

Genetics Review Booklet



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المزيد من مادة
فيزياء:

إعداد: Haji Judy

التواصل الاجتماعي بحسب الصف العاشر المتقدم



صفحة المناهج
الإماراتية على
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الرياضيات

اللغة الانجليزية

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التربية الاسلامية

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المزيد من الملفات بحسب الصف العاشر المتقدم والمادة فيزياء في الفصل الأول

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GENETICS REVIEW BOOKLET

Mendelian Genetics • Genetic Recombination • Applied Genetics

A clear revision booklet for the three lessons

Prepared by student: Judy Haji

اللهم لا سهل إلا ما جعلته سهلاً، وأنت تجعل الحزن إذا شئت سهلاً.
اللهم انفعنا بما علمتنا، وعلمنا ما ينفعنا، وزدنا علماً.
اللهم اشرح لي صدري ويسر لي أمري واحلل عقدة من لساني يفقهوا قولي.

LESSON 1 - MENDELIAN GENETICS

Practice Questions

Q1. Who is known as the "father of genetics"?

- A. Charles Darwin
- B. Gregor Mendel
- C. Isaac Newton
- D. Louis Pasteur

Q2. In what year did Mendel publish his findings?

- A. 1750
- B. 1866
- C. 1900
- D. 1920

Q3. Why are Mendel's experiments important?

- A. They helped establish the study of genetics and heredity.
- B. They showed that plants do not reproduce.
- C. They proved all plants are identical.
- D. They showed that traits cannot be inherited.

Q4. Suppose Mendel observes that a particular form of a trait repeatedly appears in offspring produced by true-breeding plants. What would be the most scientifically appropriate next step according to this approach?

- A. Ignore the observation because it occurs in plants.
- B. Form a hypothesis concerning how the trait is inherited.
- C. Prevent the plants from reproducing.
- D. Assume the trait is caused entirely by the environment.

Q5. Which sequence correctly represents the experimental process?

- A. Observe traits → formulate hypotheses → perform experiments → identify inheritance patterns
- B. Formulate hypotheses → stop reproduction → observe traits → cross-pollinate
- C. Select true-breeding plants → analyze traits → conduct controlled crosses → form hypotheses
- D. Cross-pollinate all plants → observe only parents → eliminate self-fertilization → publish

Q6. Which statement represents the central scientific significance of Mendel's work?

- A. He demonstrated that plant growth depends entirely on the environment.
- B. He established an experimental approach for investigating how traits are inherited.
- C. He showed that plants cannot reproduce by themselves.
- D. He discovered that all pea plants have identical traits.

Q7. Why is the ability to perform both self-fertilization and cross-pollination experimentally significant?

- A. It allows researchers to compare controlled reproductive situations.
- B. It prevents researchers from controlling reproduction.
- C. It eliminates inherited traits.
- D. It ensures every offspring receives identical genetic material.

Q8. What happened to the green-seed trait in the F1 generation?

- A. It appeared in every plant.
- B. It disappeared permanently.
- C. It seemed to disappear.
- D. It changed into yellow.

Q9. What ratio of yellow seeds to green seeds did Mendel observe in the F2 generation?

- A. 1:1
- B. 2:1
- C. 3:1
- D. 4:1

Q10. Why did Mendel remove the male organs from the yellow-seed plant before performing the cross?

- A. To prevent the yellow-seed plant from producing seeds
- B. To prevent self-fertilization and control which pollen was used
- C. To make the yellow seeds turn green
- D. To ensure that all F1 plants were green

Q11. Consider this reasoning: 1. True-breeding yellow and green plants were selected. 2. They were cross-pollinated under controlled conditions. 3. All F1 offspring were yellow. 4. F1 plants were allowed to self-fertilize. 5. Green seeds reappeared in F2. Which conclusion is least justified by these observations?

- A. The appearance of a trait in F1 does not necessarily mean the alternative trait has been eliminated.
- B. Examining more than one generation can reveal inheritance patterns that are not obvious in F1.
- C. The green trait was capable of appearing again in descendants of the F1 plants.
- D. The green trait must have been caused entirely by environmental conditions.

Q12. Which conclusion integrates the greatest number of observations from the entire experiment?

