單選題：請就下列各題所列選項中，挑選最適合者(每題1分，30題共30分)請將答案依題號填入選擇題作答區

1) The centromere is located _____ of a telocentric chromosome.
A) between the center and one end
B) on both ends
C) at one end
D) in the center
E) None of the above

2) The ultimate source of all genetic variation in populations is
A) selection.
B) mutation.
C) transposition.
D) recombination.
E) replication.

3) Which of the following organisms have environmental sex determination?
A) Roundworms
B) Butterflies
C) Snapping turtles
D) Birds
E) Kangaroos

4) Gametes and spores are both haploid cells. Gametes form by _____ and spores form by _____.
A) meiosis, mitosis
B) meiosis, meiosis
C) mitosis, meiosis
D) A and B
E) A, B, and C

5) A person who is known to have a particular genotype does not show the phenotype specified by the gene. This is an example of
A) incomplete penetrance.
B) phenotype switching.
C) sex reversal.
D) incomplete dominance.
E) epistasis.

6) Multiple elements of the genome (chromosomal regions) linked through genetic analysis with specific phenotypic traits are also known as
A) polygenic loci.
B) multifactorial traits.
C) discontinous traits.
D) quantitative trait loci.
E) continuous traits.

7) When does crossing over occur?
A) Prophase II of meiosis
B) Prophase I of meiosis
C) Interphase prior to meiosis
D) Anytime during the second meiotic division

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E) Anytime at random during division

8) X-linked genes in humans are easier to study than autosomal genes because
A) hemizygosity in males allows the effects of genotypic pairings to be observed.
B) they do not have as high a recombination rate.
C) Suitable pedigrees are easily available.
D) recombination frequencies are lower.
E) there are fewer genes to deal with.

9) Seedless bananas are produced from
A) sterile tetraploid allopolyploid plants.
B) monoploid plants grown from unfertilized seeds.
C) sterile triploid autopolyploid plants.
D) fertile diploid plants that are unfertilized.
E) both C and D.

10) Some parasitic or symbiotic organisms are passed from parent to offspring transovarially—through the egg—by invading the egg cytoplasm. A general term for this phenomenon is
A) extranuclear inheritance.
B) extrachromosomal inheritance.
C) infectious heredity.
D) parasitic inheritance.
E) Lamarckian heredity.

11) In the Hardy-Weinberg model, the ideal population is
A) free of mutations.
B) non-migrating.
C) very large.
D) randomly mating.
E) all of the above.

12) Which of the following is a useful characteristic for a candidate for Mendelian studies?
A) Fast growing, late to reproduce, and producing few offspring
B) Slow growing, late to reproduce, and producing many offspring
C) Fast growing, early to reproduce, and producing many offspring
D) Fast growing and nonreproductive
E) Slow growing, early to reproduce, and producing few offspring.

13) The accuracy of map distances based on recombination frequencies
A) decreases as the chance of multiple crossovers increases.
B) is greatest when genes are at a distance of 7 mu or less.
C) decreases as the distance between genes increases.
D) increases as the distance between genes increases.
E) All but D.

14) Which of the following is not a form of genetic drift?
A) Founder event
B) Nonrandom mating
C) Heterozygote advantage
D) Population bottleneck
E) All of the above are forms of genetic drift.

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15) A couple with three girls is expecting a fourth child. The probability that this child is also a girl is
A) 1/8 B) 1/2 C) 1/16 D) 1/32 E) 1/4

16) After a region of DNA has been replicated, _____ removes the RNA primers.
A) RNA primase
B) DNA polymerase I
C) DNA ligase
D) DNA polymerase III
E) DNA helicase

17) What was the significance of the Beadle and Tatum experiment?
A) It led to the discovery of the genetic code.
B) It resulted in the Central Dogma.
C) It led to the discovery of bread mold.
D) It resulted in the one-gene–one-enzyme hypothesis.
E) It showed that X-rays were mutagens.

18) Karyotype analysis
A) substitutes defective alleles with normal ones.
B) is a surgical technique that separates chromosomes that have failed to segregate properly during meiosis.
C) is used in prenatal diagnosis to detect chromosomal mutations and metabolic disorders in embryos.
D) is a means of detecting and reducing mutagenic agents.
E) None of these

19) In eukaryotes, the initiation complex binds DNA at the
A) GC box.
B) Pribnow box.
C) CAAT box.
D) TATA box.
E) GTF region.

20) The sigma factor of RNA polymerase is necessary for
A) specific recognition of promoter elements.
B) elongation of the mRNA chain.
C) formation of the transcription bubble.
D) termination of the mRNA chain.
E) maximum transcription of the gene.

21) Self-cleaving RNAs that function catalytically are called
A) snRNAs.
B) ribosomes.
C) ribozymes.
D) spliceosomes.
E) snRNPs.

22) An alpha helix and a beta-pleated sheet are types of
A) protein quaternary structure.
B) protein tertiary structure.

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C) tRNA secondary structure.
D) protein primary structure.
E) protein secondary structure.

23) Thymine dimers are commonly caused by
A) intercalating agents.
B) ultraviolet radiation.
C) alkylating agents.
D) ionizing radiation such as X-rays.
E) tautomers.

24) Barbara McClintock's contemporaries were hostile to her discovery of mobile genetic elements because
A) her experimental data did not support her interpretations.
B) she was a woman in a man's world.
C) her ideas were in contradiction to the accepted model of a static arrangement of genes on chromosomes.
D) her previous contributions to cytogenetics had not been recognized.
E) she used unconventional laboratory techniques.

