

EXAM NUMBER: _____

SEAT NUMBER _____

NAME _____

DABC 711 - HUMAN BIOCHEMISTRY
EXAMINATION NO. 2 INSTRUCTIONS, March 2, 2007

1. Write your name on the front of the exam, and on the answer sheet.
2. The exam contains 41 multiple choice questions and 7 short answer/essay questions referring to the case study. **Read each question carefully before answering.** Choose the **best choice** from each multiple choice question and record your answer on the answer sheet using a #2 pencil. The multiple choice questions are worth two (2) points each. Points will not be given for a correct multiple choice answer written on the exam but an incorrect answer on the answer sheet.
3. Questions for the case study are the last questions on the exam. Points for each case study question are given in parentheses () following the question. The case study is reproduced on the last page of the exam, and may be torn off for your use.
3. This exam is worth 100 points (although 103 are possible).
4. Use your time wisely. You have until **9:55 AM** to complete the exam.
5. **GOOD LUCK!**

1. Which of the following is the **least** utilized source of nucleotide usage in the body?
 - A. Purine salvage
 - B. *de novo* purine synthesis
 - C. Purines and pyrimidines in the diet
 - D. Pyrimidine salvage
 - E. *de novo* pyrimidine synthesis

2. PRPP is utilized in
 1. Purine salvage
 2. *de novo* purine synthesis
 3. Pyrimidine salvage
 4. *de novo* pyrimidine synthesis
 - A. 1 and 2
 - B. 3 and 4
 - C. 1 and 3
 - D. 2 and 4
 - E. 1, 2, 3 and 4

3. The precursor molecules **most** utilized in *de novo* pyrimidine synthesis are (1) .
The precursor molecules **most** utilized in *de novo* purine synthesis are (2) .
 - A. (1) amino acids; (2) amino acids
 - B. (1) amino acids; (2) carbohydrates
 - C. (1) carbohydrates; (2) carbohydrates
 - D. (1) carbohydrates; (2) amino acids
 - E. (1) carbohydrates; (2) lipids

4. Regulation of purine synthesis is more complex than regulation of pyrimidine synthesis because
 1. there is accelerated regulation in purine synthesis.
 2. the purine pathway is branched.
 3. the unbranched purine pathway is longer than the unbranched pyrimidine pathway.
 - A. Only 1
 - B. Only 2
 - C. Only 3
 - D. 1 and 2
 - E. 1 and 3

5. Which of the following is a disease state of pyrimidine metabolism?
 - A. Urea toxicity
 - B. Orotic aciduria
 - C. Gout
 - D. Lesch-Nyhan Syndrome
 - E. Hyperuricemia

6. Which of the following is **not made directly** from thioredoxin reduction?
- A. dCDP
 - B. dADP
 - C. dGDP
 - D. dUDP
 - E. All the above are made directly by thioredoxin reduction.
7. The use of anticancer drugs like Aminopterin, Methotrexate, and fluorouracil is to decrease/prevent _____ in cancerous cells.
- A. DNA synthesis
 - B. RNA synthesis
 - C. Protein synthesis
 - D. oxidation of ribonucleotides to deoxyribonucleotides.
 - E. reduction of ribonucleotides to deoxyribonucleotides.
8. Restriction enzymes are (1) isolated from (2) that cleave (3) at symmetrically positioned sites.
- A. (1) endonucleases; (2) bacterial cells; (3) double-stranded DNA
 - B. (1) endonucleases; (2) bacterial cells; (3) single-stranded RNA
 - C. (1) endonucleases; (2) human cells; (3) single-stranded DNA
 - D. (1) exonucleases; (2) bacterial cells; (3) single-stranded RNA
 - E. (1) exonucleases; (2) human cells; (3) double-stranded DNA
9. A radioactively labeled DNA probe is used to determine a specific organism in a periodontal infection. What is the step **immediately preceding** addition of the probe?
- A. autoradiography
 - B. electrophoresis
 - C. Southern blotting
 - D. Northern Blotting
 - E. enzyme cleavage
10. Which of the following is an aspect of the dideoxy method?
- A. Dideoxynucleotides will interfere with mRNA synthesis.
 - B. Dideoxynucleotides will interfere with single-chain DNA synthesis.
 - C. Dideoxynucleotides can be scanned on a DNA chip.
 - D. A DNA sequencing machine can be used to incorporate deoxynucleotides into a DNA sequence.
 - E. Incorporation of a dideoxy nucleotide will stop DNA synthesis.
11. At present, a periodontist is most likely to contract with a testing laboratory to use a DNA probe to determine a species of _____ in a periodontal infection.
- A. aerobic bacteria
 - B. anaerobic bacteria
 - C. virus
 - D. fungus.

12. Which of the following is (are) **correct** concerning PCR technique?
1. PCR technique is used to amplify DNA sequences.
 2. Primer sequences are usually larger than the target sequences.
 3. Heating and cooling are essential steps in the PCR procedure.
- A. Only 1
B. Only 2
C. 1 and 3
D. 2 and 3
E. 1, 2 and 3
13. Which of the following might be a potential problem in sequencing DNA using a DNA chip (65,536 octamers)?
- A. The DNA segment might have a sequence that might not complement DNA octamers on the DNA chip.
 - B. Dideoxy analogs on the DNA chip are hard to synthesize.
 - C. The octamers on the chip are highly radioactive.
 - D. It might be difficult to sequence a long segment of DNA.
14. You want to clone the proinsulin gene in *E. coli* bacteria. Which of the following would be the **most** important consideration to clone the correct copy of proinsulin?
- A. Make sure your vector has tetracycline resistance
 - B. Use a DNA probe
 - C. Use plasmids as vectors
 - D. Use viruses as vectors
 - E. Use cDNA
15. If a plasmid is used in a cloning project, what is usually done to insure proper selection of the recombinant cells?
- A. A section of the plasmid codes for antibiotic resistance.
 - B. A virus is added to the final cell mixture, and will select the correct recombinant cells.
 - C. Introns are excised in the plasmid DNA before incorporation in the bacterial cell.
 - D. Exons are excised in the plasmid DNA before incorporation in the bacterial cell.
 - E. Use the correct restriction enzymes to insert the DNA segment in the plasmid.
16. Human insulin is not cloned directly in procaryotes because
- A. post-translational enzyme cleavages only occur extracellularly.
 - B. procaryotes cannot directly clone any human peptide or protein.
 - C. procaryotes do not make the enzymes that cleave proinsulin to insulin.
 - D. procaryotes cannot make a single-chain protein out of the DNA used.

