

12. Genetics

1.
 - a) BB;
 - b) AA;
2.
 - a) Black mice are better adapted camouflage with the environment hence less are eaten by the owls compared to the white mice which are easily seen;
 - b) Theory of natural selection;
3.
 - Heterostly - stigma located above anthers;
 - Self sterility or incompatibility - pollen grain from the same plant do not germinate
 - Protandry - Male parts mature before female parts;
 - Protogyny - Female parts mature before male parts;
4.
 - (a) Complete dominance is when an allele completely suppresses another intermediate trait;
Incomplete dominance is when heterozygous organisms show an intermediate trait;
 - (b) Genetic recombination's of alleles leading to variations;
Independent assortment of chromosomes;
Random fusion of gametes; mutations;
Environment (may either enhance or suppress expression of a gene);
5.
 - (a) C-A - G - U - C _ A ;
 - (b) - Stores genetic information (in a coded form);
 - enables transfer of genetic information unchanged to daughter cells through replication);
 - Translates genetic information into characteristic of an organism (through protein synthesis);
6. Ability to pollinate; response to stimuli (tactic) nastic or tropics); Ability to exploit localized nutrients and ability to photosynthesize; Ability to disperse seeds/fruits, propagation;
7.
 - (a) Glucose;
 - (b) The person was a sufferer of diabetes mellitus;
 - (c) Pancreas;
8. Continuous variation shows gradation in characteristic with intermediate; discontinuous shows distinct characteristics between organisms with no intermediate groupings;

9. -mutation;

-intermixing of genes already in the population through sexual reproduction recombination;

-crossing over during prophase of meiosis I

-interdependent assortment of chromosomes, during metaphase of meiosis I

10. i) Substitution;

ii) Deletion;

iii) Inversion;

11. i) C G G A T C T A G T G;

ii) C G G A U C U A G U G;

12. a) Continuous ;

b) Nutrition/ environment; genes;

13. a) Father X^HY ;

Mother X^HX^h ;

b) i) Genes found in the same chromosome and usually transmitted together;

ii) Across to determine an unknown genotype involving use of a recessive parent;

14. a) Colour blindness; haemophilia;

Sickle cell anaemia;

b) Part of X chromosome has homologous portion on the Y chromosome therefore if the X has the recessive trait, it will show on the male phenotype ;

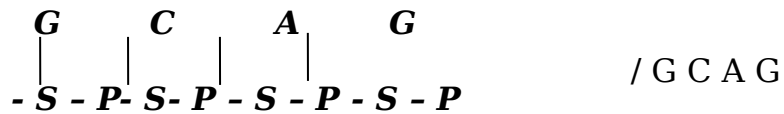
c) The son inherits the X chromosome from the mother while the daughter inherits the X chromosome from the father;

15. (a) Inversion ;

- mustard gas;
- ionizing radiation;
- gamma rays;
- X-rays ;

16. (a) Ribonucleic acid /RNA

- Because it has uracil / presence of uracil;



17. (a) Due to co-dominance /partial dominance/incomplete dominance/(Acc. equal dominance)

(b) Red: 2Pink : white - 1: 2:1 (Acc. 1RR: 2RW: 1WW) mark as a whole;

(c) Why women should drink extra milk;

(i) Bone formation for infants ;

(ii) pressure on bladder by the enlarging uterus;

18. a) Genes which are located on the sex- chromosomes and therefore are transmitted along with them

Example

Haemophilia; colour blindness;

b) Where more than two genes control a particular characteristic/ trait;

Example

ABO blood group system;

19. a) Parental Genotype Rr, Rr ;

b) Red: white;

119/41; 41/41;

2.90: 1

3: 1;

20. (i) Y - Chromosome-hairy pinna, pre-mature baldness; ;
(any one)

(ii) X - Chromosome- haemophilia (bleeders disease); colour blindness; (any one)

21. The Gene that determine the growth of long hair on pinna is sex linked and on Y-chromosomes; V hence can only be inherited by males as a single gene and it expresses itself out phenotypically

22. Due to crossing over: that results in exchange of genetic materials between homologous chromosomes;

23. (a) Co dominance/ incomplete dominance:

(b) 1 Red flowered; 2 pink flowered; 1 white flowered: for ratio for phenotype)

24. (a) Albinism;

