※ 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: <u>More than one</u> of the choices provided may be correct in some cases. (2.5 points for each question)

1. Structure of RNA
(A) like DNA, is a long, unbranched macromolecule consisting of nucleotides joined by 5' ---> 3' phosphodiester bonds.
(B) is less susceptible than DNA to degradation at high pH.
(C) can act as a catalyst.
(D) has fewer hydroxy groups than DNA.
(E) can fold back on itself to form double-helical regions with DNA.

2. Polypeptides
(A) ribosomes can be dissociated into about five proteins and three RNA molecules.
(B) ribosomes can be reconstructed from their constituent proteins and RNA molecules.
(C) GUG is part of the initiation signal.
(D) short peptides are not synthesized by ribosomes.
(E) proteins synthesis requires the coordinated interplay of ~ 60 macromolecules.

3. Regulation of transcription
(A) involves hormone receptors normally found in the nucleus.
(B) some transcription factors can form heterodimers, and have less advantages to cells.
(C) DNA-binding domain and activation domain can be in different protein subunits.
(D) altering the spacing between promoter-proximal elements or enchancers and the TATA box has been shown to have more effect on transcription from some eukaryotic promoters.
(E) as the number of initiation-complex components bound to the promoter increases, the gel migration of the DNA-protein complex will decrease.

4. Which of the following statements are true of viruses?
(A) all contain nucleic acid
(B) all contain lipid
(C) all can reproduce outside of living cells
(D) some can infect plants
(E) they always lyse the cells that they infect.

5. What is the concentration of an adenine solution whose absorbance at 257= 0.330? (ε_m = 15,100)
Assume path length = 1.00 cm.
(A) 2.18×10^{-5} M
(B) 2.18×10^{-6} M
(C) 3.3×10^{-5} M
(D) 3.3×10^{-6} M
(E) 6.6×10^{-4} M

6. A single amino acid changes in a protein can
(A) eliminate all antigenicity
(B) change its subcellular localization
(C) have no effect on antigenicity
(D) produce cross-reacting material
(E) make protein more stable.

7. What is the cell density of a yeast culture if plating 0.2 ml of a 10^5-fold dilution of the culture yields 45 colonies.
(A) 2.25×10^7

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(B) 4.5×10^6
(C) 9.0×10^6
(D) 4.5×10^7
(E) 9.0×10^7

8. Which of the following statement(s) is (are) true?
(A) Transcription start sites can be mapped by S1 protection and primer extension.
(B) Nuclease-protection method can quantitate specific RNAs in a mixture and mapping them.
(C) Cloned cDNA can be translated *in vitro* to yield labeled proteins.
(D) DNA polymorphisms are used to map human mutations.
(E) Suppressor mutations can identify genes encoding interacting proteins.

9. Which of the following statement(s) is (are) true?
(A) Single stranded nucleic acids with complementary of nucleotide sequence will find and hybridize to each other in solution.
(B) An entire genome can be cloned as fragments in a heterogeneous population of microbial cell or viruses that is called a cDNA library.
(C) Protein-coding regions of eukaryotic genes can be obtained by synthetizing genomic DNA from mRNA populations.
(D) Mitochondria and chlroroplasts have their own unique circular DNA "chromosomes" distinct from nuclear DNA.
(E) The variant phenotypes associated with organellar DNA variants are transmitted by cytoplasmic contact alone.

10. Which of the following characteristic(s) is/are TRUE for enhancer regions in eukaryotic DNA?
(A) DNA Pol I binding sites
(B) orientation and position independent
(C) promote transcription
(D) bind transcription factors
(E) promote better cloning efficiency

11. DNA sequence rearrangements is/are INVOLVED in the following processes?
(A) immunoglobulin gene expression in mammals
(B) intron splicing in ciliates
(C) transposition of bacteriophage Mu
(D) mating type switching in yeast
(E) all of the above

12. Which of the following techniques CAN be used to check DNA binding proteins?
(A) Electrophoretic mobility shift assay
(B) Southern blot
(C) Chromatin immunoprecipitation assay
(D) Primer extension assay
(E) DNAase I sensitivity assay

