PBG430 & PBG530 EXAM 3

Thursday March 19th 2015

Write your name here please:_____

1. Key considerations in Next-Generation, massively parallel, and high throughput DNA sequencing techniques (e.g. Illumina HiSeq, PacBio) are:
    a. How many sequencing gels a technician can run in a day
    b. Whether to use radioactively or fluorescently labeled dideoxynucleotides
    c. Whether to determine the DNA sequence in picograms or in Megabases
    d. Speed, read length, accuracy, and cost
2. In sequencing the strawberry (and other) genome(s), the term "contig" refers to
    a. The sequence of a complete chromosome, except for the centromeric region
    b. The sequence of one read (e.g. ~ 100 nucleotides)
    c. The contiguous sequence of several overlapping reads of DNA sequence
    d. The *n* number of chromosomes in Fragaria
3. Marker assisted selection (MAS) is so popular with plant breeders today because
    a. it allows the breeder to select for traits that cannot be easily, or cheaply, selected based on phenotype.
    b. it allows breeders to immediately patent genes.
    c. it does not involve PCR.
    d. it relies exclusively on morphological markers.
4. Which of the following is most true when it comes to extracting plant genomic DNA for sequencing?
    a. Longer fragments of DNA are better – restriction enzymes can then be used to cut the long fragments into target lengths
    b. Shorter fragments are better so that you do not need to use restriction enzymes
5. Which of the following "omes" relates to the DNA sequence of expressed genes?
    a. Genome
    b. Exome
    c. Proteome
    d. Metabolome
6. Reporter genes are included in transgenic constructs in order to
    a. enhance the level of expression of the transgene.
    b. limit gene expression to specific tissues.
    c. Genes that, upon expression in the transgenic plants, provide a clear indication that genetic transformation did occur, and indicate the location and the level of expression.
    d. ensure inducible expression of the transgene
7. Gene flow between Roundup Ready sugar beets and organic table beets is currently a concern in the Willamette Valley. What is the most likely vehicle by which genes will flow?
    a. Antipodals
    b. Synergids
    c. Eggs
    d. Pollen
8. Both hemizygotes and homozygotes for the C4 EPSPS 'Roundup Ready' gene still produce an enzyme that is inhibited by glyphosate but both types are resistant to the herbicide.
    a. True
    b. False

9. Site Specific Nuclease based genome editing technologies such as TALENs and CRISPRs can each induce breaks in DNA that can lead to mutations through a Non-Homologous End-Joining repair mechanism.
    a. True
    b. False
10. The key difference between transgenics and cisgenics is that
    a. Transgenics have the promoter controlling the transgene on one chromosome and the transgene coding region on a different chromosome whereas cisgenics have the promoter and transgene fused in a single construct
    b. Transgenics always have selectable markers and cisgenics never have selectable markers
    c. Most GMO crops in production today were derived by cisgenics, not transgenics
    d. Cisgenics involves non-sexual transfer of genes from the same or closely related species whereas transgenics involves non-sexual transfer of genes from species that are not sexually compatible
11. The minimal requirements for a transgene construct are
    a. promoter, coding region, and terminator
    b. coding region only
    c. selectable marker only
    d. start and stop codon
12. An example of a constitutive promoter is one that allows a transgene to
    a. be expressed in all tissues all the time.
    b. be expressed only in a specific tissue and at a specific stage of plant development.
    c. be detected under ultraviolet light
    d. migrate at will.
13. Autopolyploids will be fully fertile when
    a. there is homoeologous pairing.
    b. they are triploid.
    c. when there is quadrivalent pairing.
    d. when there is bivalent pairing.
14. Based on the formula "2n = 4x = 24" you can tell if the organism is an allotetraploid or an autotetraploid.
    a. True
    b. False
15. Aneuploids are
    a. polyploids with more than four complete sets of homologous chromosomes.
    b. doubled haploids with aneurisms.
    c. organisms with more or less than exact multiples of the "x" number.
    d. superior to diploids in terms of reproductive fitness.
16. You might expect the first generation of autotetraploid maize you develop by treating diploid maize (2n = 2x = 20) with colchicine to show sterility because of
    a. problems in mitosis
    b. induced cytoplasmic male sterility
    c. problems in meiosis
    d. induced self-incompatibility
17. If 2n = 6x = 42 wheat (AABBDD) is crossed with 2n = 2x = 14 rye (RR) and the F1 plant is doubled with colchicine, the F2 plants will be
    a. 2n = 6x = 42
    b. 2n = 2x = 14

