EXAM PAPERS PRACTICE

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

XVIII

Time allowed

48 Minutes

Score

/40

Percentage

%

Biology

Mark Scheme

**AQA
AS & A LEVEL**

3.7 Genetics, populations, evolution and ecosystems

1 (a) (Recessive) allele is always expressed in females / females have one (recessive) allele / males need two recessive alleles / males need to be homozygous recessive / males could have dominant and recessive alleles / be heterozygous / carriers;

> *Accept: Y chromosome does not carry a dominant allele.*
> *Other answers must be in context of allele not chromosome or gene.*

1

(b) (i) 1. 1, (2) and 5;

> *Accept: for 1 mark that 1 and 2 have slow (feather production) but produce one offspring with rapid (feather production).*
> *Neutral: any reference to 3 being offspring of 1.*

2. 1 must possess / pass on the recessive <u>allele</u> / 1 must be a carrier / heterozygous / if slow (feather production) is recessive all offspring of (1 and 2) would be slow (feather production) / if rapid (feather production) was dominant 1 would have rapid (feather production);

> *Reject: both parents must be carriers / possess the recessive allele.*
> *Reject: one of the parents (i.e. not specified) must be a carrier / heterozygous.*

2

(ii) 5 = X^fY / X^fY^- / f / f- / fY ;

7 = X^FX^f **and** X^FX^F (either way round) /

or X^fX^F **and** X^FX^F (either way round) /

or X^FX^f, X^fX^F **and** X^FX^F (in any order);

> *Note: allow 5 = X^fY, X^fY.*
> *Accept: for both 5 and 7 a different letter than F. However, lower case and capital letter must correspond to that shown in the answer. For example accept 7 = X^RX^r and X^RX^R.*

2

(iii) X^FX^f **and** X^fY **or** X^fX^F **and** X^fY

or X^FX^f **and** X^fY^- or X^fX^F **and** X^fY^- /

or Ff **and** fY /

or Ff **and** fY⁻ /

or Ff **and** f- /

or Ff **and** f;

*Accept: a different letter than F. However, lower case and
capital letter must correspond to that shown in the answer.*
Accept: each alternative either way round.

1

(c)   Correct answer of 32 (%) = 3 marks;;;
            Accept: 0.32 = 2 marks

If incorrect answer, allow following points

1. p^2 / q^2 = 4% / 0.04 / or p / q = 0.2;

2.   Shows understanding that 2pq = heterozygotes / carriers;
            *Accept: answer provided attempts to calculate 2pq. This can
            be shown mathematically i.e. 2 x two different numbers.*

3
            [9]

2 (a)   (Genes / loci) on same chromosome.

                                                                                            1

(b)   1.   GN and gn linked;
        2.   GgNn individual produces mainly GN and gn gametes;
        3.   Crossing over produces some / few Gn and gN gametes;
        4.   So few(er) Ggnn and ggNn individuals.

                                                                                            4

(c)   (Grey long:grey short:black long:black short) =1:1:1:1

                                                                                            1

(d)   1.   Chi squared test;
        2.   Categorical data.

                                                                                            2
                                                                                        [8]

3 (a) 1. Cut (DNA) at same (base) sequence / (recognition) sequence;
  Accept: cut DNA at same place

  2. (So) get (fragments with gene) **R** / required gene.
  Accept: 'allele' for 'gene' / same gene

  2

(b) 1. Each has / they have a specific base sequence;
  2. That is complementary (to allele r or R).
  Accept description of 'complementary'

  2

(c) 1. Fragments L from parent rr, because all longer fragments / 195 base pair fragments;
  Ignore: references to fragments that move further / less, require identification of longer / shorter or 195 / 135
  Accept: (homozygous) recessive

  2. Fragments N from parent RR, because all shorter fragments / 135 base pair fragments;
  1 and 2 Accept: A3 for 195 and A4 for 135
  2. Accept: (homozygous) dominant

  3. (M from) offspring heterozygous / Rr / have both 195 and 135 base pair fragments.
  Accept: have both bands / strips
  Reject: primer longer / shorter

  3

(d) 1. (Cells in mitosis) chromosomes visible;
  2. (So) can see which chromosome DNA probe attached to.

  2

(e) (i) 1. For comparison with resistant flies / other (two) experiments / groups;
  Ignore: compare results / data / no other factors

2. To see death rate (in non-resistant) / to see effect of insecticide in non-resistant / normal flies.

Accept: 'pesticide' as 'insecticide'

Accept to see that insecticide worked / to see effect of enzyme

2

(ii) (PM must be involved because)
1. Few resistant flies die (without inhibitor);
2. More inhibited flies die than resistant flies;
3. (PM) inhibited flies die faster (than resistant flies);
(Other factors must be involved because)
4. Some resistant flies die;
5. But (with inhibitor) still have greater resistance / die slower than non-resistant flies.

Accept: (with inhibitor) die slower than non-resistant flies

4 max

[15]

4 **(a)** Both alleles are expressed / shown (in the phenotype).

Accept: both alleles contribute (to the phenotype)

Neutral: both alleles are dominant

1

(b) Only possess one allele / Y chromosome does not carry allele / gene / can't be heterozygous.

Accept: only possess one gene (for condition)

Neutral: only 1 X chromosome (unqualified)

1

(c) 1. $X^G X^B$, $X^B X^B$, $X^G Y$, $X^B Y$;

Accept: equivalent genotypes where the Y chromosome is shown as a dash e.g. X^G-, or is omitted e.g. X^G

Reject: GB, BB, GY, BY as this contravenes the rubric

2. Tortoiseshell female, black female, ginger male, black male;

3. (Ratio) 1:1:1:1

2 and 3. Award one mark for following phenotypes tortoiseshell, black, (black) ginger in any order <u>with</u> ratio of 1:2:1 in any order.

*Allow one mark for answers in which mark points 1, 2 and 3 are not awarded but show parents with correct genotypes i.e. $X^G X^B$ and $X^B Y$ **or gametes as X^G, X^B and X^B, Y***

3. Neutral: percentages and fractions

3

3. Accept: equivalent ratios e.g. for 1:1:1:1 allow 0.25 : 0.25 : 0.25 : 0.25

(d) **(i)** Correct answer of 0.9 = 2 marks;

Incorrect answer but shows $q^2 = 0.81$ = one mark.

Note: 0.9% = one mark

2

(ii) Homozygous dominant increases and homozygous recessive decreases.

1

[8]