第一大題(1-12): 選擇題(24%) ※ 本大題請於試卷內之「選擇題作答區」依序作答。

1. the following glycosaminoglycans which one with protein core
   A. heparan sulfate
   B. dermatan sulfate
   C. heparin
   D. hyaluronic acid (HA)
   E. chondroitin sulfate

2. the following descriptions about o-link glycosylation are not correct
   A. GalNac-Asn linkage exist in the o-link glycosylation
   B. Form a peri cell surface liguid layer on the intestinal mucosal epithelial surface
   C. Forming a protective physical barrier for pathogens
   D. Important for vesicle traffic from ER to Golgi
   E. Sensitive to glycosidase H

3. which are the major biological functions of the nucleotide sugares
   A. the high energy high group transfer potential type
   B. are the ligands(substrates) for the transferase
   C. formed in the nucleus
   D. formed in the mitochondria
   E. formed in the cell membrane

4. which enzymes are involved in the trans Golgi oligosaccharides processing
   A. α glucosidae I
   B. α mannosidase
   C. galactosyltransferase
   D. sialyl transferase

5. which proteins are the components for basal membrane
   A. type I collagen
   B. perlecan
   C. entactin
   D. lamin
   E. fibronectin

6. which membrane proteins are involved in the epithelial cell-cell adherent junction
   A. integrin
   B. cadherin
   C. tight junction
   D. selectin
   E. gap junction

7. which functions of heparan sulfate described below are correct:
   A. binding of FGF
   B. induce receptor dimmer formation

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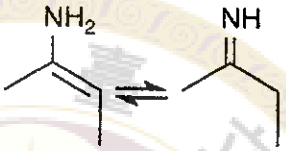
C. sequestering the enzyme on the cell surface
D. inducing the conformation change for the proteins
E. activating the proteases

8. which properties associated with metastatic cancer
A. genomic instability
B. uncontrolled proliferation
C. suppress the antigrowth signaling
D. anti apoptosis
E. inducing angiogenesis

9. The oxo and amino groups of purines and pyrimidines exhibit tautomerism. The structure is
A. amine-imine tautomerism
B. keto-enol tautomerism
C. lactam-lactim tautomerism
D. amide-imidic acid tautomerism.



10. A defect in hypoxanthine-guanine phosphoribosyl transferas (HGPRT) may cause
A. von Gierke disease B. Orotic Acidurias C. Hypouricemia D. Lesch–Nyhan Syndrome.

11. Telomerase is an enzyme that elongates
A. the template DNA strand at the 5' end
B. the template DNA strand at the 3' end
C. the template RNA strand at the 5' end
D. the template RNA strand at the 3' end.

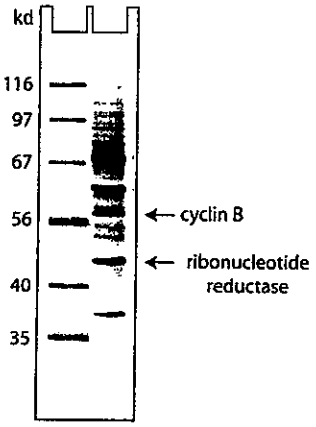
12. Which one of the following enzyme for DNA nick-sealing does need ATP?
A. DNA topoisomerase I B. DNA topoisomerase II C. DNA ligase D. None of them.

第二大題(13-26): 非選擇題

13. Figure below shows an autoradiograph of an SDS-PAGE separation of radiolabeled proteins in a cell-free extract of sea urchin eggs. Alongside are shown a set of radiolabeled marker proteins of defined molecular mass. Two bands that contain known proteins, the small subunit of ribonucleotide reductase and cyclin B, are indicated.

A. How would you use the standard set of proteins to estimate the molecular masses of ribonucleotide reductase and cyclin B? What would you estimate the molecular masses of these two proteins to be? (4%)

B. The sequences of the genes for these two proteins give molecular masses of 44 kd for ribonucleotide reductase and 46 kd for cyclin B. Can you offer some possible reasons why the SDS-PAGE estimate for the molecular mass of cyclin B is so far off? (2%)



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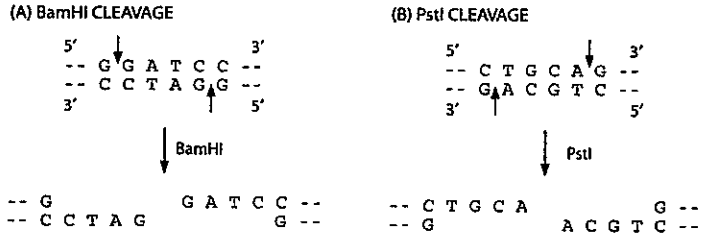
14. The restriction nucleases BamHI and PstI cut their recognition sequences as shown in Figure below.



