

**M1.(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
- 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]

**M2.(a)** organisms that reproduce together to form fertile offspring

1

(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 than **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 furrer tail / smaller feet / is furrer*

**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]

**M3.(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]

**M4.(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)  
*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]

**M5.(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]

M6.(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  
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]