GCSE

BIOLOGY

AQA - COMBINED SCIENCE

MARK SCHEME

B6

INHERITANCE & VARIATION

TEST 3

1

(a) *Triticum spelta*

1

(b) (pig) 2
and
(wheat) 4

*both needed for **1** mark*

1

(c) pig

*allow ecf from part **(b)***

1

(d) only a small sample (of DNA)

ignore references to structure and appearance

1

(e) any **three** from:

- (farmer) selects heaviest / largest chickens / parents

  allow (farmer) selects chickens with the best / most meat

- (cross) breeds these chickens together
- (farmer) selects the heaviest / largest offspring (to breed)
- repeats this many times (until you have the desired chicken)

3

(f) high(er) income / profit

1

(g) the chickens may weigh too much to be able to stand

1

[9]

2

(a) (small section of) DNA

1

(b) rr

1

(c) persons **6** and **7** (don't have Pompe but) have a child with Pompe disorder

1

(therefore) each parent must be a carrier
or
have a copy of the recessive gene

allow neither parent has Pompe disorder

1

(d)

		mother (number 7)	
		R	r
father (number 6)	R	**RR**	**Rr**
	r	**Rr**	**rr**

1 *mark for first row*

1 *mark for second row*

1

1

(e) ring drawn around **rr**

1

(f) 0.25

allow 1 in 4

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

1

(g) tested on healthy volunteers

1

(then) tested on patients

1

any **two** from:

- monitored for safety
- monitored for dosage
- monitored for efficacy
- carried out as a double-blind trial
- use of placebo

2

[12]

3 (a) between 200 and 500 million years ago

2

(b) the organism was replaced by minerals

1

(c) there are no organisms of that species alive todays

1

(d) DNA analysis

1

(e) (Carl) Linnaeus

1

(f) Protoceratops **and** Triceratops

allow

*Coronosaurus **and** Triceratops*

or

*Protoceratops **and** Coronosaurus*

or

*Marginocephalia **and** Pachycephalosaurus*

1

(g) Marginocephalia

1

(h) older fossils have a simpler structure

1

[8]

4 (a) asexual

1

clones

1

gametes

1

variation

1

mitosis

in this order

1

(b) 8

1

(c) XY

1

(d) both bars correctly plotted

1

correct labels on x-axis

allow labels mark even if bars incorrect

1

(e) 30

1

(f) any **one** from:

- because zebra fish is small and has high number of chromosomes
- not all animals are listed
- not enough data
- animals have different sizes during their life but the chromosome number stays the same

allow other sensible conclusions

1

[11]

5

(a) remains / traces of organisms

1

from millions of years ago

1

(b) no individuals of a species still alive

1

(c) microorganisms have a simpler structure than a trilobite

1

stromatolites are found in older rock than trilobites

1

(d) Marginocephalia

1

(e) Protoceratops **and** Triceratops
(in either order)

allow

*Coronosaurus **and** Triceratops*

or

*Coronosaurus **and** Protoceratops*

or

*Marginocephalia **and** Pachycephalosaurus*

1

(f) any **one** from:

- the fossil record is not complete
- new fossils may have been found since 1970s
- DNA / chemical analysis may have given new information

1

[8]

6

(a) *Oryx*

1

(b) any **two** from:
- white / light colour (to reduce thermal gain)
- short fur (to reduce thermal insulation)
- little body fat
- large hooves (to walk in sand)
- camouflaged (against sand by light colour)

2

(c) any **three** from:
- variation in population
- animals with longest horns more likely to survive / reproduce
- passing on alleles for long horns
- repeated over many generations

3

(d) breeding programme

1

(e) any **one** from:
- to increase genetic diversity

  *do **not** accept to increase biodiversity*
- species may be unable to cope if environment changes
- all susceptible to same diseases / inbreeding problems

  allow otherwise all offspring would have similar genes or a decreased gene pool
- prevents inbreeding

1

[8]

7 (a) a change in the DNA / gene

1

(b) produces a different protein / enzyme that is responsible for colour

1

(c) parents genotype both Bb

allow correctly derived gametes

1

offspring genotypes correctly derived

1

bb identified as blue

allow ring around bb only

1

65 000

allow ecf or 260 000 × 0.25

1

6.5×10^4

1

(d) cross with **bb** / blue carp

*allow annotated Punnett square diagram(s) of cross with **bb** carp*

1

if any offspring are blue, the parent was **Bb** / heterozygous

allow converse

1

*allow cross with known **Bb** carp*

*if any offspring are blue, other parent was **Bb** / heterozygous*

[9]

8 (a)

	Animalia
Phylum	
Class	
Genus	*Spodoptera*
Species	

1

1

(b) any **one** from:

- no / few natural predators
- no / few pathogens / diseases
- more favourable climate
- plentiful food as corn crops grown over wide areas in Africa

1

(c) any **one** from:

- compare the structural features with those of annelids and arthropods

  allow named structural features eg is it a segmented worm, does it form a pupa, does it turn into an adult with legs.
- carry out DNA analysis and compare with known annelids and arthropods
- carry out electron microscopy of internal parts to see fine structure and compare with known annelids and arthropods

1

(d)

Level 2: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3-4
Level 1: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	1-2
No relevant content	0
Indicative content **advantages** • killing worms will mean more corn / food for African people • so food security or no famine • it will stop the spread of the worms • so stop it reaching other countries and causing food shortages there • it will remove an invasive species • and so restore the natural ecosystem balance in the area **disadvantages** • insecticide will kill other (pollinating) insects • so will stop fertilisation of crops and lead to poor yields • insecticide will kill other insects • and upset the ecological balance in the area or reduce biodiversity in the area • insecticide may be toxic to humans • causing illness if they ingest it • insecticide may build up in the food chain • and poison / kill organisms further up the chain (ignore cost as it could be argued either way)	

4

[8]

9 (a) *Bubo*

1

(b) (individuals of one species) can interbreed to produce fertile offspring

allow converse if clearly stated

1

(c) owls have become geographically isolated from each other

or

arctic ice / temperature in different areas have separated the original population

1

northern area is much colder and has snow / ice

allow examples – biotic (eg food / predators) or abiotic

1

genetic variation / mutations in each population

allow gene(s) / mutation

1

(natural selection occurs so) better adapted survive to reproduce

1

passing on their favourable allele(s)

1

until individuals of the two populations can no longer interbreed (to produce fertile offspring)

1

[8]

10 (a) gene for the malarial protein is removed from the malarial pathogen

allow gene for the malarial protein is removed from the malarial protist

1

goat DNA / chromosome is cut open

1

using an enzyme

1

goat and malarial DNA are combined (and put back into the goat cell)

1

(b) only females produce milk

allow males don't produce milk

1

(c) ensure all the offspring are female (to produce milk)

1

ensure all goats will have the malarial protein gene

or

all will produce the malarial protein / vaccine

1

(d) any **two** from:

- everyone who drinks milk will get the vaccine
- no need for storage / refrigeration of the vaccine
- cheaper production of the vaccine
- less risk of infection from injections
- no needles which some people are scared of

2

(e) pathogens are engulfed (destroyed) via phagocytosis

1

antibodies are produced to kill the pathogens

1

(and) antitoxins are made (to stop the symptoms of malaria)

1

[12]