Question 1

First we need to calculate the number of occurrences of each letter in the input sequence and express them as Ns,Nn,Na,Nk,Ne. we need to get the M = min(Ns,Nn,Na,Nk,Ne). Clearly, the largest possible venom level L <= M. We need to apply the greedy strategy to check whether the sequence can remove some letters or not to get the remain sequence like:

$$\underbrace{S..S}_{M}\underbrace{N..N}_{M}\underbrace{A..A}_{M}\underbrace{K..K}_{M}\underbrace{E..E}_{M}$$

We need to use the binary search method to find the sequence that matches the maximum level of the Medusa DNA chain. We need to compare logn times.

The following code shows the detailed steps:

```python
def binarySearch(string):

    start = -1
    end = max_level(string)
    # binary search
    while start < end:
        mid = (end+start+1)//2
        # check the mid whether is correct
        if check_match(mid,string):
            start = mid
        else:
            end = mid - 1

    if check_match(start,string):
        return start
    else:
        return 0

def check_match(mid,string):

    max_level_string = ""
    DNA = "SNAKE"
    # create new sequence
    for i in DNA:
        max_level_string += i*mid

    i,j = 0,0
    # new sequence compare to the input string
    while i < len(max_level_string) and j < len(string):
        if max_level_string[i] == string[j]:
            i += 1
```

```
        j += 1
    # check if all letters mathc return true
    if(i == len(max_level_string)):
        return True
    else:
        return False


# calculte the possible max venom level
def max_level(string):
    i = 0
    Ns,Nn,Na,Nk,Ne = 0,0,0,0,0
    while(i < len(string)):
        if (string[i]=="S"):
            Ns+=1
        elif (string[i]=="N"):
            Nn+=1
        elif (string[i]=="A"):
            Na+=1
        elif (string[i]=="K"):
            Nk+=1
        elif (string[i]=="E"):
            Ne+=1
        i+=1


    res = min(Na,Ne,Nk,Ns,Nn)


    return res

Input_String = input("Enter a string: ")
print("Max Venom Level: ",binarySearch(Input_String))
```

Code testing:

Enter a string: SSNNAAKKEE
Max Venom Level: 2
z5173405@weill:~$ python3 snake.py
Enter a string: SSSAAANNAAEEKKEE
Max Venom Level: 2
z5173405@weill:~$ python3 snake.py
Enter a string: KKEESSANNNAAAKKKEEE
Max Venom Level: 2
z5173405@weill:~$ python3 snake.py
Enter a string: SSSNNNAAAKKKEEE
Max Venom Level: 3