

Name _____

Biotechnology, Society and the Environment (CFANS 1501)
Animal & Medical Biotechnology Exam—May 9, 2008

Multiple Choice. Choose the best answer for each of the following questions.
(2 pts./question; 48 pts. total).

1. An example of a polygenic trait:
 - a. cystic fibrosis
 - b. Huntington's chorea
 - c. hypertension
 - d. ADA
2. In the PCR reaction, what step occurs at 94° C?
 - a. denaturation
 - b. annealing
 - c. extension
 - d. you get burned
3. Transgenic fish can grow in 28° C waters if they can produce this protein:
 - a. antifreeze protein
 - b. blizzard protein
 - c. growth hormone
 - d. α 1 anti-trypsin
4. If a DNA polymorphism is very close to a gene that causes a disease, it can be used as a reliable:
 - a. enzyme
 - b. marker
 - c. protein
 - d. carrier
 - e. isogene
5. The type of diabetes that is a result of autoimmunity:
 - a. type 1
 - b. type 2
 - c. type 3
 - d. gestational
6. Chance of getting a disease if both parents are carriers of an autosomal recessive trait:
 - a. 0%
 - b. 25%
 - c. 50%
 - d. 100%

7. To detect maternally inherited DNA, this type of DNA should be analyzed:
 - a. nuclear
 - b. mitochondrial
 - c. ribosomal
 - d. plasmid
 - e. circular

8. Modifications of proteins that make them more biologically active:
 - a. transcriptional
 - b. post-transcriptional
 - c. translational
 - d. post-translational

9. siRNA is a newer method to:
 - a. degrade protein
 - b. degrade mRNA
 - c. degrade DNA
 - d. interfere with protein folding

10. Many recombinant proteins synthesized in animals can be purified from this renewable source:
 - a. meat
 - b. pancreas
 - c. liver
 - d. milk

11. For gene therapy to work, the protein expressed must be:
 - a. effective at low doses but not toxic at high doses
 - b. effective at low doses but toxic at high doses
 - c. not effective at low doses but not toxic at high doses
 - d. not effective at low doses but toxic at high doses

12. A physical method of transfecting genes into fertilized pronuclei:
 - a. liposomes
 - b. microinjection
 - c. adenovirus
 - d. electroporation

13. Which of the following is NOT true of induced pluripotent stem cells
- a. so far, they are essentially the same as ES cells
 - b. they are derived by using 4 or less transcription factor or oncogenes that are needed to maintain pluripotency
 - c. it doesn't work for primates
 - d. no embryos are ever destroyed
14. Real time RT-PCR measures exact amounts of RNA because
- a. a fluorescent dye binds only to single stranded nucleic acid products
 - b. a fluorescent dye binds only to double stranded nucleic acid products
 - c. a fluorescent dye binds only denatured DNA
 - d. fluorescent dyes are not used
15. Tumor suppressors function in a cell to allow:
- a. cell cycle genes and oncogenes to be regulated as they should be
 - b. cancer to persist
 - c. apoptosis
 - d. are often mutated in normal cells
16. Phase of the cell cycle where mitosis occurs:
- a. G1
 - b. S
 - c. G2
 - d. M
17. Single nucleotide polymorphisms are found:
- a. about every 1000bp in an individual
 - b. can't not be used as genetic markers
 - c. can't be associated with any given traits
 - d. can't be detected by sequence analysis
18. Phase III clinical trials involve testing a pharmaceutical drug on:
- a. 10-100 subjects
 - b. 100s of subjects
 - c. 1000s of subjects
 - d. only cares about safety

19. Short tandem repeats are used
- for determining brother/sister relationships
 - for identifying 1 person in $> 10^{18}$
 - for mitochondrial DNA testing
 - for microarray analysis
20. Biological reason not to clone human using somatic cell nuclear transfer
- they won't have the same phenotype
 - they won't have the same number of chromosomes
 - can't be sure that all the genes will be expressed normally after reprogramming
 - mitochondria will interfere
21. Embryonic stem cells that specialize to give rise to the gonads and the next generation of sex cells:
- STRs
 - ESTs
 - PGCs
 - SNPs
 - AFPs
22. Adult stem cells are:
- as plastic as embryonic cells
 - are very rare, but to date are found in most tissue types
 - can not be used in regenerative medicine
 - are by themselves totipotent
23. Currently insulin is effective in:
- curing diabetes
 - inducing β islet cells
 - treating diabetes
 - blocking glucose production
24. Zebrafish are biologically important for everything below except:
- determining the function of genes
 - determining developmental pathways
 - using si RNA
 - bait

Fill in the blank (2 pts./question;18 pts. total)

- _____ 1. The ploidy of a normal somatic animal cell is:
- _____ 2. The genomic DNA that is in front of a gene that serves as a regulator of RNA transcription in a tissue-specific manner
- _____ 3. The most rapidly increasing type of diabetes
- _____ 4. Retroviruses target: A) Dividing cells; or B) Non-dividing cells
- _____ 5. The first successful human gene therapy corrected for this gene (the initials for the gene are all that you need)
- _____ 6. Semi-quantitative method used to determine the amount and size of a mRNA transcript
- _____ 7. The vector system that “homes” to the lungs and is the best current way to treat cystic fibrosis patients
- _____ 8. ES cells grown in vitro are considered to be: A) totipotent; or B) pluripotent
- _____ 9. Semi-quantitative method of analyzing differences in gene expression for 10,000 or more genes at once

Matching (2pts/question; 18 pts. total).

- _____1. A chemical method of transfecting genes into animal cells.
- _____2. Three or more generations of _____ families that have a disease are used to genetically locate disease genes.
- _____3. A butterfly and the caterpillar from which it came have the same _____
- _____4. A continual problem with transgenic fish
- _____5. Transgenic pigs derived by microinjection of growth hormone have this problem
- _____6. First person (and his lab) to sequence an entire genome using shotgun sequencing and computers
- _____7. Transplanting a foreign organ or tissue into a different species
- _____8. Genetic map distance where there is 1% recombination
- _____9. An example of an ectodermal cell type

A. Phenotype
B. Containment
C. STOP
D. Post-translational
E. Liposomes
F. Craig Venter
G. Decreased backfat
H. Genotype
I. Xena, Warrior Princess
J. Skin
K. Reference

L. Translational
M. Too many fins
N. Decreased fertility
O. Xenotransplantation
P. Francis Collins
Q. Centimorgan
R. STR
S. Centipede
T. Liver
U. Base pair
V. Feuding

Short answer question (6 pts.)

Embryonic stem (ES) cells or ES-like cells can now be derived using 3 different technologies. Discuss how each method is accomplished. Is the end result (obtaining functional ES cells) always the same in every method? Provide evidence for your analyses.

Essay question (10 pts.)

The concept of a '\$1000' genome is hardly a pipedream. Within 10 years it is very conceivable that a person's entire genomic DNA can be sequenced for about \$1000 in a week or less. Now, here are points to consider. Please comment in detail for each of the following questions:

1. Who owns the individual genomic DNA database? Is it public or private in nature?
2. Who has access to the DNA database information—the individuals themselves, their physicians, others?
3. Can insurance companies gain access to this information and if so, do they have the right to deny or limit insurance coverage based on the genetic information?
4. Who should regulate the DNA database information (federal, state, local)? Or should the information not be regulated?