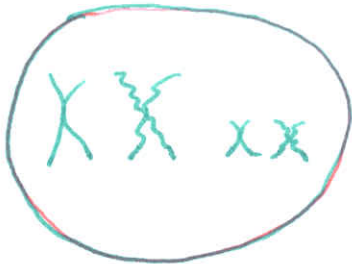
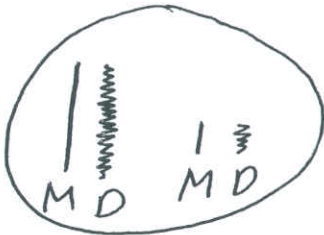
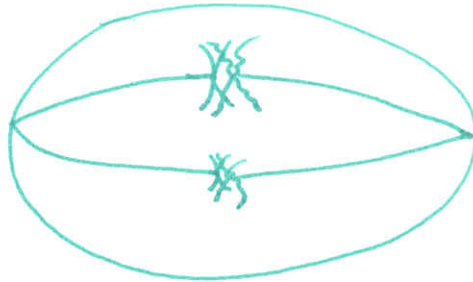


41. The following cell has two pairs of chromosomes; one of each from mom and one of each from dad.

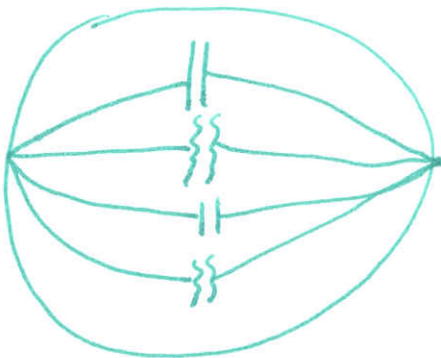
- Draw the chromosome content of the cells when each chromosome has been replicated. (1 pt)
- Draw the chromosomes in the cell in metaphase of mitosis. Make sure it is obvious to me which chromosome is which. (2 pts)
- Draw the chromosomes in the cell in metaphase I of meiosis. Make sure it is obvious to me which chromosome is which. (2 pts)
- Draw what happens in a chromosome nondisjunction event in meiosis. You need only draw anaphase of meiosis I. You needn't carry through to the end of meiosis. Make sure it is obvious to me which chromosome is which. (2 pts)



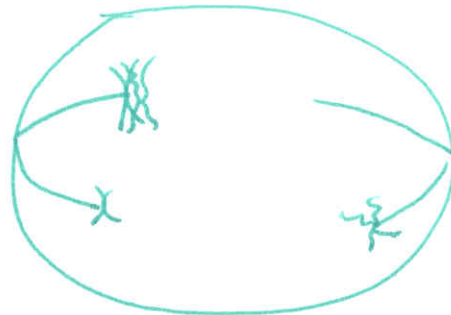
a)



c)



b)



d)

42. For cyclins and cyclin-dependent kinases, explain

- How enzyme activity is regulated (2 pts)
- What the level of each protein is throughout the cell cycle (2 pts) *explain or show*
- What are two substrates of the enzyme (2 pts)

a) cdk is only active when in a complex with cyclin



c) -lamins
-microtubule proteins
-proteins that cause destruction of cyclins

43. In the summer squash plant:

White fruit (W) is dominant, yellow fruit (r) is recessive.

Disc shaped fruit (D) is dominant, spherical fruit (d) is recessive.

Suppose a plant with white, disc-shaped fruit that is homozygous dominant for both traits is mated to a plant with yellow, spherical fruit that is homozygous recessive for both traits.

a) If the genes are unlinked, write

- The genotypes of the parents (2 pts)
- The genotypes of the gametes each parent can produce (2 pts)
- The genotype of the F1 generation (2 pts)
- The genotypes of the gametes that the F1 generation can produce (2 pts)

P - WWDD x wwdd
gametes - WD wd
F₁ WwDd
gametes WD wD Wd wd

b) Now assume the genes are linked. Write

- The genotypes of the gametes each parent can produce (2 pts)
- The genotypes of the F1 generation (2 pts)
- The genotypes of the gametes that the F1 generation can produce (2 pts) (assume NO recombination)
- The genotypes of the recombinant gametes from the F1 generation (2 pts)

gametes WD wd
F₁ WwDd
gametes (no recomb.) WD wd
gametes (w/recomb.) Wd wD

44. Two black guinea pigs were mated and over several years produced 29 black and 9 white offspring. Explain the results, giving the genotypes of both parents and progeny using allele symbols of your own choosing. (4 pts)

$Bb \times Bb$

	B	b
B	BB	Bb
b	Bb	bb

Simple dominant
recessive phenotype,
Homozygous recessives
are white.

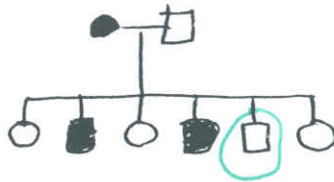
45. In humans, red-green colorblindness is recessive and X-linked. Consider two parents, a wild-type visioned (homozygous) woman and a color-blind man. Tell me the phenotypes of their boy and girl children as well as genotypes (ie homozygous dominant, etc). (4 pts)

$X^C X^C$
woman

$X^c Y$
man

female offspring all $X^C X^c$ heterozygous
male offspring all $X^C Y$ hemizygous
all can see color

46. Shaded symbols in the following pedigree represent a character. Which of the progeny (Generation II) eliminate X-linked recessiveness as a mode of inheritance for the character? Explain. (4 pts)



No boy can be unaffected if the mode is X-linked recessive. Mother would have to be homozygous, so all males would get only recessive allele. The fact that there is an unaffected male means this cannot be the mode of inheritance.

47. An animal with genotype AaBb is crossed with an animal with genotype aabb. Their progeny include:

- 442 AaBb
- 458 aabb
- 46 Aabb
- 54 aaBb

Explain these proportions and draw the chromosomes of the doubly heterozygous parent, showing the positions of the genes and alleles including map unit distances. (4 pts)

This is linkage, and since AaBb and aabb are the predominant genotype the heterozygous parent must have



Map unit distance is

$$\frac{46 + 54}{442 + 458 + 46 + 54} = \frac{100}{1000} = 10\%$$

48. If a person asks you if they should worry about inheriting Leber's Hereditary Optic Neuropathy because a parent of theirs has it, why would it be important for you to know which parent has it? (2 pts)

Leber's is caused by a mutation in the mitochondrial genome. Since children only inherit their mitochondria from the mother, if the father has it the child needn't worry about having it.