Name: _____
Score: _____ / _____

Quiz 7 on Pharmaceutical Biotechnology

Part 1

Immune cells have been genetically modified to treat cancer. Stem cells, as well as other cells in tissues and organs in the human body, have been genetically engineered. For example, transgenes could be developed and delivered into pancreatic cells, to express insulin. If these transgenes were inserted into the genome of pancreas, those cells could become fully functional insulin producing cells as a cure for diabetes. This type of an approach to genetic modification is known as:

A.
organ transplantation

B.
xenotransplatation

C. animal cloning

D.
laser surgery

E.
gene therapy

Our environment is increasingly contaminated with toxic compounds. Pesticides get a lot of press since Rachel Carson's publication "Silent Spring" in 1962 about the effects of DDT. Compounds once thought to be safe have been included in everything from cosmetics to plastics. Some are estrogen-like and are not removed from the water by standard treatments. The study of how genomes respond to environmental stressors or toxicants, brings together genome-wide mRNA expression profiling with protein expression patterns to elucidate the role of gene-environment interactions is now called:

- A. environmental chaos
- B. comparative genomics
- C. deep biology
- D. comparative ecology
- E. toxicogenomics

Each person has a highly similar but unique genomic sequence. Personalized Medicine:

- A. is a personalized approach using alternative therapy allowing patients their right of choice for their own treatment
- B. is part of the Obama Health Care Bill of 2010 requiring health care and pharmaceuticals for all people regardless of income.
- C. is individualized, hands-on health care required now for all end of life patients.
- D. is based on individual genomes indicating appropriate drug prescriptions and diagnostics of disease susceptibilities.
- E. is the result of personal appointments with your physician

The ability to clone DNA and make specific DNA vectors to transform cells to make specific proteins has opened up the possibility to make new pharmaceuticals based on this technology. Recombinant DNA technology has been able to make what class of compounds as a new class of effective drugs?

- A. Muscle fibers for treating cardiovascular diseases
- B. Small Molecules such as the Cox 2 inhibitors
- C. herbal and homeopathic treatments not regulated by the FDA
- D. Antibodies
- E. Lipids

Imagine this scenario in the not too distant future. You know your own genome, and it reveals that you have a genetic recessive gene for a deadly genetic disease (you are a 'carrier' but do not have the disease) and your spouse has the same knowledge with the same diagnosis. It might be possible based on what biotechnology approach to correct the problem caused by the disease?

- A. Xenotransplantion using cells from other animals to correct the disease traits
- B. Nanotechnology to deliver drugs to the developing fetus
- C. Cellular suicide also called' programmed cell death'
- D. Gene Therapy coupled with gene editing or DNA cloning technologies
- E. Pharmocogenomics

Small changes in the DNA sequence of coding regions (Genes) can have significant effects on the gene and the trait or protein that it encodes. Single Nucleotide Polymorphisms (or SNPs) are

- A. unimportant to the science of pharmacogenomics.
- B. deletions of large segments of DNA
- C. nonexistent in humans but occurs in other animals, such as the mouse.
- D. also collectively called 'junk' DNA
- E. single base pair changes in DNA responsible for genetic variation.

Why do we test and strictly regulate the production, manufacture and sale of pharmaceuticals in the United States? The FDA is The Food and Drug Administration and is an agency of the United States Department of Health and Human Services, one of the United States federal executive departments. The FDA is responsible for protecting and promoting public health through the regulation and supervision of

- A. bio-pharmaceuticals and vaccines
- B. all of the answers are correct.
- C. tobacco products and their derivatives
- D. prescription and over-the-counter pharmaceutical drugs(medications)
- E. dietary supplements and food additives

Individual gene sequences in genomes can be searched to find striking similarities between species. The entire genomic sequences are now known for many species of bacteria, fungi, insects, plants and animals, including humans and chimpanzees. This vast amount of information has been published and is in the public domain. The genome databases aligned and the similarities and relations can be examined. These types of analyses have shown that humans are 98% similar in DNA sequence to the chimpanzee; 88% similar to mice and about 33% similar to the genes of a rice plant. This type of analysis is called:

- A. Comparative genomics
- B. Functional genomics
- C. DNA gold mining
- D. Mutational analysis
- E. Transgenic analysis

Antibiotic resistant microbial pathogens are increasing. Antibiotic resistant tuberculosis is on the rise world-wide. Antibiotic and contagious pneumonia has been reported. Which approach to research treatment development would not be the best choice?

- A. using recombinant DNA technologies to develop a new vaccine
- B. develop gene editing methods to target resistant bacteria or susceptible cells
- C. develop cheaper methods to make the antibiotic.
- D. develop methods for the early detection and diagnosis of resistant strains
- E. sequence the genome of resistant pathogens to look for new drug targets.

The discovery that some virus can cause cancer was discovered many years ago. HPV is a sexually transmitted disease which can cause cervical and esophageal cancer. HPV stands for

- A. Henrietta's Park Virus
- B. Human Papilloma Virus
- C. Human Pancreatic Virus
- D. Hallmark Pneumonia Vaccine
- E. High Purity Vaccine

What is the difference between normal and diseased cells? The greatest challenges faced by pharmacogenomics is the systematic correlation between normal versus disease patterns of gene expression, and variation of drug efficacy and metabolism in human populations. This can be accomplished using what biotechnology tools?