(b) Makes skin supple;
- Kills bacteria/ a mild antiseptic;

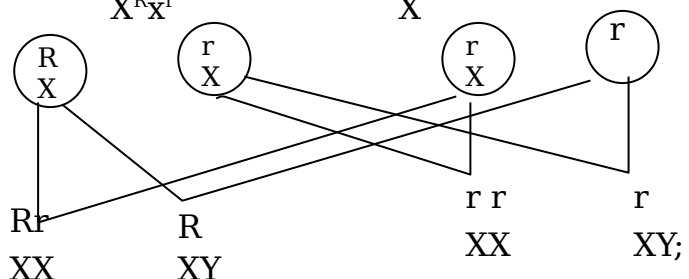
25. - Change in base sequence of the DNA;
□ 1.

26. (i) Sudden and spontaneous change in structure of chromosome and DNA which is inherited

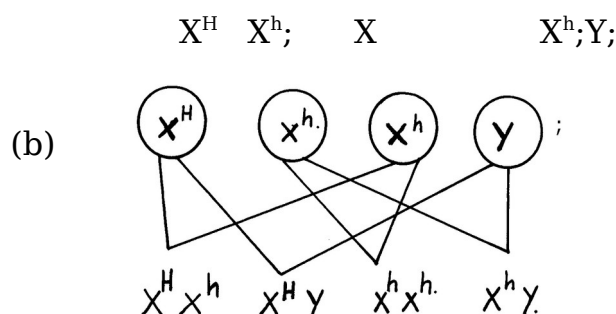
(ii) Chemical ionizing radiations, Uv light, extreme temperature or some virus

27. (a) GCCTATG - DNA
GCCUAUG- mRNA
(b) Ribosome;

28. a) Parental phenotype Pink flight feathers X
White flight feathers
Parental genotype $X^{R^r}X^r$ X
 X^rY
Parental gametes
Fusion
F1 genotypes
b) incomplete;
c) i) Ribonucleic acid;
ii) has uracil base;
ii) - 3;
- There are three codons;



29. A - X^hY ;
B - X^HY ;
F - X^HX^h ;



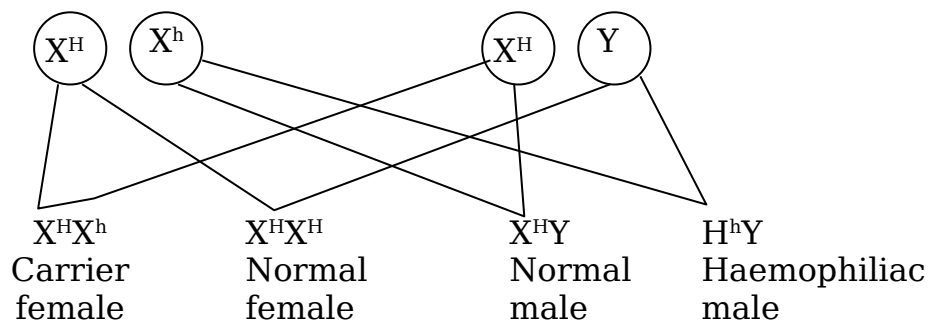
(c) Albinism; sickle cell anaemia; colour blindness; chondrodystrophic dwarfism;

30. (i) Father $X^H Y$ Mother $X^H X^h$

Since father cannot have the recessive gene and fail to be affected. The mother must be a carrier on her second X chromosome for a male son to be haemophiliac.

(ii) Parental phenotypes mother carrier, father normal

Parental genotypes $X^H X^h$ $X^H Y$



31. a) the two genes that control flower colour, that is the gene for red flowers and the one for white are codominate;

b) F_1 phenotype pink flowers

pink flowers

F_1 genotype RW X RW ;

Gameter $\bigcirc \bigcirc R W$ $\bigcirc \bigcirc R W$;

Fusion

F_2 genotypes RR RW RW WW ;

F_2 phenotypes $\underbrace{RR \quad RW}_{\text{red Flowered}}$ $\underbrace{RW \quad WW}_{\text{pink Flowered}}$ white flowered ;

c) genotypic ratio = $1RR:2RW:1WW$ / $RR:RW:WW=1:2:1$;

Phenotypic ratio=1 red flowered:2 pink flowered:1 white flowered ;

