DR. Mamoun's material (molecular techniques)

1) In DNA microarray , clustering of patient samples by Bio informatics is based on :

A. molecular fingerprinting
B. the clinical characteristics of samples
C. treatment response
D. gene expression profiling
E. mutations

Answer: D

2) you suspect that the hormone binds to large number of proteins. How can you identifythe interacting protein :

A. Yeast-Two hybrid system
B. Next -generation sequencing
C. CRISPR-Cas9 system
D. Reporter gene assay
E. Protein tagging

Answer: A

3) the following is needed for next generation sequencing :

A. DNA adapters
B. Taq polymerase
C. Dideoxynucleotide
D. Multiple pairs of gene-specific primers

Answer: A

4) the variation of the annealing temprature of PCR allows for :

A. better selectivity of amplified regions of DNA
B. amplifying GC- rich or AT- rich DNA sequences
C. synthesis of amplicons of certain lengths
D. activation of the taq polymerase
E. controlling speed of PCR reaction

Answer: A

5) you want to purify the hormone , but you you do not have an antibody that can help you purify it , you can do this :

A. Protein expression in bacteria
B. Reporter gene assay
C. CRISPR-Cas9 system
D. immunoprecipitation
E. protein tagging

Answer: E

6) you want to see a protein move from steam to leaves. How can you do this ?

A. Attach SYBR green to the hormone
B. Create a recombinant protein with His tag
C. perform a reporter gene assay
D. create a recombinant protein with green fluorescent protein
E. Create a recombinant protein with LacZ gene product (beta-galacosidase)

Answer : D

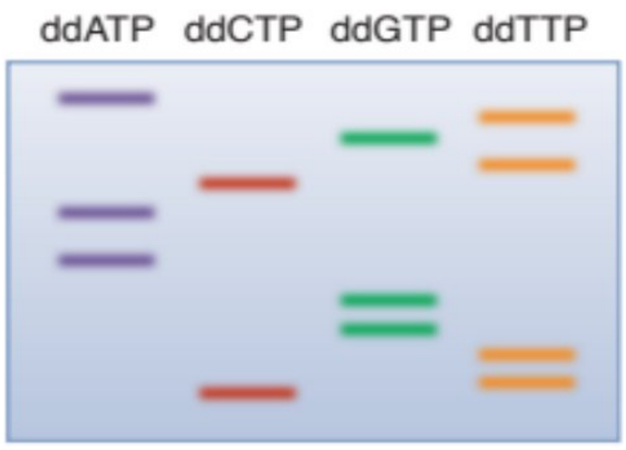
7) This technique allows you to identify the change of expression of hundreds to thousands of genes, known and unkown ones , with their alternatively spliced variants:

A. Real -time PCR of cDNA
B. Reporter gene assay
C. Next generation DNA sequencing
D. DNA microarray
E. RNA sequencing

Answer: E

8) Te sequence of the original DNA strand is :

5'TACAGTTCCAAG 3'



9) This technique allows you to investigate the change of expression several thousands of known genes , all at the same time , among plants that express the hormone versus those that do not ?

A. Quantitative real-time PCR of CDNA
B. Reporter gene assay
C. DNA microarray
D. Yeast-two hybrid system
E. Quantitative PCR

Answer: C

10)One of the following is not true in regards to the CRISPR-Cas9 system :

A. It contains DNA fragments of bacteriophage DNA
B. It is part of bacterial genome
C. It encodes Cas9 protein
D. It contains repeated palindromic sequence

Ansewr: C

11) The following is a sequence you expect NOT to be recognized by a restriction endonuclease

A. CTTAAG
B. AGCT
C. GCAGCA
D. ATATAT
E. GGATCC

Answer : C

12) In order to express a human gene in bacteria , you need one of the followig :

A. The human gene to be controlled by an efficient human promoter
B. Co-expression of a human chaperone protein
C. The whole transcribed region of the human gene after RNA processing
D. The original transcription termination sequence of human gene
E. A human gene that produces a protein without cysteines

Answer: C

13) Why cannot we detect any signal in the first few cycles of quantitative PCR ?

