Science 10

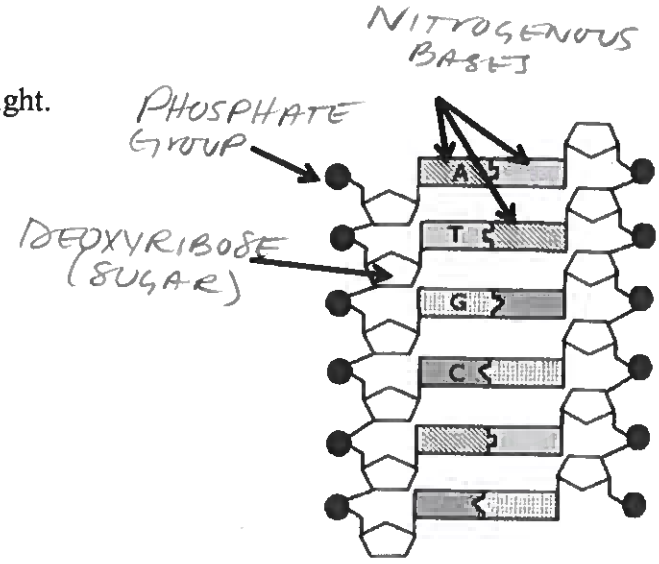
Name: key

Final Exam Review – Genetics

Part I- DNA and Protein Synthesis Review Questions

1. What is the full name for DNA? Label the diagram to the right.

DEOXYRIBOSE NUCLEIC ACID



2. How is DNA similar/different from RNA?

MADE OF SUGAR + PHOSPHATE + NITROGENOUS BASE

3. Give the full names for each nitrogenous base.

ADENINE CYTOSINE
THYMINE GUANINE

4. What are the base pairing rules for DNA?

A – T
G – C

5. Give the matching DNA strand for each of the following:

TAC AAA CTT	TAC CAT TAA	TAC AAA TAT
ATG TTT GAA	ATG GTA ATT	ATG TTT ATA

6. What is protein synthesis, and what does it have to do with genes?

- CREATION OF PROTEINS
- PROVIDES THE CODE (RECIPE) FOR MAKING PROTEIN

7. How are transcription and translation different?

- mRNA TRANSCRIBES GENE CODE FROM DNA (OCCURS IN NUCLEUS)
- mRNA'S CODE IS TRANSLATED INTO tRNA (@ RIBOSOME)

8. Describe the function of each:

a. mRNA – TRANSCRIBES DNA

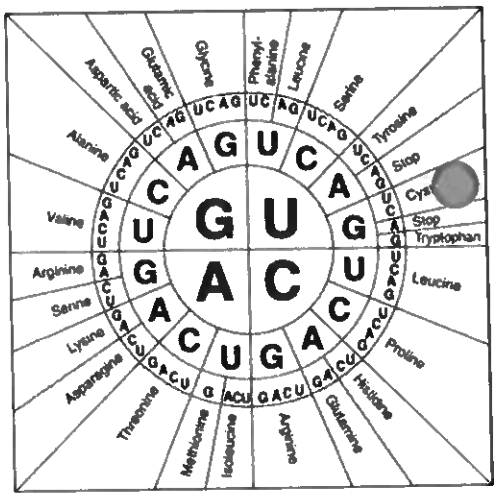
b. tRNA – BRINGS APPROPRIATE AMINO ACID TO RIBOSOME

c. ribosome (rRNA)- – MAKES THE RIBOSOME; WHERE TRANSLATION OCCURS.

