Guide to the selected readings from Watson et al., 2014.

The Watson book is beautiful, but often goes into a lot of detail that we don't need. The basics can be fairly easily isolated from the more advanced details. I included some comments to help finding the depth of understanding needed.

Structure of nucleic acids and proteins:
DNA: (Pages:78-92)
Main points: DNA as polynucleotide chains, nucleotides, phosphodiester bond, the directionality of the chain (5' and 3' ends ?), complementary and non-covalent binding of DNA strands, double helix, uniformity of structure vs. sequence specific chemical properties provided by nucleotide sequence. Ignore DNA isoforms, chemical structure of individual nucleotides and similar details.
RNA: (Pages: 107-118)
Main points are similar as those for DNA. Discussion of functional issues is useful.
Proteins: (Pages: 121-143)
Main points: Amino acids, general classes and properties (details not needed), peptide bond, protein structure, folding, motifs (i.e.: helixes, sheets, domains). A very important issue is to realize the versatility of protein function from molecular recognition (receptors), chemical transport, enzymatic activity, movement, energy transduction (voltage gating) etc. and the central importance of conformational change for protein function.

General molecular biology techniques: (Pages: 147-158). This may not be necessary but make sure you understand PCR and have some idea of how novel DNA sequences can be produced.

Maintenance of the genome:
(Pages:199-208): Chromosome (probably know this already).
(Pages: 258-263): Basic idea of DNA replication.
(Pages: 269-277): How is DNA replicated in the cell ? What are the DNA polymerase and the replication fork, other details not needed.
Homologous recombination: (Pages: 341-…). The book presents a far too detailed discussion. Only the basic phenomenon of homologous sequence exchange is of interest. No need to get into enzymatic mechanisms, topology, examples etc. We also don't care about DNA repair.
Site specific recombination: (Pages: 377-393): Again, no need to know molecular details. The important point is to understand how site specific recombination functions in virus integration as this will be important for the techniques section.

Expression of the genome:
Transcription: (Pages: 429-442): The main point is to understand the role of RNA polymerase, what is the messenger RNA and what is the function of the promoter.
(Pages: 448-454): Specific issues with transcription in Eukaryotes. Notice the increased complexity and variations of the core promoter, and importantly transcription factors.
RNA splicing: (Pages: 467-469): We only need to know about the mosaic gene structure (exons and introns) the phenomenon (but not the mechanism) of splicing and the relationship between the pre-mRNA and mature mRNA (Cap, poly-A tail).
Translation. This is discussed in Chapters 15 and 16 in excruciating detail. We will deal with this only at the most elementary level. You need to understand only the existence of the genetic code (Chapter 16), the ribosome and the role of the START and STOP codons.

Regulation of gene expression:
Prokaryotic: (Pages: 615-636): This is important for our discussion. The key is to understand the difference between the regulatory and coding sequences of the gene and the logic of the *lac* operon. Molecular details are

again not important. A beautiful discussion of the λ-phage (pages 636-653), is not needed but this is really an amazing story.

Regulation in Eukaryotes: (Pages: 657-700). This may be too much reading and we will not need all the molecular details or the examples. The important thing is to think about the general mechanisms that control the expression of genes. If transcription factors regulate the expression of genes, what regulates the expression of transcription factors ?

Gene regulation in development: (Pages: 733-773). This is important for Part III, but the details are not needed. The key issue is what does development tell us about the *nature* of the genetic encoding of the structure of organisms ? What about 'innate' functions ?