

※ 考生請注意：本試題 可 不可 使用計算機

說明：請依下列範例在答案卷上作答，請勿在本試題紙上作答，否則不予計分。

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

選擇題 (每題 2 分，共 100 分)

1)The main source of energy for producers in an ecosystem is

- A)ATP.
- B)kinetic energy.
- C)thermal energy.
- D)light energy.
- E)chemical energy.

2)Which of the following molecules contains the strongest polar covalent bond?

- A)H₂O B) H₂ C) CH₄ D) O₂ E) CO₂

3)Hydrophobic substances such as vegetable oil are

- A)polar substances that have an affinity for water.
- B)nonpolar substances that have an attraction for water molecules.
- C)charged molecules that hydrogen-bond with water molecules.
- D)nonpolar substances that repel water molecules.
- E)polar substances that repel water molecules.

4)Which two functional groups are always found in amino acids?

- A)carboxyl and amino
- B)hydroxyl and aldehyde
- C)carbonyl and carboxyl
- D)ketone and aldehyde
- E)phosphate and sulfhydryl

5)On food packages, to what does the term "insoluble fiber" refer?

- A)polypeptides
- B)amylopectin

(背面仍有題目,請繼續作答)

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- C)chitin
D)cellulose
E)starch
- 6)Large numbers of ribosomes are present in cells that specialize in producing which of the following molecules?
A)lipids
B)starches
C)steroids
D)glucose
E)proteins
- 7)Which of the following would likely move through the lipid bilayer of a plasma membrane most rapidly?
A)glucose
B)starch
C)an amino acid
D) K^+
E) CO_2
- 8)How can one increase the rate of a chemical reaction?
A)Cool the reactants.
B)Increase the activation energy needed.
C)Decrease the concentration of the reactants.
D)Add a catalyst.
E)Increase the entropy of the reactants.
- 9)Where does glycolysis takes place?
A)mitochondrial outer membrane
B)mitochondrial matrix
C)cytosol
D)mitochondrial intermembrane space
E)mitochondrial inner membrane
- 10)What is the relationship between wavelength of light and the quantity of energy per photon?
A)They have a direct, linear relationship.
B)They are logarithmically related.
C)They are inversely related.
D)They are only related in certain parts of the spectrum.
E)They are separate phenomena.
- 11)Which of the following describes the events of apoptosis?

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- A)The cell dies, it is lysed, its organelles are phagocytized, its contents are recycled.
B)Its DNA and organelles are fragmented, the cell shrinks and forms blebs, and the cell self-digests.
C)Its DNA and organelles become fragmented, it dies, and it is phagocytized.
D)Its nucleus and organelles are lysed, the cell enlarges and bursts.
E)The cell dies and the presence of its fragmented contents stimulates nearby cells to divide.
- 12)Which of the following is true concerning cancer cells?
A)They are not subject to cell cycle controls.
B)They do not exhibit density-dependent inhibition when growing in culture.
C)When they stop dividing, they do so at random points in the cell cycle.
D)B and C only
E)A, B, and C
- 13)A given organism has 46 chromosomes in its karyotype. We can therefore conclude which of the following?
A)Its gametes must have 23 chromosomes.
B)It must be human.
C)It must be an animal.
D)It must be sexually reproducing.
E)It must be a primate.
- 14)How many unique gametes could be produced through independent assortment by an individual with the genotype AaBbCCDdEE?
A)8 B)4 C)16 D)32 E)64
- 15)In a cross AaBbCc × AaBbCc, what is the probability of producing the genotype AABBCC?
A)1/64 B)1/8 C)1/16 D)1/32 E)1/4
- 16)Huntington's disease is a dominant condition with late age of onset in humans. If one parent has the disease, what is the probability that his or her child will have the disease?
A)0 B)1 C)1/4 D)1/2 E)3/4
- 17)The frequency of Down syndrome in the human population is most closely correlated with which of the following?
A)Age of the mother
B)Average of the ages of mother and father
C)Frequency of new meiosis
D)Exposure of pregnant women to environmental pollutants

(背面仍有題目,請繼續作答)

