

GENETICS MARKING SCHEME

1. 1989 Q13 P1

- a. –Smooth seed coat is dominant to wrinkled seed coat. Let R represent gene for smooth and Let r represent gene for wrinkled.

Parents RR × rr
 Gametes
 F1 Genotype
 Phenotype
 Using checker board

	R	R
r	Rr	Rr
r	Rr	Rr

All F1 are Rr

- b. From the information above,work out the following for the F2 generation.

i) Parents Rr × Rr

Gametes
 F2 Genotype

2. 1990 Q2 P1

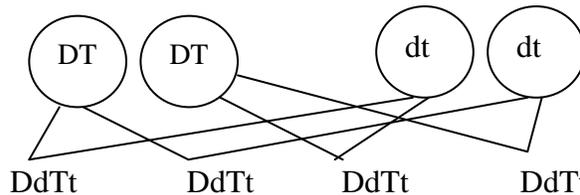
- a. Name – Ribonucleic acid
 Reason- Has the base “U”- Uracil
- b. Sequence: G-C-A-G

3. 1990 Q12 P1

- a. Green and round
- b. i) -DDTT(green round)
 - ddtt (yellow wrinkled)

i. –Both parent plants were pure breed i.e because all F1 plants had the trait found in the dominant parent-green and round.

ii. DDTT × ddtt



iii. One green round: One yellow round
 One green wrinkled:One yellow wrinkled

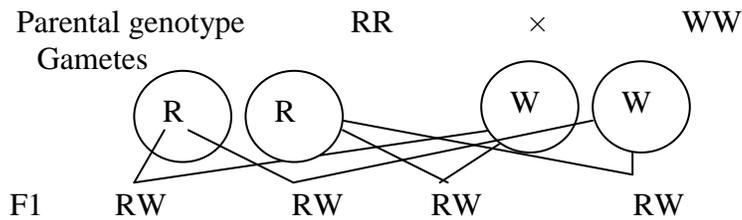
4. 1991 Q13 P1

- a. i) The parental genotypes
 BBRR brrr
 i. Gametes BR br
 ii. Gametes BR × br
 Genotype BbRr Phenotype- all spotted red

5. **1992 Q14 P1**

- a. Sequence of Mrna - GUACUCA
 b. – A sudden change in the structure of DNA at a particular locus/gene/chromosome
 c. Inversion
 Deletion
 Translocation
 Duplication
 d. –Chemicals acc examples
 Radiations acc examples e.g x-rays or light/B-rays/gamma rays/radioactive emission Rej. Cosmirays for radiations
 e. –Could result in exchange of genetic material/crossures
 -May lead to variation

6. **1993 Q12 P1**



- a) Ratio= 1:2:1 1white:2pink:1red
 1 white,2 pink and 1 red- Rej for the ratio but award for the phenotype
 b) Co-dominance/incomplete dominance/partial dominance/equal/same Dominance

7. **1994 Q11 P1**

- | | |
|-----------------------------------|---|
| RNA | DNA |
| a) Has ribose sugar | Deoxyribose sugar/one oxygen atom less than RNA |
| b) Has Uracil as one of its bases | Has thymine |
| c) Single strand | Double strand |

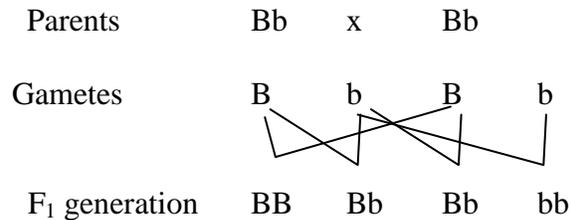
8. **1995 Q9 P1**

Sickle cell anaemia (Rej. Bleeders disease)

9. 1996 Q1 P1

- Controls/regulates/ enzymes/ synthesis is the material for inheritance

10. 1996 Q18 P1



(b) 3 black 1 brown

11. 1997 Q16 P1

a. White

Give a reason – Fewer numbers/ lower ratio; lower in numbers/ absence of white in parents & absence in offspring.

b. Heterozygous Rr. Accept appropriate letters

Rejects R.w appropriate/ letters (Co-dominance)

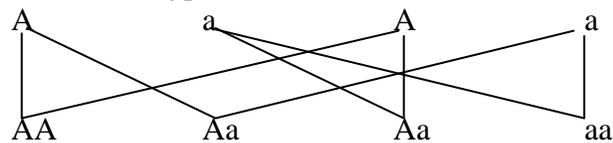
c. Double recessive /rr/ homozygous (recessive)

