3.4.4 Genetic Information, Variation And Relationship – Genetic Diversity And Adaptation – 1 **– Mark Schemes**

Q1.

(a) 1. So no contamination / other bacteria;
2. So same number of bacteria transferred **to** allow comparison;

1. Accept sterilisation / kills all (bacteria)

2. Allow amount / concentration for number

2

(b) 6 000 000
OR
6×10^6;

1 mark for 3 000 000

OR

3×10^6

Allow 1 mark for 600 (in 1cm^3 of diluted culture)

2

(c) 1. (Several) values between 10 and 15 (units);
2. Repetitions of each;

1. Accept descriptions of this

Ignore repeat the investigation / repeat at 10 and 15 units.

2

[6]

Q2.

(a) 1. Person (infected with HIV) has HIV DNA (in their DNA);
2. New HIV (particles) still made;
3. (AZT) inhibits reverse transcriptase;
4. (AZT) stops these (new HIV particles) from forming new HIV DNA;
OR
Slows / stops replication of HIV;
5. Stops destruction of more / newly infected T cells;
6. So immune system continues to work (and AIDS does not develop);

4. Context is important

4. Allow slows / stops (re)production of HIV

4. Reject (AZT) prevents DNA replication

4 max

(b) 1. Slows / stops the development of AIDS;
2. Because HIV **resistant to AZT** is damaged / destroyed / prevented from replicating (by other drugs);

OR

3. AZT continues to work as a drug;
4. Because HAART prevents the spread of AZT-resistant HIV to rest of the human population;

OR

5. No new HIV particles made;
6. Because HAART might interfere with viral protein synthesis;

Mark in pairs.

Do not mix and match.

2. Neutral HIV killed

2. Accept other drugs prevent HIV resistant to AZT from infecting new / more cells

6. Accept blocks transcription / translation / synthesis of lipid envelope / aspect of viral structure

4 max

(c) 1. (Fewer mitochondria so) less (aerobic) respiration;
2. (Muscles receive) less ATP (so waste);

1. Ignore no respiration

2. Reject less energy produced

2. Ignore no ATP is made

2

[10]

Q3.

(a) Phylum;

1

(b) **M** placed correctly between zygote and zygospore;

1

(c) Any valid reasons, e.g.

Asexual

Fewer stages so quicker
OR
Only one parent involved so can colonise new environment
OR
Produces clone so successful (geno / pheno)type maintained;

Sexual

increases genetic diversity so greater chance of survival / success.

2

(d) Spores spread / dispersed further;

1

(e) 1. Measure diameter of large number of spores;

2. Divide measured values by 700 (to find true diameter);

3. Reference to using volume of sphere.

3

[8]

Q4.

(a) 1. Antigen / epitope on surface of *N. meninigitidis* / bacterium binds to surface protein / surface receptor on a (specific / single) B cell.

If answered in context of T cell, allow Antigen binds to (specific / single) T cell

2. (Activated) B cell divides by mitosis / produces clone;

If answered in context of T cell, allow (Activated) T cell releases cytokine.

3. (Division) stimulated by cytokines / by T cells;

If answered in context of T cell, allow (Cytokine) stimulates production of plasma cells;

4. B cells / plasma cells release antibodies;

5. (Some) B cells become memory cells;

6. Memory cells produce plasma / antibodies faster

6

(b) 1. Mutation

Allow horizontal gene transfer

2. Results in Nm cell with allele for resistance to <u>one</u> antibiotic / to named antibiotic

3. (This) cell survives <u>and</u> passes the allele for resistance to offspring;

2. and 3. If gene for resistance, penalise once

4. Process repeated with different genes conferring resistance to each of the other (two) antibiotics

If reference made to 'resistant gene', 2 max for MP2, 3 and 4

4

(c) Any **five** contrasting statements, e.g.

1. Bacterial cell is <u>much</u> smaller than a human cell;

2. Bacterial cell has a cell wall but human cell does not;

3. Bacterial cell lacks a nucleus but human cell has a nucleus;

4. Bacterial cell lacks <u>membrane-bound</u> organelles but human cell has membrane-bound organelles;

Accept any named membrane-bound organelle

5. Bacterial ribosomes smaller than human ribosomes / bacteria have

70S ribosomes whereas humans have 80S ribosomes;

6. Bacterial DNA is circular but human DNA is linear;

7. Bacterial DNA is 'naked' whereas human DNA is bound to histones / proteins

Since contrast is required, both parts of each statement must be present to gain the mark.

