9th February 2024

BB101
Quiz 6
(Gene Regulation, Cell Communication, and Cell Division)

9.5

Total Marks: 10

Name: Maley Kedia
Roll No.: 23B1034.

1

Question 1. Select the correct option for the following questions related to cell division: (0.5 × 2 = 1 mark)

A. DNA synthesis takes place during _____ phase
a. M phase
b. G2 phase
D
c. G1 phase
d. S phase

B. Major event that occurs during anaphase of mitosis which brings about equal distribution of chromosomes is:
a. Splitting of centromere
b. Condensation of chromatin
c. Replication of genetic material
A
d. Pairing of homologous chromosome

0.5

Question 2. Lipid-soluble signaling molecules, such as aldosterone, cross the membranes of all cells but affect only target cells because: (0.5 mark)
a. only target cells retain the appropriate DNA segments.
b. intracellular receptors are present only in target cells.
c. only target cells have enzymes that break down aldosterone.
B
d. only in target cells is aldosterone able to initiate the phosphorylation cascade that turns genes on.

0.5

Question 3. A cell is going through cell division and has already undergone DNA replication. However, the cell detected a discrepancy in the replication of DNA. Which cell cycle checkpoint was responsible for detecting this error? (0.5 mark)
a. G1 Checkpoint
b. G2 Checkpoint
c. S Checkpoint
B
d. M Checkpoint

1

Question 4. Two cells contain 392 chromosomes each (2n=392). One of them, named A, undergoes the division that involves the formation of homologous pairs of the chromosomes at the metaphase such that the centromeres of homologous chromosomes lie on either side of the metaphase plate. Whereas, the other cell named B, undergoes the division that involves the formation of sister chromatids and individual chromosomes lining up on the

metaphase plate. Identify the cell division that cell A and B are undergoing individually and the number of chromosomes (N) possessed by the daughter cells in each case. (1 mark)

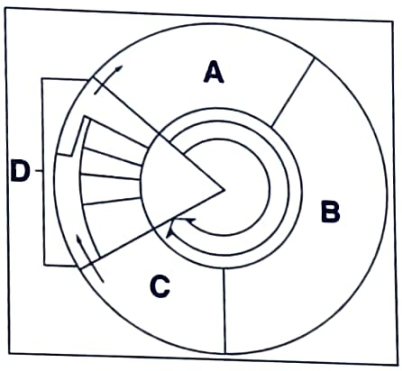
a. A= Mitosis, N= 196; B= Meiosis, N= 392
b. A= Meiosis, N= 196; B= Mitosis, N= 392
c. A= Meiosis, N= 98; B= Mitosis, N= 392
d. A= Mitosis, N= 196; B= Meiosis, N= 98

Question 5. Arrange the following events of regulation of cell cycle by cyclins and cyclin-dependent kinases in the correct order: (1 mark)

A. Degradation of cyclin
B. Accumulation of cyclin
C. Entry in G1 phase'
D. Synthesis of cyclin
E. Cyclin- Cdk complex formation
F. Entry in mitosis

a. D,B,E,F,A,C
b. A,B,C,D,E,F
c. D,B,C,A,F,E
d. A,C,D,B,E,F

Question 6. Raj has prepared well for his BB 101 quiz, but during the exam, he cannot remember the cell cycle phases. Help him score well by writing the phases A, B, C, and D of the mitotic cell cycle as per the following diagram. (1 mark)



A- G1
B- S
C- G2
D- M

Question 7. Mention whether the following statements are true or false: (0.25 × 4 = 1 mark)

A. In bacteria, translation of an mRNA only happens after the transcription is successfully completed.

Ans: False

B. ***lac*** operon is usually 'on' and gets turned off in the presence of lactose; whereas ***trp*** operon is usually 'off' and gets turned on when there is ample amount of tryptophan.

Ans: False

C. 'c' in cDNA stands for complete DNA.

Ans: False.

D. Cholera toxin causes efflux of Cl^- and Na^+ ions and H_2O from cells.

Ans: True

Question 8. If a particular operon encodes enzymes for making an essential amino acid and is regulated like the ***trp*** operon, then (1 mark)

a. the amino acid inactivates the repressor.

b. the repressor is active in the absence of the amino acid.

c. the amino acid acts as a corepressor.

d. the amino acid turns on transcription of the operon.

Question 9. Consider this pathway: Epinephrine (Hormone) → G protein-coupled receptor → G protein S adenylyl cyclase → cAMP. Identify the secondary messenger. (0.5 mark)

a. GTP

b. G-protein

c. cAMP •

d. Adenylyl Cyclase

'c' is the correct answer

Question 10. If the DNA content of a diploid cell in the G1 phase of the cell cycle is x, then the DNA content of the same cell at metaphase of meiosis I would be: (1 mark)

a. 0.25x.

b. 0.5x.

c. x.

d. 2x.

Question 11. If we continued to follow the cell lineage from question 10, then the DNA content of a single cell at metaphase of meiosis II would be: (1 mark)

a. 0.25x.

b. 0.5x.

c. x.

d. 2x.

(Assuming cytokinesis took place after Meiosis-I)

Question 12. Meiosis II is similar to mitosis in that: (0.5 mark)

a. sister chromatids separate during anaphase.

b. DNA replicates before the division.

c. the daughter cells are diploid.

d. homologous chromosomes synapse.