

國立臺北科技大學九十八學年度碩士班招生考試

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第一節 生物化學 試題

第一頁 共三頁

注意事項：

1. 本試題共四大題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、單選題，每題 2 分，共 60% (Single Choice Questions, 2 points each, 60%) :

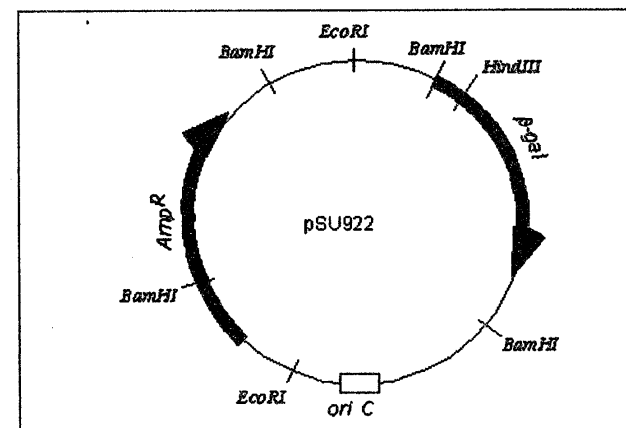
1. True hydrogen bonds can NOT form between hydrogen and this element:
 - a) N
 - b) F
 - c) C
 - d) O
 - e) All of these elements can form hydrogen bonds.
2. If the pH of 1 liter of a 1.0 M carbonate buffer is 7.0, what is the molar ratio of H_2CO_3 to HCO_3^- ? ($\text{pK} = 6.37$)
 - a) 0.234
 - b) 4.27
 - c) 6.37
 - d) 7.00
 - e) 10.20
3. The pOH of a solution of 0.04 M HCl is:
 - a) 1.4
 - b) 10
 - c) 12.6
 - d) 13.6
 - e) The pOH cannot be determined
4. Given the R-groups in the peptide, ALA-GLN-ARG-SER-HIS, it would likely be:
 - a) Very water soluble
 - b) Somewhat water soluble
 - c) Not very water soluble
 - d) Not soluble at all
 - e) You cannot tell from the sequence
5. Which of the following is not used in protein structure determination?
 - a) digestion with proteolytic enzymes
 - b) the Edman method
 - c) treatment with cyanogen bromide
 - d) treatment with alkyl halides
6. What effect does increasing temperature (T) have on enzyme-catalysed reactions?
 - a) Temperature has little effect on enzyme reactions.
 - b) Increasing T increases the rate of enzyme reactions over wide temperature ranges.
 - c) Increasing T increases the rate of enzyme reactions until the heat denatures the enzyme.
 - d) Enzymes always work fastest at the normal T of the organism in which they are found.
 - e) None of these is correct.
7. What effect is seen on a Lineweaver-Burk graph when a competitive inhibitor is added?
 - a) The y-intercept is changed, but not change the slope of the line.
 - b) The slope of the line is changed, but not the y-intercept.
 - c) Both the y-intercept and the slope of the line are changed.
 - d) Neither the y-intercept nor the slope of the line is changed.
8. The main distinguishing feature of the concerted model for the behavior of allosteric enzymes is that
 - a) the conformation of all subunits changes simultaneously.
 - b) it applies only to dimeric enzymes.
 - c) it involves three possible conformations for all subunits.
 - d) the T and R conformations exist in roughly equal amounts.
9. Which of the following can function as coenzymes?
 - a) lead ion, biotin, and lipoic acid.
 - b) copper ion, *p*-hydroxymercuribenzoate, diisopropylphosphofluoridate.
 - c) zinc ion, pyridoxal phosphate, and nicotinamide adenine nucleotides.
 - d) lead ion, *p*-hydroxymercuribenzoate, diisopropylphosphofluoridate.
10. Which of the following enzymes uses coenzyme FAD as the electron acceptor?
 - a) isocitrate dehydrogenase
 - b) succinate dehydrogenase
 - c) aconitase
 - d) malate dehydrogenase
11. During anaerobic metabolism in red blood cells, the carbons of glucose end up in
 - a) CO_2 .
 - b) ethanol.
 - c) lactic acid.
 - d) both CO_2 and ethanol.
 - e) all of the above.
12. In glycolysis, ATP is synthesized by
 - a) substrate-level phosphorylation.
 - b) oxidative phosphorylation.
 - c) both substrate-level and oxidative phosphorylation.
 - d) all three of the above methods.

