

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) A Barr body is an example of
  - A) constitutive heterochromatin.
  - B) facultative euchromatin.
  - C) facultative heterochromatin.
  - D) constitutive euchromatin.
  - E) a nucleosome.
  
- 2) Which of the following is not found in a eukaryotic promoter?
  - A) -10 box
  - B) GC box
  - C) CAAT box
  - D) TATA box
  - E) None of these are found in a eukaryotic promoter.
  
- 3) A purine is a \_\_\_\_\_ molecule, while a pyrimidine is a \_\_\_\_\_ molecule.
  - A) one-ring, one-ring
  - B) one-ring, two-ring
  - C) two-ring, one-ring
  - D) two-ring, three-ring
  - E) two-ring, two-ring
  
- 4) What did Meselson and Stahl's experiment demonstrate?
  - A) DNA replication is discontinuous.
  - B) DNA replication is conservative.
  - C) DNA replication is dispersive.
  - D) DNA replication is semiconservative.
  - E) DNA replication is sometimes conservative and sometimes semiconservative.
  
- 5) A mutation that has pleiotropic consequences
  - A) may result in only slight symptoms in a person with the mutation.
  - B) cannot be detected by enzyme assay.
  - C) is only detected in homozygotes.
  - D) has widespread consequences in the affected person.
  - E) results in a single symptom in the affected person.
  
- 6) Which parts of a eukaryotic gene are transcribed?
  - A) Both exons and introns
  - B) Exons, introns, promoter, and terminator sequence
  - C) Only the introns
  - D) Only the exons
  - E) It depends on the gene.
  
- 7) The deamination of cytosine creates
  - A) 5-bromouracil.
  - B) uracil.
  - C) 5-methyl cytosine.
  - D) thymine.
  - E) 2-aminopurine.
  
- 8) Xeroderma pigmentosum is a human genetic disease caused by
  - A) failure to produce pigment that protects the skin cells from UV light exposure.
  - B) mutations that inactivate tumor suppressor genes.

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- C) defective DNA excision-repair mechanisms.  
 D) elevated levels of cholesterol in the blood.  
 E) loss of genes controlling the SOS response.
- 9) Approximately what percentage of the human genome consists of repetitive DNA?  
 A) 85 percent  
 B) 50 percent  
 C) 25 percent  
 D) 3 percent  
 E) 97 percent
- 10) Ti plasmids are approximately \_\_\_\_\_ the related pUC19 plasmids.  
 A) 10 times smaller than  
 B) 100 times larger than  
 C) 10 times larger than  
 D) twice as large as  
 E) half the size of
- 11) Successful cotransformation in the yeast two-hybrid system will result in the binding of proteins produced by each yeast expression vector. These *fusion proteins* function by  
 A) changing color in the presence of X-gal.  
 B) binding to the *lacZ* operator, preventing transcription.  
 C) binding to RNA polymerase, preventing transcription.  
 D) binding to the *lacZ* upstream activator sequence, enabling transcription.  
 E) binding to the *lacZ* repressor, enabling transcription.
- 12) Hormones can be considered  
 A) repressors.  
 B) enzymes.  
 C) transcription regulators.  
 D) inducers.  
 E) translation regulators.
- 13) Change in the DNA-histone complex that increases transcriptional activity is termed  
 A) chromatin remodeling.  
 B) nucleosome formation.  
 C) gene regulation.  
 D) induction.  
 E) None of the above
- 14) Removal of the 5' G-cap of mRNA transcripts  
 A) leads to degradation by exonucleases.  
 B) prevents transcript transport.  
 C) extends mRNA half-life.  
 D) reduces mRNA half-life.  
 E) leads to polyadelylation.
- 15) *Heterochromatin* is associated with  
 A) mRNA translation.  
 B) differential gene expression.  
 C) gene silencing.  
 D) heterozygotes.  
 E) A, B, and C
- 16) A *P* value in statistics is

- A) the probability of getting the observed data distribution by chance.  
 B) arbitrarily set depending on statistical test.  
 C) a measure of the accuracy of a data set.  
 D) a measure of the accuracy of a statistical test.  
 E) none of the above.
- 17) Which of the following statements is not true?  
 A) Sex determination is chromosomal in some organisms and genic in others.  
 B) Chromosome number is generally constant within groups of organisms.  
 C) The Y-bearing sex is termed heterogametic.  
 D) The sex chromosome system of birds and mammals is likely to have evolved independently.  
 E) Many plants exhibit alternation between haploid and diploid stages.
- 18) Chromosomes consist of  
 A) DNA.  
 B) DNA and phospholipid.  
 C) DNA and RNA.  
 D) DNA and protein.  
 E) all of the above.
- 19) In an interacting gene pair, the gene whose expression is masked by another gene is the \_\_\_\_\_ gene.  
 A) hypostatic  
 B) epistatic  
 C) homostatic  
 D) limnostatic  
 E) hyperstatic
- 20) A \_\_\_\_\_ trait is typically influenced by one or two genes.  
 A) polygenic  
 B) quantitative  
 C) continuous  
 D) multifactorial  
 E) discrete
- 21) If alleles of different genes always maintain their parental association rather than assorting independently into offspring, this is because  
 A) they are on the same chromosome but far apart.  
 B) they are really alleles of a single gene.  
 C) there was a meiotic error.  
 D) they are very close together on the same chromosome.  
 E) Mendel's experiments were flawed.
- 22) Organisms that achieve genetic recombination without undergoing the normal processes of meiosis and fertilization are said to have  
 A) sporadic sexual systems.  
 B) alternation of generations.  
 C) unisexual systems  
 D) parasexual systems.  
 E) asexual systems.
- 23) If a horse and a donkey are mated, the resulting hybrid animal will be  
 A) haploid and sterile.  
 B) polyploid and fertile.  
 C) polyploid and sterile.