5 max

[15]

Q5.

(a) PKNJ.

1

(b) *Lutra lutra.*

1

(c) Bone / skin / preserved remains / museums.

1

(d) 1. (Hunting) reduced population size(s), so (much) only few alleles left;

Accept bottleneck

2. Otters today from one / few surviving population(s);

Accept founder effect

3. Inbreeding.

*Allow any **two***

2 max

(e) 1. Population might have been very small / genetic bottleneck;
2. Population might have started with small number of individuals / by one pregnant female / founder effect;
3. Inbreeding.

*Allow any **two***

2 max

[7]

Q6.

(a) (No – no mark)
Graph / bar chart only shows number of species, not the name of the species.

1

(b) (No – no mark)
1. Mutations are spontaneous / random;
2. Only the rate of mutation is affected by environment;
3. Different species do not interbreed / do not produce fertile offspring;
4. So mutation / gene / allele cannot be passed from one species to another.

Ignore references to correlation does not prove causation

4

(c) 1. Initially one / few insects with favourable mutation / allele;
2. Individuals with (favourable) mutation / allele will have more offspring;
3. Takes many generations for (favourable) mutation / allele to become the most common allele (of this gene).

3

[8]

Q7.

(a) 1. Kingdom, Phylum, Class, Order, Family;
2. *Luscinia svecica.*

1 mark for each correct column

Allow Genus and Species if both placed in box for species but not if both placed in genus box

2

(b) Number of different alleles of each gene.

Accept number of different base sequences (found) in each gene

1

(c) 1. Has greater proportion of genes / percentage of genes showing diversity;
2. Percentage is 35% compared with 28% / proportion is 0.35 compared with 0.28.

Allow correct figures that are not rounded up, i.e., 34.9% / 0.349 and 27.8% / 0.278

2

[5]

Q8.

(a) 0.32.

Correct answer = 2 marks

Accept 32% for 1 mark max

Incorrect answer but identifying 2pq as heterozygous = 1 mark

2

(b) 1. Mutation produced *KDR minus* / resistance allele;
2. DDT use provides selection pressure;
3. Mosquitoes with *KDR minus* allele more likely (to survive) to reproduce;
4. Leading to increase in *KDR minus* allele in population.

4

(c) 1. Neurones remain depolarised;
2. So no action potentials / no impulse transmission.

2

(d) 1. (Mutation) changes shape of sodium ion channel (protein) / of receptor (protein);
2. DDT no longer complementary / no longer able to bind.

2

[10]

Q9.

(a) 1. Size of cotton swab;

2. Dampness of cotton swab;

3. Size of area of skin;

4. Time rubbed on skin;

5. Part of the body / skin sampled;

6. Volume of agar / nutrient concentration of agar;

7. Incubation time;

8. Incubation temperature;

3 max

(b) 99.8;

OR

57 271;

1 mark for writing out correct calculation: (401.6 – 0.7)/401.6 × 100 ***OR*** *(401.6 – 0.7)/0.7 x 100*

1 mark max for incorrect rounding

Accept answers to any number of significant figures as long as rounding is correct

2

(c) 1. Spread here greater above the mean than below;

2. Some / many Petri dishes had no colonies;

Accept idea that data are not normally distributed / is skewed.

1 max

(d) 1. Treatment **C** / treatment normally used at the time;

2. (Because) using untreated / soap and water / treatment **A** / treatment **B** would have too great a risk of infection;

Accept C has least / lower risk of infection

Accept description of 'infection'

2

[8]

Q10.

(a) 1. Change in DNA base/nucleotide (sequence);

Accept: mutation in DNA base (sequence).

Accept: deletion/substitution/addition of a DNA base/nucleotide.

2. Change in amino acid (sequence)/primary structure;

Reject: different amino acid formed.

Ignore: change in code for amino acid.

3. Alters (position of) hydrogen/ionic/disulfide bonds;
4. Change in tertiary structure (of receptor);

Reject: any reference to active site.

Ignore: 3°.

4

(b) 1. (Receptor) is not complementary

OR

(HIV) cannot bind/attach and enter/infect (helper) T cell;

Accept: 'complimentary'.

Accept: invade as alternative to infect.

2. No replication (of virus)

OR

No destruction of (helper) T cell;

Accept: reproduction (of virus).

2

(c) 1. Low/lower exposure to HIV (in Europe)

OR

Low/lower number of HIV/AIDS (infections/cases);

Accept: converse.