c. 2n = 6x = 49
d. 2n = 8x = 56

18. Pairing of homoeologous chromosomes occurs in
    a. Autopolyploids
    b. Allopolyploids, all the time, and leads to complete fertility
    c. Allopolyploids, rarely, and leads to sterility
    d. Diploids
19. You are hired to breed seedless (3x) watermelons. Which of the following strategies is likely to be most successful and efficient?
    a. Self-pollinate resistant triploids.
    b. Cross unrelated triploids
    c. Select for unreduced gametes in triploids.
    d. Cross tetraploids with diploids to produce triploids.
20. Euploidy is the situation where
    a. an organism has more or less chromosomes than an exact multiple of the x umber
    b. an organism has exact multiples of the basic x number
    c. an organism is a 3N from Europe
    d. an organism has no centromeres
21. If you have a species that is 2n = 2x = 14 (RR) and your cross it with a related hexaploid species (2n = 6x = 42; AABBDD) the F1 will be
    a. Sterile
    b. Have 42 chromosomes
    c. Both a and b, above
    d. Neither a nor b, above
22. In the preceding question, if the ABDR plant undergoes chromosome doubling, the resulting plant will be
    a. Diploid
    b. Tetraploid
    c. Hexaploid
    d. Octaploid
23. The Ph1 pairing locus in bread wheat is important because:
    a. it controls which bread wheat genotypes can be mated
    b. it promotes pairing between homologous chromosomes
    c. it disrupts spindle formation during meiosis
    d. it controls the production of gluten
24. Which of the following methods have been used to produce doubled haploid plants:
    a. Pollination with a related species
    b. Isolation and culture of pollen grains (microspores)
    c. Crossing with a ‘haploid inducer’ line
    d. All of the above
25. Stress treatments such as cold and/or nutrient changes applied at the early to mid-nucleate stage of pollen development can change the development of pollen grains from the normal gametophytic (pollen) pathway to a sporophytic (embryo) pathway:
    a. True
    b. False
26. Potato is an autotetraploid and can therefore have up to 4 copies of a resistant allele at a disease resistance locus. The advantage of this in potato breeding is that when one parent has 3 or more

copies of the resistant allele, all the progeny are all expected to have at least one resistant allele irrespective of the contribution from the other parent.

a. True
b. False

27. SNPs – and other molecular markers – can be used to generate maps. Which of the following are examples of the utility of linkage maps?
    a. Determine evolutionary relationships
    b. Find the genome location of target genes
    c. Determine how many base pairs a target gene is from the centromere
    d. a and b, above
    e. All of the above
28. Monomorphic markers are
    a. Not informative for linkage map construction
    b. Useful for identifying regions of the genome that may indicate shared ancestry in two individuals
    c. Both of the above
    d. None of the above
29. Which of the following best describes three cyclic steps in PCR, in the correct order?
    a. Denaturing DNA to make it single stranded, primer annealing, synthesis of a new DNA strand
    b. Primer annealing, denaturing DNA to make it single stranded, synthesis of a new DNA strand
    c. Synthesis of a new DNA strand, primer annealing, denaturing DNA to make it single stranded
30. If your goal is to study promoter and dark matter sequences, what type of library would you use?
    a. cDNA
    b. gDNA
    c. rRNA
    d. tRNA
31. Which of the following two elements are essential for making cDNA from mRNA?
    a. A 5'cap and TAQ polymerase
    b. A 3' poly-A tail and reverse transcriptase
    c. An oligo corresponding to the target promoter and RNA polymerase
    d. Micron beads, adapters, and emulsion PCR
32. Locus Specific Marker systems such as KASP or TAQMAN can be used by breeders to:
    a. Select for specific alleles at a few key genetic loci
    b. Identify which parents carry desirable alleles at specific loci
    c. Provide a simple cost-effective system for marker-assisted breeding
    d. All of the above.
33. The primers that are used for a PCR reaction to amplify genomic DNA consist of
    a. Taq polymerase.
    b. Amino acids.
    c. Oligonucelotides.
    d. Dideoxynucleotides.
34. Restriction enzymes are such useful molecular tools because
    a. They cut up bacteria that invade and contaminate sterile cell cultures
    b. They cut DNA at defined recognition sequences and the longer the target sequence the more often it occurs in any given sample of DNA
    c. They make molecular biology more exciting because you never know at what DNA sequence they will cut

