

※ 注意：請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

Please choose the most appropriate terms/phrases/statements that complete or answer the questions. Attention: More than one of the choices provided may be correct. (2.5 points for each question)

每題 5 個選項，每個選項 0.5 分，答對得 0.5 分，答錯倒扣 0.5 分。倒扣至該題零分為止。

1. The conversion of IMP to GMP requires which of the following ?
 - (A) ATP
 - (B) GTP
 - (C) Aspartate
 - (D) Glutamine
 - (E) NAD^+
2. Which of the following compounds would give rise to urate if they were catabolized completely in human ?
 - (A) ADP-glucose
 - (B) GDP-mannose
 - (C) CDP-choline
 - (D) UDP-galactose
 - (E) CoA
3. Which of the following statements about DNA ligase are *correct* ?
 - (A) It forms a phosphodiester bond between a 5'-hydroxyl and a 3'-phosphate in duplex DNA
 - (B) It requires a cofactor, either NAD^+ or ATP depending upon the source of the enzyme, to provide the energy to form the phosphodiester bond
 - (C) It catalyzes its reaction by a mechanism that involves the formation of a covalently-linked enzyme adenylate
 - (D) It catalyzes its reaction by a mechanism that involves the activation of a DNA phosphate through the formation of a phosphoanhydride or pyrophosphate bond with AMP
 - (E) It is involved in DNA replication, repair, and recombination
4. Which of the following statements about structures like those at the nodes or crossover points of chi-form DNA molecules are *correct* ?
 - (A) they are formed in high yields when bacteria bearing certain plasmids are grown in the presence of chloramphenicol, a protein-synthesis inhibitor
 - (B) they are intermediates that are formed during plasmid replication
 - (C) they are formed from plasmids in *E. coli* strains that have mutations in the *rec* genes
 - (D) when they are derived from plasmids, they are composed of two duplexes that are connected *via* 4 single strands of DNA
 - (E) when they are derived from plasmids, they can be resolved in two different ways: one resolution yields two unit-length circular molecules, and the other produces a single, two-unit long circular molecule
5. General recombination is likely to require which of the following ?
 - (A) DnaB protein
 - (B) Topoisomerase I
 - (C) RecA protein
 - (D) RecBCD complex
 - (E) ATP
6. What processes are involved in receptor tyrosine kinase activation?
 - (A) homodimerization

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- (B) heterodimerization
 (C) acetylation
 (D) methylation
 (E) ligand stimulation.
7. What can an enzyme change?
 (A) reaction direction
 (B) free energy
 (C) reaction rate
 (D) the internal energy of reactants
 (E) the transition state of reaction.
8. What processes happen in the nucleus?
 (A) mRNA splicing
 (B) RNA interference
 (C) 3' polyadenylation
 (D) ribosome formation for translation
 (E) 5' capping.
9. What modification may occur on the lysine residue of target proteins?
 (A) hydroxylation
 (B) acetylation
 (C) methylation
 (D) phosphorylation
 (E) proteolysis.
10. What proteins or components will be found in growing *E. coli* genomic DNA?
 (A) DNA polymerases
 (B) telomeres
 (C) introns/exons
 (D) polyadenylation
 (E) RNA polymerases.
11. Which of the following activities are involved in eukaryotic DNA replication?
 (A) reverse transcriptase
 (B) DNA ligase
 (C) restriction endonuclease
 (D) primase
 (E) helicase
12. Protein products of different lengths can be produced from a single gene by
 (A) alternative splicing
 (B) internal ribosome entry sites
 (C) polyadenylation of mRNA
 (D) framshifting events
 (E) polysome formation
13. Which of the following cellular processes are facilitated by the actions of DNA topoisomerases?
 (A) DNA recombination
 (B) translation

