wing / tail for flight to find (prey)

1

(ii) any **two** from:

- new predators
- new diseases
- better competitors
- catastrophe eg volcanic eruption, meteor
- changes to environment over geological time

  accept climate change

  allow change in weather
- prey dies out **or** lack of food

  allow hunted to extinction

2

[8]

Q19.

(a) any **two** from:

- most people still believed that God made all the animals / plants on Earth

  allow against their 'religion'
- insufficient evidence

  do not allow no proof / evidence

  ignore 'fossil'
- the mechanism of inheritance / genes unknown (at the time)

2

(b) any **four** from:

- finches separated / isolated
- genetic variation / mutation (in finch population(s))
- finches with alleles / genes best suited to their environment survive

  Do not allow 'characteristics'
- advantageous alleles / genes passed on (to offspring)
- after many generations / a long time, the populations can no longer successfully interbreed

  Ignore 'speciation'

4

(c) (i) vegetarian finch

1

(ii) **R**

1

(iii) mangrove **and** woodpecker finches

1

[9]

Q20.

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(a) (i) (volume) increases (with time)

ignore numbers

1

(ii) there is more evidence / specimens / results (for Homo sapiens)

allow examples of this, eg more / better fossils

allow converse if clearly referring to Australopithecus

ignore reference to being 'more recent'

1

(b) 2.5 – 3.15 (million years ago)

accept any number in range

1

(c) (i) Darwin

1

(ii) any **one** from:

- they believed in other theories

  allow they believed that God made all life
- insufficient evidence

  ignore 'no evidence'
- no proof

  allow not enough proof
- genes / mechanism of inheritance not known / discovered

1

[5]

Q21.

(a) mumps

in either order rubella / German measles

both needed for the mark

ignore measles unqualified

1

(b) (i) 80(.0)

*allow **1** mark for* $\frac{504}{630}$ ***or** 0.8*

2

(ii) less chance of epidemic / pandemic

or

less chance of spread of disease / measles / mumps / rubella

allow idea of herd immunity (increased protection for those who are not vaccinated)

*ignore less chance of getting the disease **or** to eradicate the disease*

1

(c) (i) dead / inactive pathogens / viruses / bacteria

allow antigens / proteins from pathogens / viruses / bacteria

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ignore microorganisms

1

(ii) white blood cells produce antibodies

1

antibodies produced rapidly (on re-infection) **or** response rapid (on re-infection)

allow ecf if antibodies incorrectly identified in first marking point

1

these antibodies kill pathogens / viruses / bacteria

*do **not** accept idea that original antibodies remain in blood and kill pathogens*

1

(d) (i) antibiotics don't kill viruses

allow antibiotics only kill bacteria

1

(because measles) virus / pathogen lives inside cells

*allow antibiotics do not work inside cells **or** killing virus / pathogen would kill / damage cell*

1

(ii) (bacteria / pathogens) develop resistance (to antibiotic)

ignore reference to immunity

ignore viruses develop resistance

1

[11]

Q22.

(a) (i) variation (in population) / mutation

1

longer nosed individuals get more food / leaves

allow longer nosed individuals more likely to survive

1

(these) survivors breed (more)

1

pass on genes / alleles / DNA (for long nose)

allow pass on mutation

1

(ii) Phiomia / ancestor stretched its nose (during its lifetime) to reach food / leaves

1

passed on (stretched nose) to offspring

allow offspring inherit (stretched nose)

*do **not** allow ref to genes*

1

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(b) (i) insufficient evidence / no proof

ignore other theories, eg religion

*do **not** allow no evidence*

1

mechanism of inheritance not known

allow genes / DNA not discovered

1

(ii) God made all living things / them

allow creationism

ignore religion

1

[9]

Q23.

(a) fossils show change over time.

1

(b) covered in sediment / mud or sinks into the mud

1

soft parts decay / are eaten
or
bones / hard parts / shell do not decay

1

minerals enter bones / parts are replaced by minerals / mineralisation

accept turns to rock

allow 'is an impression' / 'imprint' / 'cast'

1

(c) skin is soft / skin not preserved / not fossilised / skin decays

accept not enough / no evidence / no-one has seen one

allow 'this fossil is only bones'

1

(d) any **two** examples of:

accept 2 physical factors or 2 biological factors or one of each for full marks

physical factors such as volcanic activity (allow volcanoes) / earthquakes / asteroid (collision) / ice age / temperature change

ignore pollution

and / or

biological factors such as predators / disease / named pathogen / competition/ lack of food / mates / cyclical nature of speciation / isolation / lack of habitat or habitat change

if no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for 1 mark

2

[7]

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Q24.

