Basic molecular biology and biochemistry concepts and techniques Q/A list

1. What are the essential components for a plasmid vector? What are the difference between bacteria (prokaryotic) and yeast (eukaryotic) vector?
2. For traditional restriction-enzyme digestion cloning, why do you need to pick unique restriction enzyme site to cut your plasmid DNA? What happens if you choose a blunt-end enzyme?
3. What are the major transcriptional and translational control signals for prokaryotic and eukaryotic cell? What are the sequence feature for promoter, terminator, RBS, 5'UTR, riboregulator? How do they work inside the cell?
4. How do you know your gene of interest Is inserted to the vector? What are the major selection markers for E. coli and yeast?
5. What is polymerase chain reactions? What is the annealing temperature or the melting point ™ of a DNA? What is overlap PCR and how do you use overlap PCR to assemble gene fragment?
6. How do you design primer to amplify your gene of interest?
7. What is promoter, terminator, ribosome binding site, SD sequence, replication origin, centromere, riboregulator? How do they control gene expression?
8. What is polycistronic gene? What is intron, exon and RNA splicing?
9. How do you sequence DNA? How do you know your sequence is correct?
10. What is blue-white screening? What is the requirement for host background?
11. What is the basic principle of Gibson assembly? How do you design primer for Gibson assembly?
12. What is 5xHistidine tag and how do you use this tag to purify protein?
13. What is signal peptide? What is molecular chaperon? What is PTS, MTS, NLS signal?
14. What is lactoce operon? How does IPTG induce the expression of gene?
15. What is inducible expression and constitutive expression? What is gene activation and repression?
16. What is gene attenuation? Please explain tryptophan operon attenuation mechanism?
17. What is catabolite repression? Please explain the molecular mechanism how cAMP and CAP are involved in this process?
18. How do you do quantitative PCR (q-PCR)? Explain the principles.
19. What is homologous recombination? How do we delete gene in E. coli using lamda red recombinase? How do you cure the maker?
20. How do we delete genes in yeast using Cre recombinase? How do we cure the marker?
21. What is quorum-sensing? Please explain the molecular mechanism?

22. What is CRISPR-Cas9? How does it work? Explain the detail how to delete, insert or replace a gene with CRISPR-Cas9?

23. What is Zinc-nuclease and how does it work in the cell?

24. What is TALEN, how does it work in the cell?

25. What is yeast counter selection? How does 5-Fluoroorotic Acid, Canavanine and 5-Fluoroanthranilic acid works inside the cell?

26. To be continued … ….

Basic biochemistry knowledge that is important to your research

1. What are the major enzyme steps in EMP, TCA, PP, fatty acid biosynthetic/degradation pathway and glyoxylate shunt pathway?

2. What are the ATP/NADH/NADPH-generation steps in in EMP, TCA, PP, fatty acid biosynthetic / degradation pathway and glyoxylate shunt pathway?

3. What are the ATP/NADH/NADPH-consumption steps in in EMP, TCA, PP, fatty acid biosynthetic / degradation pathway and glyoxylate shunt pathway?

4. What is the difference between respiration and fermentation?

5. To be continued … …