12. 1998 Q12 P1

(a) Aa, Aa, Aa, both are Aa

(b) Normal children AA, Aa,

Genotype of the albino child- Albino child aa,



(c) 25% / 1/4

13. 1999 Q7 P1

a. Co dominance

Acc; partial/incomplete/equal
b. 1 red flower

2 pink flowers
1 white flower Acc 1:2:1

14. 2000 Q12 P1

- (a) RR and rr
(b) (i) red
(ii) complete dominant; i.e Rd dominant/ white recessive

(c) Ratio of filial generation: 3: 1
(i.e. in every 4 flowers 3 are red 1 is white
Therefore 480 red flowers means $\frac{3}{4}$ of the total number
Total number of flowers $\frac{480 \times 4}{3} = 640$

So $\frac{1}{4}$ of 640 flowers are white in F₂ plants
 $\frac{1}{4} \times 640 = 160$ flowers

15. 2001 Q9 P1

– Inversion duplication, deletion, translocation, non- disjunction

16. 2001 Q14 P1

- (a) (i) Tt, Tt
(ii) Tt and Tt
(iii) 1TT; 2Tt; 1tt/ 1 tall homozygous; 2 tall heterozygous
1 short homozygous 1:2:1
(b) Crossing a homozygous recessive organism with an organism which shows dominant characteristics.

17. 2002 Q5 P1

High yielding / hybrid vigor / heterosis; resistance to decrease early maturity.
Resistance to drought / salinity.

18. 2002 Q11 P1

Y CHROMOSOME
Tuft and hair sprouting from pinna / baldness; hairy pinna;

X CHROMOSOME
Colour blindness / haemophilia.

19. 2004 Q12 P1

- (a) RR WW
(b) Parental genotypes RW
Gametes R W X WW

Fertilization
Offsprings

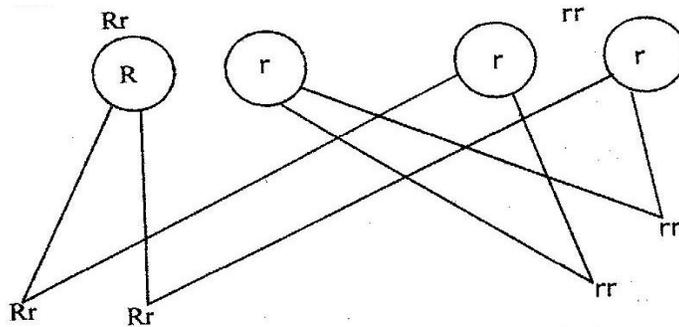
	R	W
RR	RW	RW
		WW

- (c) (i) Phenotypic ration Red Pink White
1 2 1
(ii) 1RR : 2RW; 1WW

c) (ABO) blood grouping; blood groups; reject Rh factor

20. 2005 Q12 P1

- a) 3:1
b)(i) Parent gametes
f₂ generation offspring
(ii) 1:1



c) Apart of Genes with contrasting characteristics

21. 2006 Q2 P2

(a) Albinism; sickle cell anaemia; Haemophilia; colour blindness

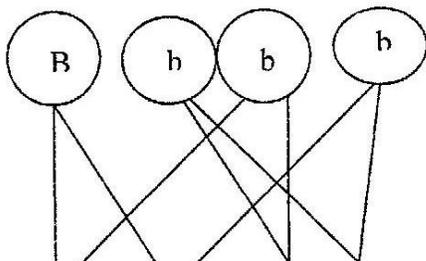
(b) (i) Occurs when chromatids/ chromosomes break at 2 places and when rejoining the Middle piece rotates and joins in an inverted position.

(ii) Occurs when a section of chromatid break off and becomes attached to another chromatid of another chromosome.

Parental genotype gametes

Bb x bb

if other letters are used, penalize at parental genotype



	B	b
b	Bb	bb
b	Bb	bb

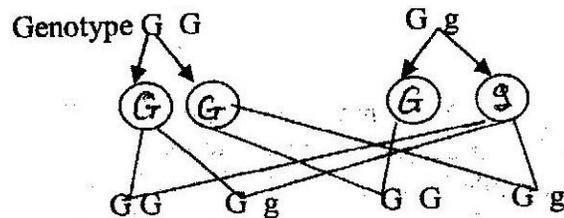
$$\frac{2}{4} \times 100 = 50\%$$

22. 2007 Q20 P1

- (a) It is an alternative form of a chromosome, similar in structure but may have different composition
- (b)(i) Occurs when some nucleotides of a part of a gene break off and disappear
(ii) Occurs when the nucleotides of a part of gene become inverted by taking a 180° turn.
- (c) Testing the genotype of an individual by crossing with the recessive trait

23. 2007 Q5 P2

- (a) Parental homozygous X heterozygous
Phenotype purple grains Purple grains



- The genotype ratio:
2 homozygous purple coloured grains
2 heterozygous purple coloured grains

- (ii) All purple coloured grained maize plants
- (b) Deliberate modification of characteristics of an organism by manipulate genes and DNA by transferring genes from one organism to another
- (c) It is when best characteristics are developed from both parents and offspring better than either parent.