注意：背面尚有試題

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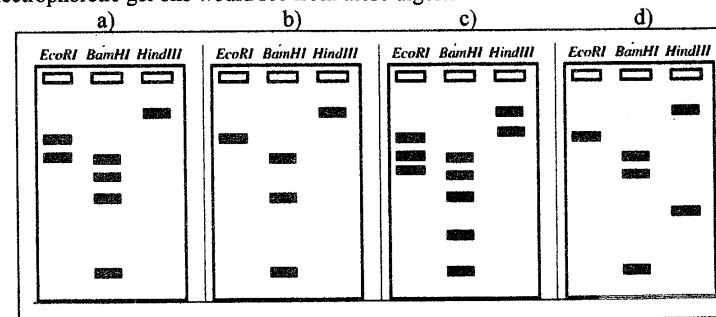
13. The order of compounds in the conversion of glucose to pyruvic acid is as follows: (PEP = phosphoenolpyruvate)
- Fructose-*bis*phosphate, fructose-6-phosphate, 1,3-phosphoglyceric acid, 3-phosphoglyceric acid, PEP.
 - Fructose-6-phosphate, fructose-*bis*phosphate, PEP, 1,3-phosphoglyceric acid, 3-phosphoglyceric acid.
 - Fructose-6-phosphate, fructose-*bis*phosphate, 1,3-phosphoglyceric acid, 3-phosphoglyceric acid, PEP.
 - Fructose-6-phosphate, fructose-*bis*phosphate, 3-phosphoglyceric acid, 1,3-phosphoglyceric acid, PEP.
 - Fructose-*bis*phosphate, fructose-6-phosphate, 3-phosphoglyceric acid, 1,3-phosphoglyceric acid, PEP.
14. The main difference, on the surface of a red blood cell, between the A-B-O major blood groups depends on
- the presence or absence of a certain protein sequence.
 - the presence or absence of a certain sugar.
 - the presence or absence of an acetyl group on a sugar.
 - all of the above.
15. Which of the following monosaccharides is a ketose?
- glucose
 - fructose
 - galactose
 - mannose
16. ATP is a good source of energy to run metabolic reactions for all the following reasons, except:
- The pyrophosphate bond has a high energy of hydrolysis.
 - The sugar group is very reactive.
 - The bonds between the phosphates are acid anhydrides.
 - The phosphate groups can combine readily with other molecules.
 - All of these explain why ATP is a good energy source.
17. Eukaryotic and prokaryotic ribosomes can be compared in all these ways, **EXCEPT**:
- Both have large and small subunits.
 - Eukaryotic ribosomes are larger.
 - Both contain the same number of RNA molecules.
 - Eukaryotic ribosomes contain more proteins.
 - All of these statements are accurate comparisons.
 - All organisms can do this.
18. Which of the following is not a function characteristic of membrane proteins?
- Transport
 - Catalytic activity
 - Blood clotting
 - Receptor sites

19. The "natural" function of restriction endonucleases is to
- protect bacterial cells from invasion by viruses (bacteriophages).
 - help bacteriophages infect cells.
 - regulate gene expression from specific promoters.
 - remove chromatin from histones.
20. The presence of bacterial or viral clones is detected experimentally by
- the presence of colonies or plaques on a suitably prepared Petri dish.
 - gel electrophoresis.
 - analytical ultracentrifugation.
 - X-ray crystallography.
21. The plasmid pSU922 is a circular DNA containing 25000 base pairs. The β -gal gene codes for the enzyme β -galactosidase, the product of which will turn bacterial colonies blue when grown in the presence of X-gal; the Amp^R gene confers ampicillin resistance.



Which restriction site is best for inserting a DNA fragment for analysis?

- BamHI
 - EcoRI
 - HindIII
 - They're all equally good
22. Referring to 21, in three separate vessels, the plasmid is treated with the restriction endonucleases EcoRI, BamHI, and HindIII. Which of the following best represents the electrophoretic gel one would see from these digests?



23. Referring to 21, neglecting any discussion of whether it's a good or bad choice, I attempt to insert a gene fragment into the HindIII site and transform bacteria with the plasmid. How can I tell which transformants have the insert?
- The bacteria will not be able to grow in the presence of ampicillin, and they will be blue.
 - The bacteria will not be able to grow in the presence of ampicillin, and they will be white.
 - The bacteria will be able to grow in the presence of ampicillin, and they will be blue.
 - The bacteria will be able to grow in the presence of ampicillin, and they will be white.
24. The ability of cancer cells to travel to other parts of the body and produce new tumors is called
- immortality.
 - oncogenesis.
 - metastasis.
 - suppression.
25. Which of the following molecules is **not** a product of the pentose phosphate pathway?
- NADPH
 - ribose-5-phosphate
 - glycerate-3-phosphate
 - xylulose-5-phosphate
26. Which of the following enzymes **does not** use NAD⁺ for oxidation?
- Alpha*-Ketoglutarate Dehydrogenase complex.
 - Iso*Citrate Dehydrogenase.
 - Succinate Dehydrogenase.
 - Malate Dehydrogenase.
 - All of these enzymes use NAD⁺
27. Electron flow in the mitochondria follows this pathway:
- Complex I → complex II → complex III → complex IV.
 - Complex IV → complex III → complex II → complex I.
 - Complex I → complex III → complex IV.
 - Complex II → complex III → complex IV.
 - Both complex I → III → IV and complex II → III → IV.
28. The reactions involved in beta-oxidation of fatty acids include the following:
- Cleavage of acetyl-CoA from the fatty acid.
 - Hydration of a double bond.
 - Formation of a C-C double bond.
 - Oxidation of an alcohol.
- The correct order of these reactions is:
- 1 → 2 → 3 → 4
 - 4 → 3 → 2 → 1
 - 3 → 2 → 4 → 1
 - 2 → 4 → 3 → 1
 - 1 → 4 → 3 → 2

29. The reactions during the light phase of photosynthesis include the following:

- Light absorption in photosystem I
- Light absorption in photosystem II
- Formation of O₂ from water
- Formation of NADPH
- Formation of ATP

The order of the reactions is as follows:

- 4 → 2 → 3 → 1 → 5.
- 3 → 2 → 5 → 1 → 4.
- 3 → 1 → 5 → 2 → 4.
- 4 → 1 → 5 → 2 → 3.
- 5 → 2 → 4 → 1 → 3.

30. Which of the following amino acids has a net charge of +1 at pH 4 and a net charge of 0 at pH 8?
- glu
 - arg
 - his
 - tyr

二、名詞解釋，每題3分，共21分 (Glossary illustration, 3 points each, 21%)

- induced-fit model of enzymes
- nick translation
- Lineweaver-Burk double-reciprocal plot
- Q cycle
- RFLPs
- enkephalins
- ketone bodies

三、Please describe why and how alcohol abusing causes "fatty liver" and malnutrition diseases. (9%)

四、Please describe the transcription processes in prokaryotes and eukaryotes respectively. (10%)