d. They cut DNA at defined recognition sequences and the shorter the target sequence the more often it occurs in any given sample of DNA

35. Clones in a cDNA library will be shorter than the original genomic coding sequences because the
    a. promoters are removed.
    b. telomeres shorten with each replication.
    c. introns were removed during mRNA processing.
    d. ribosomes removed unnecessary information.
36. For DNA marker analysis, electrophoresis is used to
    a. increase the number of desired fragments.
    b. extract DNA from the target organism.
    c. radioactively label fragments.
    d. separate DNA fragments by size.
37. The highest temperature steps in a PCR reaction are necessary for
    a. denaturation of the DNA.
    b. primer annealing.
    c. primer extension.
    d. cutting at palindromic sequences
38. A genomic library consists of
    a. DNA fragments generated by reverse transcriptase of mRNA molecules.
    b. DNA fragments generated by irradiation of nuclei.
    c. DNA fragments generated by a restriction digest of total nuclear DNA.
    d. mRNA transcripts.
39. When genotyping an allopolyploid, homoeologous SNP markers can be used to identify:
    a. the ploidy level of the genotype
    b. the ancestral species that the SNP originated in
    c. the size of the genome of the species
40. Genome wide molecular marker assays such as the Affymetrix Axiom SNP array can be applied to crop plants to provide an efficient marker-assisted breeding strategy to screen large F2 populations for individuals carrying the desirable alleles at just one locus:
    a. True
    b. False
41. Genotyping by Sequencing (GbS) can provide a large number of genome wide polymorphisms at a relatively low cost for any species without needing a reference sequence
    a. True
    b. False
42. You read that wheat has maternal inheritance of organelles (chloroplasts and mitochondria). This means that androgenetic doubled haploid systems (e.g. anther culture) will not work for wheat since all doubled haploids will be albinos.
    a. True
    b. False
43. You compare two linkage maps. Each map is based on a different population of the same species. Population “A x B” is derived from “normal” parents. Population “C x D” is derived from parents homozygous for an inverted segment of one chromosome. Which of the following is the most noticeable difference that you would expect from the comparison?
    a. Marker order will be the same in the two maps.
    b. Marker order will be the same but distances between markers will be different.
    c. Marker order will be inverted in C x D compared to A x B at the inverted region.
    d. None of the above.