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- E)Age of the father
- 18)Which would you expect of a eukaryotic cell lacking telomerase?
- A)a reduction in chromosome length
 - B)a high probability of becoming cancerous
 - C)production of Okazaki fragments
 - D)inability to repair thymine dimers
 - E)high sensitivity to sunlight
- 19)If a cell were unable to produce histone proteins, which of the following would be a likely effect?
- A)Amplification of other genes would compensate for the lack of histones.
 - B)The cell's DNA couldn't be packed into its nucleus.
 - C)There would be an increase in the amount of "satellite" DNA produced during centrifugation.
 - D)Spindle fibers would not form during prophase.
 - E)Pseudogenes would be transcribed to compensate for the decreased protein in the cell.
- 20)Why do histones bind tightly to DNA?
- A)Histones are highly hydrophobic, and DNA is hydrophilic.
 - B)Histones are positively charged, and DNA is negatively charged.
 - C)Histones are covalently linked to the DNA.
 - D)Histones are negatively charged, and DNA is positively charged.
 - E)Both histones and DNA are strongly hydrophobic.
- 21)Which of the following covalently connects segments of DNA?
- A)primase
 - B)helicase
 - C)ligase
 - D)DNA polymerase III
 - E)DNA polymerase I
- 22)In an analysis of the nucleotide composition of DNA, which of the following will be found?
- A)A = G and C = T
 - B)A = C
 - C)A + C = G + T
 - D)G + C = T + A
- 23)Why does the DNA double helix have a uniform diameter?
- A)Purines pair with pyrimidines.
 - B)C nucleotides pair with A nucleotides.
 - C)Nucleotides bind with nucleoside triphosphates.
 - D)Nucleotides bind with nucleosides.
 - E)Deoxyribose sugars bind with ribose sugars.

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- 24) A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for the mRNA transcribed is
- A) 3' UCA 5'.
 - B) 3' ACU 5'.
 - C) 3' UGA 5'.
 - D) 5' TCA 3'.
 - E) either UCA or TCA, depending on wobble in the first base.
- 25) Which of the following statements are true about protein synthesis in prokaryotes?
- A) Unlike eukaryotes, prokaryotes require no initiation or elongation factors.
 - B) Translation can begin while transcription is still in progress.
 - C) Extensive RNA processing is required before prokaryotic transcripts can be translated.
 - D) Translation requires antibiotic activity.
 - E) Prokaryotic cells have complicated mechanisms for targeting proteins to the appropriate cellular organelles.
- 26) Each of the following options is a modification of the sentence THECATATETHERAT. Which of the following is analogous to a frameshift mutation?
- A) THETACATETHERAT
 - B) CATATETHERAT
 - C) THECATARETHERAT
 - D) THECATATTHERAT
 - E) THERATATETHECAT
- 27) What are the coding segments of a stretch of eukaryotic DNA called?
- A) introns
 - B) exons
 - C) transposons
 - D) codons
 - E) replicons
- 28) Introns are significant to biological evolution because
- A) they are translated into essential amino acids.
 - B) their presence allows exons to be shuffled.
 - C) they correct enzymatic alterations of DNA bases.
 - D) they maintain the genetic code by preventing incorrect DNA base pairings.
 - E) they protect the mRNA from degeneration.
- 29) Which of the following is true for both prokaryotic and eukaryotic gene expression?
- A) After transcription, a 3' poly-A tail and a 5' cap are added to mRNA.
 - B) The mRNA transcript is the exact complement of the gene from which it was copied.
 - C) RNA polymerase binds to the promoter region to begin transcription.

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- D)mRNA is synthesized in the 3' → 5' direction.
E)Translation of mRNA can begin before transcription is complete.
- 30)Which of the following statements is true about stem cells?
A)Stem cells can continually reproduce and are not subject to mitotic control.
B)Stem cell DNA lacks introns.
C)Stem cells can differentiate into specialized cells.
D)Stem cells are found only in bone marrow.
E)Stem cells are found only in the adult human brain.
- 31)The phenomenon in which RNA molecules in a cell are destroyed if they have a sequence complementary to an introduced double-stranded RNA is called
A)RNA blocking.
B)RNA disposal.
C)RNA targeting.
D)RNA obstruction.
E)RNA interference.
- 32)Genomic imprinting, DNA methylation, and histone acetylation are all examples of
A)epigenetic phenomena.
B)chromosomal rearrangements.
C)genetic mutation.
D)translocation.
E)karyotypes.
- 33)Transcription of the structural genes in an inducible operon
A)starts when the pathway's substrate is present.
B)stops when the pathway's product is present.
C)starts when the pathway's product is present.
D)occurs continuously in the cell.
E)does not result in the production of enzymes.
- 34)When this is taken up by the cell, it binds to the repressor so that the repressor no longer binds to the operator:
A)promoter
B)repressor
C)inducer
D)corepressor
E)operon
- 35)Which of the following can be effective in preventing viral infection in humans?
A)applying antiseptics
B)getting vaccinated