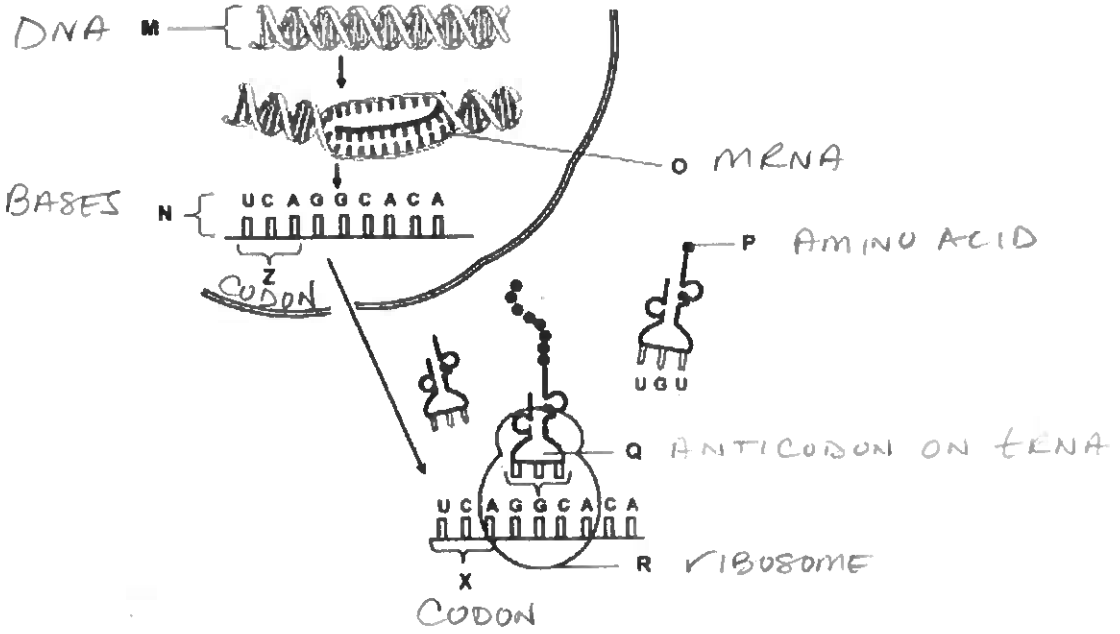
9. Give the amino acid sequence for the following:

TAC AAA CTT CAT TAC AAA TAT TTT

AUG UUU GAA GUA AUG UUU AUA AAA



10. Label each part below and describe what is happening at each step.



Part II- MUTATIONS AND GENETIC ENGINEERING Questions

1. List the 3 types of gene mutations and give an example of each.

SUBSTITUTION ATT → ATC

INSERTION ATT → AGTT

DELETION ATT → AT

2. What is a frameshift mutation? Give an example using the code CAT TAA TTT → CTT AAT TT

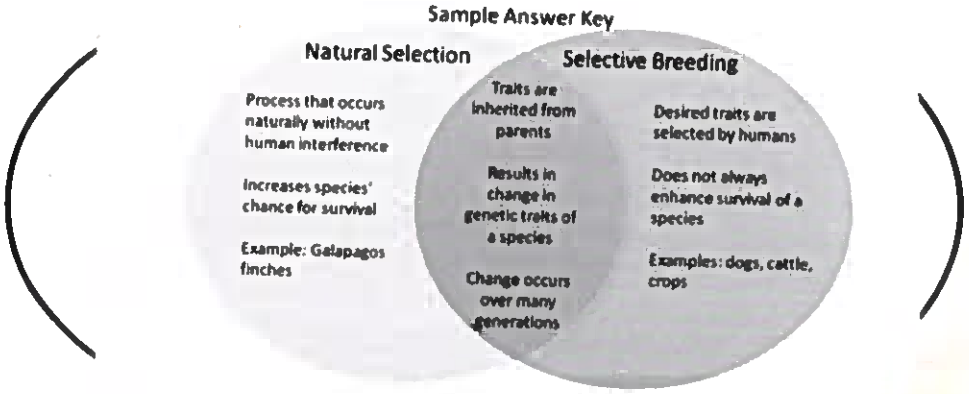
(SINGLE BASE IS ADDED OR DELETED WHICH SHIFTS THE READING OF CODONS BY ONE BASE

3. What is the difference between a gene mutation and a chromosomal mutation? Which do you think has the potential of being the most harmful?