A. SYBR green is not yet activated
B. The taq polymerase is not active
C. Limitation in the sensitivity of the instrument
D. There is no amplification taking place
E. The proper size of the amplicon has not been reached

Answer: C

14) you expressed the hormone in every plant cell, but the hormone does not function You want to identify the gene that has a mutation , but their plant genome is composed of 5000 genes . you don't know what the gene is . you can perform this technique and compare the results to the database of the normal genome

A. Quantitative PCR
B. real time PCR
C. RNA sequencing
D. next generation sequencing
E. fluorescent based sequencing

Answer: C

15) you want to study the regulatory sequence of the hormone gene including the promoter, promoter proximal element and silencer. you perform a reporter gene essay. one of the following is true:

A. you need to make cDNA from the hormone mRNA
B. you need the coding region of the hormone without introns
C. you need to use the LacZ as a reporter gene
D. you need to create an expression victor that contains different regions of regulatory sequence
E. you need to create a recombinant hormone with luciferase

Answer : D

16) your performed fluorescence based DNA sequencing of the coding region of the hormone gene in two plants ; one has a functioning hormone and other does not. you found identical homology except for one position where the peak totally changed colors . This indicates :

A. one heterozygous single point to mutation
B. Polymorphism
C. Bese insertion
D. two homozygous single point mutation
E. frameshift mutation due to the deletion

Answer : D

17) you aim to create mutations in the hormone gene. you can do this by:

A. activation of non-homologous end joining following introduction of CRISPER-Cas9 system
B. Target the gene with specific primers
C. Activation of homologous recombination following introduction of CRISPER-Cas9 system
D. Allow cells to express specific restriction endonucleases
E. Create a recombinant DNA with glutathione -S-transferase gene conjugated to the hormone gene

Answer : A

18) Proteins are tagged in order to :

A. purify them
B. retain their function
C. detect them
D. all of the above
E. A and C only

Answer : E

19) What is SYBR green ?

A. It is a molecule that terminate DNA synthesis in sequencing reaction
B. It is a molecule that activates and stabilize DNA polymerase
C. it is a molecule that binds to double-stranded DNA and fluoreces
D. it is a molecule that activates and stabilize DNA
E. it is a molecule that tags proteins

Answer : C

20) All of the following are advantages of using fluorescence-based sequencing over radioactivity-based sequencing except :

A. It detects heterozygosity
B. It is automated
C. It is safe and cheap
D. It is fast

Answer : A

21) A blue colony generated in yeast two-hybrid system indicates

A. The enzyme beta-glactosidase is inactive
B. The recombinant plasmid are successfully inserted into yeast
C. No expression of LacZ gene
D. A confirmation of protein -protein interaction
E. Lactose is metabolized

Answer : D

(you may be confused with B but the recombinant plasmid has to be inserted successfully either the colony converted to blue or not)

22) The luciferase reporter assay is used to

A. Identify transcription start sites
B. Identify introns and exons within eukaryotic genes
C. Identify termination sequences of genes
D. Identify genes
E. Identify regulatory sequences within promoters

Answer : E

23) The CRISPR part of CRISPR -Cas9 system is :

A. The gene that encodes the nuclease that cleaves viral DNA
B. A RNA molecule representing viral genome
C. The enzyme responsible for replacing a gene by another
D. A genetic component that contains parts of viral genome
E. The RNA that guides the nuclease into the host genome

Answer : D

24) Taq polymerase is specifically used in PCR due to its

A. accuracy
B. High efficiency
C. Low price
D. Availability
E. Stability at high temperature

Answer : E

25) A cloning expression vector contains all of the following exept ;

A. A promoter
B. A transcription termination sequence
C. An enhancer
D. A shine-Dalgarno sequence
E. A cloning site

Answer: C

26) Each spot in DNA microarray represents ;

A. A known DNA sequence
B. a protein with high affinity to a DNA sequence
C. A known RNA sequence
D. A heterogeneous population of DNA fragments
E. An unkown DNA fragment

Answer : A

27) The purpose of GFP conjugated to protein is:

A. Protein detection
B. Protein purification
C. Protein folding
D. Protein solubility
E. Protein secretion

Answer : A

28) 2-Why we use DNA adapters in next generation sequencing?

