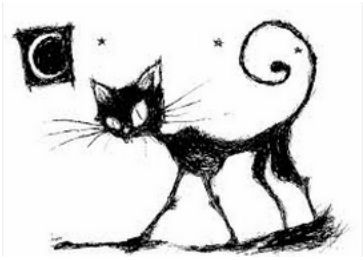
STE_ST Pretest 3.4
Name_____



1. In cats, black fur(b) is a recessive trait. You have two black cats whose parents had tabby-coats(dominant).

What is the probability that their mother will have more black kittens? Show a Punnett square.

Their mother must have been Bb to be tabby coated and to have the possibility of producing bb(black kittens). The Tabby-coated father, for the same reason, also had to be Bb.

	B	b
B	BB	Bb
b	Bb	bb

Bb: ¼ = 25%. Notice that it's like the stock-market. Previous records to not change the probability of future outcomes.

2. In peas, seed shape and seed color are Mendelian traits found on separate chromosomes.. **R is the allele for the dominant, spherical shape** characteristic; r is the allele for the recessive, dented shape characteristic. **L is the allele for the dominant, yellow color characteristic**; l is the allele for the recessive, green color characteristic.
What will be the phenotypic ratio of the offspring, if a rrLl pea plant is crossed with

RrLl? Show a Punnet square (4 marks)

	rL	rl	rL	rl
RL	RrLL	RrLl	RrLL	RrLl
Rl	RrLl	Rrll	RrLl	Rrll
rL	rrLL	rrLl	rrLL	rrLl
rl	rrLl	rrll	rrLl	rrll

Spherical and yellow: 6/16 : 37.5%
Spherical and green: 2/16: 12.5%

Dented and Yellow: 6/16 : 37.5%
Dented and green: 2/16: 12.5%

4. a) If the messenger RNA code is AAAGUGUCA, what was the corresponding DNA code?

TTT-CAC-AGT

b) Give the three transfer RNA codes matching the messenger RNA code of AAAGUGUCA.

UUU-CAC-AGU

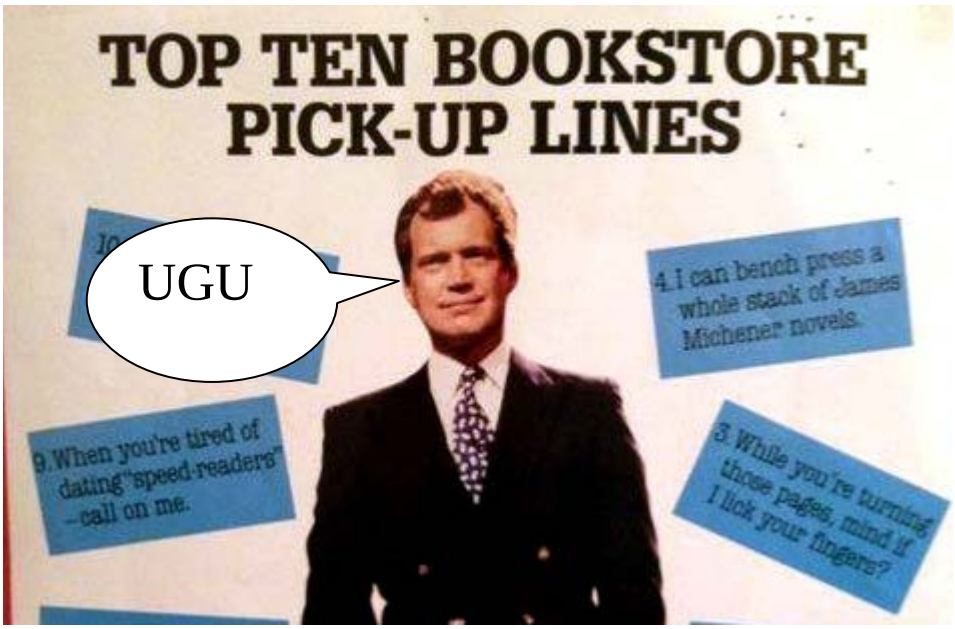
c) What amino acids will be picked up by the transfer RNA's from question(b). See mRNA codes in table.