24. 2008 Q6 P1

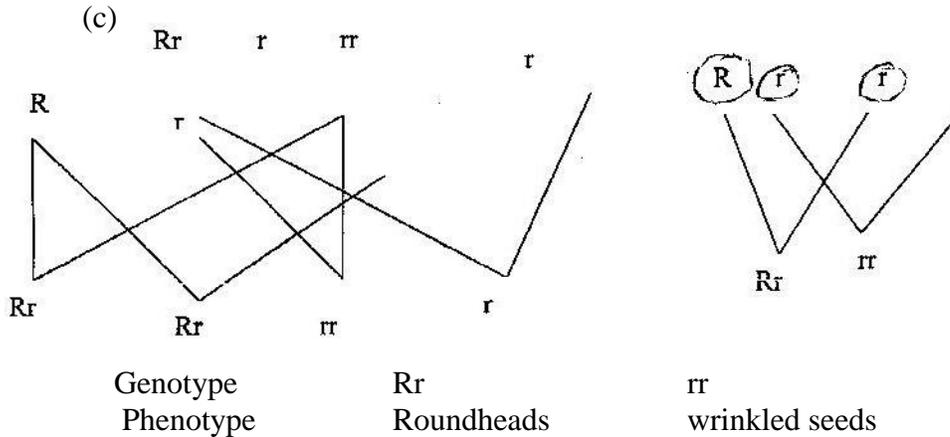
- (a) Failure of homologous same to separate during meiosis/ prophase I
Failure of sister chromosomes to separate during meiosis Prophase II

(b) Height/ skin colour/ weight

25. 2008 Q2 P2

(a) Round seed plants
Wrinkled seed plants

(b) R and r
r and r / both r / r accept of the gamete are circled



	R	R
r	Rr	Rr
r	Rr	rr

d) Cross between individuals of unknown genotype with a homozygous recessive individual/ organisms cross both an individual showing a character for dominant gene with a homozygous recessive individual/ organism

26. 2009 Q5 P1

(a) (i) Production of plants and animals that have superior/greater productivity/have beneficial/ characteristics than either of their parents;

(ii) Condition in which an individual has more than two sets of chromosomes;

(b) *Rej: Cosmic rays as mutagenic or chromosomes*

- Radiations such as alpha, gamma, beta UV and X-rays least one
Rej; symbols α β and γ increase in temperature;
- Chemicals such as calchicine, phenols, bromate, pesticides at least one
- Heavy metals e.g. Lead, Mercury; *Rej symbols*
- Viruses such as Papilloma / *Rej: Mustard gas – affects gene mutation*

27. 2010 Q10 P1

- Resistance to diseases/pests/adverse weather conditions (Acc. Correct examples e.g. drought, very high/ low temperatures)
- Increased yields

- Earlier maturity Acc. Early maturity

28. 2010 Q27 P1

(a) Failure of homologous chromosomes to segregate during meiosis/ anaphase I / meiosis I

Failure of sister chromatid to segregate during meiosis/ anaphase II / meiosis II.

(b)

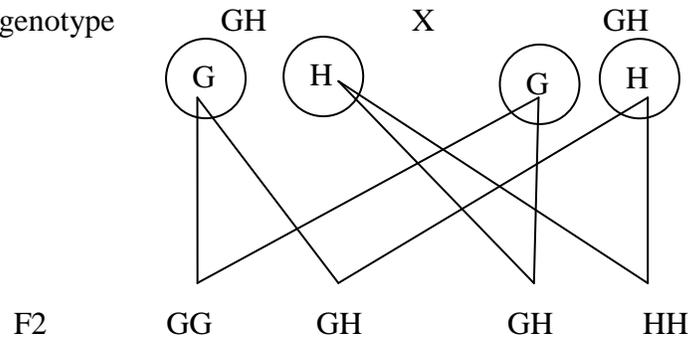
i) Down's syndrome; Turner's syndrome; Klinefelter's syndrome
Surnerz syndrome

Acc. Mongolism for Doran's syndrome

ii) Albinism; single cell anaemia; heamophilia; colour blindness
Chondrodytrophic dwarfism/ Achondroplasia

29. 2010 Q5 P2

a) Parental genotype
Gametes



- Genotypes
- Gametes

Genotypic ratio GG: GH: HH = 1:2:1;

Punnet Square

Parental genotype GH x GH

NB: use of difference letter away 1mark for fusion lines only.