- A. True-breeding parental plants can be crossed to produce an F1 generation in which only one trait is observed, and self-fertilization of F1 can result in the reappearance of the other trait in F2 in an approximately 3:1 ratio.
- B. A trait that disappears in F1 is necessarily eliminated from the offspring.
- C. Cross-pollination always produces offspring with equal numbers of each parental trait.
- D. The F1 generation is sufficient by itself to determine every aspect of inheritance.

Q13. Suppose Mendel had stopped his experiment after observing the F1 generation. Which important observation would he have missed?

- A. That true-breeding plants can produce seeds
- B. That cross-pollination can occur
- C. That the green-seed trait can reappear in the F2 generation
- D. That yellow-seed plants exist

Q14. A student claims: "Because green seeds disappeared in F1, the green trait must have been destroyed during fertilization." Which observation from Mendel's experiment most directly contradicts this claim?

- A. The parental plants were true-breeding.
- B. Mendel removed the male organs from one parent.
- C. Green seeds appeared again in the F2 generation.
- D. All F1 seeds were yellow.

Q15. How many contrasting forms did each trait studied by Mendel have?

- A. One
- B. Two
- C. Three
- D. Four

Q16. What is the genotype of a green-seed pea plant?

- A. YY
- B. Yy
- C. yy
- D. YYY

Q17. Mendel's observation of an approximately 3:1 ratio in the F2 generation supported which conclusion?

- A. Alleles occur in pairs and segregate during gamete formation, producing predictable inheritance patterns.
- B. Every organism has only one allele for each gene.
- C. Recessive alleles do not exist.
- D. All traits are controlled by environmental factors.

Q18. Consider two pea plants: • Plant A: YY • Plant B: Yy Both have yellow seeds. What does this demonstrate?

- A. They have identical genotypes and phenotypes.
- B. They have different genotypes but the same phenotype.
- C. They have identical genotypes but different phenotypes.
- D. Neither plant has a dominant allele.

Q19. Consider two plants: • Plant A: Yy • Plant B: yy Both contain a y allele. Why do they have different phenotypes?

- A. Plant A has a dominant Y allele that masks the recessive y allele.
- B. Plant B has a dominant y allele.
- C. Plant A is homozygous while Plant B is heterozygous.
- D. The y allele is dominant in Plant B.

Q20. A student says, "If an allele is recessive, it is not present when the phenotype is dominant." What is the best correction?

- A. Correct, because recessive alleles disappear whenever a dominant allele is present.
- B. Incorrect, because a recessive allele can be present but masked in a heterozygous organism.
- C. Correct, because only dominant alleles are inherited.
- D. Incorrect, because all alleles are always expressed equally.

Q21. A yellow-seed plant has an unknown genotype. Based only on its phenotype, which two genotypes must be considered?

- A. YY and yy
- B. Yy and yy
- C. YY and Yy
- D. YY and Y

Q22. An organism has two different alleles for a trait, and the dominant allele is present. Which combination is correct?

- A. Homozygous + recessive phenotype
- B. Homozygous + dominant phenotype
- C. Heterozygous + dominant phenotype
- D. Heterozygous + recessive phenotype

Q23. What happens to the chromosome number when a diploid cell produces haploid cells by meiosis?

- A. It doubles.
- B. It stays the same.
- C. It is reduced by half.
- D. It becomes zero.

Q24. Which process causes the two alleles for a trait to separate into different gametes?

- A. Fertilization
- B. Seed development
- C. Meiosis
- D. Germination

Q25. Why does the genotype of the F1 zygote differ from the genotype of either parent?

- A. The zygote receives one allele from each parent
- B. The zygote receives both alleles from the yellow parent
- C. The zygote receives both alleles from the green parent
- D. Fertilization removes one parent's allele

Q26. If every egg and pollen gamete from the YY plant contains Y, what does this demonstrate about the plant's genotype?

- A. It is heterozygous
- B. It is homozygous
- C. It is a hybrid
- D. It is recessive

Q27. Which explanation best describes the complete genetic process?

- A. The YY and yy parents produce gametes carrying one allele each; fertilization combines Y and y to form a Yy F1 zygote, which develops into a yellow hybrid.
- B. The YY parent produces Yy gametes, which combine with yy gametes to produce YY offspring.
- C. The yy parent produces Y gametes, which combine with Y gametes to produce yy offspring.
- D. Both parents produce gametes containing two alleles, which combine to create a four-allele zygote.

Q28. If the yellow parent were not YY but instead Yy, which statement would change?