First letter	Second letter: U	Second letter: C	Second letter: A	Second letter: G	Third letter
U	UUU Phe UUC Phe UUA Leu UUG Leu	UCU Ser UCC Ser UCA Ser UCG Ser	UAU Tyr UAC Tyr UAA Stop UAG Stop	UGU Cys UGC Cys UGA Stop UGG Trp	U C A G
C	CUU Leu CUC Leu CUA Leu CUG Leu	CCU Pro CCC Pro CCA Pro CCG Pro	CAU His CAC His CAA Gln CAG Gln	CGU Arg CGC Arg CGA Arg CGG Arg	U C A G
A	AUU Ile AUC Ile AUA Ile AUG Met	ACU Thr ACC Thr ACA Thr ACG Thr	AAU Asn AAC Asn AAA Lys AAG Lys	AGU Ser AGC Ser AGA Arg AGG Arg	U C A G
G	GUU Val GUC Val GUA Val GUG Val	GCU Ala GCC Ala GCA Ala GCG Ala	GAU Asp GAC Asp GAA Glu GAG Glu	GGU Gly GGC Gly GGA Gly GGG Gly	U C A G

AAAGUGUCA corresponds to
Lys-Val-Ser

d) What is the advantage of having different codes for the same amino acid?

The redundancy protects against mutations. If one base turns into another, there's a chance that it will still lead to the same amino-acid pick up.



e) Which nitrogen base in the DNA probably changed if valine(val) was replaced by aspartic acid (asp) in the protein being made?

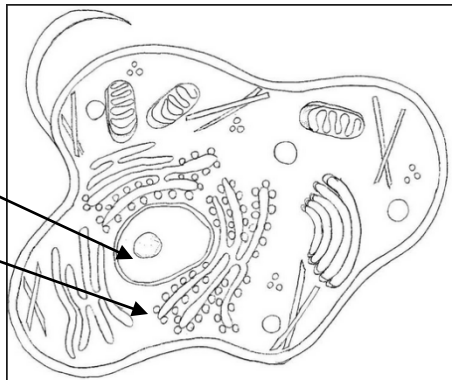
GUU	Val	GAU	Asp
GUC		GAC	
GUA			
GUG			

The RNA codes that resemble each other are GUU and GAU in Val and Asp, respectively, and GUC and GAC in Val and Asp, respectively.
The corresponding DNA codes are
CAA and CTA in Val and Asp, respectively: a switch from A to T; and
CAG and CTG: in Val and Asp, respectively: again, a switch from A to T.

5. TRUE? Or FALSE?

a) A gene is part of a chromosome that has the genetic code required to make 1 protein.____Vero, Vrai, true, αληθής , verdadero , đúng , 真
b) A gene is made up of DNA._____true_____-
c) Lipids and carbohydrates consist of amino acids : falso, faux,false, ψευδής , falso, sai, 假
d) The order in which amino acids are combined influences the type of protein being made. true
e) Human sex cells have 23 unpaired chromosomes true 23X1 = 23 ; body cells have 23 pairs, for a total of 46

6. Show the locations of transcription and translation in the cell.



STE Flashback: see website

ST

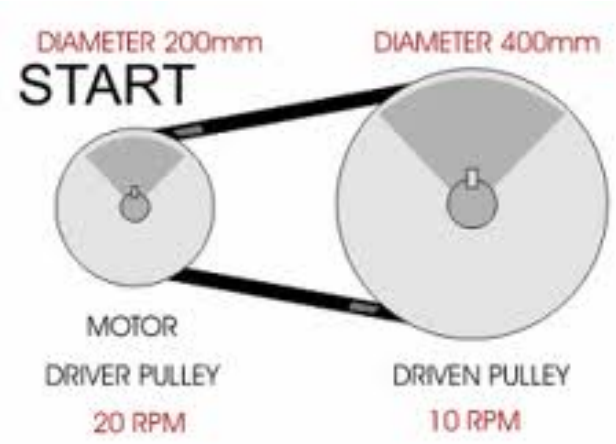
1. a) If we turn a small gear(11 teeth) so that it make 34 turns in a certain time interval, how many turns will the large gear(17 teeth) complete?

$V_{out}/V_{in} = n_{in}/n_{out}$
$x/34 = 11/17$
$x = 22$ turns

b) How much more turning force (find the mechanical advantage) does the large gear have?
17/11 times as much

2. a)What makes this system different from a chain-sprocket system? Give two differences
Belt instead of chain
Groove instead of teeth on gears

b) Calculate the speed (velocity ratio)of this system. V = I/O = 200/400 = 0.5

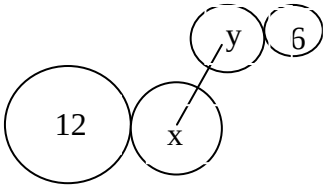


3. You want the motor to spin a certain gear very quickly, but you want the other gear that's attached to the 1st one to move very slowly.

What kind of gear system will work best? Worm-worm-gear

4. A machine requires no toothed gears, and you don't want any belts either. What kind of gear system can be used? Friction gears

5. Draw a gear train where the input gear has 12 teeth, the output gear has 6 teeth, but the velocity ratio is not 2 but 36.



12/x * y/6 = 36
12y/(6x) =36
2y/x =36
y/x =18
Need two numbers that divide to produce 18, so 108=y and 6=x.