2. (HIV) has only been present for a short time period

OR

(HIV relatively) recently evolved;

3. Mutation/CCR5 has been around for many years;

Accept: frequency of mutation has always been high.

4. Mutation/CCR5 is advantageous (for something else);

2 max

[8]

Q11.

(a) Hydrolysis (reaction);

1

(b) 1. (Phosphate required) to make RNA;
2. (Phosphate required) to make DNA;

1 and 2. If neither DNA or RNA are named allow one mark for nucleotide/nucleic acid/phosphodiester bonds/sugar-phosphate backbone.

3. (Phosphate required) to make ATP/ADP;
4. (Phosphate required) to make membranes;

Ignore: phospholipids without reference to membranes.

5. (Phosphates required) for phosphorylation;

Accept: as additional mark points any named biological molecule containing phosphate e.g. NADP, AMP, RuBP.

2 max

(c) Accept answer in range from 3.7 : 1 to 4.1 : 1;

Reject any ratio not : 1.

1

(d) 1. Seeds/embryo remain dormant/inactive in winter/cold
OR
Growth/development of seed/embryo during winter/cold;

Ignore: hibernate.

Accept: 'seed survives winter/cold'.

Reject: plant develops or seed germinates during winter/cold.

2. Seeds/plants develop in spring/summer
OR
Seeds/plants develop when temperature/light increases;

Accept: seeds/plants develop when more light or when temperature is higher.

Accept: seed germinates/"sprouts' during spring/summer or when temp/light increases.

3. Plant photosynthesise (in spring/when warm);
4. Produce (more) seeds/offspring in spring/growing season;

3 max

[7]

Q12.

(a) Bacteria killed;

Ignore: no growth or growth of bacteria prevented.

Accept: bacteria destroyed.

Accept: no living bacteria.

1

(b) Clear zone would be too large
OR
Clear zones would overlap/merge
OR
Could kill all bacteria (on the plate);

Must convey idea of too large.

1

(c) 1. (Same) size;

Accept: any measure of size e.g. thickness, area, diameter.

Ignore: 'same shape' as shape shown on the diagram.

2. (Same) material/absorbency;
3. In solution for same time period;

Ignore: reference to volume of disinfectant.

2 max

(d) Any number between 2.5 to 3.2 = **two** marks;;

*Allow **one** mark for an incorrect answer but shows method of calculating how many times more effective D is than B*

e.g. 22 divided by 13/14

or 11 divided by 6.5/7

or 1.57/1.6/1.69/1.7.

2

[6]

Q13.

(a) Locus;

Accept: loci

1

(b) Differences in DNA / differences in base sequence of DNA;

Accept: number of different alleles / size/variation in gene pool

Reject: genes

1

(c) 1. Jack Russell (genetic) diversity is (significantly) greatest;
2. Bull terrier (genetic) diversity is (significantly) smallest / is most inbred;
3. Miniature terrier and Airedale terriers are similar;

1-3: do not credit just a list of values

4. Standard deviations do not overlap / do overlap with correct ref to significance;

Reference to significance must be relevant to examples given

Max 3

(d) 1. (Bull terrier) breeding has included a genetic bottleneck/ small population/more inbreeding/ greater selection (pressure);

Accept: founder effect

2. Reduced number of different alleles/size of gene pool;

Reject: decrease in number of genes

Ignore ref to mutations

OR

3. Miniature (terrier) breeding has included more outbreeding/less selection (pressure);
4. Increased number of different alleles/larger gene pool/more variety of alleles;

Reject if genes used instead of alleles

Reject: lower frequency of alleles

Ignore ref to mutations

2

[7]

Q14.

(a) 1. Type of feed affects (antibiotic) <u>resistant</u> bacteria (in animals);

Accept: null hypotheses

Accept predictions, for example

More antibiotic resistant bacteria form in animals fed with antibiotics in their food

2. (Antibiotic) resistant <u>resistant</u> infect /are passed on to animals/farmer / resistant <u>resistant</u> are passed between animals;

Accept: bird to bird/bird to human/human to human

Accept: a link (exists) between (antibiotic) resistance in animals and their keepers/farmers – as lowest level QWC

3. Incidence of (antibiotic) resistant <u>resistant</u> differs in chickens and turkeys;

Accept: a comparison, eg 'more resistant bacteria in chickens than turkeys'

4. Incidence of (antibiotic) resistant <u>resistant</u> differs in chicken farmers and turkey farmers;

Accept: a comparison, eg 'more resistant bacteria in chickens than turkeys'

