

KEY LECTURE EXAM 2, SUM 2006

Mean = 95, STDEV = 20

NOTE: The directions state clearly you must put your name on each page or the page WILL NOT be graded. Instead we decided to take off 2 pts for each page without a name. You were told specifically to put your name on the pages (at least 3 times).

1.

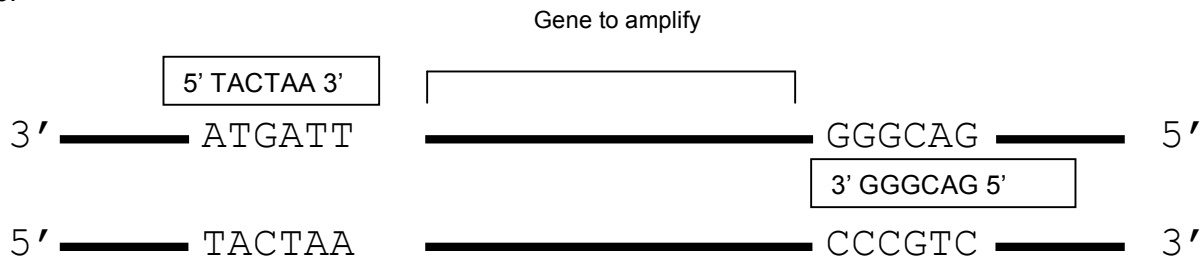
5' ATGACGTATAATGACCGTACATGAGTAATACAT (AAATCAG) - 3'
 3' TACTGCATATTACTGGCATGTACTCATTATGTA (TTTAGTC) - 5'
 3' UACUGCAUGGCAUGUACUCAUUAUGUA 5' or 5' AUGUAUUACUCAUGUACGGUACGUCAU 3'

1 pt—transcribing correct strand, 1 pt—not transcribing promoter, 1 pt—removing intron, 1 pt—correctly designating 5'—3' ends, 1 pt—U instead of T

2. ac---cxy---dv—stf---pg---zin

3 pts all or none. *zin* is more than 50 m.u. from *ac* and *dv*, but since *zin* is 20 m.u. from *stf*, its location can be mapped. *zin* cannot lie between *dv*---*stf* or between *ac*---*stf*, otherwise it would have to have a recombination rate less than 50%.

3.



4. A. According to the results, which baby—X, Y, or Z—is Ming-Li and Shamiq's? **Baby Y = 2 pts.**
 B. The use of DNA differences to uniquely identify individuals is called what? **DNA fingerprint = 1pt**
 C. What type of “genes” are targeted (give name) for amplification in PCR to generate DNA patterns such as that on this gel? **VNTR genes = 1pt**

5. The cross is *NarrAa* x *NaRRaa* Parent 1 is *NarrAa* this cross gives 3 narrow to 5 broad. There is NO other solution.

6.

A. Female = $\frac{X^{rg+}}{X^{rg+}}$ Male = $\frac{X^{r+g}}{Y}$

B. Female = $\frac{X^{r+g}}{X^{rg+}}$ Male = $\frac{X^{rg+}}{Y}$

F1 offspring results indicate that the gene for wing stripe must be on an X chromosome. No stripe (wild type) is dominant to red and no groove (wild) is dominant to grooved, since F1 females have this genotype. The testcross data indicate that the genes are linked, therefore both genes are on the X chromosome.

C. Genes are linked. F1 female is heterozygous. The second cross described is a testcross. If unlinked, would expect 1:1:1:1 phenotypic ratio. This is not observed. Instead, red striped/no groove and white striped/grooved are in equal and higher percentages (parentals).

D. $(25 + 30) / (125 + 25 + 120 + 30) =$ or $80/300 =$

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9. Differentiate between IPSPs and EPSPs (inhibitory and excitatory post synaptic potentials) in terms of their effect on membrane potential and suggest an ion channel that could be **activated** to cause each. (4 pts)

IPSP:

Effect on membrane potential: *hyperpolarization*
 Ion channel: **potassium channels (or chloride)**

EPSP:

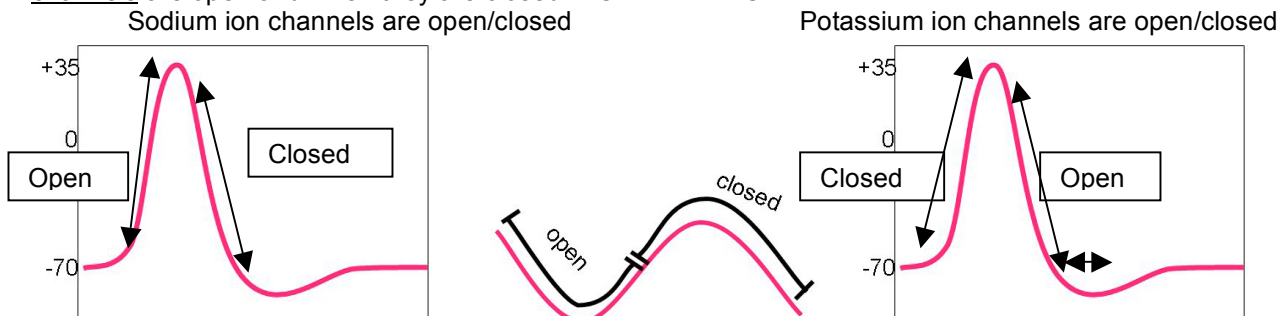
Effect on membrane potential: *depolarization*
 Ion channel: **sodium channels**

7. (7 pts) You will need to fill in the empty boxes (7) for the following table. Some of the boxes have already been filled in. Read **down** for each column in the table. In lecture it was discussed that there are three components of a homeostatic control mechanism. Only one of these is listed in column 1, box 1. You need to identify the other two components (Column 1, boxes 2 & 3). Briefly describe homeostatic control systems and the features involved in the regulation of temperature and of arterial P_{CO2} (CO₂ concentration). Some of the boxes have been filled in as examples of filling in the chart. Again, read down the chart. Examples are given in italics

Column 1: Component of homeostatic control system	Column 2: General function of component of homeostatic control systems	Column 3: Specific component in regulation of temperature.	Column 4: Specific component in regulation of arterial PCO ₂
1. Receptor	<i>Sensory receptor that senses changes in the level of the parameter.</i>	Thermoreceptors (in the hypothalamus)	<i>Chemoreceptors (in the great arteries).</i>
2. Integrating center.	<i>Compares information on the level of the parameter with a set point, and regulates the effector.</i>	Thermoregulatory center in hypothalamus	<i>Respiratory center in the medulla oblongata (or brain stem).</i>
3. Effector.	Physiological processes that change the value of the parameter.	<i>Changes in vasodilation or constriction, in sweating, and in shivering.</i>	Change in ventilation rate.

1 pt each box

8. (4 pts) On the following diagrams of an action potential, indicate when sodium channels (left diagram) are open and when they are closed. Use notations as in the example on the middle. On the right diagram indicate when potassium channels are open and when they are closed. NO PARTIAL CREDIT.



Total (44) _____.