CHANGE IN NUCLEOTIDE SEQ IN A GENE

CHANGE IN SEVERAL GENES } POTENTIALLY MORE HARMFUL B/C MORE GENES ARE AFFECTED

4. Use the Venn Diagram below to compare and contrast artificial and natural selection.



5. DDT is a pesticide that was used to kill mosquitoes in the 1950s.The first DDT resistant mosquitoes were discovered in 1959. DDT resistance is a negative mutation for mosquitoes.

A. True
B. False

6. Mutation may be neutral for an organism.

A. True
B. False

7. Which of the following shows the mutations in order from most negative to most positive as it would affect each organism?

I	a bacterium with antibiotic resistance
II	a squirrel that is albino
III	a human with uncontrolled reproduction in skin cells

	most negative effects		**most positive effects**
A	III	II	I
B	II	III	I
C	II	I	III
D	I	II	III

8. What is a GMO? Are GMO's necessarily bad?

GENETICALLY MODIFIED ORGANISMS; NOT NECESSARILY BAD (CAN ↑ CROP YIELD, GROW MORE ON LESS LAND, ↓ PESTICIDE USE, ↑ NUTRIENT CONTENT, ETC.)

9. Explain how genetic engineering may be used in gene therapy to treat certain genetic diseases like cystic fibrosis.

COULD INSERT NORMAL GENE FOR MUTATED ONE ESSENTIALLY CORRECTING THE ERROR

10. What is a clone? Describe the steps in making a cloned curly haired sheep from a frizzy haired egg donor mother and a curly haired somatic cell donor.

AN ORGANISM PRODUCED ASEXUALLY FROM ONE INDIVIDUAL WHICH IS GENETICALLY IDENTICAL.

- DNA FROM MAMMARY CELL OF CURLY HAIRED DONOR IS REMOVED
- EGG DONOR'S DNA IS REMOVED & DNA FROM CURLY HAIRED DONOR ADDED
- EGG WITH NEW DNA IS IMPLANTED INTO SURROGATE'S UTERUS

Part III- GENETICS

1. Which term identifies different forms of the same gene?

A. alleles
B. genotype
C. homozygous
D. heterozygous

2. What is the term given to an organism's genetic makeup?

A. mutation
B. variation
C. genotype
D. phenotype

3. Which of the following conditions **must** be present for a recessive trait to be expressed?

A. one recessive gene
B. one dominant gene
C. two recessive genes
D. two dominant genes

4. Which of the following describes phenotype?

I	TT
II	brown eyes
III	the genes for a particular trait
IV	the physical appearance of an organism

A. I and II only
B. I and IV only
C. II and III only
D. II and IV only

5. Which of the following is true of a dominant allele?

I	It will mask the recessive allele.
II	It is more likely to be passed onto the next generation than the recessive allele.
III	It will express the same phenotype when it appears in a homozygous or heterozygous condition.

A. I and II only
B. I and III only
C. II and III only
D. I, II and III only

6. A boy inherits one allele for a trait from his mother.

A. True
B. False

7. In codominance, heterozygous individuals have both phenotypes.

A. True
B. False

8. The hairy toe allele is dominant (H) and the smooth toe allele (h) is recessive. The genotype for a homozygous individual is Hh.

A. True
B. False

Match each Description on the left with the correct Term on the right.
Each Term may be used as often as necessary. Record your answers on the Answer Sheet.

Description	Term
9. two different alleles D	A. genotype
10. two alleles of the same type C	B. phenotype
11. the physical appearance of an organism B	C. homozygous
12. the combination of alleles in an organism A	D. heterozygous
	E. F_1 generation

13. Which of the following crosses would result in only heterozygous offspring?

A. tt x tt
B. Tt x tt
C. Tt x Tt
D. TT x tt

14. What will produce a white flower with a red trim when a white flower is crossed with a red flower?

A. mutation
B. dominance
C. codominance
D. incomplete dominance

15. A homozygous tall plant is crossed with a homozygous short plant. If the tall gene is dominant, which of the following describes the offspring?

