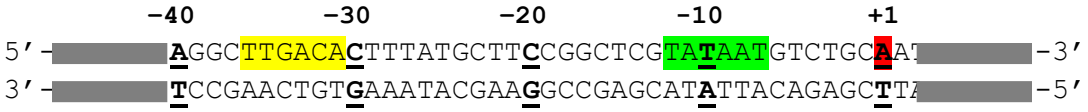
Quiz/Self-assessment-II

Q. 1 Shown below is the fragment of an *E. coli* gene (the bold and underlined nucleotides are numbered):



(a) Name the regions highlighted in yellow and green?
(b) What is the basis of the numbering of the nucleotides?
(c) Which of the above strands (top strand or bottom strand) is the template strand?

Q. 2 Complete the following table:

	Replication	Transcription	Translation
Where does this take place in an eukaryotic cell?			
Which enzyme/protein complex carries out this process			
What is the template that is read during this process?			
Which direction the template is read in?			
What is the start signal for this process			
What is the product of this process			
What are the monomers used in this			
What type of bond is formed between the monomers?			

Q. 3 Insertion or deletion of one or two base-pairs from the coding region of the gene changes the reading frame of the gene; such mutations are known as …….

Q. 4 In the process of translation, each amino acid is coded for by 3 nucleotides—a codon. Why does it has to be at least 3 nucleotides as opposed to 2 or 1 nucleotides coding for an amino acid?

Q. 5 Codon is the three nucleotide code present in …….

Q. 6 How many codon are required for specifying 5 amino acids?

Q. 7 What do aminoacyl t-RNA synthetases do?

Q.8 The 80S eukaryotic ribosome is composed of two subunits of …… and …….

Q. 9 Given below is a hypothetical bacterial gene:

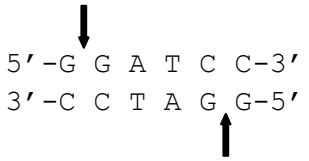
```
 -40       -30        -20        -10         +1
5′-AGGCTTGACACTTTATGCTTCCGGCTCGTATAATGTCTGCAATAGGAGGTGACTATCCTCCAGTGA-3′
3′-TCCGAACTGTGAAATACGAAGGCCGAGCATATTACAGAGCTTATCCTCCACTGATAGGAGGTCACT-5′
```

(a) Write down the sequence of the RNA molecule that will be synthesized from the above gene.
(b) What will be the length of the protein/peptide synthesized from this mRNA (Given: AGGAGGU is the ribosome binding site on the mRNA).

Q. 10 Match the columns

A	**B**
(a) *E. coli* is grown in a medium having both glucose and lactose	(i) Binds to the operator
(b) Repressor	(ii) Binds to the promoter
(c) RNA polymerase	(iii) Repressor becomes inactive
(d) Bacteria growing in a medium having lactose as the only carbon source	(iv) Catabolite activator protein (CAP) active
	(v) High concentration of cyclic AMP

Q.11 BamHI is a restriction endonuclease with the cleavage sites as shown below:



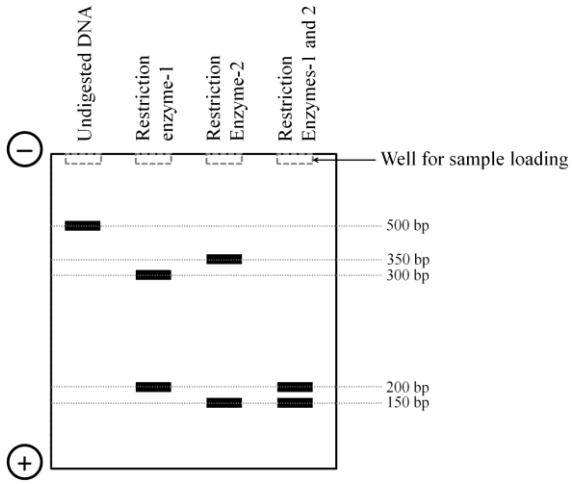
Which of the following statements is/are correct (tick all correct options):

(a) The enzyme produces sticky ends with 5’ overhangs
(b) The enzyme produces blunt ends
(c) The enzyme produces sticky ends with 3’ overhangs
(d) The enzyme produces sticky ends with 3’ overhang in one strand and 5’ overhang in the other

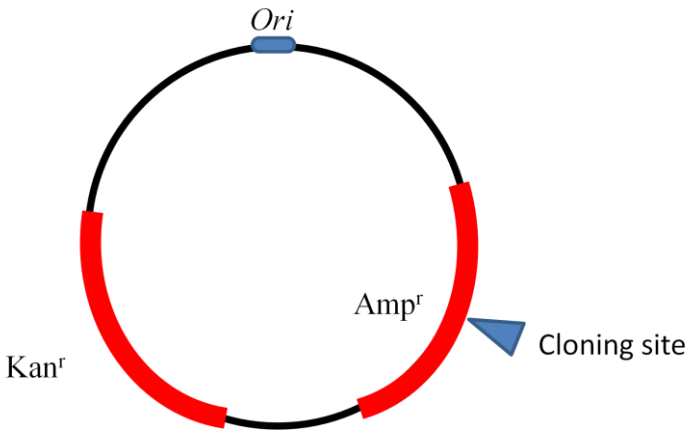
Q. 12 Mention in one or two sentences is the function of β-galactosidase in *lac* operon?

Q. 13 Name three key steps of polymerase chain reaction.

Q. 14 Shown below is the gel run following restriction digestion of a given linear DNA molecule with two restriction enzymes. Prepare the restriction map of the enzyme:



Q. 15 You performed cloning of a gene using following vector:



where, Kan^r and Amp^r are the Kanamycin resistance and ampicillin resistance genes, respectively. You go ahead like this:

(a) Cut the plasmid with the appropriate enzyme.
(b) Cut out your gene of interest from the genome using the same enzyme.
(c) Mix the cut plasmid and the gene of interest and add a DNA ligase in the reaction. Allow the reaction to go for some time
(d) Perform bacterial transformation (putting the DNA into bacterial cell) with the above mix.
(e) Grow these bacteria in a suitable liquid medium

How will you now select the bacteria that have got your gene of interest? Give your answers step-by-step (in not more than 5 sentences).