1) One or more part of the nucleosomes can be epigenetically modified. Which ones cannot be epigenetically modified? More than one answer is correct.

    a) Histone's core
    b) DNA sequence
    c) Histone's Tails
    d) Scaffold proteins that regulate histone modification e) Histone-1

The correct answers are D and E. The scaffold proteins are part of the reader complex and detect the histone modifications to spread the signal. The histone-1 is the linker histone between two nucleosomes.

2) Mutations of HDAC proteins induce loss of their activity and it results in changes of the chromatin epigenetic marks. What is the effect on gene expression?

    a) Gene silencing
    b) No changes
    c) Activation of gene expression d) Increase H3 methylation
    e) Depends on other proteins

The correct answer is C. Loss of function of Histone Deacetylation increases Lysine-Acetylation and this is usually associated with activation of gene expression.

3) How many fluorescent probes (60 nucleotides long) you need to label a genomic region spanning from Chr 6: 13.5 Mb to 13.7 Mb.

    a) roughly 3000 probes b) 400 probes
    c) 333000 probes
    d) 1200 probes
    e) roughly 300 probes

The correct answer is A. To label 0.2 Mb (200,000 bp) using 60 oligonucleotides fluorescent probes you need roughly 3000 probes.

4) At mitosis, human chromosome 1 is condensed to a form that measures only 10 µm in length. A single nucleosome core particle is 11 nm long and contains 147 bp of DNA (0.34 nm/bp). What packing ratio (DNA length to nucleosome length) has been achieved by wrapping DNA around the histone octamer?

    a) 0.025
    b) 4.5
    c) 3.5
    d) 0.45
    e) 0.25

The correct answer is B, The packing ratio within a nucleosome core particle is 4.5 [(147 bp *0.34 nm/bp)/(11 nm) = 4.5].

5) Which are the less condensed regions of an interphase chromosome that stain diffusely?

a) Introns
b) Exons
c) Coding genes
d) Euchromatin
e) Heterochromatin

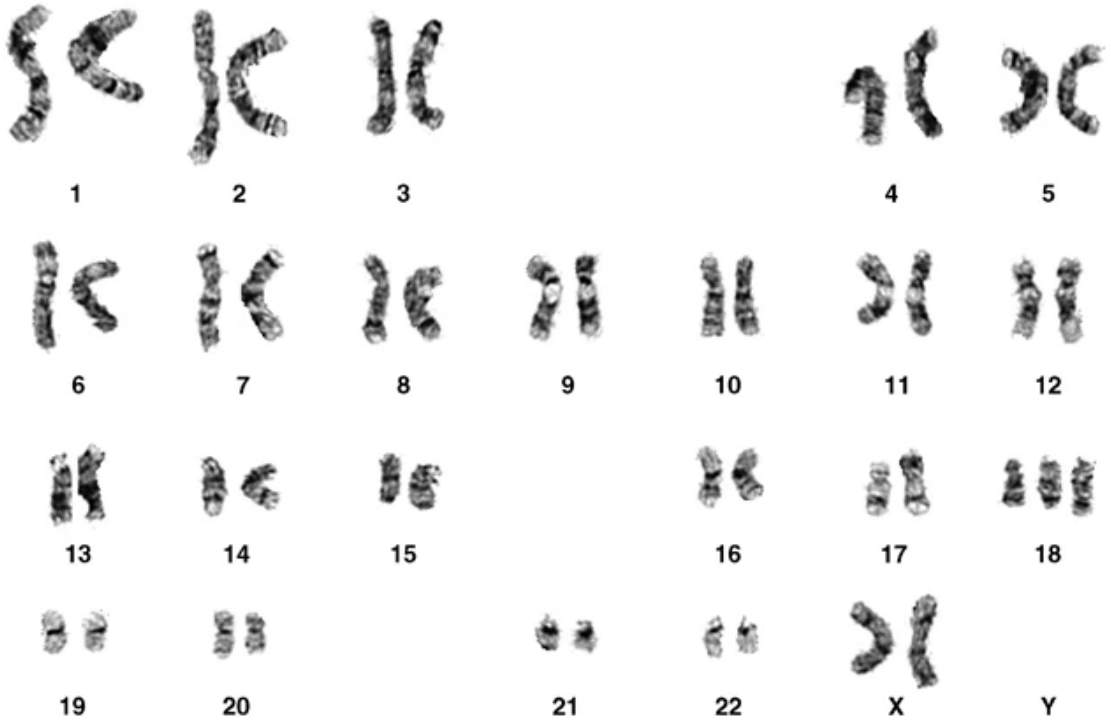
The correct answer is D. The euchromatin includes coding and non- coding regions and its condensation depends on the histone marks post- translational modifications

6) Which of the following information is correct (can be multiple answers)?

a) The reader complex is a protein complex
b) The reader complex is made of proteins and DNA
c) The reader complex recognises histone modifications
d) The reader complex modifies histone tails
e) The reader complex recruits other components with a catalytic activity

The correct answers are A, C and E.

7) Observe the karyotype below and select all the correct answers.



a) The patient is male
b) The patient is healthy
c) The patient is trisomic

d) The patient has chromosomal translocations
e) The chromosomes were extracted at mitosis

The correct answers are C and E.

TRUE or FALSE

1) The DNA is organized in chromosomes only during mitosis.

TRUE or **FALSE**

2) In the living cell, chromatin usually adopts the extended “beads-on-a string” form.

TRUE or **FALSE**

3) The four core histones are relatively small proteins with a very high proportion of positively charged amino acids; the positive charge helps the histones bind tightly to DNA, regardless of its nucleotide sequence.

TRUE or FALSE

4) Genes are highly expressed during mitosis.

TRUE or **FALSE**

5) Core histones are highly conserved across evolution

TRUE or FALSE

6) Histone-3 in the nucleosome can be methylated and acetylated on the same position at the same time.

TRUE or **FALSE**