	T	T
t	Tt	Tt
t	Tt	Tt

A. all tall
B. all short
C. all purebred
D. half tall, half short

16. Why is colour blindness a sex-linked trait?

A. Only males can have colour blindness.
B. Only females can have colour blindness.
C. The allele causing colour blindness is on a Y chromosome.
D. The allele causing colour blindness is on an X chromosome.

brown

17. A purebred male hamster was mated with a purebred female golden hamster. All the offspring were brown. Which of the following describes the allele for the colour brown?

A. recessive
B. dominant
C. sex-linked
D. codominant

18. A homozygous, long-tailed cat is mated with a homozygous, short-tailed cat. If long tails are the dominant trait, which of the following would be expected in the offspring?

A. all long-tailed
B. all short-tailed
C. 50% long-tailed; 50% short-tailed
D. 75% long-tailed; 25% short-tailed

	h	h
l	hl	hl
l	hl	hl

19. A purebred black corn plant is crossed with a purebred white corn plant. The resulting F1 generation all appear black. If two individuals from the F1 generation are crossed, what is the probable appearance of the F2 generation?

Bb

A. 100% black
B. 100% white
C. 50% black and 50% white
D. 75% black and 25% white

	B	b
B	BB	Bb
b	Bb	bb

20. Having a widow's peak (P) is dominant and having a straight hairline (p) is recessive. If there is a 100% chance that a particular individual will have a widow's peak, which of the following are the genotypes of the parents?

A. pp x pp
B. Pp x Pp
C. PP x pp
D. Pp x pp

Use the following information to answer question 21.

H = hairy toes

h = smooth toes

I	Hh x Hh
II	Hh x hh
III	HH x Hh
IV	HH x hh

2 Hh
2 Hh
2 Hh
4 Hh

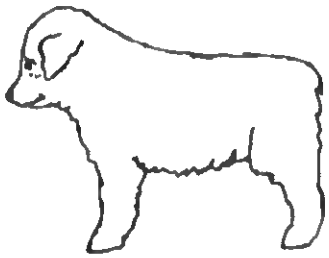
21. The hairy toe allele is dominant and the smooth toe allele is recessive. Which of the following crosses have equal chances of producing heterozygous hairy toed individuals?

A. I, II and III only
B. I, II and IV only
C. I, III and IV only
D. I, II, III and IV

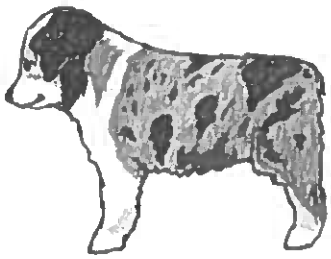
Use the following information to answer question 22.

Australian Shepherd dogs

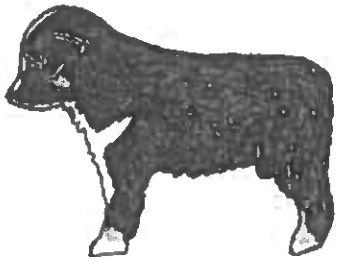
Australian Shepherd dogs have white coats, merled coats or tricolour coats.
Homozygous dominant dogs are white and have serious eye disorders.



white (MM)
with serious eye disorders



merle (Mm)
with normal eyes



tricolor (mm)
with normal eyes

22. If a homozygous white is crossed to a heterozygous merle, what is the probability of the offspring being white and having serious eye disorders?

A. 0%
B. 25%
C. 50%
D. 75%

	M	M
m	Mm	Mm
m	Mm	Mm

23. Draw Punnett squares for the crosses below. State the ratio of the genotype produced.

AA x aa

	A	A
a	Aa	Aa
a	Aa	Aa

0 AA : 4 Aa : 0 aa

Rr x Rr

	R	r
R	RR	Rr
r	Rr	rr

1 RR : 2 Rr : 1 rr

TT x Tt

	T	T
T	TT	TT
t	Tt	Tt

2 TT : 2 Tt : 0 tt
1 TT : 1 Tt

24. In squirrels, the gene for black fur color is incompletely dominant over the allele for white fur color. If a grey squirrel is crossed with a homozygous white squirrel, what are the genotypic and phenotypic ratios of their offspring? Show a Punnett square to support your answer.