44. The C-value paradox refers most correctly refers to
    a. The fact that polyploids always have bigger genomes than diploids
    b. Chromosomes architecture varies greatly between eukaryotes and prokaryotes
    c. At a given ploidy level (e.g. when comparing two different diploids) genome size is not related to chromosome number or the number of genes
45. A recessive trait can be due to
    a. complete deletion of a gene
    b. deletions or insertions of multiple nucleotides at key regions of a gene
    c. nucleotide substitutions at key regions of a gene
    d. all of the above
46. The heritability of plant height estimated from the progeny of a cross between the wheat varieties Avalon and Cadenza is calculated to be 0. This means that in this experiment differences in plant height among the wheat plants in the population are due to causes other than genetics (i.e. soil nutrition, water availability, etc)
    a. True
    b. False
47. Following up on question # 46, which of the following is true?
    a. The heritability of stem length in all wheat populations will be 0
    b. If you did a better job of controlling environmental variation in a subsequent experiment involving the Avalon x Cadenza population, the heritability might increase
    c. Heritability is so difficult to calculate that it is of little practical utility
    d. Stem length is a qualitative trait and therefore has no heritability
48. Substitution of one base for another in a DNA sequence is an example of
    a. frameshift
    b. transvestitism
    c. transversion or transition
49. If you wanted to determine how many introns are in a gene, your best choice would be which type of sequence?
    a. cDNA
    b. EST
    c. Genomic DNA
    d. Mature mRNA
50. In the case of two-locus epistasis (assume the loci show independent assortment), which of the following ratios would NOT be expected in an F1-derived doubled haploid population?
    a. 2:2 (= 1:1)
    b. 3:1
    c. 1:2:1
    d. 9:7
51. Which of the following elements of a gene best describes the coding sequence?
    a. Region between transcription start site and start codon
    b. Region between start codon and stop codon
    c. 3' nucleotide sequence that signals the end of translation
    d. Binding site for RNA polymerase
52. For any given polypeptide chain, except those containing only Met and Trp, the exact DNA sequence cannot be determined (use table at the end if necessary).
    a. True
    b. False

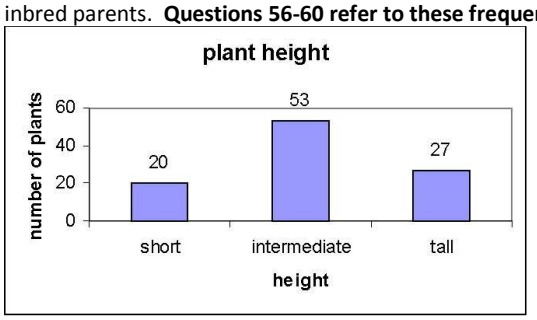
Comment [TWT1]: Also correct; not on key so extra marks added in manually to sheet.

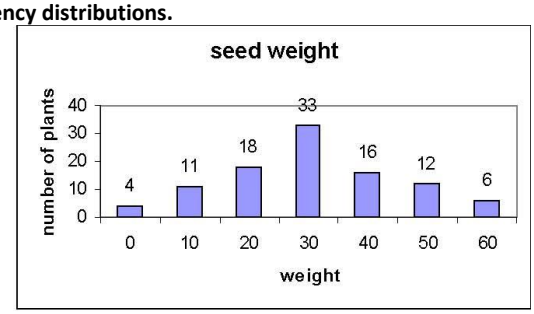
53. In the case of partial dominance for a Naked Eye Polymorphism determined by alleles at a single locus, the homozygous dominant, heterozygote, and homozygous recessive individuals will:
    a. all look different
    b. all look the same
    c. occur in 1:1:1 ratio
    d. occur in a 9:3:7 ratio
54. Markers A, B, and C are linked together on the same chromosome in the order ABC and there is segregation at all three loci. You use the recombination fractions between A and B and B and C to calculate the expected number of double crossovers as 5. You observe no double cross-overs in your population. Do you conclude that Interference is:
    a. Negative
    b. Positive
    c. Complete
    d. Absent
55. The following example showing sequence and codon alignments, as well as the translated protein, is an example of what type of mutation?
    a. Frameshift
    b. Missense
    c. Silent
    d. Nonsense

*** CTG GGA GAT TAT GGC TTT AAG***
*** CTG GGA GAT TAT GGC TTC AAG*** alignment

Leu Gly Asp Tyr Gly Phe Lys
Leu Gly Asp Tyr Gly Phe Lys translation

Consider the following phenotypic frequency distributions for plant height and seed weight observed in an F2 population of 100 plants developed by self pollinating the F1 of a cross between two completely inbred parents. **Questions 56-60 refer to these frequency distributions.**





