

M1.(a)	salivary gland	1
(b)	liver	1
(c)	any <b>four</b> from: <ul style="list-style-type: none"> <li>• merozoites released (from liver) and enter the red blood cells</li> <li>• (some of these) turn into <u>schizonts</u></li> <li>• (which) burst the red blood cells</li> <li>• releasing (more) merozoites</li> <li>• coincides with fever attacks.</li> </ul> <p style="text-align: center;"><i>points credited must be in correct sequence</i></p>	4
(d)	(i) three bases code for one amino acid	1
	middle code of CTC is now CAC / T changed to A	1
	so will be a different amino acid (in the chain)	1
	(and so chain / protein will have a different shape) due to a different sequence of amino acids	1
	(ii) correct parental genotypes (both <b>Aa</b> ) <i>allow ecf for 2<sup>nd</sup> and 4<sup>th</sup> marking points</i> <b>or</b> correct gametes ( <b>A+a A+a</b> ) <i>allow alternative symbols if defined</i>	1
	correct derivation of offspring genotypes from gametes	1
	<b>aa</b> identified (homozygous for) SCA	1
	0.25 <i>allow 25% or 1 in 4 or 1:3 or 1 / 4</i>	1

- (iii) **(Aa)** less likely to get malaria (than homozygous dominant / **AA**)  
*allow resistance or protection if correctly qualified eg some protection*  
**do not accept** 'immune'

1  
[15]

- M2.(a)** (i) in the chromosome(s)  
*ignore genes / alleles*

1

in the nucleus  
*allow nuclei*  
*allow mitochondria*

1

- (ii) the DNA / chromosomes / genes are replicated / copied / multiplied / doubled / duplicated  
*allow DNA is cloned*  
*ignore same DNA / chromosomes / genes if unqualified*

1

- (b) (i) 1 / one

1

- (ii) 2 / two

1

- (c) **B**

1

[6]

- M3.(a)** (different / alternative) forms of a gene  
**do not accept types of genes**

1

- (b) DNA isolated from embryo

1

(fluorescent) probe mixed with embryo DNA 1

probe (then) binds with embryo DNA 1

(UV light) to show alleles / gene for disorder 1

(c) genotypes of parents and gametes correct (Man **D** and **d**, Wife **d** and **d**)  
*allow half-size genetic diagram with only one **d** from wife* 1

offspring genotypes correct ( $\frac{1}{2}$  = **Dd** and  $\frac{1}{2}$  = **dd**)  
*allow ecf if parental genotypes are wrong* 1

offspring phenotypes correctly assigned to genotypes 1

(d) genotypes of parents and gametes correct (**N** and **n**)  
*allow ecf if parental genotypes are wrong* 1

offspring genotypes correct (**NN**, 2 × **Nn**, and **nn**) 1

offspring phenotypes correctly assigned to genotypes; 1

correct probability = 0.25 /  $\frac{1}{4}$  / 25% / 1 in 4 / 1:3, only;  
*do not allow '3:1' / '1:4'* 1

[12]

**M4.(a)** (i) nucleus  
*correct spelling only*  
*accept mitochondrion*  
*ignore genes / genetic material / chromosomes* 1

(ii) base(s)  
*Accept all four correct names of bases*

*ignore nucleotides and refs to organic / N-containing*

1

(iii) 4

1

(iv) codes for sequence / order of amino acids  
*ignore references to characteristics*

1

codes for a (specific) protein / enzyme

**or**

the sequence / order of three bases / compounds / letters

codes for a specific amino acid

**or**

the sequence / order of 3 bases / compounds / letters

codes for the order / sequence of amino acids

1

(b) (i) DNA

1

circular / a ring **or** a vector / described

1

(ii) kills any cells not having **kan<sup>r</sup>** gene / so only cells with **kan<sup>r</sup>** gene survive

1

hence surviving cells will also contain **Bt** gene / plasmid

1

(iii) cells divide by mitosis  
*ignore ref to asexual reproduction*  
*correct spelling only*

1

genetic information is copied / each cell receives a copy of (all) the gene(s) / all cells produced are genetically identical / form a clone

1

(iv) any **two** from:

- gene may be passed to pathogenic bacteria
  - cannot then kill these pathogens with kanamycin
- or**
- cannot treat disease with kanamycin
  - may need to develop new antibiotics
  - gene may get into other organisms
  - outcome unpredictable

2

[13]