

Mark schemes

- 1** (a) (i) meiosis
allow mieosis 1
- (ii) testis / testes
allow testicle 1
- (b) (i) 23 1
- (ii) fuses / joins with cell D / with egg cell **or** used in fertilisation
allow fuse with another cell 1
- prevents doubling of chromosome number / restores original no. / 46 / diploid
no. / normal no. / full no.
accept 23 from each parent / from each gamete 1

[5]

- 2** (a) When the dominant allele is not present. 1
- (b) (i) Bb 1
- (ii)

		Woman Brown hair	
		B	b
Person 3 Red hair	b		bb
	b	Bb	bb

3 correct = 2 marks
2 correct = 1 mark
1 or 0 correct = 0 marks
allow bB for Bb

2

- (iii) 1 in 2
allow ecf from part ii 1

[5]

- 3** (a) salivary gland 1

- (b) liver 1
- (c) any **four** from:
- merozoites released (from liver) and enter the red blood cells
 - (some of these) turn into schizonts
 - (which) burst the red blood cells
 - releasing (more) merozoites
 - coincides with fever attacks.
- points credited must be in correct sequence*
- 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 **Aa**)
- allow ecf for 2nd and 4th marking points*
- or** correct gametes (**A+a A+a**)
- allow alternative symbols if defined*
- 1
- correct derivation of offspring genotypes from gametes 1
- aa** identified (homozygous for) SCA 1
- 0.25
- allow 25% or 1 in 4 or 1:3 or 1 / 4*
- 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]

4 (a) DNA

1

(b) X and Y

1

(c) (i) 46 chromosomes

1

(ii) half the number

1

(d) meiosis

1

[5]

5

(a) (i) man has (inherited) polydactyly (PD) allele (from mother)

1

man has (inherited) other / normal / recessive allele from father

1

because father does not have PD allele **or** if father had it father would have had PD **or** father only has normal allele **or** father is homozygous recessive

1

allow gene for allele

(ii) 0.5 / $\frac{1}{2}$ / 1 in 2 / 1:1 / 50%

do not allow 1:2 or 50/50

allow 50:50

1

(b) parental phenotypes: both brown

1

parental genotypes: both **Bb**

1

gametes: **B b** and **B b**

1

allow only on gametes answer line

allow ecf from genotypes

offspring genotypes: **BB (2)Bb bb**

allow ecf from gametes

1

offspring phenotypes correctly assigned to genotypes:

BB & Bb = brown **bb** = red

do not penalise confusion of 'phenotypes' & 'genotypes' here

1

[9]

6

- (a) testis / testes
allow testicle(s) 1
- (b) (i) **B** = 13.2
C = 6.6
E = 3.3
all 3 correct = 2 marks
2 or 1 correct = 1 mark
*If no marks awarded allow ecf for C **and** E based on answer to B*
ie C = ½ B and E = ½ C for one mark 2
- (ii) 6.6
allow twice answer for cell E in part bi 1
- (iii) mitosis
correct spelling only 1
- (c) (i) any **two** from:
 - cells that are able to divide
 - undifferentiated cells / not specialised
 - can become other types of cells / tissues **or** become specialised /differentiated*allow pluripotent* 2
- (ii) 4-day embryo is a (potential) human life
or
destroying/damaging (potential) human life
allow cord would have been discarded anyway
ignore reference to miscarriage
allow cannot give consent 1
- (iii) perfect tissue match **or** hard to find suitable donors
allow same/matching antigens
allow no danger of rejection
allow no need to take immunosuppressant drugs (for life)
*ignore genetically identical **or** same DNA* 1
- (iv) stem cells have same faulty gene / allele / DNA / chromosomes
allow genetically identical
ignore cells have the same genetic disorder 1

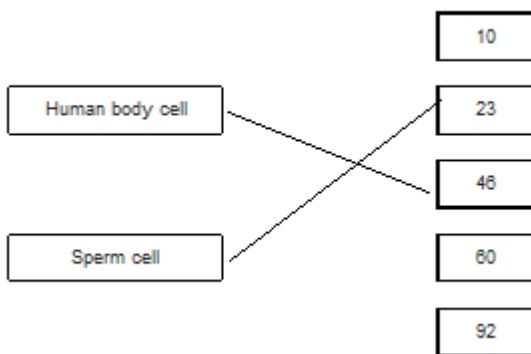
[10]

- 7** (a) ovary 1
- (b) 46 1
- (c) (i) does not fit the pattern
or
 it is higher than the 3rd value / it should be lower than the 3rd value / it should be between the 3rd and 5th values
do not allow use of incorrect figures 1
- (ii) As age increases % of women (having a baby) decreases 1
- (d) (i) 33
allow 1 mark for $\frac{66}{2}$
if no answer / wrong answer 2
- (ii) low success rate 1
- more likely to have a baby with health problems / abnormalities / a faulty chromosome 1

[8]

- 8** (a) A 1

(b)



- (c) one x circled under mother
accept if clearly indicated choice even if not circled 1
- (d) XY
allow YX 1

(e) 50 (%)

1

[6]

9

(a) phosphate

allow PO₄³⁻

1

do not allow P

(b) A / adenine and T / thymine

and

C / cytosine and G / guanine

do not allow U / uracil

1

(c) (mutation) changes from C to T DNA code

or

there is a change in the three bases / triplet from CAG to TAG

1

(mutation) changes the amino acid

1

(this could) change the protein

1

(so it) forms a different shape / changed active site

accept different tertiary structure

1

(therefore) the enzyme no longer fits the substrate / carbohydrate

1

(d) mother / woman's gametes correct: A a

1

father / man's gametes correct: a a

1

correct derivation of offspring

ecf

1

identification of child with syndrome H or genotype aa

1

0.5

ecf

allow 50% / 1 / 2 / 1 in 2 / 1:1

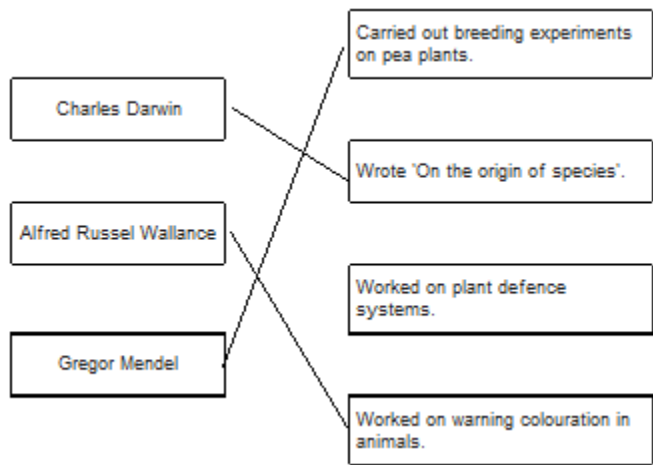
1

do not accept 1:2

[12]

10

(a)



3

(b) a gene

allow allele

1

(c) 4

1

(d) correct derivation of children's genotypes

1

identification of children with cystic fibrosis (dd)

1

0.25

allow ecf

allow ¼ / 25% / 1 in 4 / 1:3

1

do not accept 1:4

(e) heterozygous

1

[9]