Notes: i) there must be cross on genotype

ii) gameter should be circled

d) recessive gene expressed it self only underlined

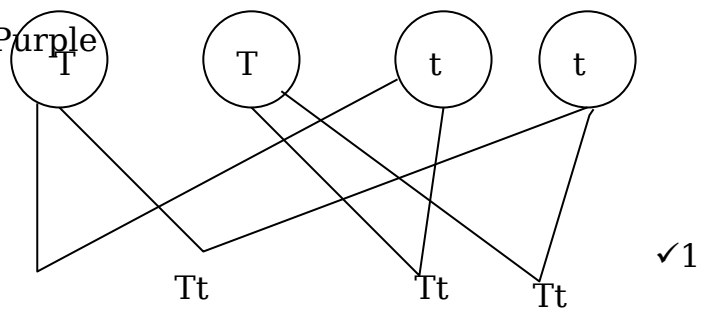
homozygous condition while dominant gene expresses it self in both homozygous and heterozygous conditions;

32. (a) (i) Male and female flowers are separate hence cross pollination is made possible.



(ii) 1 Yellow : 3 Purple

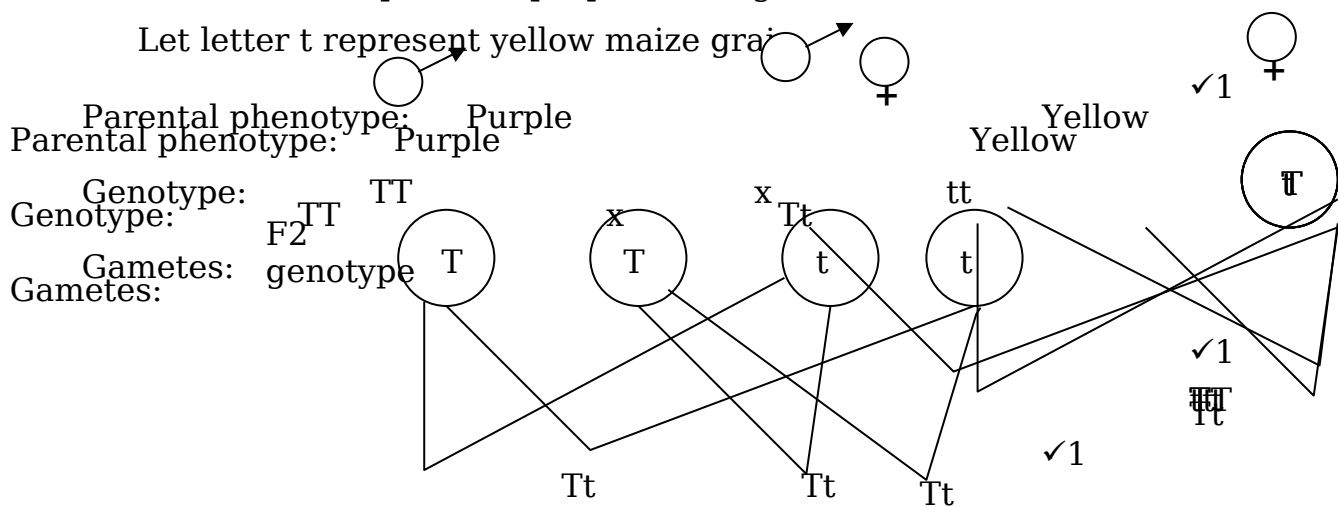
Rej.: 15 yellow : 45 Purple



F1
genotype

(b) Let letter T represents purple maize grain

Let letter t represent yellow maize grain



(c) Gene for purple grain;

(d) (i) Finger prints are used to identify criminals;

(ii) Blood groups are used to settle parental disputes;