Max 2

(b) (i) 1. Large(r) percentage of <u>resistant</u> bacteria in turkeys/low(er) percentage of <u>resistant</u> bacteria in chickens;

Accept: E coli for bacteria

Ignore: number, eg. ignore 'more'/'fewer' turkeys/chickens

2. Large(r) percentage of <u>resistant</u> bacteria in turkey farmers/low(er) percentage of <u>resistant</u> bacteria in chicken farmers;

2

(ii) 1. (More) antibiotic in turkey feed kills (more) non-resistant bacteria / resistant bacteria survive;

Accept: antibiotic creates selection pressure

Survive must be explicit, not implied by 'reproduce'

2. (Resistant bacteria) reproduce / pass on gene for resistance;

2

(c) (Human) faeces contain pathogens;

Accept: harmful organisms

1

(d) 1. Large number of farms / farmers (surveyed) / 46;

'Reliable' is used in the question stem

2. So results are (likely to be) representative / can identify anomalous results;

Ignore: reproducible / accurate / valid / reliable

Accept valid explanation of replicates minimising effects of chance

2

(e) 1. (DNA) hybridisation (of gene for resistance in bacteria taken from bird and farmer);

2. (Identical) strands separate at high(est) temperature;

OR

3. Compare base/nucleotide sequence (of gene for resistance in bacteria taken from bird and farmer);

4. (Identical strains) have identical/same base sequences

Mark in pairs, do not mix and match.

Accept: bacteria in bird and farmer/both types of bacteria have identical base sequences = 2 marks

2

(f) 1. (Antibiotic use has) increased cases of bacterial resistance;

Accept: number

2. Transfer/horizontal transmission of (resistance) gene to pathogens/harmful bacteria;

Accept: conjugation

3. (Antibiotic) resistant bacteria cause harm / medical treatments less effective;

Accept: superbug

4. Avoids side effects on animals;
5. Increased demand for organic food;
6. Antibiotic/resistant bacteria could be present in human food;
7. High cost of antibiotics;
8. Legislation has controlled antibiotic use;

Accept: EU/government guidelines

4 max

[15]

Q15.

(a) 1. Change / mutation in base / nucleotide sequence (of DNA / gene);

Q.

Ignore: references to changing base-pairing

Accept: affect for change, if in correct context

Accept: changes triplets / codons

2. Change in amino acid sequence / primary structure (of enzyme);

Accept: different amino acid(s) coded for

***Q** Reject: different amino acids produced / formed / made*

3. Change in hydrogen / ionic / disulfide bonds;

Accept: references to sulfur bonds

4. Change in the tertiary structure / shape;

Neutral: alters 3D structure / 3D shape

5. Change in active site;

6. Substrate not complementary / cannot bind (to enzyme / active site) / no enzyme-substrate complexes form.

Accept: no E S complexes form

6

(b) 1. Non-SR strain falls more / SR strain falls less / up to 10(µg / cm−3);

Must include 10 but only required once in either MP1 or MP2

Ignore: units or absence of

This must be a comparative statement

2. Above 10(µg / cm^{-3}), SR strain levels out / off and non-SR strain continues to decrease;

3. Greater difference between strains with increasing concentration of antibiotic.

This must be a comparative statement

2 max

(c) 1. Division stopped (of both strains by scientist);

Reject: references to mitosis stopping

2. SR strain still more resistant / fewer die / none die (at higher concentrations of antibiotic).

Accept: SR strain and non-SR strain would be similar if resistance is due to only stopping division

Need some comparison with non-SR

2

(d) 1. Make a competitive / non-competitive inhibitor;

Mark in pairs

either MP1 <u>and</u> MP2 OR MP3 <u>and</u> MP4

2. Competitive competes with / blocks active site / non-competitive inhibitor affects / changes <u>active site</u>;

Do not mix and match

OR

3. (Make a drug) that inhibits / denatures / destroys enzyme / stringent response;

Accept: drug that 'knocks out' / destroys enzyme

4. Give at the same time as / before an antibiotic.

2 max

(e) (SR strain)

1. Fewer free radicals (than non-SR);

Note: has to be comparative statement

2. Produces more catalase (than non-SR);

Accept converse statements for non-SR.

3. Catalase (might be) linked to production of fewer free radicals / breaking down / removing free radicals.

Accept: hydrolysis of radicals by catalase.

3

[15]

Q16.

