

# ANSWERS

(1)

- a) asexual
- b) sexual
- c) gene
- d) 46
- e) 23

$\left(\frac{1}{2}, \text{ each}\right)$

- f) recessive
- g) sexual
- h) Dominance
- i) heterozygous / hybrid
- j) homozygous (purebred)

(5)

(2)

red = R (dominant)

silver = r (recessive)

$\left(\frac{1}{2}\right)$

$\left(\frac{1}{2}\right)$

male = silver ~ rr , female = heterozygous = Rr

	r	r
R	Rr	Rr
r	rr	rr

(1)

50% red, heterozygous Rr  $\left(\frac{1}{2}\right)$

50% silver, homozygous rr  $\left(\frac{1}{2}\right)$

(3)

brown eyes = dominant = B

blue eyes = recessive = b

man = blue eyes = bb , female = brown eyes = BB  
or  
Bb

children = 2x brown eyes = BB or Bb

1x blue eyes ~ bb

(a) Father = bb  $\left(\frac{1}{2}\right)$

Mother = Heterozygous  $\left(\frac{1}{2}\right)$

Bb

(Not asked to explain this)

(b)

B	b	b
B	Bb	Bb
b	bb	bb

(1)

blue eyes phenotype = 50%  $\left(\frac{1}{2}\right)$

Chance next child will have blue eyes is 50%.

(4)

Father = AB blood type =  $\text{AB}$  genotype  
( $\frac{1}{2}$ )  
Mother = O blood type =  $\text{OO}$  genotype  
( $\frac{1}{2}$ )

	A	B	
O	Ao	Bo	50% Ao, A type blood
O	Ao	Bo	

(1)      (13)

Child could be type A blood or type B blood -  
an equal chance of both (50%) - (1)

(5)

(a) Alkaptonuria is caused by a recessive allele.  
( $\frac{1}{2}$ ) | individuals 4 & 5 are affected - but neither  
of his parents are (1 & 2). If the disease  
(1) | was caused by a dominant allele, the disease  
would be expressed in the parents as  
they have the allele causing the disease

(5)

- (b) 1 =  $\text{Aa}$  - unaffected & has dominant allele  
( $\frac{1}{2}$ ) | see above answer, has one recessive allele, passed this onto  
individuals 4 & 5 who are affected
- 4 =  $\text{aa}$  ( $\frac{1}{2}$ ) - affected by a recessive trait.
  - 10 =  $\text{Aa}$  - unaffected & one or more dominant allele, passed on  
(1) | recessive allele to 13 is heterozygous
  - 11 =  $\text{Aa}$  - same as above.  
( $\frac{1}{2}$ )

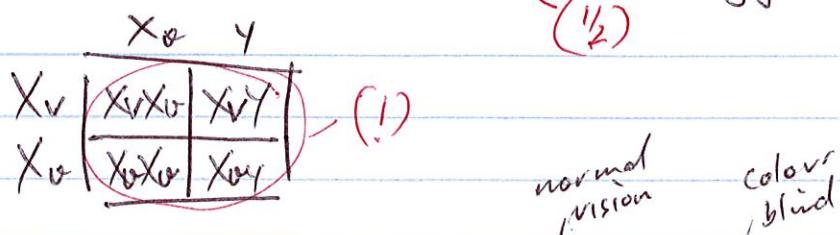
6

Sex linked -  $XX \times XY$

Colour vision is recessive  $\rightarrow$  "Normal" vision =  $\checkmark$

Dad = colour blind =  $XoY$  -  $(\frac{1}{2})$

Mum = carrier  $\rightarrow XvXo$  heterozygous



(a) Boy - 2 possibilities  $XvY$  or  $XoY$   
 $\therefore 50\% (\frac{1}{2})$  chance of being colour blind (1)

1/4

(b) Girl - 2 possibilities  $XvXo$  or  $XoXo$   
 $\therefore 50\%$  chance of being colour blind (1)  
 Normal vision      colour blind

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Dihybrid cross.

Fur colour - white = recessive  
 brown = dominant } Assumption \* determined from Q.

Fur/hair appearance - straight = recessive  
 curly = dominant } given in Q.

\* ALL offspring are brown  $\therefore$  very unlikely white is dominant  
parent 1 white, straight haired g.pig =  $bbss$  - both recessive traits  
parent 2: Brown, curly haired =  $BBSS$  or  $BbSs$  - not  $ss$

SCENARIO 1 assume this is the case as  
 All offspring are brown

↑  
 some offspring are  $ss$   
Scenario 2

## SCENARIO 1

### PARENT I.

bs bs bs bs

BS	BbSs	BbSs	BbSs	BbSs
BS	BbSS	Bbss	Bbss	Bbss
BS	BbSS	bbSs	BbSs	BbSS
BS	Bbss	Bbss	Bbss	Bbss

Parent 2.

offspring all have

brown hair - Bb  
(heterozygous)

with curly hair  
heterozygous Ss

with straight hair  
ss

∴ offspring genotypes are - BbSs - brown curly  
or Bbss - brown straight

## Scenario 2 Parent 2 is BbSS

Similar punnett square to above except that 50% of offspring will inherit bb, not Bb.

∴ 50% should be white. As all offspring are brown ~~this~~ is it is less likely Parent 2 is BbSS, however offspring will have same genotypes as in Scenario 1

\* Assumption made white is recessive, brown is dominant.

If white was ~~dominant~~, the genotypes of the parents would be.

parent 1 WwSS  
parent 2. wwss

Do punnet square - 50% of offspring should be white. No offspring are white, this

is a  $\frac{1}{2^{16}} = \frac{1}{2} \times \frac{1}{2}$  probability

$= \frac{1}{2^{16}}$  } v. unlikely parents have these genotypes

NOTE: This probability also applies to scenario 2.