56. Plant height is best described as showing what type of inheritance?
    a. Quantitative
    b. Qualitative
    c. Monomorphic
    d. Impenetrable
57. Seed weight is best described as showing what type of inheritance?
    a. Quantitative
    b. Qualitative
    c. Monomorphic

d. Impenetrable

58. If you decided to perform a chi square test on the plant height data, how many degrees of freedom would you use for your test?
    a. 1
    b. 2
    c. 3
    d. 4
59. If your calculated chi square test for plant height showed excellent fit to the expected ratio, how many loci do you hypothesize are involved in determining plant height?
    a. 1
    b. 2
    c. 3
    d. 4
60. If the species in which you are studying plant height is a diploid, how many alleles are possible at the height locus in any single plant?
    a. 1
    b. 2
    c. 3
    d. 4
61. Expected dihybrid ratios for backcross and doubled haploid progeny of crosses between two completely inbred parents are
    a. 1:1
    b. 1:1:1
    c. 1:1:1:1
    d. 1:1:1:1:1:1:1
62. In a chi square test for segregation of SNP alleles at a locus in a population of doubled haploids, you test for a 3:1 ratio and you calculate a chi square value of 10.7 (See table 2.2 at the end of the exam). Will you therefore:
    a. Accept the null hypothesis.
    b. Reject the null hypothesis and conclude that you chose the wrong ratio to test for doubled haploids.
    c. Reject the null hypothesis and conclude that alleles at this locus show segregation distortion.
    d. Conclude you should never use a chi square test for molecular marker data.
63. If you expect a 9:3:3:1 ratio, how may degrees of freedom (df) will you use for your chi square test?
    a. 1
    b. 2
    c. 3
    d. 4
64. If you self a diploid F1 plant for three generations to F4, what % of the original heterozygosity would you expect to be retained in any one progeny? Assume each of the parents of the F1 was completely homozygous but was fixed for contrasting alleles at a genetic locus.
    a. 100%
    b. 50%
    c. 33%
    d. 25%
    e. 12.5%
65. Apomixis is a phenomenon in plants that gives rise to seeds without sex due to
    a. parthenogenesis

b. parthenocarpy
c. pleiotropy
d. poltroonism

66. In the case of the T cytoplasm source of male sterility for hybrid corn breeding, susceptibility of lines with the male sterile cytoplasm to the Southern Corn Leaf Blight disease is an example of
    a. Segregation
    b. Independent assortment
    c. Pleiotropy
    d. Mueller's ratchet
67. In a tri-nucleate pollen grain,
    a. the mitochondria are all 2n.
    b. two of the nuclei will become sperms while the third will become the pollen tube.
    c. the three nuclei will fuse to give triploid endosperm.
    d. two of the nuclei will become tube nuclei while the third will become the sperm.
68. Which of the following is one of the principal disadvantages of sexual reproduction in plants?
    a. In monoecious species, half of the reproductive effort is wasted in the production of males.
    b. In dioecious species, half of the reproductive effort is wasted in the production of males.
    c. The XY chromosome system ensures that female offspring will outnumber male offspring 2:1.
    d. The frequent failure of spindle fibers to form at mitosis.
69. Advantages of cross-pollination as compared to self-pollination include avoiding inbreeding depression. Inbreeding depression refers to
    a. Recurring depression from remaining indoors.
    b. Too much effort devoted to producing male plants.
    c. Phenotypes due to interaction between dominant alleles at different loci.
    d. Negative phenotypes due to homozygosity for deleterious recessive alleles.
70. If a Megaspore Mother Cell (MMC) has the genotype "AABBCC", each of the four "n" cells resulting from meiosis will have a different genotype.
    a. True
    b. False
71. In terms of the genetics of parents and progeny, asexual reproduction from somatic tissue and propagation from apomictic seeds are equivalent.
    a. True
    b. False
72. In plants, the ancestral condition was dioecious. Monoecious and hermaphroditic plans evolved through the progressive elimination of sex chromosomes.
    a. True
    b. False