(a) 250 000;

1

(b) (i) Loss of 3 bases / triplet = 2 marks;;

'Stop codon / code formed' = 1 mark max unless related to the last amino acid

Loss of base(s) = 1 mark;

eg triplet for last amino acid is changed to a stop codon / code = 2 marks

3 bases / triplet forms an intron = 2 marks

Accept: descriptions for 'intron' eg non-coding DNA

'Loss of codon' = 2 marks

2

(ii) 1. Change in tertiary structure / active site;

Neutral: change in 3D shape / structure

2. (So) faulty / non-functional protein / enzyme;

Accept: reference to examples of loss of function eg fewer E-S complexes formed

2

[5]

Q17.

(a) 1. No interbreeding / gene pools are separate / geographic(al) isolation;

Accept: all marks if answer written in context of producing increased diversity of plants

1 Do not award this mark in context of new species being formed and then not interbreeding

1 Accept reproductive isolation as an alternative to no interbreeding

2. Mutation;

2 Accept: genetic variation

3. Different selection pressures / different foods / niches / habitats;

3 Accept: different environment / biotic / abiotic conditions or named condition

3 Neutral: different climates

4. Adapted organisms survive and breed / differential reproductive success;

5. Change / increase in allele frequency / frequencies;

5

(b) Similar / same environmental / abiotic / biotic factors / similar / same selection pressures / no isolation / gene flow can occur (within a species);

Accept: same environment

1

[6]

Q18.

(a) (i) (We should maintain biodiversity to)

Prevent extinction / loss of populations / reduction in populations / loss of habitats / save organisms for future generations (idea of);

Neutral: references to 'playing God' / animal rights

1

(ii) A suitable example of how some species may be important financially e.g.

1. medical / pharmaceutical uses;

2. commercial products / example given;

3. tourism;

4. agriculture;

5. saving local forest communities;

1 max

(b) 1. Fewer plant species / decrease in plant diversity;

Accept: converse arguments for islands with a high percentage of forest remaining

1. Neutral: fewer plants

2. Fewer habitats nesting sites / niches / food sources / varieties / less protection from predators / hunters / environment;

2. Neutral: fewer homes

2. Neutral: less food

2

(c) 1. Number of (individuals / birds of) each species;

1. Neutral: number of species

2. Total number of individuals / birds of all species;

2. Accept: 'total number of birds' as given context for 'all species' in the investigation

2

(d) 1. (Larger birds have) a low(er) SA:VOL;

Neutral: reference to fat / feathers

2. (So) less heat loss / more heat retained;

MP2 is independent of MP1

2

[8]

Q19.

(a) 2 of the following pairs:

Mark for explanation must be paired with correct change in structure

1. Larger leaves;

2. Photosynthesis;

OR

Accept converse descriptions of leaves, root and stem: longer root, taller stem, smaller leaves

3. Larger / bigger / thicker root;

4. Storage;

OR

5. Stem shorter / absent;

Accept converse correct explanation

6. Less energy used in stem growth / more energy for producing sugar;

4 max

(b) Beet ready quicker / less time required / allows land to be used again / harvested earlier;

Allow more crops / many harvests. Ignore references to yield / profit

1

(c) 1. (Diversity) reduced / fewer different alleles / less variation / smaller gene pool;

2. As alleles have been chosen / rejected;

2

[7]

Q20.

(a) (i) 4;

1

(ii) 1. Change in amino acid / (sequence of) amino acids / primary structure;

1. Reject = different amino acids are 'formed'

2. Change in hydrogen / ionic / disulphide bonds alters tertiary structure / active site (of enzyme);

2. Alters 3D structure on its own is not enough for this marking point.

3. Substrate not complementary / cannot bind (to enzyme / active site) / no enzyme- substrate complexes form;

3

(b) 1. Lack of skin pigment / pale / light skin / albino;

2. Lack of coordination / muscles action affected;

2 max

(c) Founder effect / colonies split off / migration / interbreeding;

Allow description of interbreeding e.g. reproduction between individuals from different populations

1

[7]

Q21.

(a) (i) (Human cells) don't have a cell wall;

Accept "they" refers to human cells.

1

(ii) (Affects) protein synthesis;

Allow description e.g. 'amino acids not joined together / translation.

Reject: affects transcription.

1

(b) 1. Mutation present / occurs;

Ignore antibiotic causes mutation.

2. Resistance gene / allele;

1. or 2.

Reference to immunity disqualifies first credited marking point.

