UFSO

SCIENCE OLYMPIAD
AT THE
UNIVERSITY OF FLORIDA

Northern Regional: January 19th, 2019

Designer Genes C Answer Key

Name(s): _____

Team Name: _____

School Name: _____

Team Number: _____

Rank: _____

Score: _____

1. E
2. C
3. B
4. E
5. C
6. C
7. D
8. E
9. D
10. A
11. A
12. B
13. E
14. E
15. E
16. Cdks need to be free of Cdk inhibitor proteins (CKIs) and associated with cyclins in order to be activated; Bind to cyclin **(1 pt)**
17. Translocation **(1 pt)**
18. Character **(1 pt)**
19. A cross with homozygous recessive to determine if genotype is homozygous dominant or heterozygous **(1 pt)**
20. Genomic totipotency- all somatic cells share the same DNA **(1 pt)**
21. Binary fission and mitosis both are processes by which information is transmitted. Binary fission is the process by which info is transmitted in prokaryotes. Mitosis it in eukaryotes. **(1 pt)**
22. Necrosis is premature cell death caused by external agents like toxins. Apoptosis is programmed cell death. **(1 pt)**
23. **C** **(1 pt)**
24. **A** **(1 pt)**
25. **D** **(1 pt)**
26. **D** **(1 pt)**
27. **B** **(1 pt)**
28. **A** **(1 pt)**
29. **F** **(1 pt)**
30. **A** **(1 pt)**
31. **I** **(1 pt)**
32. **D** **(1 pt)**
33. **G** **(1 pt)**
34. **B** **(1 pt)**
35. **C** **(1 pt)**
36. **J** **(1 pt)**

37. **H** **(1 pt)**

38. E **(1 pt)**

39. A **(1 pt)**

40. D **(1 pt)**

41. C **(1 pt)**

42. 1) If II-2 has a son, there is a 1 in 4 chance (25%) that he will be red-green colorblind. **(1 pt if answer says '1 in 4 ' or '25%')**

a. This is because color blindness is X linked recessive. As boys only have one X chromosome they (they are XY), they only need to have one X chromosome with red-green colorblindness to have the disorder.

b). Punnet square or math is shown, resulting in the answer 1 in 4 or 25%.

(1 pt if answer has a. or b.) do not need both to receive 1 point. if both a and b. are in the answer, team can only receive maximum of 1 point

2) If II-2 has a daughter, there is a 0% chance (or close to 0 chance) that she will be red green colorblind. **(1 pt if answer says 'close to 0 ' or '0%')**

a. In order for the daughter to be red-green colorblind, she must have both XX with red-green colorblindness. She will receive one from the mother, but the father is not affected by red-green colorblindness. She will be a carrier, but she will not have this disorder

b. Punnet square or math is shown, resulting in the answer 0% or close to 0.

(1 pt if answer has a. or b.) do not need both to receive 1 point. if both a and b. are in the answer, team can only receive maximum of 1 point

Total: 4 pts

43. 1) **Prophase**: **(.25 pts if answer says 'Prophase')**

a. the chromosomes become much more tightly coiled and condensed-each chromosome has two DNA molecules called sister chromatids, joined at a region called the centromere **(.25 pts if answer has a.)**

b. centromeres serve as poles toward which the chromosomes move **(.25 pts if answer has b.)**

c. the spindle forms between the poles from microtubules-kinetochore microtubules attach to kinetochores on the chromatid centromeres

i. sister chromatids attach to kinetochore microtubules from opposite sides so that the two chromatids will move to opposite poles

ii. sister chromatids become daughter chromatids after separation **(.25 pts if answer has C.i. & .25 pts if answer has D.ii.)**

(1 pt)

2) **Prometaphase:** **(.50 pts if answer says 'Prometaphase')**

a. the nuclear envelope breaks down and chromatids attach to the kinetochore microtubules **(.50 pts if answer has a.)**

3) **Metaphase**: **(.50 pts if answer says 'Metaphase')**

a. the chromosomes line up at the midline of the cell (equatorial plate)
(.50 pts if answer has a.)

(2 pts)

4) **Anaphase**: **(.25 pts if answer says 'Anaphase')**

a. the chromatids separate, and the daughter chromosomes move toward the poles **(.25 pts if answer has a)**

5) **Telophase: (.25 pts if answer says 'Telophase')**

a. nuclear envelopes form around each set of chromosomes, and the spindle breaks down and chromosomes become less compact. **(.25 pts if answer has a)**

(1 pt)

6) **Cytokinesis: (.50 pts if answer says 'Anaphase')**

a. In animals: cell membrane pinches in between the nuclei
(.25 pts if answer has a.)

b. In plants: vesicles fuse to form a cell plate (and eventually a cell wall) that divides the cell into two **(.25 pts if answer has b.)**

(1 pt) **Total: 5 pts**

43. Nondisjunction: (1 pts if answer says 'Nondisjuction'.)

a. Homologous pair fails to separate at anaphase I
b. Sister chromatids fail to separate at anaphase II
(.5o pts if answer has a.) + (.50 pts if answer has b.)

c. Results in **aneuploidy** (an abnormal number of chromosomes):
(.50 pts if answer has c.)

i. most human embryos from aneuploidy zygotes do not survive
ii. the most common human aneuploidy is trisomy 16
iii. **Trisomy 21 (down syndrome)** is one of the few aneuploidies that allow survival
iv. Sex chromosome variation: X,45; XXX; XXY; XYY

(.25 pts if one point from i.-iv.) <u>or</u> (.50 pts if two points from i.-iv.) maximum of .50 points for i.-iv., even if answer has all i.-iv.

(3 pts)

Translocation: **(1 pt if answer has 'translocation'.)**

a. Portion of chromosome breaks off and attaches to a non-homologous chromosome. **(1 pt if answer has a.)**

(2 pts) Total: 5 pts

40. **Crossing Over:** **(1 pt if answer has 'crossing over'.)**
    a. Genetic material is exchanged between nonsister chromatids at the **chiasmata** (where the homologs remain attached)**.**
    b. Any of the four chromatids in the tetrad can participate, and a single chromatid can exchange material at more than one point.
    c. Crossing over results in **recombinant** chromatids and increases genetic variability of the products.

(.5o pts if answer has a.) + (.50 pts if answer has b.) + (.50 pts if answer has c.) + (1 pt EXTRA BONUS POINT if answer has ALL A-C).

Independent Assortment: **(1 pt if answer has 'independent assortment'.)**

a. Random selection of half the diploid chromosome set to form a haploid gamete

(.5o pts if answer has a.) **Total: 5 pts**

TEST TOTAL: 50 POINTS. GRADE TEAMS _____/60