※ 注意：請於答案卷上依序作答，並應註明作答之題號。

I. (單選題, 每題 1 分)

1. Recognition of antigen by T-cell receptor is mediated through
   (A) major histocompatibility complex
   (B) RAG1
   (C) RAG2
   (D) Ligase
   (E) Kinase.

2. At which phase of cell cycle the cells contain the highest protein mass?
   (A) G1
   (B) S
   (C) G2
   (D) M
   (E) G0.

3. The function of a gene is completely eliminated by
   (A) Point mutation
   (B) Transduction
   (C) Transfection
   (D) Null mutation
   (E) Silent mutation.

II. (複選題, 每題 2 分)

4. Methods used to determine the relative quantity of RNA
   (A) Southern blotting
   (B) Northern blotting
   (C) ELISA
   (D) Western blotting
   (E) RNase protection assay.

5. Core histone
   (A) is formed by H4
   (B) is formed by H3
   (C) is formed by H2A
   (D) is formed by H1B
   (E) is an octamer.

6. Protein kinase (dual specificity kinase) can phosphorylate target proteins on
   (A) Ala
   (B) Ser
   (C) Thr
   (D) Leu
   (E) Tyr.

接背面

7. Which statements about the transcription of prokaryotic gene are true?
   (A) Catalyzed by RNA polymerase
   (B) RNA polymerase bind to one face of DNA
   (C) Sigma factor controls binding to DNA
   (D) Promoter recognition depends on consensus sequences
   (E) Three modes of termination.

8. Which are bacterial rRNAs?
   (A) 28S
   (B) 23S
   (C) 18S
   (D) 16S
   (E) 5S.

9. RNA polymerase III
   (A) transcribe mRNA
   (B) transcribe rRNA
   (C) transcribe small RNA
   (D) transcribe tRNA
   (E) recognize promoter directly.

10. Which are the subunits of mammalian ribosomes?
   (A) 60S
   (B) 50S
   (C) 40S
   (D) 30S
   (E) 70S.

11. Which statements about protein trafficking are true?
   (A) Exocytosis is mediated by coated vesicles
   (B) Glycoproteins are generated in the ER and Golgi
   (C) Receptors recycle via endocytosis
   (D) Endocytosis is not mediated by coated vesicles
   (E) Neurotransmitters are released from a presynaptic cell when an impulse causes endocytosis.

12. Which of the following trigger programmed cell death?
   (A) Irradiation
   (B) Withdrawal of essential growth factor
   (C) Cytotoxic lymphocytes attacking target cells
   (D) Glucocorticoid treatment
   (E) Ligand binding to receptor

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13. Which factors are needed for recombination of immunoglobulin gene?
    (A) Consensus octamer
    (B) Consensus heptamer
    (C) Consensus nonamer
    (D) 12 bp spacer
    (E) 23 bp spacer.

14. Normal cells can develop into cancer cells. What properties listed below define a cancer cell?
    (A) Apoptosis
    (B) Immortalization
    (C) Transformation
    (D) Metastasis
    (E) Translocation.

III. 解釋名詞：(15 分)

15. RAG

16. MAP kinase

17. Si RNP

18. Caspase

19. Ubiquitin

IV. 問答題

20. 說明當細胞受到刺激例如 tumor necrosis factor(TNF)的刺激時，細胞內 nuclear factor-κB (NF-κB)是如何經由訊息的傳導而活化的？以及它是如何受到調控？(10 分)

21. 請簡述 poly(A)如何加入 mRNA 3' end。(8 分)

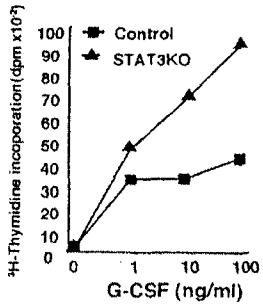
22. 請敘述 excision repair system 修補 DNA damage 的過程。(8 分)

23. 請由 TATA box 與 general transcription factor 結合開始，說明 transcription initiation complexes 如何在 eukaryotic gene promoter 上組合起來。(9 分)

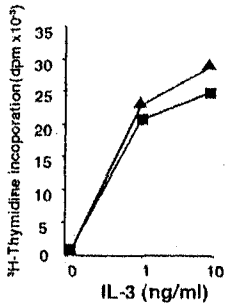
24. Cytokine response is controlled by positive regulators, such as JAK-STAT pathway, and negative regulators, such as suppressor of cytokine signaling (SOCS). To investigate the role of STAT3 in cytokine response, bone marrow cells lacking STAT3 (STAT3KO) were treated with increased amount of G-CSF (A) or IL-3 (B). ^{3}H-Thymidine incorporation as an indication of cell proliferation was measured after cytokine treatment. Please describe the effect of STAT3 in G-CSF or IL-3-mediated proliferation (5 分). SOCS3, a member of SOCS family was suspected to be responsible for the abnormal response in STAT3KO cells. The level of SOCS3 was then measured in cells treated with G-CSF (10 ng/ml) at indicated times by RT-PCR. According to the results in (C), please speculate a mechanism for the results seen in (A) (10 分).

接背面

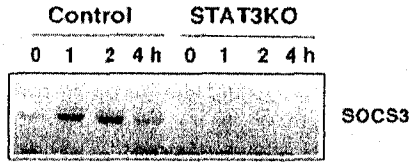
A.



B.

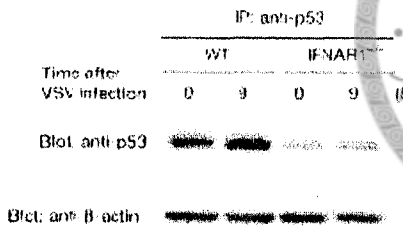


C.

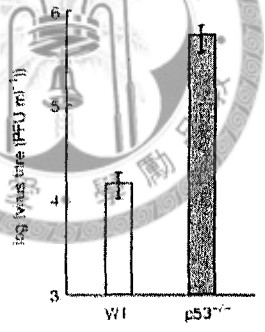


25. Tumor suppressor P53, activated in response to DNA damage, induces cell cycle arrest or apoptosis. On the other hand, IFNα/β, induced in the cells in response to viral infection is a critical cytokine for anti-viral response. To investigate the relationship between P53 and IFNα/β in anti-viral response, cells with (WT) or without IFNα/β (IFNAR1$^{-/-}$) receptor were infected with a virus, VSV. The protein level of P53 was measured in (A). Please make a conclusion for the results shown in (A) (5 分). Cells with (WT) or without P53 (P53$^{-/-}$) were further infected with VSV followed by measuring the viral titer after the infection (B). In combination with the findings in (A), please summarize these two experiments in terms of the role of P53 in anti-viral response (5 分).

A.



B.



試題隨卷繳回