3. Resistant bacteria (survive and) reproduce;

Reference to mitosis negates marking point 3.

2

[4]

Q22.

(a) Difference in DNA / base sequence / difference in alleles / genes / gene pool;

Neutral: 'fewer alleles' unless qualified e.g. fewer different alleles.

1

(b) Environmental;

Accept: Environment

1

(c) Reduced (genetic diversity);

As fewer different / varied alleles / genes / reduced gene pool;

2

[4]

Q23.

(a) (i) Antibiotics kill other bacteria / *Clostridium* is resistant;

Less / no competition so (*Clostridium*) reproduces / replicates / multiplies / increases in number;

Reference to bacteria being 'immune' negates first marking point.

Reference to mitosis negates second marking point.

2

(ii) Immune system less effective / more likely to have other infections / been in hospital;

Accept: 'Weak / lower' immune system'.

1

(b) Attaches to <u>active</u> <u>site</u> (of enzyme);
(Methicillin) is a competitive inhibitor / prevents monomers / substrate attaching (to enzyme);

'Competes for active site' = 2 marks.

Neutral: 'Prevents monomers joining / attaching to each other'.

Allow one mark max for answers relating to non-competitive inhibitor changing active site / preventing substrate attaching.

Do not penalise Methicillin forms an enzyme / substrate complex.

2

(c) (i) Have other illness / medical condition / 'weak' immune system / disease / infection;

Reject: Due to 'other factors', 'are smokers', 'are obese' unless related to disease or illness.

1

(ii) Increase up to 2006 / 20 (per 100 000) then decreases;

1

(iii) Correct answer in range of 52 – 59.1% = two marks;

Incorrect answer but shows change as between 4.8 – 5.2 / shows
correct subtraction giving this change e.g. 14 – 9 = one mark.

2

[9]

Q24.

(a) Same number of ryegrass seedlings in distilled water;

1

(b) (i) Produce null hypothesis;

Carry out Spearman Rank correlation test / find correlation coefficient;

Use values to show P < critical value / find probability of results being due to chance;

Accept valid example

E.g. There is no correlation between inhibition of germination and the concentration of the extract.

2 max

(ii) May be another factor / named factor (that also inhibits germination);

e.g. amount of water in extract

1

(c) (i) Extract inhibits ryegrass germination / extract stops ryegrass starting to grow;

Inhibition of root length / causes ryegrass to have shorter roots;

2

(ii) Scientists crushed plants to get extract;

Plants might not secrete substances in the extract into the soil;

These substances might get broken down in the soil;

Wheat and ryegrass might not grow at the same time / wheat plants might not produce substance when ryegrass is growing;

Concentration of extract in the soil might be different from that in solution;

3 max

[9]

Q25.

(a) (i) 22;

1

(ii) 1. Odd number of chromosomes / 33 chromosomes (in leaf cell);

2. Chromosomes cannot pair / cannot undergo meiosis / would result in half chromosomes / cannot form haploid cells;

2

(b) (i) Fast growth / produces crop fast / produces large crop;

Do not insist on relative statement.

Accept similar terms for fast. E.g. "better" growth

Do not accept unqualified references to profit.

1

(ii) Leaves less likely to break / higher breaking strength;

1

(c) Low genetic diversity because they are produced by mitosis;

Will all have the same DNA / genes / alleles / will be <u>genetically</u> identical / will be clones;

OR

Low genetic diversity because they are not produced by meiosis;

No crossing over / independent segregation / will not be <u>genetically</u> different;

Independent segregation is the specification term.
Accept other such as random assortment.

2

[7]

Q26.

(a) **Shape**

1. Different penicillin has different shape / structure / enzyme / active site has specific shape / structure;

Not different

Binding

2. No longer fits / binds to active site / not complementary to active site / does not form E-S complex;

Consequence

3. (Different) penicillin not broken down;

3

(b) (i) 1. Kills pathogenic / harmful bacteria / pathogens;

2. Disease less likely / improves health / animals healthier / reduces spread of infection;

3. Faster growth / more productive animals / more food converted to meat / greater survival / lower vet's bills / increased yield / less energy (for "fighting infection");

Principles:

Action of antibiotic. Do not accept stops all disease

Action on health

Effect on production

2 max

(ii) 1. (Adding antibiotics) selects in favour of antibiotic resistance / resistant bacteria more likely to survive;

2. Increase in numbers / higher proportion of resistant bacteria;

Penalise immune only on the first occasion it occurs in this part of the question.

2

[7]