(a) lack of fossils / fossils destroyed

allow lack of evidence

1

(due to soft parts) decaying / geological activity

allow an example – eg vulcanism or earth movements or erosion

allow converse points re skeletons, shells, hard parts

1

(b) (i) **A** and **B** did not mate successfully

*'**A** and **B** did not mate' insufficient*

allow did not produce fertile offspring

1

(ii) any **two** from:

- may not be mating season
- **A** and **B** may not find each other attractive
- this is just a one-off attempt / an anomaly / need repeats
- may be juvenile / immature
- may be the same sex

allow other sensible suggestion eg were put in unfavourable environment or one / both could be infertile

2

(c) 1. (two ancestral populations) separated (by geographical barrier / by land) / were isolated

1

2. genetic variation (in each population) **or** different / new alleles **or** mutations occur

1

3. different environment / conditions

allow abiotic or biotic example

1

4. natural selection occurs **or** some phenotypes survived **or** some genotypes survived

1

5. (favourable) alleles / genes / mutations passed on (in each population)

1

6. eventually two types cannot interbreed successfully

allow eventually cannot produce fertile offspring

1

[11]

Q25.

(a) pathogens

1

(b) (i) A disease affecting people in many countries

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1

(ii) birds fly / migrate

accept converse

OR

human contact with birds more likely

birds not contained / difficult to control movement

OR

there are more birds (than pigs)

1

(c) (i) antibiotics (only) kill bacteria

ignore flu is caused by a virus unqualified

OR

antibiotics don't kill viruses

ignore virus resistant / immune

1

(ii) painkillers

accept any correct named painkiller, eg aspirin or paracetamol

allow antivirals / Tamiflu

ignore medicine / tablets

1

(iii) resistant

1

bacteria

1

in this order

[7]

Q26.

(a) (i) natural

1

(ii) simple

1

(iii) three billion

1

(b) any **two** from:

- reference to religion
- insufficient evidence / couldn't prove it / no proof

ignore no evidence

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- mechanism of inheritance / variation not known
  allow genes / DNA not known about
- reference to other theories
- reference to Darwin's status

2

(c) (i) tree

1

(ii) hippopotamus **and** pig
both required, either order
allow hippo

1

(iii) new evidence from fossils

1

[8]

Q27.

(a) variation (between organisms within species)
allow described example
*allow mutation – but **not** if caused by change in conditions*

1

those most suited / fittest survive

1

genes / alleles passed on (to offspring / next generation)
allow mutation passed on

1

(b) (i) any **two** from:
allow converse

- increase in latitude reduces number of (living) species
  ignore references to severity of conditions
- increase in latitude reduces time for evolution (of new species)
- the less the time to evolve the fewer the number of (living) species

2

(ii) any **two** from:
*do **not** accept intention or need to evolve*

- (increase in latitude reduces number of (living) species because) less food / habitats / more competition <u>at high latitude</u>
  allow only extremophiles / well-adapted species can survive
- (increase in latitude reduces time for evolution (of new species) because) severe conditions act more quickly / to a greater extent on the weakest

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- (the less the time to evolve the fewer the number of (living) species because) species that evolve slowly don't survive

2

[7]

Q28.

(a) (i) animal walking on soft material **or** suitably named material

or

further detail – eg dries out / buried / hardens / turns to rock

*do **not** allow general descriptions of how fossils are formed*
***or** reference to bones not decaying*

1

(ii) any **one** from:

- (from) bones / shells / hard parts **or** from parts that do not decay / rot or are preserved

  ignore imprint / impression

- animal trapped in resin / amber / ice / peat

  allow frozen

- infiltration with minerals / named

1

(b) any **two** from:

examples of physical factors such as flooding, volcanic activity (allow volcanoes) asteroid collision, drought, ice age / temperature change

accept 2 physical factors or 2 biological factors or one of each for full marks

ignore pollution

examples of biological factors such as predators (allow hunters), disease / named pathogen, competition lack of food / mates, cyclical nature of speciation / isolation / lack of habitat or habitat change

*If no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark*

2

(c) older fossils simpler

to gain the mark there must be implication of change

or

change (with time)

ignore evolve
ignore extinction

1

(d) insufficient / no evidence / no remains **or** fossils survive

ignore no people were there

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allow no proof

1

[6]

Q29.

