

Brett Robbins Academic Consulting

Biology 30 Practice Test

Unit C: Cell Division, Genetics & Molecular Biology

25 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, contact Brett for clarification.

Question 1

The diploid chromosome number in dogs is 78.

A skin cell of a dog divides by mitosis. The number of chromosomes in each daughter cell is

- A) 39
- B) 78
- C) 156
- D) 23

Question 2

In organisms that reproduce sexually, the primary purpose of meiosis is

- A) to produce genetically identical body cells
- B) to repair damaged chromosomes
- C) to produce gametes with half the chromosome number
- D) to double the chromosome number before fertilization

Question 3

In a molecule of DNA, 30% of the nitrogen bases are adenine.

The percentage of the bases that are guanine is

- A) 20%
- B) 30%
- C) 25%
- D) 70%

Question 4

In pea plants, the allele for tall stems (T) is dominant to the allele for short stems (t).

A heterozygous tall plant is crossed with a short plant. The probability that an offspring will be short is

- A) 0.00
- B) 0.25
- C) 0.75
- D) 0.50

Question 5

A segment of the template strand of a gene has the base sequence TAC TTT.

The base sequence of the mRNA transcribed from this segment is

- | | |
|------------|------------|
| A) ATG AAA | B) AUG AAA |
| C) UAC UUU | D) AUG UUU |

Question 6

The phase of mitosis during which sister chromatids separate and move toward opposite poles of the cell is

- | | |
|-------------|--------------|
| A) prophase | B) metaphase |
| C) anaphase | D) telophase |

Question 7

A species of grasshopper has a diploid chromosome number of 24.

The number of chromosomes in a grasshopper gamete is

Question 8

In guinea pigs, black coat colour (*B*) is dominant to brown coat colour (*b*).

A black guinea pig is crossed with a brown guinea pig, and half of the offspring are brown.

The genotype of the black parent is

- | | |
|--------------|-------------------------|
| A) <i>Bb</i> | B) <i>BB</i> |
| C) <i>bb</i> | D) cannot be determined |

Question 9

In snapdragons, flower colour shows incomplete dominance. A red flower ($C^R C^R$) crossed with a white flower ($C^W C^W$) produces pink offspring.

When two pink snapdragons are crossed, the probability that an offspring will be white is

- | | |
|---------|---------|
| A) 0.00 | B) 0.50 |
| C) 0.75 | D) 0.25 |

Question 10

Two heterozygous parents ($Aa \times Aa$) are expected to produce 240 offspring.

The expected number of offspring that will show the recessive phenotype is

Question 11

Red – green colour–blindness is an X–linked recessive disorder.

A woman who is a carrier ($X^N X^n$) and a man with normal vision ($X^N Y$) have children.

The probability that a son of this couple will be colour–blind is

- | | |
|---------|---------|
| A) 0.50 | B) 0.25 |
| C) 0.00 | D) 1.00 |

Question 12

Two genes assort independently. In a cross between two double heterozygotes ($AaBb \times AaBb$), the probability that an offspring will show the dominant phenotype for both traits is

- | | |
|-------------------|-------------------|
| A) $\frac{1}{16}$ | B) $\frac{9}{16}$ |
| C) $\frac{3}{16}$ | D) $\frac{6}{16}$ |

Question 13

In the dihybrid cross $AaBb \times AaBb$, 160 offspring are expected.

The expected number of offspring that will show the recessive phenotype for both traits is

Question 14

A pedigree shows two unaffected parents in generation I who have three children :

an unaffected son, an affected daughter, and an unaffected daughter.

No other family members are affected. The mode of inheritance of the disorder is

A) autosomal dominant

B) X-linked recessive

C) autosomal recessive

D) X-linked dominant

Question 15

A woman with genotype $I^A i$ and a man with genotype $I^A I^B$ have children.

The blood type that their children could NOT have is

A) type A

B) type B

C) type AB

D) type O

Question 16

Hemophilia is an X-linked recessive disorder. A woman whose father had hemophilia marries a man with normal blood clotting.

The probability that their first child will have hemophilia, as a decimal, is

Question 17

In mice, coat colour is controlled by two genes. Mice with genotype $B_$ produce black pigment, and mice with genotype bb produce brown pigment. A second gene determines whether pigment is deposited in the fur: $E_$ allows deposition, while ee blocks deposition and produces a cream coat. In a cross $BbEe \times BbEe$, the probability that an offspring will be brown is

- A) $\frac{3}{16}$
- B) $\frac{1}{16}$
- C) $\frac{9}{16}$
- D) $\frac{4}{16}$

Question 18

A section of mRNA has the base sequence AUG UUU GGC UAA.

Use the following codon information: AUG = methionine (start), UUU = phenylalanine, GGC = glycine, and UAA = stop.

The amino acid sequence produced from this section of mRNA is

- A) phenylalanine – glycine – methionine
- B) methionine – phenylalanine – glycine
- C) methionine – glycine – phenylalanine
- D) phenylalanine – methionine – glycine

Question 19

A mutation in a gene changes a codon in the mRNA from UGU , which codes for the amino acid cysteine, to UGA , which is a stop codon. This mutation is classified as a

- A) silent mutation, because the amino acid sequence is unchanged
- B) missense mutation, because one amino acid is replaced by another
- C) nonsense mutation, because translation stops early and the protein is shortened
- D) frameshift mutation, because the reading frame of the gene is shifted

Question 20

Genes *S* and *T* are located on the same chromosome, 26 map units apart.

Gene *M* is located between them, 9 map units from gene *S*.

The distance, in map units, between gene *M* and gene *T* is

Question 21

To produce bacteria that make human insulin, scientists cut both a bacterial plasmid and the human insulin gene with the same restriction enzyme. The same enzyme is used so that

- A) both DNA molecules have complementary sticky ends that can join together
- B) the insulin gene is cut into the smallest possible fragments
- C) introns are removed from the human insulin gene
- D) the plasmid is prevented from closing back on itself

Question 22

Nondisjunction of one pair of sister chromatids occurs during meiosis II of spermatogenesis.

The proportion of the sperm produced that will contain an extra chromosome is

- A) 1.00
- B) 0.75
- C) 0.50
- D) 0.25

Question 23

A man with type AB blood and a woman with type O blood have children.

The probability that a child of this couple will have type A blood, as a decimal, is

Question 24

Two unaffected parents have a child who has an autosomal recessive metabolic disorder.

The probability that their unaffected son is a carrier of the disorder allele is

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

Question 25

A karyotype of a newborn baby shows 47 chromosomes, including an *XXY* set of sex chromosomes.

This karyotype indicates that the baby is

- A) a female with Turner syndrome
- B) a male with an extra Y chromosome
- C) a male with Klinefelter syndrome
- D) a female with Down syndrome

Answer Key

- | | | |
|-------|----------|----------|
| 1. B | 10. 60 | 19. C |
| 2. C | 11. A | 20. 17 |
| 3. A | 12. B | 21. A |
| 4. D | 13. 10 | 22. D |
| 5. B | 14. C | 23. 0.50 |
| 6. C | 15. D | 24. B |
| 7. 12 | 16. 0.25 | 25. C |
| 8. A | 17. A | |
| 9. D | 18. B | |

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