Biotechnology 1010 Practice Exam 2

MATCHING. Choose the item in column 2 that best matches each item in column 1.

1) Leading strand	A) DNA–cutting enzymes found primarily in bacteria	1) _____
2) Lagging strand	B) a modified nucleotide without a 3' oxygen	2) _____
3) lytic cycle	C) small, circular, self–replicating double–stranded DNA molecules	3) _____
4) Genetic engineering	D) laboratory technique for amplifying and cloning DNA	4) _____
5) Restriction enzymes	E) a lab technique used to identify bacteria containing recombinant DNA	5) _____
6) Plasmid	F) public database of DNA sequences	6) _____
7) Transformation	G) the process by which bacteria take in DNA from the surroundings	7) _____
8) Genbank	H) DNA vector that can be used to produce proteins	8) _____
9) Bioinformatics	I) The process of altering an organism's DNA	9) _____
10) Polymerase chain reaction	J) – interdisciplinary science that involves developing and applying information technology for analyzing biological data	10) _____
11) Dideoxyribonucleotide	K) the strand of newly synthesized DNA that is created continuously 5' to 3'	11) _____
12) Expression vector	L) the strand of newly synthesized DNA that is created discontinuously 5' to 3'	12) _____
13) Restriction site	M) a process of bacteriophage replication	13) _____
14) Selection	N) specific sequence of DNA nucleotides recognized and cut by a restriction enzyme	14) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

15) Which of the following techniques involves hybridizing a cDNA sample to a chip containing thousands of single–stranded DNA sequences, allowing one to study the expression of thousands of genes simultaneously? 15) _____
A) PCR
B) Southern blot
C) DNA microarray
D) FISH
E) Agarose gel electrophoresis

16) When making a complementary DNA (cDNA) library, which enzyme is used to copy mRNA into DNA? 16) _____
A) Primase
B) DNA ligase
C) Reverse transcriptase
D) RNA polymerase
E) DNA polymerase

17) In a recombinant DNA experiment, which enzyme is used to join together DNA fragments by forming phosphodiester bonds between nucleotides? Recall that this same enzyme joins together Okazaki fragments on the lagging strand during DNA replication. 17) _____
A) DNA primase
B) Reverse transcriptase
C) DNA helicase
D) DNA ligase
E) DNA polymerase

18) Which of the following vectors would be the best choice for gene transfer in plant cells? 18) _____
A) Cosmid
B) Plasmid
C) Bacterial artificial chromosome
D) Bacteriophage vector
E) Ti vector

19) Transformation in a cloning experiment is: 19) _____
A) Cutting DNA with restriction enzymes
B) A technique for determining gene copy number in a genome
C) Using PCR to clone a gene
D) Inserting DNA into bacteria cells
E) Ligating pieces of foreign DNA together

20) What is the name of the final stage of PCR? 20) _____
A) annealing
B) denaturation
C) extension
D) transformation
E) hybridization

21) Which of the following is an incorrect statement about restriction enzymes? 21) _____
A) Restriction enzymes can cut to create overlapping single–stranded ends of DNA
B) Restriction enzymes usually recognize palindromic sequences
C) Most restriction enzymes are isolated from bacteria
D) Restriction enzymes can cut to create blunt–ended pieces of DNA
E) Restriction enzymes create phosphodiester bonds between pieces of DNA in a cloning experiment

22) Approximately how large is the human genome? 22) _____
A) 3 billion bp
B) 13 million bp
C) 1 billion bp
D) 30 billion bp
E) 20,000 bp

23) Which of the following techniques is most commonly used to separate and analyze DNA by size? 23) _____
A) Hybridization
B) DNA microarray analysis
C) Agarose gel electrophoresis
D) PCR
E) DNA libraries

24) Which of the following techniques is the best choice for amplifying DNA in a laboratory? 24) _____
A) DNA replication
B) Restriction digestion
C) DNA sequencing
D) Microarray analysis
E) PCR

25) A _____ consists of cloned DNA fragments for all expressed genes in a particular tissue. 25) _____
A) cDNA library
B) shotgun library
C) Guggenheim library
D) genomic DNA library
E) PCR library

