Review questions

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Note to students: These questions were formulated in an attempt to recapitulate the expected spirit of exam questions. They are not pulled from previous exams and should be viewed as a general assessment of your coursework knowledge and not a conclusive or exhaustive guide to the material covered in class. That being said I hope they help you prepare for exam 1. After the exam please let me know if you thought these questions were helpful so I can plan more effective reviews in the future.

Lecture 1

1. George Beadle and tatum were recognized for their work in what?

Understanding in-born errors in metabolism (1 gene 1 enzyme hypothesis)

2. What do you think an advantage of fruit flies is as a model system that has lead to so many major discoveries in genetics?

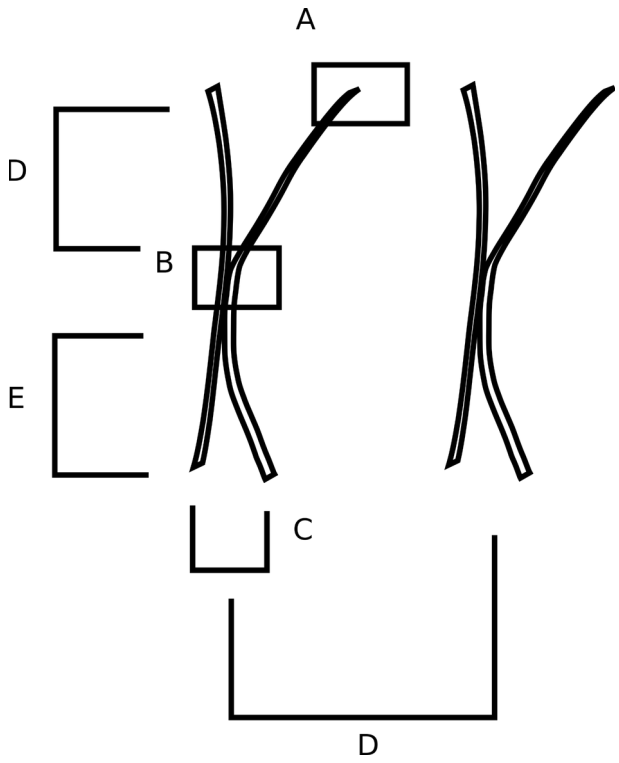
Fast reproduction time, lots of offspring, etc.

Lecture 2

3. A normal human karyotype contains ___ pairs of autosomes and ___ pairs of sex chromosomes . The total number of chromosomes is ___. A cell just after completing S phase will have ___ total chromosomes.

22, 1, 46, 92

4. Identify the regions or structures indicated in the replicated chromosome below.



A = Telomere, B = centromere, C = sister chromatids, D = homologous chromosome, E = q arm, D = P arm

5. The chromosome in the figure above would most likely be identified as a

a) telocentric
b) acrocentric
c) submetacentric
d) metacentric

D

6. Geimsa stains what type of DNA?

Late replicating, more condensed, heterochromatin

7. How would the following chromosome band name be pronounced?

13.3

a) Thirteen point three
b) Thirteen three
c) One three point three
d) One hundred and three point three
e) One hundred thirty three

C

8. Which of these bands will be located closest from the centromere? Assume all bands are on the same arm.

a) 22.1
b) 22.2
c) 14.1
d) 27.2
e) 11.3
f) Cannot be determined from band number alone

E

9. rDNA encodes what class of molecules?

Ribosomal RNA

10. Nucleosomes are composed of ___ (number) ____ (type) proteins.

8, histone

11. What assay can be used to identify the location of chromosome territories?

FISH

12. Chiasma are present during

a) S phase
b) Metaphase mitosis I
c) Metaphase mitosis II
d) Interphase of metaphase I
e) Interphase meiosis I
f) S phase meiosis II
g) Metaphase of interphase II
h) S phase of interphase I
i) Metaphase I of interphase II

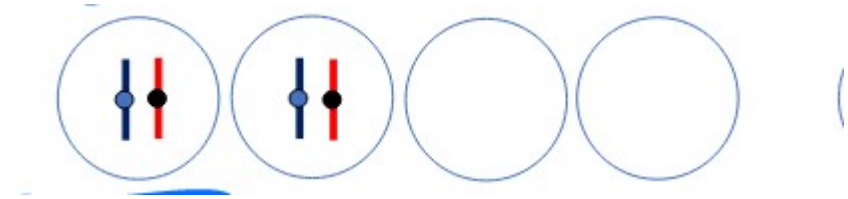
13. Centromeric cohesion is lost when? Why is this the case?

Meiosis II, allows the separation of sister chromatids (sisters stay together until the end!)