25) Bacteria protect their own DNA from restriction enzyme damage by adding _____ groups to certain nucleotides.
A) methyl B) hydroxyl C) phosphate D) amino E) carboxyl

26) Allelic variants differing by a single nucleotide are called
A) single-nucleotide polymorphisms (SNPs).
B) monomorphic alleles (MMAs).
C) uninucleotidic variants (UNVs).
D) monoallelic polymorphisms (MAPs).
E) none of the above.

27) The subfield of genomics that deals with gene expression and interaction is
A) comparative genomics.
B) hypothetical genomics.
C) structural genomics.
D) expression genomics.
E) functional genomics.

28) Candidate open reading frames of a genome are identified by searching for
A) a promoter.
B) introns and exons.
C) a start codon "in frame" with a stop codon.
D) a start codon.
E) all of the above.

29) Unlike prokaryotes, much gene regulation in eukaryotes
A) is controlled by inhibitory proteins.
B) is controlled at the level of transcript processing.
C) takes place at the transcriptional level.
D) is based on post-translational modification.
E) None of the above

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30) The protein cofactor *ubiquitin* is involved in
A) degradation of mRNA transcripts.
B) selective transport of mature mRNAs in the cytoplasm.
C) differential splicing of pre-mRNA molecules.
D) construction of the cytoskeleton.
E) degradation of proteins.

是非題：請就下列各題的敘述，以T標示正確者F標示錯誤者(每題1分，20題共20分)請將答案依題號填入選擇題作答區的A格位。

31) The centrosomes are highly conserved chromosome regions that interact with spindle fibers during cell division.

32) Phenotypic traits of members of the same family have high heritability.

33) A coefficient of coincidence of zero is the same as an interference value of zero.

34) Inversion loops form in order to allow homologous chromosomes containing homozygous inversions to pair properly during meiosis.

35) For two populations to remain genetically homogenized, a significant proportion of the population of each must be exchanged at least every other generation.

36) The eukaryotic nuclear envelope dissolves during cell division.

37) X-linked or sex-linked traits express in males but not in females.

38) In descriptive statistics, the median is defined as the value exactly in the center of a distribution, with half the values lying above and half lying below.

39) Mitotic crossover events involving mutant alleles produce recombinant phenotypes in the progeny of a cross.

40) The genetic code is universal, including organisms of all kingdoms and organellar DNA.

41) At the growing end of a DNA chain, DNA polymerase catalyzes the formation of a disulfide bond between the 3'-OH group of the deoxyribose on the last nucleotide and the 5'-phosphate of the dNTP precursor.

42) Group I introns, such as those found in *Tetrahymena*, are unique in that they are excised from mRNA by a protein-driven catalytic reaction.

43) With absolutely no exception, all organisms utilize the same genetic code for the production of proteins.

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44) LINEs and SINEs are repetitive sequences in humans that are also retrotransposons that can insert into genes and cause disease.

45) A tautomer is an uncommon form of DNA base that naturally exists along with the common form.

46) Cloning vectors generally possess unique restriction sites and dominant selectable markers.

47) RT-PCR is a PCR technique used in amplifying DNA copies of mRNA.

48) Much plant genetic engineering is accomplished with the soil bacterium *Agrobacter tumefaciens*.

49) The "transcriptome" is the complete set of polypeptides produced by an organism.

50) A relatively new field that combines elements of genomics with computer science and mathematics is called *bioinformatics*.

簡答題：請在答案紙上標明題號依序回答下列各題(12題共50分，各題配分如各題題目後所示)請將答案填入非選擇題作答區

51) A monohybrid (1-gene) cross yields 4 genotypic classes, and a dihybrid (2-gene) cross yields 16. How many classes are expected from a tetrahybrid (4-gene) cross? (4分)

52) What are the forms of crossovers that may occur between two genes that are far apart on the same chromosome?(4分)

53) What are the possible segregation patterns and genotype ratios of genes *C* and *c* in a linear tetrad in the case of second-division segregation?(4分)

54) Red-green color blindness is an X-linked trait. In a population genetic study, 1,000 people, 500 men and 500 women, were tested for this trait, and 35 men were found to be color blind. Use this information to compute the frequency of the color blindness allele and the wild-type allele in this population, and estimate the expected number of carrier females.(4分)

55) List and briefly define the ways in which genetic variation is generated. (4分)

56) A nonalbino man and a nonalbino woman have several children, one of whom is albino. (a) What can you conclude about the genotype of the mother? (b) What is the probability that the nonalbino children are heterozygous?(5分)

57) In eukaryotes, what is the difference between promoter proximal elements in "housekeeping genes" vs. cell-specific genes, and how does this relate to gene expression? (4分)

58) What is a retrotransposon, and how does it differ from typical transposons? (4分)

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59) Say you were using random PCR primers to amplify fragments of DNA. Would you expect to get more or less amplification products if you set the PCR machine at a relatively higher or lower annealing temperature, respectively, and why? (4分)

60) Considerable concern has been voiced over engineering crop plants with certain kinds of traits, notably the expression of pesticide genes and herbicide resistance, for fear that such traits may find their way into natural plant populations, including weeds. How might this be prevented? (4分)

61) Rapid detection of SNPs, which are allelic variants, can be accomplished with DNA microarrays. If a microarray is set up for a set of genes, including all variants, outline a general procedure for quickly assaying the genotype of multiple individuals for that set of genes. (5分)

62) In genetic imprinting, expression depends on the parent of origin of a given allele. How might imprinting affect the expression of a hypothetical autosomal disease that expresses in dominant fashion and recessive fashion, and how might imprinting be detected? (4分)

試題隨卷繳回