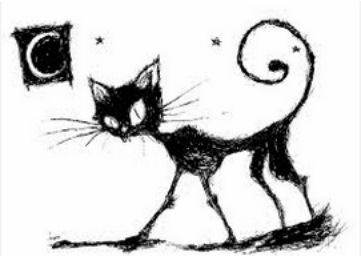


1. In cats, black fur(t) is a recessive trait. You have two black cats whose parents had tabby-coats(dominant).

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

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

	T	t
T	TT	Tt
t	Tt	tt

Tt: 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%

3. When we write "Rr", how many chromosomes are carrying the R and r genes? 2

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

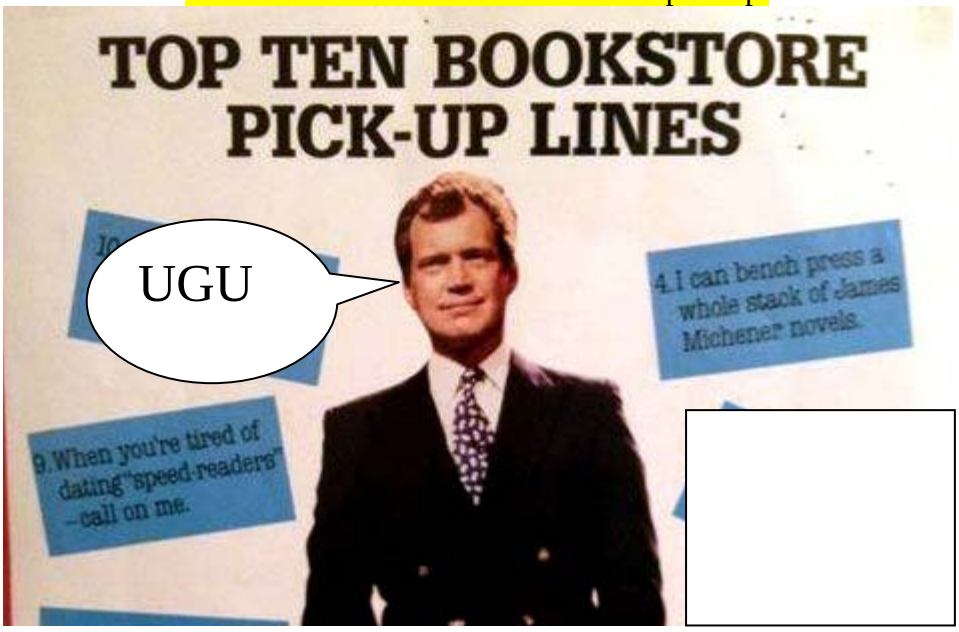
c) What amino acids will be picked up by the transfer RNA's from question(b). See mRNA codes in table.

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

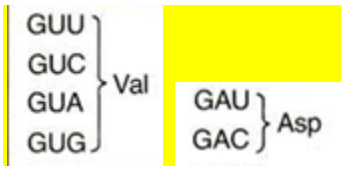
AAAGUGUCA corresponds to
Lys-Val-Ser

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?

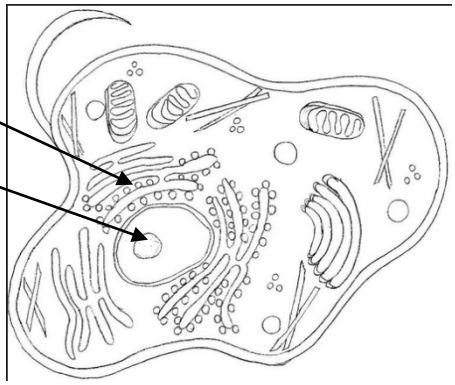


The RNA codes that resemble each other are GUU and GAU in Val and Asp, respectively, and GUC and GAC in Val and Asp, respectively.
The corresponding DNA codes are
CAA and CTA in Val and Asp, respectively: a switch from A to T; and
CAG and CTG: in Val and Asp, respectively: again, a switch from A to T.

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.



7. Red hair is caused by two mutations in the genes necessary to bring about the conversion of the reddish pigment to brown or black eumelanin. What molecules can't be made by the mutated genes? Why not?

It takes enzymes to convert one melanin-type into another. Normal genes have the code to produce those. Mutated genes don't make the necessary enzymes that are needed to turn the reddish pigment to brown or black.

8. A hemophiliac man has a mother and sister who do not have the disease. Hemophilia is recessive and is carried only on the X chromosome.

Give his genotype, and also that of his mother, and the possibilities for his sister and father.

Let N = gene for normal blood clotting
n= gene for hemophilia

The hemophiliac man is $X^n Y$

He received his X chromosome from his mother only. Since she does not have the disease she has one X^N, but she must, however, also have the X^n that she passed on to him. So she's $X^N X^n$

But his father could be $X^N Y$ or $X^n Y$. **If the father is $X^N Y$, then the sister is either**

$X^N X^N$ or $X^N X^n$

	X^N	Y
X^N	$X^N X^N$	$X^N Y$
X^n	$X^N X^n$	$X^n Y$

But if the father is **$X^n Y$, then the non hemophiliac sister must be $X^N X^n$**

	X^n	Y
X^N	$X^N X^n$	$X^N Y$
X^n	$X^n X^n$	$X^n Y$

9. **Given:** $2\ LiOH + H_2SO_4 \rightarrow Li_2SO_4 + 2\ H_2O$

What will the concentration of Li^+ be in a total of 250 ml if 39.2 g of H_2SO_4 react? Respect your grandmother and sig figs.

39.2 g of H_2SO_4(mole/98g) = 0.40 molesH_2SO_4

0.40 molesH_2SO_4 $\left(\frac{Li2SO4}{H2SO4}\right)$ = 0.40 moles Li_2SO_4

0.40 moles $Li_2SO_4\left(\frac{2Li+}{1\ Li2SO4}\right)$= 0.80 moles Li^+

Concentration = n/V = 0.8 moles Li^+ / 0.250 L = 3.2 M (answer has 2 SF 250 ml has 2SF)

10. Why would there be 3 X 6.02 X 10^{23} atoms of oxygen atoms in 1 mole of ozone molecules?

There are 3 atoms for every O_3 molecule, so there would be 3 moles of O atoms for every 1 mole of O_3 molecules.

The following topics are not covered on this test, but you'll be tempted to do them.

11. Use c = 4.19 J/(g ^oC) to figure out the final temperature of 2300 g of water initially at 12.0 ^oC, if it absorbed 35 kJ of energy (3 marks)

Q = mcΔT

35000J =2300 g (4.19 J/g/^oC)(T-12)

T = 15.6 ^oC

12. **Beta$^-$ decay occurs for isotopes with an excess of neutrons. What occurs is that the neutron is converted into a proton (thereby changing the element) and another elementary particle. Start with a neutron as the "reactant" and show a balanced equation to reveal what that particle is.** (2 marks)

$$_0^1n \rightarrow _1^1p + _{-1}^0e$$

The last particle is a beta particle