13. Which of the following statements about "retrotransposons" is/are CORRECT?
(A) They replicate through an RNA intermediate
(B) They use RNA polymerase I for replication
(C) They use reverse transcriptase for replication
(D) They may contain introns
(E) None of the above

14. Which of the following statements about "TUMOR SUPPRESSOR" is/are CORRECT?
(A) They are generated by mutations that constitutively activate growth factor receptor genes

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(B) Loss of both alleles of tumor suppressors can cause tumor
(C) Some of tumor suppressors act by blocking cell cycle progression
(D) The Philadelphia translocation generates a new tumor suppressor
(E) They can be activated by insertion of a nondefective retrovirus

15. 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) DNA synthesis

16. Which of the following is/are INVOLVED in the processing of mRNA precursors in eukaryotic cells?
(A) Transport of the pre-mRNA to the cytoplasm
(B) Capping of 5' end
(C) Addition of polyA
(D) Excision of introns
(E) Splicing of exons

17. Which of the following is/are "Termination codons" ?
(A) UGG
(B) UAG
(C) UAU
(D) UAA
(E) UGC

18. A bacterial protein coding-gene contains a terminator codon in the middle of coding region, yet expression of the gene in the bacterium produces a function protein. Translation of the gene probably requires
(A) the excision of an intron
(B) ribosomes that lack 5S RNA
(C) a suppressor of tRNA
(D) an mRNA with no ribosome binding site
(E) an mRNA with no secondary structure

19. Which of the following information CAN be determined from the traditional Northern blotting technique?
(A) The size of an mRNA species
(B) The half-life of an mRNA species
(C) The initiation sites of an mRNA species
(D) The strand of DNA that is transcribed into mRNA
(E) All of the above

20. Which of the following statements is/are CORRECT?
(A) Virus-mediated transfer of cellular genetics from one bacterial cell to another by means of virus particles is called transduction
(B) Introduction of foreign genetic material (DNA) into eukaryotic cells is called transformation
(C) Introduction of foreign genetic material (DNA) into bacterial cells is called transfection
(D) Movement of a transposon to a new site in the genome is called transposition
(E) A prophage is freed from the restrictions of lysogeny by the process called induction

21. A signal has to be expected in the precursors of the following proteins.
(A) Signal peptidase
(B) Acid maltase, a lysomal hydrolase

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(C) *Ribosomal proteins*
(D) The sodium-potassium ATPase in the plasma membrane.
(E) Polyubiquitin proteins

22. The deficiency of an ubiquitin ligase can potentially result in
(A) The abnormal accumulation of ubiquitin in the cell.
(B) Failure to direct lysomal proteins to the lysosomes
(C) The excessive breakdown of some classes of proteins
(D) The buildup of abnormal proteins in the cells.
(E) An increased mutation rate.

23. If you want to use genetically engineered bacteria for the production of human growth hormone, you need the following ingredients.
(A). A cDNA obtained by the reverse transcription of growth hormone mRNA
(B) Endoproteinases
(C) Genomic DNA of the growth hormone gene
(D) A DNA sequence that codes for a bacterial ribosome-binding sequence
(E) A bacterial promoter sequence

24. *Eukaryotic enhancers are*
(A) Regulatory DNA sequences within the coding sequences of genes that affect the rate of transcriptional elongation.
(B) DNA sequences that can be thousands or even tens of thousands of base pairs away from the transcriptional start site
(C) Proteins that bind to regulatory base sequences in DNA
(D) DNA sequences outside the promoter region that contain multiple binding sites for regulatory proteins
(E) Binding sites for general transcription factors in the promoter.