73. Which of the following mechanisms will encourage cross pollination in hermaphroditic and/ or monoecious plants?
    a. Spatial distribution of sexes
    b. Differential maturation rates of pollen and stigma
    c. Population density
    d. All of the above
74. If doubled haploids are derived from XY (male) asparagus plants, the progeny will segregate
    a. 1XX:2XY:1YY
    b. 1 YY: 1 XX

c. 1XY:1XX
d. 3YY:1XY

75. Many plants with perfect flowers do not self-pollinate, or self-pollination is relatively infrequent compared to cross-pollination. This is because
    a. Perfect flowers do not have male organs
    b. Recombination between X and Y chromosomes prevents self pollination
    c. There are often advantages to heterozygosity, including avoidance of inbreeding depression
    d. The flowers are self-compatible
76. Telomeres are of particular interest due to
    a. the role of these structures in spindle fiber attachment
    b. the relationship of telomere shortening with aging
    c. the key role they play in assembly of ribosomes
    d. what happens to them after mRNA processing
77. A plant homozygous for a duplication is expected to be
    a. semigamous
    b. fully fertile
    c. completely sterile
    d. semi-sterile
78. The synaptonemal complex is
    a. the protein matrix that surrounds the centromere
    b. the end of the chromosome
    c. observed during Pachynema (Pachytene) between paired homologous chromosomes
    d. the point of attachment of spindle fibers
79. Transposable elements have primary responsibility for the C-value paradox in higher plants. This means that
    a. the elements replace thymine with cytosine, leading to higher percentages of cytosine than expected
    b. the elements cause genome expansion
    c. transposable elements cause genome contraction
    d. if you centrifuge total DNA extracts, the transposable elements rise to the top as the lightest fraction
80. Independent assortment of alleles at two or more loci can be determined by
    a. Random alignment of non-homologous chromosomes at Metaphase I
    b. Crossover between homologous chromosomes at Pachynema
    c. a. and b. above
    d. None of the above
81. If a plant that is 2n = 2x = 20 undergoes mitosis, the result will be
    a. 2 daughter cells, each 2n = 20
    b. 4 daughter cells, each n = 10
82. If a plant that is 2n = 2x = 20 undergoes meiosis, the result will be
    a. 2 daughter cells, each 2n = 20
    b. 4 daughter cells, each n = 10
83. Where would you most likely see active transcription of genes?
    a. Euchromatin
    b. Constitutive heterochromatin
    c. Epigenetically silenced chromatin
84. If recombination between two genes is 50% this means that
    a. The two genes are very far apart on the same chromosome or on different chromosomes.

b. The two genes are exactly 50 cM apart.
c. The two genes are very close together on the same chromosome.
d. These genes are pleiotropic.

Chromosome 3 of *Capsicum burnem* is reported to be 150 centiMorgans long. The R and H loci are shown near each other on the chromosome 3 linkage map. One locus controls pod color (alleles R_ and rr determine red and green respectively) and the other controls flavor (alleles H_ and hh determine hot and mild flavor, respectively). You score the two traits in 100 doubled haploid progeny derived from the F1 of the cross between two inbred parents. You record the following numbers of plants in each category:

Red and mild	Red and hot	Green and mild	Green and hot
35	10	10	45

Use the data in the above table to answer questions 85-88.

85. The "parental" classes are
    a. Red/hot and Green/mild
    b. Red/mild and Green/hot
    c. Not identifiable given these data
86. Because the two loci are reported to be on the same chromosome, you want to see if they are linked in your cross. To do so, you would divide
    a. The parental classes/100
    b. The non-parental classes/100
    c. The non-parental + parental classes/100
87. You calculate the chi-square for a 1:1 relationship between the "parental" and "recombinant" classes as 136 and you also estimate that the frequency of recombination is 20%. Would you conclude that the report of the two loci being on the same chromosome is wrong? (see table 2.2 for chi-square tests).
    a. Yes
    b. No
88. You expect your calculated recombination % to be
    a. Lower than the map distance cM value
    b. The same as the map distance cM value
    c. Higher than the map distance cM value
    d. The map distance cM value multiplied by 0.150
89. Which of the following terms best describes linkage?
    a. Proportion of individuals in a population with the same allele that show the same phenotype
    b. One gene confers more than one phenotypic trait
    c. Two genes in close proximity on the same chromosome
    d. Two genes that interact
    e. Two genes with a single regulatory region
90. You determine that the linkage maps of *Fragaria* and *Prunus* have blocks of the same loci in the same order but have different numbers of chromosomes. This is an example of
    a. analogy
    b. xenology
    c. homoeology
    d. synteny
91. In 2015, linkage maps can be made from the following molecular marker types:
    a. Single Nucleotide Polymorphisms (SNPs)
    b. Insertion/Deletion (INDEL) based markers
    c. Simple Sequence Repeats (SSRs) or microsatellites