33. a) Aa; Aa; because of one child - 4

b) AA; Aa; because of cross between parent 1 and 2

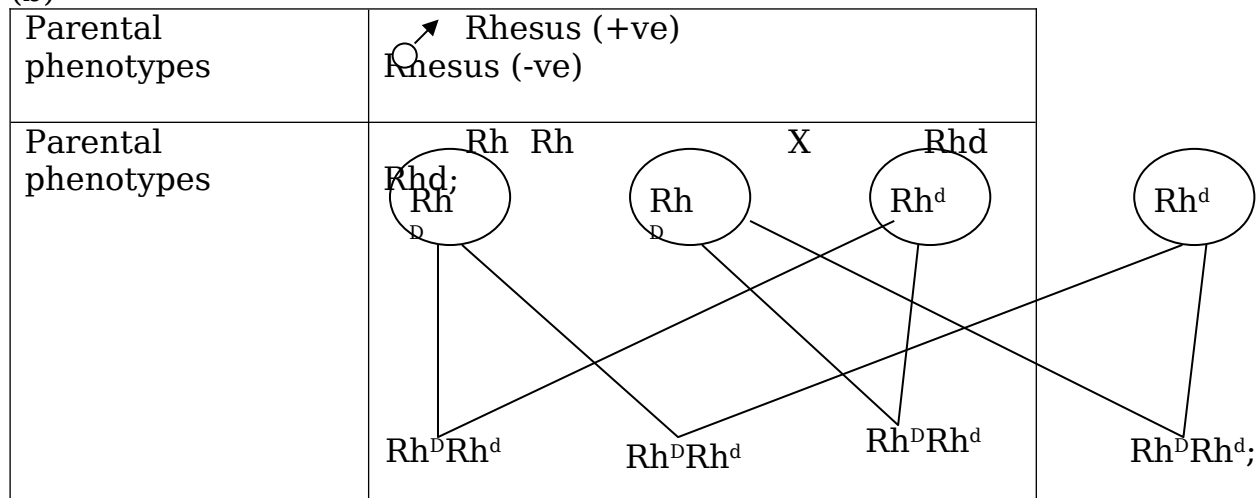
c) Lethal genes easily inherited;

d) Sickle celled anaemia; colour blindness; haemophilia

34. (a) Y - Blood group A⁺;

Z - Blood group B⁻

(b)



Parental gametes

Fusion;

F1 offspring;

c) All Rhesus positive/ all Rh^DRh^d;

(d) None

35. - By keeping their mouth open/panting; to lose heat over surface area of the tongue by evaporation;

-Basking; to gain heat by conduction;

- Shivering; to generate heat through increased metabolism;

- Physical activity (e.g. running); to generate heat through metabolism;

- Hibernation; to increase metabolism;

- Putting on warm clothes when it is cold; to retain the heat energy;

- Reduction of physical activity; to reduce the metabolic rate;

- Migratory behaviour to cooler environment; to reduce the body temperature;
- Moving into water when it is hot; to cool the body;
- Staying around fire place; to gain heat by convection;
- Taking hot drinks; to warm the body;

36. a) Parental genotypes

- i) Woman/ O^x - AO
- ii) Man/ O - BO

b

	A	O
B	AB	BO
O	AO	OO

c) Cases of disputed paternity settlement

- Determining compatible blood groups in blood transfusion

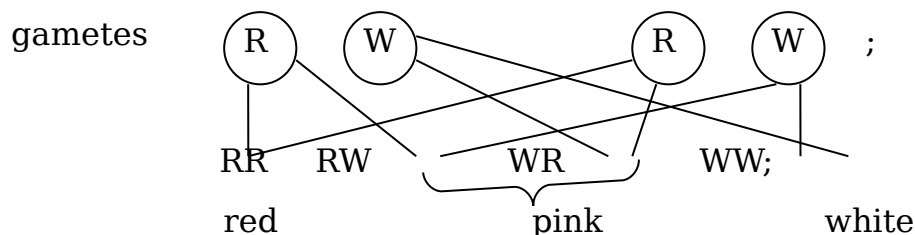
- d) i) Corresponding complementary DNA strand GAA;
- ii) Corresponding RNA CUU
- iii) Nitrates/ sulphites/ hydroquinone/ gamma/ beta/ alpha/ x-

rays/ UV light/ hydrogen peroxide

37. let R rep. gene for Red flowers

W.rep gene for white flowers

a) parental phenotype Pink flowered
genotype RW X RW ;

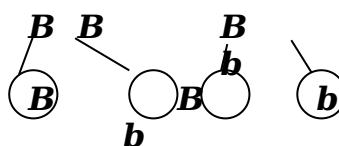


b) phenotypic ratio 1Red:2Pink:1White;
genotypic ratio: 1RR:2RW:1WW;

c) $\frac{2}{4} \times 480 = 240$

38.

