Homework for Friday 25th Nov:

6. (a) Distinguish between RNA and DNA.

DNA and RNA both consist of chains of nucleotides, each composed of a sugar, a base and a phosphate. There are differences between them.

Feature	DNA	RNA
Number of strands in the molecule	Two strands forming a double helix	One strand only
Type of sugar in each nucleotide	Deoxyribose	Ribose
Types of bases contained	A, C, G and T	A, C, G and U Uracil replaces thymine

(b) Explain the process of DNA replication.

DNA replication is a way of copying DNA to produce new molecules with the same case sequence. It is semi-constructive which means each molecule formed by replication consists of one new strand and one old strand conserved.

Step 1

- The DNA double helix is unwound and separated into strands by breaking the hydrogen bonds.
- Helicase is the main enzyme involved.

Step 2

- The single strand act as templates for new strands
- Free nucleotides are present in large numbers around the replication fork
- The bases of thee nucleotides form hydrogen bonds with the bases on the parent strand
- The nucleotides are linked up to form the new strand
- DNA polymerase is the main enzyme involved

Step 3

- The daughter DNA molecules each rewind into a double helix

(c) Outline how enzymes catalyze reactions.

When an enzyme and a substrate are present, the substrate molecule is in continual random motion. If one collides with the active site it can bind to it. The substrate fits the active site. If other molecules collide with the active site the do not fit and fail to bind. This is called the enzyme-substrate complex. The active site catalyzes a chemical reaction. The substrate is turned into products, which then form the enzyme-product complex. The products detach from the active site, leaving it free for more substrate to bind.

7. (a) Outline how antibiotic resistance in bacteria can arise in response to environmental
change.

Antibiotics are used to control diseases cause by bacteria in humans. Genes that give resistance to an antibiotic can be found in the microorganisms that naturally make that antibiotic. A gene that gives resistance to an antibiotic is transferred to a bacterium by means of a plasmid or in some other way. There is then variation in this

type of bacterium – some of the bacteria are resistant to the antibiotic and some are not. Antibiotic resistance can be inherited; and alleles for resistance can be passed from one cell to another by exchange of plasmids, which is conjugation. Some varieties are more resistant than other since bacteria reproduce very rapidly and have high mutation rate in other words evolution occurs rapidly. Increased exposure to antibiotics is the environmental change that selects for resistant varieties. This result will change in genetic makeup of population.

(b) Outline the principle of immunity.[redacted]

Immunity is the ability of an organism to resist infection this is due to presence of specific antibodies. Immunity can be active or passive. Passive is due to receiving antibodies from external sources, and active results from facing an infection directly. Foreign pathogen cell invades body, which leads to clonal selection and the formation of the B memory cell. B cells produce specific antibodies; if the same pathogen enters body again memory cells are activated to divide. Antibodies produced faster and in greater amounts.

(c) Discuss the benefits and dangers of vaccination.[redacted]

- Benefits
  - Some diseases such as small pox can be eradicated
  - Deaths can be prevented
  - Long-term disabilities can be prevented
    - Rubella in pregnant women can lead to birth defects
    - Mumps can cause infertility in men
- Dangers
  - Immunity developed after vaccination may not be as effective as immunity developed in response to the actual disease
  - Dangers of side effects of some vaccines include:
    - Whooping cough, vaccine can cause brain damage
    - Pregnant women, cancer patients, and others can be harmed by cross-infection from people vaccinated with the live virus