A) How would the ends be modified if you incubated the cut molecules with DNA polymerase in the presence of all four dNTPs? (2%)

B) After the reaction in part A, could you still join the BamHI ends together by incubation with T4 DNA ligase? Could you still join the Psti ends together? (T4 DNA ligase will join blunt ends together as well as cohesive ends.) (2%)

C) Will joining of the ends in part B regenerate the BamHI site? Will it regenerate the Psti site? (2%)

15. How many copies of a protein need to be present in a cell in order for it to be visible as a band on a gel? Assume that you can load a 100 μg of cell extract onto a gel and that you can detect 10 ng in a single band by silver staining. The concentration of protein in cells is about 200 mg/mL, and a typical mammalian cell has a volume of about 1000 μm^3 and a typical bacterium a volume of about 1 μm^3. Given these parameters, calculate the number of copies of a 120-kd protein that would need to be present in a mammalian cell and in a bacterium in order to give a detectable band on a gel. (4%)

16. You want to amplify the DNA between the two stretches of sequences shown in Figure below. Of the listed primers choose the pair that will allow you to amplify the DNA by PCR. (4%)

DNA to be amplified

5′-GACCTGTGGAAGC ——————————CATACGGGATTGA-3′
3′-CTGGACACCTTCG ——————————GTATGCCCTAACT-5′

primers

(1) 5′-GACCTGTCCAAGC-3′
(2) 5′-CTGGACACCTTCG-3′
(3) 5′-CGAAGGTGTCCAG-3′
(4) 5′-GCTTCCACAGGTC-3′
(5) 5′-CATACGGGATTGA-3′
(6) 5′-GTATGCCCTAACT-3′
(7) 5′-TGTTAGGGCATAC-3′
(8) 5′-TCAATCCCGTATG-3′

17. Please describe how ribosomal RNAs are transcribed, processing, and assembling into the 80S ribosome for the translation in eukaryotes (8%).

18. Please described how lysosomal proteins are synthesized, processing, and targeting to the lysosome for the function of protein degradation (8%).

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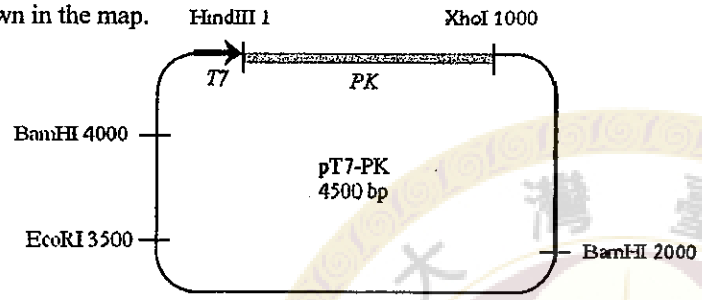
19.Please describe the cascade of biochemical reactions involved in the visual cycle. (8%)

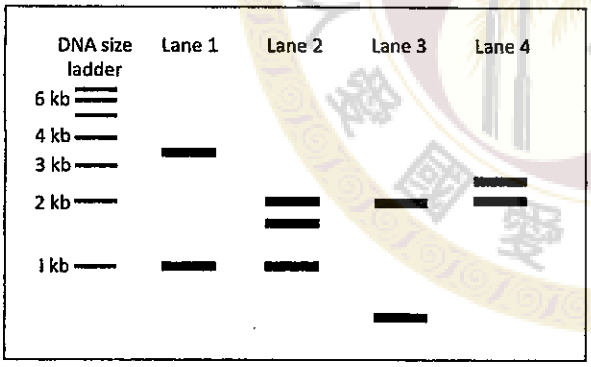
20.Please describe each step of the *de novo* biosynthesis pathway of cholesterol and its derivatives in human adrenal gland and sex organs. (8%)

An in vitro trascription/translation system was used to express a viral protein, PK. The following is the plasmid map for the expression, and the location of the sites for some restriction endonucleases (RE) on the plasmid are shown in the map.



21. The plasmid is 23 percent guanosine determined by chemical means. What is the percent composition of adenosine in the plasmid? (2%)

To check the plasmid, several combinations of two REs in the map above were used to digest the plasmid DNA and the digested DNA fragments were analyzed by agarose gel electrophoresis as shown in the following figure.



22. What are the REs used in the sample from Lane 4? (2%)

23. Continued the #22 question, what are all possible combinations of REs used in the sample from the Lane 1? (2%)

24. Continued the questions above, how many kilodaltons (kDa) of the PK protein should be predicted to observe after in vitro translation with the plasmid and analysis with SDS-PAGE? (2%)

25. Please simply give four different examples of protein posttranslational modifications. (8%)

26. Please describe the role of transfer RNA (tRNA) in translation. (8%)

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