- A. The use of small particles, called nanotechnology, to disrupt cell division
- B. using the cells of other organisms as a variation of xenotransplantation to treat the disease.
- C. Human cloning procedures to reset the genetic code
- D. Phenotyping by genomics, transcriptomics, and proteomics.
- E. Psychotropic drugs and opiods to relieve the patient's pain response during disease.

Gene editing has recently emerged as a new possible therapeutic approach. Gene editing allows biologists to

- A. create new drugs faster and get them to market in less than a year
- B. create new drugs cheaply for under a million dollars
- C. sleep at night if they use them as self-medication
- D. "knock down" or knock out gene expression of a specific gene to see how the absence of that gene affects the disease
- E. enhance the expression of genes that fight diseases

Pathogens often recognize their host by binding to proteins on the outside of cells. Specialized proteins embedded in cell membranes which receive and transmit chemical messages are often desirable drug targets and are referred to as:

- A. random walkers
- B. transgressors
- C. receptors
- D. transducers
- E. interactors

Viruses mutate and can become more pathogenic to humans. Some viruses may originate in other animals, such as birds, bats or pigs and then become infectious to humans. An influenza pandemic is a global outbreak of disease that occurs when a new influenza A virus appears or “emerges” in the human population, causes serious illness, and then spreads easily from person to person worldwide. Such a pandemic

- A. proves that the theory of evolution is incorrect since viruses cannot evolve.
- B. has only occurred once in recorded human history with devastating consequences but could happen again
- C. is only a matter of time before another occurrence
- D. is totally preventable
- E. is only the material of Hollywood movies such as "Contagion" and really not much to be concerned about

Some of the controversies surrounding vaccines and human health that have been proven NOT to be true including that (1) Vaccines Can Cause Autism and that (2) A Vaccine Could Compromise Your Immune System. These common misunderstandings about vaccines jeopardize personal health and our health care system. In fact some people opt to not have their children vaccinated. Some health professionals think this should be illegal as a form of child abuse, neglect or endangerment to a child. A vaccine

- A. typically contains an agent that resembles a disease-causing microorganism to stimulate the body's immune system so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters.
- B. typically contains a microbial agent that will cause the disease so that the next time the body is capable of overcoming it agent
- C. has been responsible for millions of deaths worldwide and not demonstrated as ineffective against most virulent diseases, such as polio
- D. is a program created by the US government to eradicate polio has recently been shown to be a ruse by the pharmaceutical industry to generate more funds
- E. against HIV has been relatively easy to create but suppressed for over two decades

Vaccines have been shown to NOT cause autism, but still controversies persist because of a lack of understanding about how vaccines work and how they are made. A vaccine is a biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and "remember" it, so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters. Vaccines can be made from

- A. recombinant DNA
- B. attenuated (or incapacitated) virus (i.e. polio vaccine)
- C. use of a similar pathogen (i.e. smallpox)
- D. all of these, or none of these have contributed to new vaccines
- E. toxoid proteins (i.e. tetanus)

Why do some pharmaceuticals work better for some people than others? Why do some people experience side effects and not others? We all have a unique genetic sequence. A drug which may be great for you, may not respond so well for another person. In fact, a medication which may do well for you may even result in the death of another person as seen with the examples of Celebrex and related medications. Genetic predisposition to disease or drug response is the focus of what area of biotechnology?

- A. Pharmacogenomics and personalized medicine.
- B. Animal cloning
- C. Stem cell research
- D. Population analysis of herbal medicine.
- E. Analysis of ancient herbal medicinal treatments to discover new drugs.

The sequence of bases in DNA is transcribed to RNA and then decoded into a sequence of amino acids specified by that code. The sequence of amino acids is specific to the protein encoded by the gene. Proteins have the ability to fold into specific shapes that determine their function because of:

- A. intelligent design providing a purpose for every protein
- B. the presence of actin fibers in muscle tissues
- C. the sequence of amino acids specified by the gene
- D. the dynamics of cytoplasmic streaming in the cell
- E. the process of transcription of mRNA in the nucleus.

People often criticize the cost of new drugs made by the large pharmaceutical companies. This is a high risk business with high investment of time and money. An approximate time and cost from ‘Bench to Bedside” for the development of a new pharmaceutical product would be in the range of

- A. 1-5 yrs and $10 million
- B. 3-7 yrs and $20 million
- C. 12-15 yrs and over $1,000 million
- D. 1-5 yrs and $500 million
- E. 3-7 yrs and $100 million

We have known the human genome how since 2001. This sequence has provided vast insights into who we are, how we differ and where we have come from. These advances in Human Genetics have most profoundly increased the:

- A. the study of inheritance patterns of specific human traits, including our susceptibility to diseases, our reactions to medications, and our response to the environment.
- B. genomic chaos
- C. our appreciation of particle physics
- D. deep biology related to climate change
- E. ability to study comparative ecology