**Parental
genotype;
Gametes**
;



♂ ♀	B	Bb
b	Bb	Bb
b	Bb	Bb

F1 generation Award for punnet Square and genotypes

(b) (i) IBB : 2Bb: lbb

(1 mark for ratio, 1 mark Par genotype)

(ii) 3 B lack: I brown

(iii) 24;

39. (a) Homologous structures:

Structures of common embryonic origin modified to perform different functions;

Example: Eye structure in man and octopus/ wings in birds and insects (I mark)

Analogous structures Example

(b) They undergo mutations: resulting in new forms that are selection resistant to drugs;

(c) (i) Failure of chromosomes to separate during anaphase I resulting in gametes

with an extra chromosome and others with less chromosomes: (I mark)

(ii) Down's syndrome / Klinefelter's syndrome/ Turner's syndrome: any I (1mk)

40. a) Homologous structures have a common embryonic origin but are modified to

Perform different functions; while analogous structures have different embryonic origin but are modified to perform similar functions;

b) Nictitating membrane; post anal tail; body hair;

41. a) Pentadactyl limb structure of mammals; beaks of birds; feet of birds;

b) - Missing links between fossils because some parts or whole organisms were not fossilized

- Some parts were distorted during fossilization hence may give wrong impression of structures;

- Some structures have been destroyed by geological activities;

42. Camouflage is the conceal/ element of identity of an organism by resembling the color

of the environment while mimicry is the imitation of non-living organisms to conceal identity

43. Light energy splits water molecules; into hydrogen ions and oxygen atoms;

44. (a) Caecum/ Rumen/ pauch;

(b) Closes to prevent food from moving up the oesophagus;

45. (a) - the soft bodied organisms fail to fossilize;

- Human activities interfere with fossilization;
- Earth movements e.g. volcanic eruptions interfere with fossilization; (mark any first 2 pts)
- (b) - They resembled from neck downwards;
 - They walked upright;
 - The shape of the skull suggested they were able to speak;
- 46. a i) vestigial structures are those structures that have ceased to be functional over a long period of time and hence reduced in size
- ii) - appendix;
 - caecum
 - coccyx or tail/tail bone;
 - Nictitating membrane/semi-lunar fold at the corner of the eye;
 - ear muscles
 - Body hair;
- b) Disease causing organism mutates; and became resistant;
- 47. Struggle for existence - environmental pressure on the population in order to survive;
 - Survival for the fittest - advantageous variations an individual possesses to make it survive;
- 48. Secretion of antidiuretic hormone; reabsorption of salts at the loop of Henle;
- 49. - Divergent evolution refers to a situation where by organisms that are believed to have had a common ancestral origin have homologous structures which have been modified to suit different environments;
- 50. a) Allows survival of organisms with better qualities / traits / characteristics; eliminates organisms with unfavorable characteristics/ traits;
- b) Divergent;
- 51. Evidence does not support Lamarck's theory
 - Acquired characteristics are not inherited;
 - Inherited characteristics are found in reproductive cells ;
- 52. (a) Vestigial structures
 - (i) Are those structures that have ceased to be functional over a long period of time hence reduced in size;
 - (ii) Appendix/coccyx/tail/ nictitating membrane semilunar fold at the corner of the eye/caecum/ear muscles, body hairs;
 - (b) Disease causing micro-organisms mutate and become resistant;
- 53. a) The gradual emergence of complex life forms from pre-existing simple forms over a long

period of time ;

b) Nature selects those organisms with structures that are well adapted to survival in

the environment. These structures are passed to their offspring; organisms with structures

that are poorly adapted perish ;

54. The insecticide kills most of the insects when introduced; those that survive; give rise to a new generation of flies that are resistant to insecticide.

55. - Most organisms especially soft-bodied ones do not form fossils;

- Most fossils have not yet been discovered;

- Exposed fossils are usually destroyed by physical and chemical weathering;

- Earth movements e.g. volcanicity, earthquakes, tsunami do destroy fossils;

- Most animals are preyed upon;

56. -Fossil records/paleontology ;

- Comparative anatomy/taxonomy;

- Comparative embryology;

- Geographical distribution;

- Cell biology;

- Comparative cellology/immunology; (award 1st three 3mks)