	G	H
G	GG	GH
H	GH	HH

b) Black : Black & white : White = 1: 2 : 1

c) i) Codominance; (Rej: incomplete dominance, partial dominance, equal dominance, blending inheritance.

ii) ABO blood group inheritance. Acc. Blood group(Rej; Rhesus factor sickle cells trait.

30. 2011 Q24 P1

a) (i) Dominant gene expresses itself in both its homozygous and heterozygous states while recessive gene can only express itself in the homozygous state;

(ii) Continuous variation is a characteristic for which there is continuity or range while discontinuous variation is a characteristic for which there are discrete/distinct categories or units.

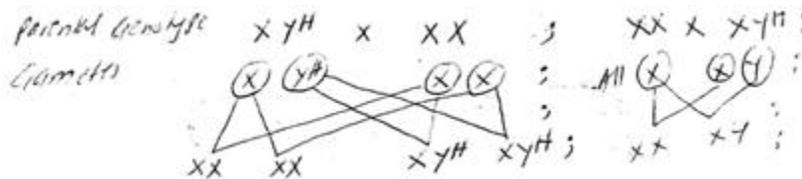
(b) Either all offspring show the dominant characteristics ; or half offspring show the recessive while the other half show the dominant characteristics;

31. 2011 Q2a-c P2

In humans, a hairy ear is controlled by a gene on the Y chromosome.

a) Using letter Y^H to represent the chromosome carrying the gene for hairy ears, work out a cross between a hairy eared man and wife.

(4 marks)



(b) (i) What is the probability of the girls having hairy ears? (1 mark)

Zero / 'o'; accept $0/2$ or $0/2 = 0$; $0/1$

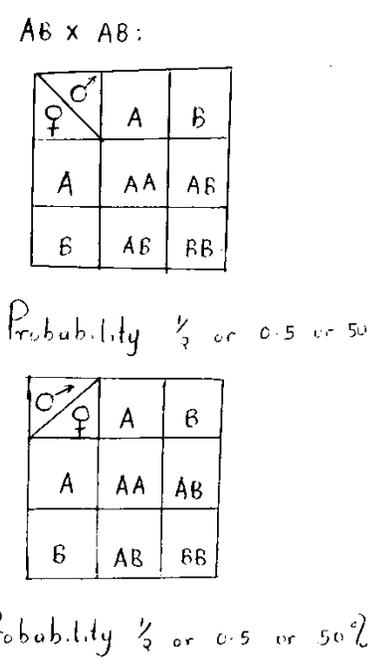
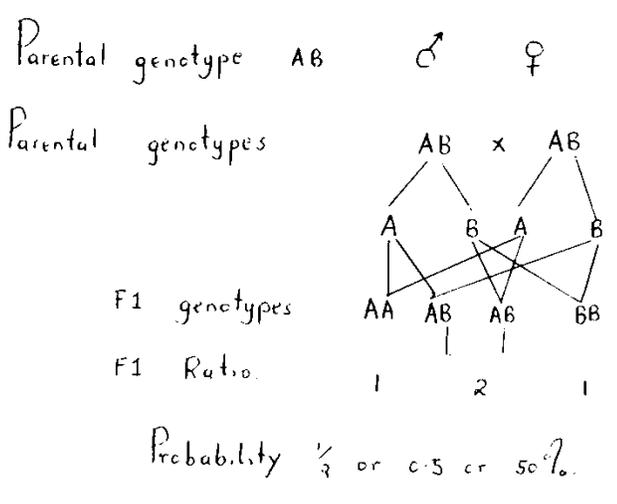
(ii) Give a reason for your answer in b (i) above (1 mark)

The gene for hairy ears is on the Y chromosomes which girls do not inherit from their father

c) Name two disorders in humans that are determined by sex-linked gen (2 marks)

Haemophilia; colour blindness; premature baldness; (Duchene) muscular Dystrophy;

32. 2012 Q8 P1



33. 2012 Q1 P2

(a) Lack of chlorophyll, the plants do not manufacture food/photosynthesize; plants die as soon as the stored food reserves get depleted.