- (C) transcription
(D) replication
(E) chromosome segregation
14. Which of the following statements regarding molecular cloning are correct?
(A) When the coding region of a gene is cloned downstream of a translation start codon, the chance of in-frame fusion is 1/3.
(B) When the coding region of a gene is cloned downstream of a translation start codon, the chance of in-frame fusion is 1/6.
(C) To construct a plasmid for expressing a human protein in *E. coli*, you should first PCR amplify the coding region of this protein using human genomic DNA library as the template.
(D) To construct a plasmid for expressing a human protein in *E. coli*, you should first PCR amplify the coding region of this protein using human cDNA library as the template.
(E) None of the above.
15. Transmembrane polypeptide segment usually forms which of the following structures within lipid bilayer?
(A) loop
(B) α -helix
(C) type I β -turn
(D) β -sheet
(E) type II β -turn
16. Which of the following compounds or proteins can enter nucleus and regulate gene functions?
(A) EGF receptor
(B) Cytochrome C
(C) Triglyceride
(D) Cholesterol
(E) Vitamin D
17. What is the molecular target of shellfish toxin in human that cause paralytic shellfish poison?
(A) Sodium channels
(B) Potassium channels
(C) Calcium channels
(D) Chloride channels
(E) Na^+K^+ -ATPase
18. Which of the following methods can be used to determine insulin concentration in human blood?
(A) enzyme immunoassays
(B) agarose gel electrophoresis
(C) polymerase chain reaction
(D) isoelectric focusing
(E) western blot analysis
19. NF- κ B is a (an) :
(A) enzyme
(B) receptor
(C) transcription factor

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- (D) chaperone
(E) scaffold protein
20. Choose the enzyme that catalyses phosphorylated proteins:
(A) phosphatase
(B) phospholipase A₂
(C) phospholipase C
(D) phosphodiesterase
(E) HDAC
21. Which of the following statements is/are CORRECT?
(A) Monomeric proteins do not contain a quaternary structure
(B) Cysteine residue is part of a zinc-finger motif
(C) tRNA has its bases methylated after synthesis
(D) A mutation that changes a cysteine codon to a tryptophan codon is called a nonsense mutation
(E) None of the above
22. Kinases, which are responsible for the activation or inactivation of a number of proteins, serve to add phosphate groups onto
(A) Tryptophan residues
(B) Serine residues
(C) Cysteine residues
(D) Threonine residues
(E) Tyrosine residues
23. Which of the following method can examine the interaction of proteins with DNA?
(A) Electrophoretic mobility shift assay
(B) Chromatin immunoprecipitation
(C) Southern blotting
(D) DNase I digestion assay
(E) Primer extension
24. Which of the following methods can separate proteins based on their mass?
(A) Centrifugation
(B) Ion exchange chromatography
(C) SDS polyacrylamide gel electrophoresis
(D) Gel filtration chromatography
(E) All of the above
25. Which of the following is/are required for RecA-dependent recombination between two DNA molecules?
(A) Strand migration
(B) Ligation
(C) Mismatch repair
(D) Nuclease digestion
(E) All of the above
26. DNA that is transcriptionally active
(A) is more susceptible to DNase I digestion.
(B) is tightly packed into a solenoid arrangement.

- (C) contains unacetylated histones.
(D) is more condensed than nontranscribed DNA.
(E) None of the above
27. Which of the following component(s) of a retrovirus is/are encoded by the viral genome?
(A) Matrix proteins
(B) Viral RNA's
(C) Capsid proteins
(D) Envelope lipid
(E) Receptor-binding proteins
28. All of the following statements about the essential carboxy terminal domain (CTD) of RNA polymerase are true
(A) The CTD can become phosphorylated.
(B) The CTD is present in RNA polymerase I, II, and III.
(C) The CTD is critical for viability.
(D) The CTD of mammals contains more than 50 repeats of a heptapeptide.
(E) All of the above
29. Which of the following proteins does not "footprint" the *lac* operon control region?
(A) lac repressor
(B) β -galactosidase
(C) RNA polymerase
(D) cAMP-CAP
(E) None of the above
30. Which of the following does not require protein enzymes?
(A) RNA editing
(B) excision of group II introns
(C) transsplicing
(D) excision of group III introns
(E) All of the above
31. Which of the following statements is/are TRUE?
(A) Most genes are probably pleiotropic.
(B) The phenotypic ratio of 1:2:1 is characteristic of the F-2 of a monohybrid cross where dominance is lacking.
(C) Crossing over involves the exchange of parts between nonhomologous chromosomes.
(D) Meiosis is often called "reduction division" because the genetic material is reduced by half.
(E) Mitosis distributes exact copies of genetic material so the daughter nuclei are genetically identical to each other and identical to the mother nucleus from which they came.
32. Which of the following statements is/are TRUE?
(A) Mitochondria and chloroplasts have their own unique circular DNA "chromosomes" distinct from nuclear DNA.
(B) The synthesis of fatty acids and phospholipids takes place in the rough endoplasmic reticulum.
(C) Peroxisomes synthesize fatty acids and degrade toxic compounds.