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- D) haploid and fertile.  
E) diploid and sterile.
- 24) The virulent T2 bacteriophage life cycle is characterized as  
A) a prophage pathway  
B) lytic and lysogenic cycles  
C) a lysogenic pathway only  
D) a lytic cycle only  
E) none of the above.
- 25) In the maternal effect case of shell coiling in *Limnaea* snails, a Mendelian cross starting with a dextral ( $D/D$ ) female and a sinistral ( $d/d$ ) male yields \_\_\_\_\_  $F_2$ s.  
A) all sinistral  
B) a 3:1 dextral:sinistral ratio  
C) half dextral and half sinistral  
D) all dextral  
E) None of the above
- 26) Twenty loci are screened for genetic variation in a common caterpillar species. Four loci are found to have two or more alleles. The proportion of polymorphic loci for this population is thus  
A) 0.10.      B) 0.20.      C) 0.30.      D) 0.40.      E) 0.50.
- 27) The probability that two parents with a family of four will have one girl and three boys is  
A) 1/8      B) 1/16      C) 1/4      D) 1/32      E) 1/2
- 28) What did Lederberg and Tatum's 1946 experiment show?  
A) That genetic exchange between bacterial cells is a bidirectional process  
B) That bacterial cells can be made to uptake bits of DNA from the environment  
C) That sexual recombination can occur between bacterial cells  
D) That viruses are required for genetic exchange between bacterial cells  
E) That genetic recombination in bacteria occurs at a very high rate
- 29) Cells with more than one mitochondrial genotype are  
A) heteroplasmic.  
B) polymorphic.  
C) homozygous.  
D) heterozygous.  
E) homoplasmic.
- 30) Which method is least useful for assessing levels of genetic variation in populations?  
A) Phenotypic observation  
B) DNA sequencing  
C) Protein electrophoresis  
D) RFLP analysis  
E) VNTRs

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) Primer DNA is the strand on which complementary base-pairing occurs.

32) Because Lesch-Nyhan syndrome is a recessive X-linked disease, females who have an allele with the mutation responsible for this disease are generally symptom-free.

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- 33) Composite transposons contain a central region with genes and repeated sequences at their ends but do not terminate with IS elements.
- 34) DNA-level screening for genetic disease typically involves RFLP- or PCR-based approaches.
- 35) Methylation, which in prokaryotes protects DNA from restriction, plays a role in gene silencing in eukaryotes.
- 36) Karyotypes consist of a complete set of anaphase chromosomes.
- 37) Topoisomerase and SSB proteins are important components of the replication process in prokaryotes, but they are not found in eukaryotes.
- 38) Gene silencing in eukaryotes is often achieved through chromatin structure.
- 39) The distribution of coding genes is surprisingly even throughout the human genome.
- 40) DNA fingerprinting can be used to convict criminals but has little application in exonerating individuals already convicted.
- 41) Mendel was the first to describe dominant, recessive, and codominant traits.
- 42) The genotypic F<sub>2</sub> ratio expected in a dihybrid cross is 9:3:3:1.
- 43) If a gene is haplosufficient, a heterozygote for an allele expresses only enough gene product for an intermediate phenotype.
- 44) A coefficient of coincidence of zero is the same as an interference value of zero.
- 45) A complete bacterial medium contains only the nutrients required for the growth of wild-type cells.
- 46) The genetic code is universal, including organisms of all kingdoms and organellar DNA.
- 47) A test cross with a heterozygous dominant individual will yield only heterozygous dominant offspring.
- 48) The centrosomes are highly conserved chromosome regions that interact with spindle fibers during cell division.
- 49) Testcrosses may be used by geneticists to determine if two genes are linked.
- 50) Genetic exchange in bacteria by transduction requires cell-to-cell contact.

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) What must be the three principle characteristics of the hereditary molecule in cells?  
(4分)
- 52) What is the importance of centromeres and telomeres? (4分)

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53) What is the advantage of having a promoter sequence upstream of a coding sequence? (4分)

54) How can mutant organisms assist scientists in understanding how normal physiological processes take place? (4分)

55) Two STR loci were determined to have the following allele frequencies in the general population:

	STR A	STR B
Alleles:	1A: 0.1	1B: 0.4
	2A: 0.55	2B: 0.4
	3A: 0.25	3B: 0.2
	4A: 0.1	

A suspect in a criminal trial was genetically tested for these loci and was found to have the genotype (1A, 1A) for STR A and (2B, 2B) for STR B homozygous for both loci. What is the probability that a randomly sampled person from this population would also have this genotype? (5分)

56) Plants produce steroids called phytosterols, which have various functions in plant physiology. Some phytosterols are thought to have a defensive function, however, specifically in repelling insect herbivores. How might plant-derived steroids help protect plants from insect attack? (4分)

57) You observe an individual of your favorite study organism expressing the dominant phenotype for a certain trait. How would you go about determining if the individual was homozygous dominant or heterozygous for that trait? (4分)

58) X-linked traits are more likely to be expressed in males. Why? Under what circumstances are they expressed in females? (4分)

59) In a controlled cross for a quantitative trait, 600 F<sub>2</sub> offspring are obtained, 10 of which exhibit the phenotype of one of the parentals. How many genes are estimated to control this trait based on these results? (4分)

60) Why can a male fruit fly be used as a testcross individual with a female heterozygote to test for recombinant phenotypes in X-linked genes? (4分)

61) Some recessive mutations can be exceedingly debilitating or lethal when expressed in homozygotes. If their effects are so severe, why doesn't natural selection simply purge such alleles from the population completely? (4分)

62) How is hybrid sterility overcome in allopolyploid plants? (5分)

試題隨卷繳回