d. Genotyping by Sequencing
e. all of the above

92. DNA replication is semiconservative because
a. only one parent strand serves as a template for transcription
b. both parental strands serve as templates for replication
c. DNA polymerase is pro-choice
d. promoters have consensus sequences

93. In a deoxyribonucleotide, 5' and 3' refer to the
a. start site for translation.
b. start site for transcription.
c. carbons where (respectively) the phosphate and hydroxyl groups are attached.
d. carbons where (respectively) the pyrimidine and purine bases are attached.

94. In higher plants, each chromosome has a single bidirectional origin of DNA replication located at
a. the centromere.
b. the promoter.
c. the dark matter.
d. none of the above.

95. Transcription of genes located on the 20 chromosomes of maize occurs
a. in the cytoplasm
b. in the nucleus
c. in both the nucleus and cytoplasm
d. only in translocation heterozygotes

96. The DNA code is degenerate because
a. The same codons specify different amino acids in different organisms
b. Start and stop codons are reversed in prokaryotes and eukaryotes
c. The same codon can specify multiple amino acids
d. The same amino acid can be specified by more than one codon

97. Ribosomes are
a. part of the mitochondrion
b. coded for by nuclear genes
c. formed by exon shuffling
d. double stranded RNA molecules

98. During the elongation phase of the translation process, the next incoming tRNA will
a. arrive at the ribosome's P site
b. carry an amino acid at its 5' end
c. have an anti-codon sequence complementary with the codon in the mRNA

99. When RNA has a regulatory role, as in RNAi, this involves
a. Methylating the DNA
b. Introducing premature stop codons
c. Removing genes from the DNA
d. Degrading mRNA transcripts

100. A transcription factor is a
a. gene whose protein product regulates the expression of other genes
b. signal for terminating synthesis of mRNA
c. type of promoter used to visualize expression of transgenes
d. special sequence in 18S rRNA s

Table 2-2 Critical Values of the χ^2 Distribution

	P									
df	0.995	0.975	0.9	0.5	0.1	0.05	0.025	0.01	0.005	df
1	.000	.000	0.016	0.455	2.706	3.841	5.024	6.635	7.879	1
2	0.010	0.051	0.211	1.386	4.605	5.991	7.378	9.210	10.597	2
3	0.072	0.216	0.584	2.366	6.251	7.815	9.348	11.345	12.838	3
4	0.207	0.484	1.064	3.357	7.779	9.488	11.143	13.277	14.860	4
5	0.412	0.831	1.610	4.351	9.236	11.070	12.832	15.086	16.750	5
6	0.676	1.237	2.204	5.348	10.645	12.592	14.449	16.812	18.548	6
7	0.989	1.690	2.833	6.346	12.017	14.067	16.013	18.475	20.278	7
8	1.344	2.180	3.490	7.344	13.362	15.507	17.535	20.090	21.955	8
9	1.735	2.700	4.168	8.343	14.684	16.919	19.023	21.666	23.589	9
10	2.156	3.247	4.865	9.342	15.987	18.307	20.483	23.209	25.188	10
11	2.603	3.816	5.578	10.341	17.275	19.675	21.920	24.725	26.757	11
12	3.074	4.404	6.304	11.340	18.549	21.026	23.337	26.217	28.300	12
13	3.565	5.009	7.042	12.340	19.812	22.362	24.736	27.688	29.819	13
14	4.075	5.629	7.790	13.339	21.064	23.685	26.119	29.141	31.319	14
15	4.601	6.262	8.547	14.339	22.307	24.996	27.488	30.578	32.801	15