Oncogene	A cancerous version of a proto-oncogene usually resulting from a mutation that either changes the function of a protein or increases the production of a protein.
Proto-oncogene	The normal version of an oncogene
Tumor suppressor	A gene that codes for a protein which can suspend transcription long enough to correct a mutation in DNA so it isn't expressed
Growth factor	A signal for a cell to divide; proteins, their receptors, and intracellular molecules of signal pathways
Growth Factor receptor	A receptor protein that passes the signal for a cell to divide
Translocation	The movement of a gene from one chromosome to another
Gene amplification	Done through PCR and gel electrophoresis
Ras	A G protein in the signal cascade that causes cell division
P53	A tumor suppressor gene
Rb	A tumor suppressor gene; retinoblastoma
Metastasis	The spreading of cancer to a different region of the body
Polyp	A small benign tumor caused by a few mutations that keep building until it can become cancerous
Adenoma	A larger benign growth with more dividing and adhesive cells
Malignant	A cancerous tumor

1. What is an operon? What is the advantage to bacteria of organizing its genes into operons?

It is a set of linked structural genes that usually code for enzymes in a metabolic pathway. An advantage to this is a coordinately controlled gene system where they're used in the same function.

2. What is the difference between a promoter and an operator? What is the effect of each on the transcription of an operon?

3. What is a repressor protein? What does it do? Is the gene for the repressor for an operon located within the operon, or remotely? Is the repressor made in response to nutrients, or is it made all the time?

A repressor protein in allosterically controlled & always produced at low levels even though it may be inactive; when active and bound to the operator, transcription is off.

4. What is tryptophan, and what kind of molecule is it? What is it to the E. coli cell (something the cell makes, something it eats, etc.) What does a cell want to do if it has none? What if it has plenty?

Tryptophan is built in an anabolic pathway when there is none present in the cell. The repressor is activated by the presence of tryptophan (feedback inhibition) to stop expression when there is plenty of it.

5. Is the trp repressor active or inactive in the presence of tryptophan? What does an active repressor do? What does an inactive repressor do? How is the trp operon regulated in the presence and absence of tryptophan?

Active in the presence of tryptophan. An active repressor stops expression of the genes for that protein so that it doesn't make more than it needs to. The trp operon is not bound by the repressor when it needs to make tryptophan, and it is inactivated by the active repressor when there is plenty of tryptophan.

6. What kind of molecule is lactose? What is it to the E. Coli cell? What does the cell do when it has none, and what does it do when it has plenty?

Lactose is metabolically broken down by the E. Coli cell when there is no glucose present. When there is no lactose, the repressor is bound and inactivates the operon because it doesn't need to digest it. When there is lactose present (without glucose), allolactose binds to the repressor to INACTIVATE it, therefore allowing transcription of the lac operon. When glucose is not present, cAMP levels are raised, and with cAMP there is the CAP regulator protein. CAP will bind as an activator protein to stimulate expression of the lac operon.

7. Is the lac repressor active or inactive in the presence of lactose? What does the active repressor do? What does it do when it is inactive? How is the lac operon regulated in presence and absence of lac?

It is INACTIVE in the presence of lactose. The active repressor binds to the operator in the presence of lactose and stops expression of the lac operon genes. When inactive, it leaves the operator alone and allows expression of the lac genes.

8. How does the presence of glucose affect the lac operon? What happens to cyclic AMP levels when glucose is present or absent? How does the CAP protein affect the lac operon?

Glucose is preferred over lactose as fuel so glucose will decrease lac operon expression. When glucose is very low, cylic AMP increases along with CAP which can bind to the lac operon and increase expression.

9. What is a histone? How many are in a nucleosome? How do these appear in an electron micrograph?

It is a positively charged protein that is associated with chromosomes in the nucleus to form chromatin. It affects the structure and transcription of DNA to RNA. 8 histones make up a nucleosome, which is a complex of DNA wrapped around the histone proteins with their N-terminus tails sticking outward. They appear on an electron micrograph like BEADS ON A STRING.

10. What is the difference between euchromatin and heterochromatin? What kind of genes would you expect to be in a heterochromatic state?

Euchromatin is normal, heterochromatin is highly condensed. Genes in a heterochromatic state might be on the x-chromosome, inactivated due to X-inactivation.

Microarray	A tool with little wells where each cDNA fragment goes. A solution with each of the 4 bases is put onto the microarray and rinsed off, allowing a PPi flash of light when the base binds, if it is complementary. It is read by a computer.
Fluorescein	
Rhodamine	
Reproductive Cloning	Cloning of a new organism by taking a donor nucleus and an egg donor and growing the embryo in a surrogate mother to create an organism that is identical to its single parent (they get mitochondrial DNA from the EGG donor)
Nuclear transfer	Transferring the nucleus of one animal (to be cloned) into the egg of another animal.
Therapeutic Cloning	Cloning for the purpose of fixing damaged organs/tissue in people
Stem cell	A cell that can become multiple or any types of cells; is NOT committed
Committed cell	One that
Differentiated cell	A cell that
Self renewal	Used by stem cells to regenerate themselves
Intestinal crypt	A place in the intestine where stem cells are kept
Haematopoetic stem cell	Found in bone marrow cells; capabale of becoming any type of blood cell
Stromal stem cell	A stem cell in the stroma of a plant
Embryonic stem cell	A totipotent cell that is found in embryos and important for development of all tissues
Pluripotent	A cell that can become many types of cells
Totipotent	A cell that can become any type of cell
Adult stem cells	are less well characterized- their full potential is not yet known (but they could provide a non-controversial solution to avoid the ethical issues that arise when human embryos are involved)
Gene Therapy	The processing of inserting corrected genetic information to cure disease
Induced pluripotency	Un-differentiating a cell so that it can become many types of cells

1. What is a restriction endonuclease? What is their normal function in bacteria? Where do they cut DNA?

It is an enzyme that cuts DNA at a specific, palindromic 4-8 nucleotide sequence. Their function in bacteria is to digest unmodified DNA in defense to viruses. They cut DNA by cleaving the sugar-phosphate backbone.

2. Which DNA sequences function best as restriction sites? What kind of cut ends do restriction enzymes make?

They can cut to make blunt ends or sticky ends, where one base sticks off at the end and can hydrogen bond with a complementary fragment (temporarily, without ligase).