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- (D) The nucleus contains the DNA genome, RNA synthetic apparatus, and a fibrous matrix.
- (E) Lysosomes vary in size and shape, and several hundred may be present in a typical animal cell.
33. Which of the following statements is/are TRUE?
- (A) There are more than five types of filaments compose the cytoskeleton.
- (B) Monomeric actin and tubulin subunits assemble into microfilaments.
- (C) Dimeric subunits composed of α - and β -tubulin polymerize into microtubules.
- (D) Microtubules radiate from centrosomes and organize certain subcellular structures.
- (E) Intermediate filaments are assembled from a large of diverse family of proteins.
34. Eukaryotic primary RNA transcripts of protein-encoding genes
- (A) encode the product of a single gene.
- (B) undergo de-capping and polyadenylation.
- (C) contain exon(s) in the 5' untranslated region.
- (D) contain exon(s) in the 3' untranslated region.
- (E) may be translated immediately.
35. Alternative splicing
- (A) creates different mRNA from more than one single gene.
- (B) creates related mRNA from a single gene.
- (C) creates un-related mRNA from a two genes.
- (D) specific sequences are not required for ensuring very accurate splicing.
- (E) specific proteins ensure very accurate splicing.
36. Epigenetic modifications of the genome
- (A) only one Y chromosome is active in female mammals.
- (B) heterochromatin silences nearby genes.
- (C) one of the two X chromosomes in female mammals is accurately inactivated to achieve proper gene dosage.
- (D) DNA methylation is not a heritable mark on the DNA.
- (E) DNA methylation decreases the rate of mutation.
37. Which are the characteristics of the ER or the Golgi?
- (A) protein oligomerization occurs in the Golgi.
- (B) protein folding occurs in the Golgi.
- (C) protein quality control occurs in the ER.
- (D) oligosaccharide is added to many proteins in the ER.
- (E) N-terminal acetylation usually occurs in the Golgi.

38. The results of pulse-chase experiments
- (A) can be used to estimate the time required to synthesize a cellular constituent.
 - (B) can not be influenced by the pool size.
 - (C) can be used to determine the direction in which macromolecules are synthesized.
 - (D) can depend on the nature of the precursor used.
 - (E) can not be used to determine the location in the cell where a particular cellular constituent is synthesized.
39. Which of the following statements is/are TRUE?
- (A) All trans-membrane proteins and glycolipids are asymmetrically oriented in the bilayer.
 - (B) Membrane-embedded sheets are the primary secondary structures in most trans-membrane proteins.
 - (C) Lipid-binding motif in peripheral proteins interact with non-polar head groups of membrane phospholipids.
 - (D) Interactions with the cytoskeleton impede the mobility of integral membrane proteins.
 - (E) Most lipids and a few proteins are laterally mobile in biomembrane.
40. Which of the following statements about tRNA is/are TRUE?
- (A) The un-folded structure of tRNA promotes its decoding functions.
 - (B) Some 30-40 different tRNA have been identified in bacterial cells and as many as 50-100 in animal and plant cells.
 - (C) The first and second bases of a codon in tRNA almost always form standard Watson-Crick base pairs with the third and second bases, respectively, of the corresponding anticodon.
 - (D) The G:U base pair can structurally fit almost as well as the standard G:C pair.
 - (E) Four of the six codons for leucine (CUA, CUC, CUU, and UUA) are all recognized by the same tRNA with the anticodon 3'-GAI-5'.

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