- A. Not every gamete from the yellow parent would necessarily contain Y
- B. The green parent would no longer be yy
- C. Fertilization would stop occurring
- D. The F1 plants could not receive alleles from both parents

Q29. A student claims that the green allele disappears because the F1 plant is yellow. What is actually observed instead?

- A. The y allele remains present in the F1 genotype
- B. The y allele is destroyed during fertilization
- C. The y allele changes into Y
- D. The y allele never entered the zygote

Q30. Why does each gamete contain only one allele of the pair?

- A. Chromosome number is divided in half during meiosis
- B. Fertilization removes one allele
- C. Dominant alleles destroy recessive alleles
- D. Plants contain only one allele

Q31. Which genotype represents a pea plant that is homozygous dominant for both yellow seed color and round seed shape?

- A. YYRR
- B. yyrr
- C. YyRr
- D. YYrr

Q32. What type of cross did Mendel perform using two traits?

- A. Monohybrid cross
- B. Dihybrid cross
- C. Test cross only
- D. Mutation cross

Q33. Which of the following is one of the possible gametes produced by a YyRr plant?

- A. YY
- B. RR
- C. YR
- D. YyRr

Q34. According to the law of independent assortment, what happens to unlinked Y/y and R/r allele pairs during gamete formation?

- A. They always remain together.
- B. They assort independently of one another.
- C. They combine into a single allele.
- D. They disappear during meiosis.

Q35. Which gamete contains the recessive seed-color allele and dominant seed-shape allele?

- A. YR
- B. Yr
- C. yR
- D. yr

Q36. A YyRr plant self-fertilizes. If its male gamete is Yr, which of the following could be the female gamete and form a zygote?

- A. YR
- B. YY
- C. YyRr
- D. RR

Q37. Suppose the four gamete types from a YyRr plant are equally likely. Which statement is most accurate?

- A. YR is more likely than yr because Y and R are dominant.
- B. yr is more likely because both alleles are recessive.
- C. YR, Yr, yR, and yr each have an equal chance of being produced.
- D. Only YR and yr can be produced.

Q38. If a YyRr plant produces 100 gametes, approximately how many of each type would be expected if the four types are equally likely?

- A. 10 of each
- B. 20 of each
- C. 25 of each
- D. 50 of each

Q39. Who developed the Punnett square in the early 1900s?

- A. Gregor Mendel
- B. Dr. Reginald Punnett
- C. Charles Darwin
- D. Louis Pasteur

Q40. What is a Punnett square used to predict?

- A. Plant height only
- B. Possible offspring genotypes from a cross
- C. The age of an organism
- D. The number of chromosomes in a cell

Q41. In a cross between true-breeding YY and yy pea plants, what genotype do all F1 offspring have?

- A. YY
- B. Yy
- C. yy
- D. YYY

Q42. What is the genotype ratio shown for the F2 generation in a monohybrid cross (Yy × Yy)?

- A. 3:1
- B. 1:1
- C. 1:2:1
- D. 2:1

Q43. What is the phenotype ratio shown for the F₂ generation in a monohybrid cross ($Yy \times Yy$)?

- A. 1:2:1
- B. 3:1
- C. 1:1
- D. 2:2

Q44. If F represents freckles and f represents the recessive allele, which genotypes could produce freckles?

- A. FF only
- B. Ff only
- C. FF and Ff
- D. ff and Ff

Q45. In the same cross ($Yy \times Yy$), what percentage of offspring are expected to be yellow?

- A. 25%
- B. 50%
- C. 75%
- D. 100%

Q46. A plant has genotype TT and is crossed with a plant having genotype tt. What percentage of the offspring will be Tt?

- A. 0%
- B. 25%
- C. 50%
- D. 100%

Q47. In a $Yy \times Yy$ cross, the probability of getting Yy is $1/2$. In a $Rr \times Rr$ cross, the probability of getting Rr is $1/2$. What is the probability of getting $YyRr$?

- A. $1/4$
- B. $1/2$
- C. $3/4$
- D. 1

Q48. In $Yy \times Yy$, the probability of yy is $1/4$. In $Rr \times Rr$, the probability of rr is $1/4$. What is the probability of $yyrr$?

- A. $1/4$
- B. $1/8$
- C. $1/16$
- D. $1/2$

Q49. A Punnett square for $YyRr \times YyRr$ has 16 boxes. If one box contains $yyrr$, what fraction of the possible offspring are $yyrr$?