26) Dideoxyribonucleotides (ddNTPs) used for DNA sequencing lack oxygen atoms at: 26) _____
A) The 5′ carbon of the pentose sugar
B) The 1′ carbon of the pentose sugar
C) The 1′ and 2′ carbons of the pentose sugar
D) The 3′ and 5′ carbons of the pentose sugar
E) The 2′ and 3′ carbons of the pentose sugar

27) You digest the gene below with the restriction enzyme BamH1 (g/gatcc). If you run the digestion on an agarose gel, what lane represents the size of the fragments formed? 27) _____

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1   tcaatagttg gtcgtccaaa gatgccaggt gttatggttg gtatggatcc aaaggattgc
61  tatgttggtg atgaagctca atcaaaaaga ggtattttga cattgaaata tccaattgag
121 cacggtattg ttacaaattg ggaagatatg gaaaagatat gacatcacag gatccataat
181 gaataacgtg ttgctccaga ggagcatcct gtattgtaga cagaagcccc aatgaaccct
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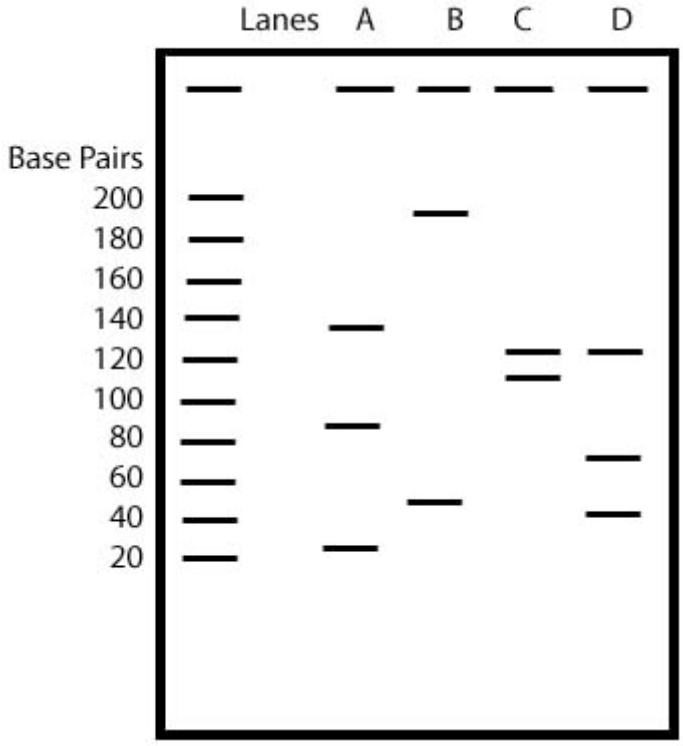

A) A B) B C) C D) D

28) What are the last two amino acids coded for in the **gene** from problem 27? 28) _____
A) Val–Phe B) Cys–Trp C) Lys–Ile D) Leu–Asn

29) On which DNA strand do you find RNA during DNA replication? 29) _____
A) leading strand
B) lagging strand
C) coding strand
D) complement strand
E) parent strand

30) Which of the following is a normal number of cycles in PCR? 30) _____
A) 25 B) 5 C) 15 D) 35

31) Which of the following is NOT an application of PCR? 31) _____
A) restriction mapping of genomes
B) studying gene expression
C) detection of DNA at crime scenes
D) diagnosis of genetic conditions
E) detection of viral infection

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

32) Identify the forward and reverse primer sequences for the gene in problem 27. (Assume the first ATG is the start codon. Design 21–nt primers. Do not include the stop codon in the reverse primer. Make sure to show the polarity of each primer.)

33) What are the four parts of an expression vector?

34) What are 5 of the 7 ingredients in a polymerase chain reaction?

35) Diagram the process of semiconservative replication of DNA by drawing a replication fork and indicating important enzymes, proteins and other components involved in this process. Provide a one–sentence description of the function of each component.

Answer Key
Testname: PRACTICETEST2BOOTH

1) K
2) L
3) M
4) I
5) A
6) C
7) G
8) F
9) J
10) D
11) B
12) H
13) N
14) E
15) C
16) C
17) D
18) E
19) D
20) C
21) E
22) A
23) C
24) E
25) A
26) E
27) D
28) C
29) B
30) A
31) A
32)
33)
34)
35)