Assignment 2 (2023)

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Instructions

Write Python code for the following questions using only basic Python data structures, loops, and conditional statements. You cannot use any inbuilt function for searching, sorting, or replacing.

Allowed : list, set, tuple, dictionary, variables (int, float), control statements (if-else, switch-case), loops (for, while)

IMPORTANT: **Use the same function name and parameters given in each question**

All files that DISREGARD the naming convention will NOT be corrected and 0 marks will be awarded for the respective questions.

Write explanations as **comments** in the python file.

Q1. Diet planner

6 points

Following a proper diet is necessary for maintaining health. The dietitian suggests that every meal the following nutritional requirements need to be met:

1. Carbohydrates - Not more than 300 units
2. Fats - Not more than 150 units
3. Proteins - More than 80 units but not more than 500 units
4. Vitamins - More than 10 units but not more than 100 units
5. Minerals - More than 10 units but not more than 50 units

Provided below is the menu at a mess that you'll be eating one meal a day the rest of this semester (This mess does not necessarily reflect reality). Write a python program to print all the combinations of the food items that satisfy the dietitian's criteria in tuple format

Function

```
def diet_planner():
    """
    write your code here
    """
```

Example output:
(('Cheeseburger'),('Veg Curry','Potato Chips','Roti'),...)

Add file

Units of nutrients in different food components

Name	Carbs	Fats	Proteins	Vitamins	Minerals
Rice	195	12	12	5	7
Veg Curry	50	36	42	23	3
Cheeseburger	203	95	150	63	27
Potato Chips	78	78	25	14	12
Roti	76	20	34	14	6
Soft Drink	98	7	8	9	21

Q2. Primer designing

6 points

A researcher wants to create a 20 nucleotide primer from the sequence “ATGGCAATCAAGTCATTGGAATCGTTCCTTTTCGAAAGAGGTCTAGTAGG” which satisfies the following conditions

a. The GC content (the number of G's and C's in the primer as a percentage of the total bases) of a primer should be 40-60%.

b. The melting temperature (Tm) should be between 52 to 56 degrees. The formula for primer Tm calculation: Tm = **4(G + C) + 2(A + T)**

Your task is to help the researcher find as many 20 nucleotide primers from the gene sequence satisfying the above-mentioned conditions using a function that takes the gene sequence as input and returns all possible primers satisfying the conditions.

Note: No need to use complementary primers. Just use the given sequence to design 20 nucleotide sequences by smoothly sliding over 20 bases (1 to 20, 2 to 21 ……)

```
def primer_design(seq =
“ATGGCAATCAAGTCATTGGAATCGTTCCTTTTCGAAAGAGGTCTAGTAGG”):
    """
    write your code here
    """
```

The function should return a list of strings.

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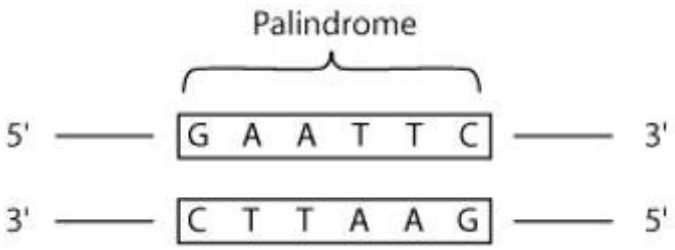
Q3. a. Palindromic sequence

8 points

Restriction enzymes cut double-stranded DNA at palindromic sites. Palindromic sites refer to those regions where both the forward and reverse strands of the DNA have the same sequence. Given below is an example of a palindromic site.
Given the sequence in the file 'dna.fasta' (you can use file handling to open the file), write a python file that evaluates and prints:
a. The number of 6 base pair long palindromic sites in the DNA sequence
This is the link for the FASTA file.

```
def palindrome():
    """
    write your code here
    """
```

The function should return an integer denoting the number of 6 base pair long palindromic sites in the DNA sequence



Add file

Q3. b. Bonus question

5 points

The total number of palindromic sites there are in the DNA sequence? (Regardless of the length of the palindrome)

```
def palindrome_2():
    """
    write your code here
    """
```

The function should return an integer denoting the number of palindromic sites in the DNA sequence

Add file