(a) organisms that can breed together

accept converse points re. 2 different species

1

successfully

accept produces fertile offspring

1

(b) any **two** from:
(live at)

- different pH of soil
- different height above sea level
- different flowering times

2

AND

genetic variation / mutation / different alleles (produced in isolated populations)

1

natural selection acts differently on the two populations

or different characteristics in the two populations survive

or different alleles passed on in the two groups

1

eventually resulting in interbreeding no longer possible

1

[7]

Q30.

any **two** from:

- religious objections
- insufficient evidence

allow 'could not prove'
*ignore '**no** evidence'*

- mechanism of heredity not known

[2]

Q31.

(a) wing pattern similar to *Amauris*

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allow looks similar to Amauris

1

birds assume it will have an unpleasant taste

1

(b) mutation / variation produced wing pattern similar to *Amauris*

*do **not** accept breeds with Amauris*

*do **not** accept idea of intentional adaptation*

1

these butterflies not eaten (by birds)

1

these butterflies breed **or** their genes are passed to the next generation

1

[5]

Q32.

(a) (i) decrease

1

rate of decrease slows

1

(ii) any **one** from:

- more use of disinfectant

  allow any reasonable increase in hygiene or sterilisation precautions
- more use of hand washing
- more careful / more often cleaning of patient facilities
- raised awareness / education about hygiene

1

Explanation:
stops / reduces the bacteria being transferred / spreading

1

(iii) 800 – 500 / 800 × 100 =

1

37.5 (%)

*correct answer with or without working gains **2** marks*

1

(iv) any **one** from:

- numbers quite low now so hard to reduce further
- was a big campaign / much publicity (in 2009) so more people already doing it
- hygiene / cleaning now good so hard to improve
- hospitals short of money so less staff to clean

1

(b) mutation occurred giving resistance (to methicillin)

*do **not** accept overuse caused mutation*

1

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resistant bacteria not able to be treated / not killed

1

these bacteria multiplied / reproduced / spread quickly

1

[10]

Q33.

(a) sulfur dioxide

1

(b) (i) mutation

1

(ii) pale form now (more) easily seen (by predators) **or** dark form now less easily seen (by predators)

accept ref to camouflage

1

so pale form (more) likely to be eaten **or** dark form less likely to be eaten

1

so dark form (more likely to) breed / pass on genes

or

pale form less likely to breed / pass on genes

1

(c) (i) pyramid of three layers of diminishing size

either way up

1

three labels in food chain order

award 2 marks only if the pyramid is correctly labelled

accept trees / birch

accept (peppered) moth(s) / larvae

1

(ii) some material is lost in waste from the birds

1

peppered moth larvae do not eat all the leaves from the trees

1

[9]

Q34.

(a) Lamarck

ignore any first name(s)

1

(b) (i) variation / range of sword lengths (in ancestors)

accept mutation produced longer sword

1

those with long swords get more food

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accept those with short swords get less food

1

swordfish (with long swords) survive **and** breed

allow have offspring for breed

1

(survivors) pass on gene(s) / allele(s) (for long sword)

allow mutation for gene(s) / allele(s)

1

(ii) any **one** from:

- more evidence (now)
  accept examples of evidence, e.g. more fossils
- DNA / genes / mechanism of inheritance discovered
  allow Lamarck's theory has been disproved
  ignore religious arguments
  ignore proof

1

[6]

Q35.

(a) (i) (remains of) an organism / a bone / a shell / hard part of an organism / part of organism that does not decay / impression of an organism / footprint / burrow / rootlet trace

1

further detail – eg in rock / ice / amber / mineralisation

or

from a long time ago / many years ago

if number, > 1000 years
ignore hundreds

1

(ii) older fossils are simple(r)

must make ref to change and time
allow deeper fossils are simple(r)

or

fossils show change / adaptation with time

1

(b) (i) 18 to 30

allow 30 to 18
allow 12
ignore units

1

(ii) small sample

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allow <u>only</u> 49 shells / not representative / not enough evidence

allow not all fossils found

1

(c) example of a physical factor such as flooding, volcanic activity (allow volcanoes) asteroid collisions, drought, ice age / temperature change

allow natural disaster / climate change / weather change / catastrophic event / environmental change

or

example of a biological factor such as predators / disease / competition / lack of food or mates / cyclical nature of speciation / isolation / lack of habitat or habitat change

ignore human factors eg hunting / pollution

1

[6]

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