Assignment 1

Due on 2020-02-12, 23:59 IST.

The due date for submitting this assignment has passed.

No point will be credited for this assignment.

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The size of a typical bacterium such as E. coli serves as a convenient standard size for characterizing length scales in molecular and cell biology. A rule of thumb derived from electron microscopic measurements for the dimension of E. coli cell cell is to assume it is of about $\sim 5 \mu m$, a length that can be approximated as a sphere with a volume of:

$$V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \left( \frac{5 \mu m}{2} \right)^3 = 52.36 \mu m^3.$$

1) Calculate the volume of E. coli, and the volume of sphere of radius $5 \mu m$, where A is the area image. Enter the volume of A. Note: $\pi = 3.14$.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

2) Calculate the mass of E. coli. Assume that E. coli cells are about 25% water and the other components, the proteins, have a characteristic density of about 1.3 times the density of water. Let the mass be $C = 10^{-12} \text{g}$. Enter the mass of C, correct units (g), placed round up your answer.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

3) The embryonic development of the Drosophila embryo serves as a testbed for developmental biology. In the initial stage of development, the embryo undergoes cellular division, in which the nuclear divide without forming associated cellular membranes. This process continues until the fourth nuclear cycle, and at this stage, all nuclei are in the cytoplasm, and nuclear content can diffuse throughout the embryo. The drosophila embryo can be modeled as a sphere with a radius of 100 μm and a volume of 41.86 μm$^3$. During the late stage, the nuclei are in the nucleus of the embryo. After the end of the fifth nuclear cycle, most of the nuclei migrate to the cell, from the nucleus.

Given that there are approximately 2400 nuclei on the surface of the embryo after the 10th cycle, what is the number of nuclei that rejoin to the surface at the end of the sixth cycle? Report your answer correct units (nuclei) placed round up your answer.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

4) Enter the number of nuclei at the end of the 10th cycle, i.e., the number of nuclei at the unit area. Enter this density, C, as the number of nuclei per μm$^2$ (with $\pi = 3.14$), then enter 800 μm$^3$ to 3 decimal places (rounded up your answer).

No. the answer is incorrect.

Score: 0

5) Known below is the pattern of gene expression at the end of the 10th cycle for these genes. Which, then, are expressed, and Cluster? As can be seen from the figure, the proteins corresponding to these three genes organizes a segment pattern, which is the precursor to the homoeologous gastrulation seen in the adult fly.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

6) As given reading frame CDR$^+$ is the part of a reading frame that has to be translated. Thus an ORF of length $N$ is defined as a sequence of $N$ amino acids. Enter the value of the correct option (decimal places round up your answer).

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

7) The presence of E. coli might not be a threat to the food, even for the food, it is in the form of a cooled soup. What is the number of possible readings frames, i.e., the number of possible ways to read a linear sequence of bases appealing to E. coli. Enter your answer as an integer.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

8) Assume that the codes A, G, T, C occur with equal probability and independently using a segment of DNA.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

9) In the genetic code, a stop codon is recognized by a particular trinucleotide or a segment pattern, which is the precursor to the homoeologous gastrulation seen in the adult fly.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

10) As given reading frame CDR$^+$ is the part of a reading frame that has to be translated. Thus an ORF of length $N$ is defined as a sequence of $N$ amino acids. Enter the value of the correct option (decimal places round up your answer).

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2

11) The presence of E. coli might not be a threat to the food, even for the food, it is in the form of a cooled soup. What is the number of possible readings frames, i.e., the number of possible ways to read a linear sequence of bases appealing to E. coli. Enter your answer as an integer.

No. the answer is incorrect.

Score: 0

Accepted Answers:

Type: Range 1 x 2