A. To anneal with primers
B. To stabilize the DNA strands

Answer: A

29) Taq DNA polymerase is utilized in PCR since it is?

A. Cheap
B. Available in high amounts
C. Stable at high temperatures

Answer : C

30) Which of the following is not required in expression vectors ?

A. Cloning site.
B. Promoter region.
C. Ribosome binding region.
D. Tagging sequence.
E. A selectable marker

Answer : D

31) Which of the following is not true about the CRISPR/CAS9 system?

A. Cas9 is guided by an RNA molecule
B. Breaking double stranded DNA can be repaired by the system
C. Breaking double stranded DNA can cause a mutation
D. CRISPR is a bacterial genetic that constitutes the immune system of
E. bacteria against phages

Answer : B

32) Which of the following can't be detected by the RNA-seq mechanism?

A. RNA Stability
B. Amount of transcripts
C. Significant transcripts

Answer: A

33) Which of the following is true about the LacZ system?

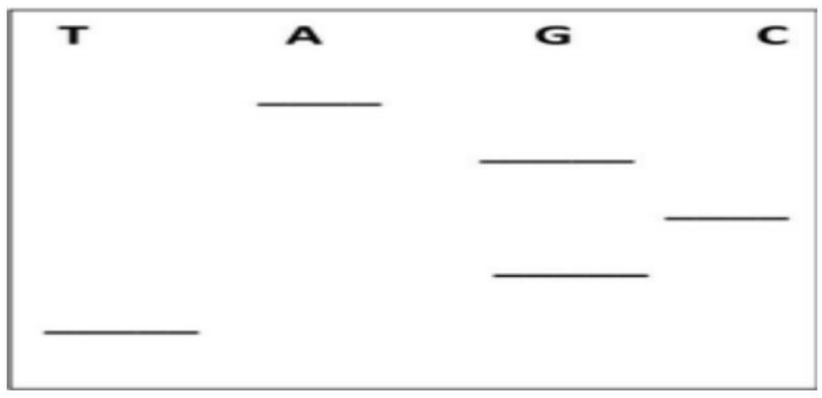
A. It gives a white colour when activated
B. It tests the binding of two proteins together
C. It tests the binding of a protein with a DNA molecule

Answer: B

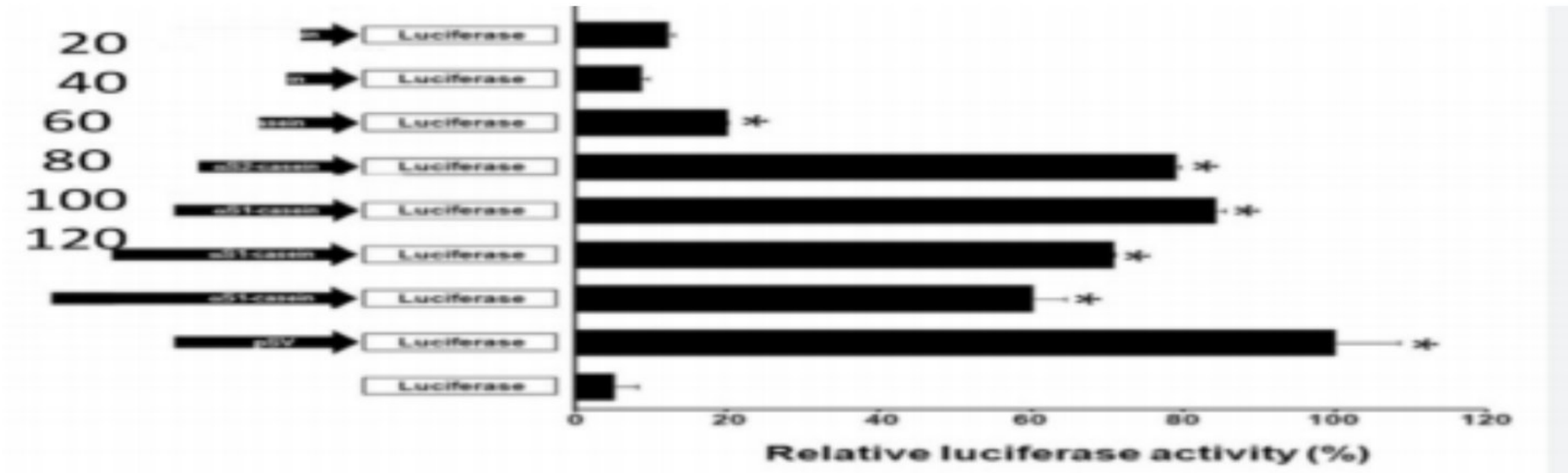
34)What is the DNA sequence when we perform premature termination of DNA synthesis by dideoxynucleotide shown here?