- A. $1/2$
- B. $1/4$
- C. $1/8$
- D. $1/16$

Q50. A coin is flipped twice. What is the probability of getting heads both times?

- A. $1/2$
- B. $1/4$
- C. $3/4$
- D. $1/8$

Q51. A coin is flipped 100 times. Why would the results generally be expected to be closer to the predicted ratio than after only 2 flips?

- A. More trials generally make the observed results more likely to approach the predicted ratio.
- B. The coin changes after 100 flips.
- C. The probability becomes 100%.
- D. The first 99 flips determine the last flip.

Q52. If an event has a probability of $\frac{1}{4}$, which calculation correctly finds the expected number out of 80 trials?

- A. $80 \div 4$
- B. 80×4
- C. $80 - 4$
- D. $80 \div 2$

Q53. A student observes a genetic outcome 18 times out of 24 offspring. What is the observed fraction?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. $\frac{3}{4}$
- D. $\frac{4}{3}$

LESSON 2 - GENETIC RECOMBINATION

Practice Questions

Q54. Which two processes contribute to genetic recombination?

- A. DNA replication and mutation
- B. Crossing over and independent assortment
- C. Fertilization and mitosis
- D. Transcription and translation

Q55. In the formula 2^n for possible chromosome combinations in gametes due to independent assortment, what does n represent?

- A. The total number of chromosomes in a diploid cell.
- B. The number of homologous chromosome pairs (the haploid number).
- C. The number of gametes produced.
- D. The number of offspring.

Q56. How many possible chromosome combinations can result from independent assortment when a pea plant has 7 pairs of chromosomes?

- A. 14
- B. 49
- C. 64
- D. 128

Q57. A species has 7 pairs of chromosomes. Which calculation gives the number of possible chromosome combinations in gametes due to independent assortment?

- A. 2×7
- B. 7^2
- C. 2^7
- D. $7 \div 2$

Q58. Where are linked genes located?

- A. On different organisms
- B. Close to each other on the same chromosome
- C. Only in the cytoplasm
- D. On separate cells

Q59. Which process separates homologous chromosomes?

- A. Meiosis I
- B. Meiosis II
- C. Fertilization
- D. DNA replication

Q60. Which statement best explains the relationship between independent assortment and genetic recombination?

- A. Independent assortment contributes to the different combinations of chromosomes found in gametes.
- B. Independent assortment prevents genetic variation.
- C. Independent assortment causes linked genes to always separate.
- D. Independent assortment produces genetically identical gametes.

Q61. What happens to homologous chromosomes during Meiosis I?

- A. Centromeres separate.
- B. Homologous chromosomes separate.
- C. Gametes fuse.
- D. DNA is translated into protein.

Q62. What happens during Meiosis II?

- A. Homologous chromosomes pair up.
- B. Sister chromatids separate as centromeres divide, producing haploid cells.
- C. DNA replication occurs.
- D. Two organisms reproduce.

Q63. Which statement best compares genetic recombination and gene linkage?

- A. Genetic recombination increases variation through crossing over and independent assortment, while linked genes close together on the same chromosome usually travel together.
- B. Genetic recombination and gene linkage are exactly the same process.
- C. Genetic recombination prevents variation, while gene linkage creates unlimited combinations.
- D. Gene linkage occurs only when chromosomes have no genes.

Q64. What usually happens to genes that are very close together on the same chromosome during meiosis?

- A. They tend to be inherited together.
- B. They always separate.
- C. They disappear.
- D. They move permanently to different chromosomes.

Q65. What can crossing over create?

- A. New genetic combinations
- B. Identical chromosomes only
- C. Fewer genes
- D. No genetic variation

Q66. Genes that are close together on a chromosome have what type of crossing-over frequency?

- A. Higher frequency
- B. Lower frequency
- C. 100% frequency
- D. No relationship to distance

Q67. If two genes are far apart on the same chromosome, what is expected to happen to their crossing-over frequency?

- A. It tends to be higher.
- B. It tends to be lower.
- C. It becomes zero.
- D. It cannot change.

Q68. Which relationship is correctly described regarding gene distance and crossing over?

- A. Greater distance between genes → generally greater crossing-over frequency.
- B. Greater distance between genes → always lower crossing-over frequency.
- C. Smaller distance → always greater crossing-over frequency.
- D. Gene distance has no relationship to crossing over.