14. What is the difference in total number of male and female gametes produced during gametogenesis in humans?

3

15. The gametes shown below resulted from a non-disjunction during what stage of meiosis?



1

Lecture 3

16. Name a key technology that was used in the T2T sequencing project? How did it help to complete the human genome assembly?

Pac Bio or nanopore, long reads help to span repetitive regions that are collapsed by short read sequencing.

17. What would be the sequence resulting if the following population of molecules were produced as part of a sanger sequencing run?

ATGTGAGAAGTGTGAGTAGT
ATGTGAGAAGTGTGAGTAG
ATGTGAGAAGTGTGAGTA
ATGTGAGAAGTGTGAGT
ATGTGAGAAGTGTGAG
ATGTGAGAAGTGTGA

AGTAGT

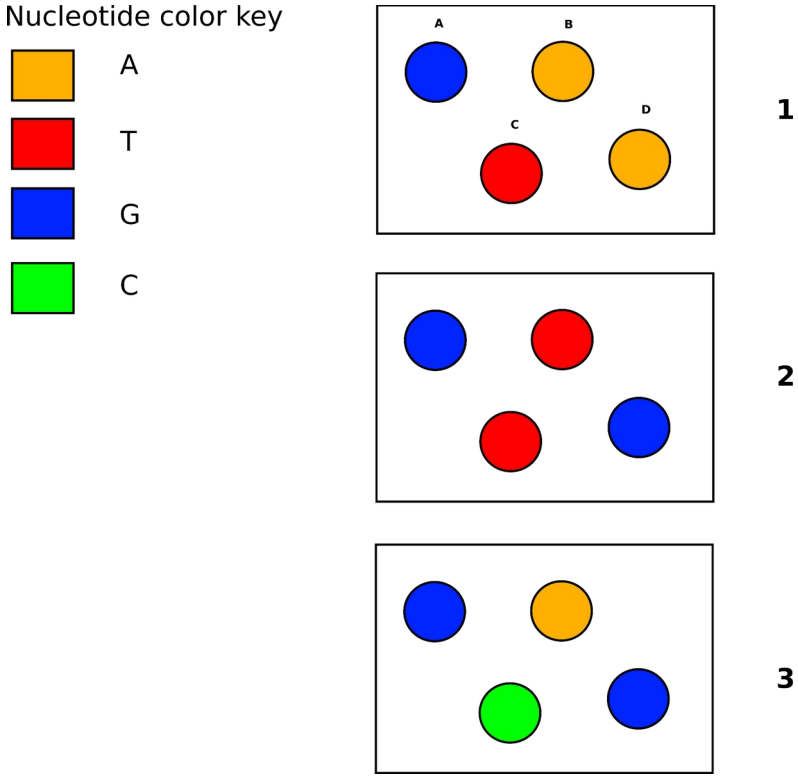
18. Sanger sequencing relies on _____ to _____ in order to sequence a population of DNA molecules

dideoxyribonucleotide / chain terminating molecules, block

19. Illumina sequencing is considered a _____ read technology.

short

20. What are the sequences of the four reads that would be produced from this Illumina flow cell given the series of images and the color key below.



A = GGG
B = ATA
C = TTC
D = AGG

21. PacBio relies on _____ to achieve high accuracy.

Consensus sequences

22. True or False? The development of nanopore technology required developing a specialized DNA polymerase.

False

23. True of False? The mitochondria produces the majority of its own proteins.

False

Lecture 4

24. What percentage of the human genome is protein coding? What percent (approximately) do you think is transcribed?

2% protein coding, 35% + (consider introns make up a significant portion of the genome)

25. What sequence would you be most likely to find in the promoter region of a gene?

a) CGATGCGATACGCGCG
b) ATGAGTGAGTAGTAGT
c) AAAAAAAAAAAAAAAA
d) CCCCCCCCCCCCCCC
e) CTCTCTCTCTCTCTCT

A (lots of CpG sequences)

26. CpG islands that act as promoters generally show ___ levels of DNA methylation?

reduced / low

27. Name a characteristic that could be used to identify a protein coding gene?

Promoter sequences, active chromatin marks, open reading frame

28. RNA Pol ___ is primarily responsible for created rRNA molecules.

I

29. Acrocentric chromosomes are prone to what type of translocations?

robertsonian

Lecture 5

30. What are the two major classifications of pseudogene? Which class is most likely to be due to transposition of a LINE1 element?

Processed and unprocessed. Processed.

31. What type of pseudogenes can result from segmental duplications? What is a famous group of genes that have arisen from segmental duplications?

Un-processed, globin genes

32. LINE elements compost approximately _____ % of the human genome.

21

33. LINE elements contain ____ open reading frames.

2

34. Alu elements are a class of _____ elements that are unique to _____ species.

SINE, primate