1 BW : 1 WW

one grey to every one white

	B	W
W	BW	WW
W	BW	WW

25. In humans, the allele that codes for an ability to taste PTC is dominant (T), and the allele that codes for an inability to taste this chemical is recessive (t). A male who is heterozygous for this trait marries a female who cannot taste PTC.

a. What are the genotypes of the male and female?

Tt tt

b. Draw a Punnett square to show the possible genotypes of their offspring.

	T	t
t	Tt	tt
t	Tt	tt

c. What is the predicted percentage of their offspring that will be able to taste PTC? 50%

d. What is the percentage that will not be able to taste PTC? 50%

26. Human eye color is inherited as brown eyes are dominant and blue eyes are recessive. Use Punnett squares to solve the following problems. Pick your own letters to represent eye color traits.

a. A man with blue eyes marries a woman with brown eyes, whose mother had blue eyes. What proportion of the children would be expected to have blue eyes?

50%

	b	b
B	Bb	Bb
b	bb	bb

b. A brown eyed man marries a blue eyed woman. The first child is blue eyed. What is the man's genotype?

Bb

27. Define and state the difference between complete dominance, co-dominance and incomplete dominance? Use examples of each.

a. complete dominance One allele is completely dominant over another If only one dominant allele is present, the trait will be expressed.

b. co-dominance

Both alleles are equally dominant so heterozygote expresses both traits

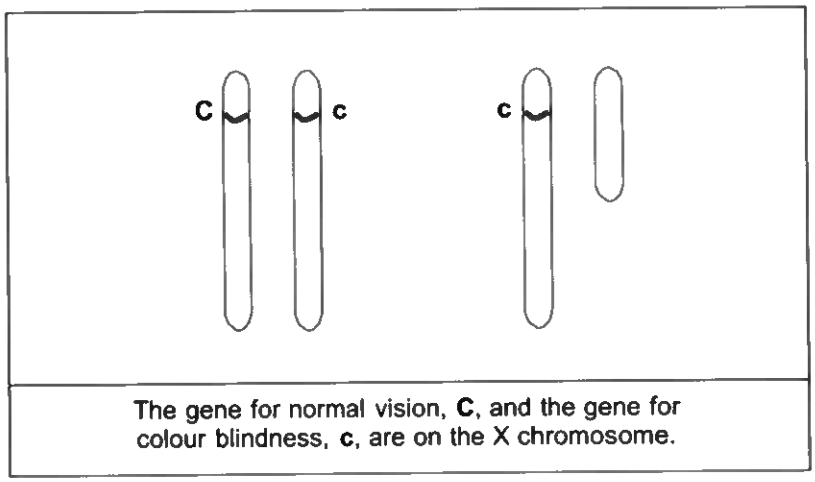
c. incomplete dominance

Neither allele is dominant over the other so heterozygote will express a blending of the traits.

28. Hemophilia is inherited as a sex linked recessive trait. A male who does not have hemophilia and female who is a carrier of hemophilia have a son. What is the probability the son has hemophilia? Show a Punnett square to support your answer. 50%

	X^H	Y
X^H	X^HX^H	X^HY
X^h	X^HX^h	X^hY

Use the following diagram to answer question 26.



The gene for normal vision, **C**, and the gene for colour blindness, **c**, are on the X chromosome.

X^CX^c X^cY

26. A woman who is heterozygous for colour blindness and a man with colour blindness are considering having children. What is the probability of having a child who is **both** male and colour-blind?

A. 100%
B. 75%
C. 25%
D. 0%

	X^c	Y
X^C	X^CX^c	X^cY
X^c	X^cX^c	X^cY