Q69. What is polyploidy?

- A. The loss of one chromosome
- B. The occurrence of one or more extra sets of chromosomes
- C. The duplication of one gene
- D. The absence of chromosomes

Q70. Most somatic cells in animals and many plants are typically:

- A. Haploid
- B. Diploid
- C. Triploid
- D. Polyploid

Q71. In which group of organisms does polyploidy occur relatively rarely?

- A. Flowering plants
- B. Plants
- C. Animals
- D. Crops

Q72. According to the course material, approximately what fraction of known flowering plant species are polyploid?

- A. One in ten
- B. One in three
- C. One in two
- D. Three in four

Q73. Which characteristic is mentioned as desirable in some polyploid plants?

- A. Smaller flowers
- B. Smaller fruits
- C. Larger flowers
- D. Fewer leaves

Q74. Bread wheat is described as having which chromosome condition?

- A. $2n$
- B. $3n$
- C. $6n$
- D. $8n$

LESSON 3 - APPLIED GENETICS

Practice Questions

Q75. Has selective breeding been used only with animals?

- A. Yes, only animals can be selectively bred.
- B. No, plants can also be selectively bred.
- C. Yes, because plants cannot reproduce.
- D. No, but only wild plants can be bred.

Q76. A breeder wants an animal suited for running long distances. Which trait described would be most relevant?

- A. Keen sense of smell
- B. Endurance
- C. Trainability
- D. Large fruits

Q77. Why would a breeder select animals with particular traits for reproduction?

- A. To increase the chance that desired traits are passed to future generations
- B. To prevent the animals from reproducing
- C. To eliminate all genetic variation
- D. To make every organism identical immediately

Q78. What is the main purpose of selective breeding?

- A. To obtain offspring with desired traits
- B. To prevent organisms from reproducing
- C. To eliminate all inherited characteristics
- D. To make organisms genetically unrelated

Q79. What is another term for hybridization?

- A. Inbreeding
- B. Crossbreeding
- C. Test crossing
- D. Cloning

Q80. What is one disadvantage of hybridization?

- A. It is time-consuming and expensive.
- B. It always produces unhealthy offspring.
- C. It prevents desired traits from being inherited.
- D. It cannot produce hybrids.

Q81. Which animals are given as examples of organisms maintained by inbreeding?

- A. Clydesdale horses, Angus cattle, and German shepherd dogs
- B. Lions, tigers, and bears
- C. Cats, rabbits, and mice
- D. Dolphins, whales, and seals

Q82. What is a test cross primarily used for?

- A. Determining the unknown genotype of an organism showing a dominant phenotype by crossing it with a homozygous recessive organism.
- B. Producing only polyploid organisms.
- C. Measuring the size of an organism.
- D. Determining the number of chromosomes in a cell.

Q83. A breeder performs the cross $Aa \times aa$. Which gametes can the first parent produce?

- A. A only
- B. a only
- C. A and a
- D. AA and aa

Q84. A breeder wants to combine a disease-resistance trait from one parent with a fast-growth trait from another. Which process is most directly suited to this purpose?

- A. Hybridization
- B. Inbreeding
- C. Test cross
- D. Polyploidy

ANSWER KEY

Question number and correct answer

Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	22	C	43	B	64	A
2	B	23	C	44	C	65	A
3	A	24	C	45	C	66	B
4	B	25	A	46	D	67	A
5	A	26	B	47	A	68	A
6	B	27	A	48	C	69	B
7	A	28	A	49	D	70	B
8	C	29	A	50	B	71	C
9	C	30	A	51	A	72	B
10	B	31	A	52	A	73	C
11	D	32	B	53	C	74	C
12	A	33	C	54	B	75	B
13	C	34	B	55	B	76	B
14	C	35	C	56	D	77	A
15	B	36	A	57	C	78	A
16	C	37	C	58	B	79	B
17	A	38	C	59	A	80	A
18	B	39	B	60	A	81	A
19	A	40	B	61	B	82	A
20	B	41	B	62	B	83	C

21

C

42

C

63

A

84

A

دعاء ختام المراجعة وحفظ العلم

الحمد لله الذي بنعمته تتم الصالحات.

اللهم إنني أستاذك ما قرأت وما حفظت وما تعلمت، فرده إلي عند حاجتي إليه.

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