25. Which of the following statements about single nucleotide polymorphism (SNP) are true?
(A) SNPs represent about 90% of the common variation in the genome
(B) Most SNPs are functional may change amino acid sequence of the encoded gene
(C) SNPs are the major genetic contributor to individuality
(D) Drug response and SNP correlation studies are important for the development of personalized medicine
(E) SNP studies are important for identification of rare 'severe' genetic mutations

26. Which of the following method(s) can be used to identify the amount and size of a mRNA?
(A) Northern blot analysis
(B) Southern blot analysis
(C) Primer extension
(D) RNase protection assay
(E) q-PCR

27. Which of the following can be used to label probes for RNase protection assays?
(A) α^{32}P-dTTP
(B) α^{32}P-ddTTP
(C) α^{32}P-UTP
(D) γ^{32}P-UTP
(E) α^{32}P-ATP

28. It is correct to say that DNA supercoiling :
(A) can occur if a closed circular double-stranded DNA molecule has a nick.
(B) can be induced by separating the strands of a helical structure.
(C) can be induced during transcription.
(D) can result in compaction of the DNA structure.

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(E) *is the twisting of the DNA axis upon itself.*

29. Which of the following amino acids are essential for zinc finger?
(A) Serine
(B) Cysteine
(C) Threonine
(D) Tyrosine
(E) Histidine

30. Which of the following events or machines are directly involved in glucose level in the cells?
(A) water channels
(B) insulin signaling
(C) symporters
(D) ATPase
(E) pinocytosis

31. Cytochrome C is directly participated in:
(A) Growth hormone function
(B) Electron transport chain
(C) *Drug detoxification and metabolism*
(D) Nerve conductance
(E) Apoptosis

32. Which of the following events or machines are directly involved in the maturation of red blood cells?
(A) Janus kinase
(B) Tyrosine phosphorylation
(C) Nitric oxide formation
(D) Na^+-K^+ ATPase
(E) Signal transducer and activator of transcription

33. Choose the **WRONG** statements of the followings.
(A) The gene sequences of 28 S and 18S RNAs are highly conserved among species but the promoter sequences of rDNA are divergent among different species.
(B) UBF that binds to UCE of the rDNA promoter are responsible for species-promoter specificity.
(C) SL1 complex directly binds to the CORE and affects the species-promoter specificity.
(D) UBF interacts with SL-1 complex to form a stable complex with the rDNA promoter.
(E) RNA polymerase III forms pre-initiation complex (PIC) in the rDNA promoter.

34. Which of the following statements are **WRONG**
(A) 5'capping reaction of transcribed RNA is present in eukaryotes, but not in bacteria.
(B) RNA splicing only occur in eukaryotes.
(C) 3'poly A tail addition is only present in eukaryotic mRNA.
(D) Exons are removed from hnRNA during processing in the nucleus.
(E) Translation can couple with transcription in prokaryotes.

35. Choose the reagents you will need to sequence the gene cloned in pBR322 by Sanger's method.
(A) An 18-bp primer that can be annealed to the upstream region of cloning site of denatured pRB322.
(B) An enzyme that can catalyze 5'-> 3' template-dependent DNA polymerization.
(C) dATP, dCTP, dTTP, and dGTP
(D) ddATP, ddCTP, ddTTP, and ddGTP
(E) $MgCl_2$

36. John wants to clone a human albumin gene promoter into a reporter plasmid. Which of the following genomic DNA samples he **cannot** use for PCR amplification of DNA fragment containing the human albumin gene promoter sequence.

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(A) Human cervical cancer HeLa cells.
(B) Human liver tissues.
(C) Mouse liver tissues.
(D) Mouse PC12 neuroblastoma cells
(E) Human skin fibroblasts.

37. Which RNA molecule(s) can be synthesized by eukaryotic RNA polymerase III?
(A) mRNA
(B) 18S rRNA
(C) 5.8S rRNA
(D) tRNA
(E) hnRNA

38. Suppressor tRNA molecules are capable of suppressing
(A) missense mutations
(B) nonsense mutations
(C) frameshift mutations
(D) promoter activity
(E) Intron splicing

39. Which aminoacyl tRNA is structurally similar to puromycin?
(A) alanyl-tRNA
(B) prolinyl-tRNA
(C) phenylalaninyl-tRNA
(D) tyrosinyl-tRNA
(E) tryptophanyl-tRNA

40. Which event(s) can cause DNA loss?
(A) tRNA processing
(B) gene rearrangement
(C) gene deletion
(D) gene amplification
(E) loss of heterozygosity