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- C)taking antibiotics
D)taking vitamins
E)taking nucleoside analogs that inhibit transcription
- 36)What are prions?
A)viruses that invade bacteria
B)viral DNA that has had to attach itself to the host genome
C)tiny molecules of RNA that infect plants
D)misfolded versions of normal brain protein
E)a mobile segment of DNA
- 37)Bacteria containing recombinant plasmids are often identified by which process?
A)using radioactive tracers to locate the plasmids
B)producing antibodies specific for each bacterium containing a recombinant plasmid
C)removing the DNA of all cells in a culture to see which cells have plasmids
D)examining the cells with an electron microscope
E)exposing the bacteria to an antibiotic that kills cells lacking the resistant plasmid
- 38)Why are yeast cells frequently used as hosts for cloning?
A)only yeast cells allow the gene to be cloned
B)they easily form colonies
C)they can remove exons from mRNA.
D)they are eukaryotic cells
E)they do not have plasmids.
- 39)Which of the following is used to make complementary DNA (cDNA) from RNA?
A)gel electrophoresis
B)gene cloning
C)reverse transcriptase
D)restriction enzymes
E)DNA ligase
- 40)When does exon shuffling occur?
A)during mitotic recombination
B)as the result of faulty DNA repair
C)as an alternative splicing pattern in post-transcriptional processing
D)as an alternative cleavage or modification post-translationally
E)during splicing of DNA
- 41)What is it about short tandem repeat DNA that makes it useful for DNA fingerprinting?
A)The sequence of DNA that is repeated varies significantly from individual to individual.
B)The sequence variation is acted upon differently by natural selection in different environments.

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- C)The number of repeats varies widely from person to person or animal to animal.
D)Every racial and ethnic group has inherited different short tandem repeats.
- 42)Which of the following pieces of evidence most strongly supports the common origin of all life on Earth?
- A)All organisms use essentially the same genetic code.
B)All organisms have undergone evolution.
C)All organisms show heritable variation.
D)All organisms reproduce.
E)All organisms require energy.
- 43)The DNA polymerases of all cellular organisms have proofreading capability. This capability tends to reduce the introduction of
- A)genetic variation by mutations.
B)extra genes by gene duplication events.
C)proofreading capability into prokaryotes.
D)chromosomal translocation.
- 44)After ingestion, the first type of macromolecule to be worked on by enzymes in the human digestive system is
- A)protein.
B)glucose.
C)nucleic acid.
D)cholesterol
E)carbohydrate.
- 45)All of the following could be considered advantages of asexual reproduction in plants except
- A)adaptation to change.
B)cloning an exceptional plant.
C)success in a stable environment.
D)increased agricultural productivity.
E)production of artificial seeds.
- 46)Species that are not closely related and that do not share many anatomical similarities can still be placed together on the same phylogenetic tree by comparing their
- A)chloroplast genomes.
B)plasmids.
C)mitochondrial genomes.
D)homologous genes that are highly conserved.
E)homologous genes that are poorly conserved.
- 47)Which of the following statements is correct about protoplast fusion?

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- A)It is the method of test-tube cloning thousands of copies.
 - B)It is used to develop gene banks to maintain genetic variability.
 - C)It can be used to form new plant species.
 - D)It requires that the cell wall remain intact during the fusion process.
 - E)It occurs within a callus.
- 48)The N-P-K percentages on a package of fertilizer refer to the
- A)relative percentages of organic and inorganic nutrients in the fertilizer.
 - B)total protein content of the three major ingredients of the fertilizer.
 - C)proportions of three different nitrogen sources.
 - D)percentages of manure collected from different types of animals.
 - E)percentages of three important mineral nutrients.
- 49)The main way that pine trees disperse their offspring is by using
- A)spores.
 - B)squirrels to bury cones.
 - C)flagellated sperm swimming through water.
 - D)fruits that are eaten by animals.
 - E)windblown seeds.
- 50)Which of the following is not a valid argument for preserving tropical forests?
- A)Many organisms are becoming extinct.
 - B)Plants that are possible sources of medicines are being lost.
 - C)Plants that could be developed into new crops are being lost.
 - D)People in the tropics do not need to increase agricultural output.
 - E)Clearing land for agriculture results in soil destruction.