A. 5' – AGCGT – 3'
B. 5' – TGCGA – 3'
C. 3' – TGCGA – 5'

Answer: B



35) The promoter of a specific gene only is placed upstream of a "reporter gene" luciferase gene in a plasmid, the plasmid is transfected (inserted) into the cells, and the expression level of luciferase is measured, what can you tell?



A. There is inhibitor region within 80 and 100.
B. There is repressor region within 100 and 120.
C. Gene transcripted at best when there is no promoter.
D. Promoter does NOT affect the transcription.

Answer: B

36) A quantitative, error free, SYBR green real-time PCR assay is performed for two flu patients as shown in the chart, you can tell:

A. a-patient A has more viral content in his body than patient B
B. b-patient B has more viral content in his body than content A

Answer: A

37) DNA sequencing refers to the

A. technique used to determine the sugar sequence and DNA
B. technique used to determine the phosphate sequence in DNA molecule
C. technique used to determine the base sequence in DNA molecule
D. All of these

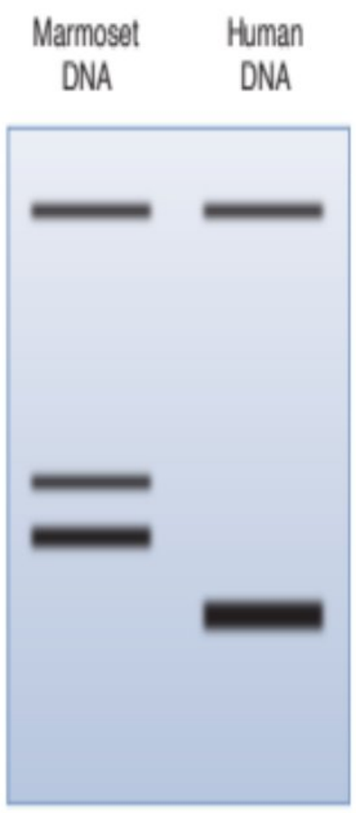
Answer: C

38) the principal of sangars method relies on

A. use of dNTPs for change termination
B. use of ddNTPs for change termination
C. use of ^{32}P for chain termination

Answer : B

39) mRNA encoding glucose 6-phosphatase was isolated from baboon liver and used to make a 32P-cDNA probe. DNA was then isolated from marmoset and from human tissue, digested with a restriction endonuclease, Southern blotted, and probed with the 32P-cDNA. Which of the following conclusions can be drawn from the results of this analysis shown below?



A. The glucose 6-phosphatase gene is present in baboon, marmoset and human liver.
B. Both marmoset and human liver express the glucose 6-phosphatase gene.
C. There are two glucose 6-phosphatase genes in the human liver.
D. The glucose 6-phosphatase gene is on different chromosomes in the marmoset and in the human.
E. The human and marmoset tissue used in this experiment is from liver

Answer: A

All 3 tissues contain the gene (the probe was produced from baboon mRNA, implying the gene is also there)

40) Restriction fragment length polymorphisms may be produced by mutations in the sites for restriction endonucleases. For instance, a single base change in the site for the nuclear SalI produces the sequence GTGGAC, which can no longer be recognized by the enzyme. What was the original sequence recognized by SalI?

A. GTAGAC
B. GCGGAC
C. CTGGAC
D. GTCGAC
E. GTGTAC

Answer : D

(All options represent single-base changes in the mutant sequence in the stem, but only choice D reestablishes a palindrome)