17. Which of the following is (are) **true**?
1. A single correct amino acid sequence can be determined from an exon nucleotide sequence.
 2. A single correct nucleotide sequence can be determined from an amino acid sequence.
 3. The rate of virus incorporation into bacterial cells is higher than the rate of plasmid incorporation into bacterial cells.
- A. Only 1
B. Only 2
C. 1 and 2
D. 1 and 3
E. 2 and 3
18. Consider statements 1 and 2 concerning Chromosome Walking.
1. The procedure is used on large segments of DNA.
 2. The procedure is dependent on overlap of different DNA regions of interest.
- A. Statement 1 is true and Statement 2 is false.
B. Statement 1 is false and Statement 2 is true.
C. Both statements are true.
D. Both statements are false.
19. Which of the following is/are **true** concerning inflammation?
1. Redness and heat are attributable to vasoconstriction.
 2. The level of pain is dependent on the amount of swelling in a confined space.
 3. Swelling is due to decreased vascular permeability.
- A. Only 1
B. Only 2
C. 1 and 3
D. 2 and 3
E. 1, 2 and 3
20. In inflammation, PMNs are:
- A. vasoactive amines.
B. prostaglandins.
C. leukotrienes.
D. white blood cells.
E. immunoglobulins.
21. Consider statements 1 and 2 concerning PMN and monocyte action.
1. Chemotaxis is the process where a PMN or monocyte moves toward a foreign target.
 2. Opsonization is the process of recognizing and attaching to the target.
- A. Statement 1 is true and Statement 2 is false.
B. Statement 1 is false and Statement 2 is true.
C. Both statements are true.
D. Both statements are false.

22. Which of the following is not or does not work via radical formation?

- A. Superoxide
- B. Lactoferrin
- C. Hydrogen Peroxide
- D. Hypochlorous Acid

23. What is the **best** sequence of events in wound healing?

- 1. Wound contraction
- 2. Epithelization
- 3. Inflammation
- 4. Granulation tissue formation

- A. 3, 1, 2, 4
- B. 2, 4, 1, 3
- C. 4, 2, 3, 1
- D. 3, 2, 4, 1
- E. 2, 1, 3, 4

24. Which of the following is/are **true** concerning capillary budding?

- 1. It is considered part of Granulation.
- 2. Endothelial cells will project from pre-existing capillaries.
- 3. Increased blood flow will occur.

- A. Only 1
- B. Only 2
- C. 1 and 3
- D. 2 and 3
- E. 1, 2 and 3

25. Consider statements 1 and 2 concerning wound healing.

- 1. There is a considerable loss of tissue when healing by second intention (compared to healing by first intention.)
- 2. A diabetic would likely have wounds that heal poorly.

- A. Statement 1 is true and Statement 2 is false.
- B. Statement 1 is false and Statement 2 is true.
- C. Both statements are true.
- D. Both statements are false.

26. Which nerve fiber requires the least stimulation to "fire"?

- A. A-delta fibers
- B. B-delta fibers
- C. C-delta fibers
- D. C fibers

27. The interstitial pressure within the pulp in **irreversible** pulpitis is approximately
- A. 5 mm Hg
 - B. 10 mm Hg
 - C. 15 mm Hg
 - D. 25 mm Hg
 - E. 35 mm Hg
28. In the inflamed pulp, nerve tissue is typically
- A. hyperreactive before necrosis occurs
 - B. hyporeactive before necrosis occurs
 - C. unchanged until inflammation has progressed to necrosis
29. Which one of the following is not a result of inflammation?
- A. vascular dilation
 - B. decreased vascular permeability
 - C. edema
 - D. cellular migration through vessel walls
30. During wound healing and remodeling, which cell produces procollagen and proteoglycan?
- A. Neutrophil
 - B. Platelet
 - C. Fibroblast
 - D. Macrophage
 - E. None of the above
31. Which immune cell plays a key role in wound debridement and production of growth factors?
- A. Platelets
 - B. Macrophages
 - C. Plasma cells
 - D. Neutrophils
 - E. None of the above
32. Which of the following conditions may adversely affect the outcome of periodontal surgery?
- 1. Diabetes
 - 2. Bacteria
 - 3. Suturing technique
 - 4. Smoking
- A. 1 and 2
 - B. 3 and 4
 - C. 1, 2 and 3
 - D. 2, 3 and 4
 - E. 1, 2, 3 and 4

33. Consider statements 1 and 2 concerning wound healing.
1. Resolution involves the removal of inflammatory elements from a tissue or organ resulting in return to normal structure and function.
 2. The alternative to resolution is fibrous repair.
- A. Statement 1 is true and Statement 2 is false.
B. Statement 1 is false and Statement 2 is true.
C. Both statements are true.
D. Both statements are false.
34. Consider statements 1 and 2.
1. There is more fluoride in bone than dentin.
 2. The amount of fluoride in a cross-section of enamel is fairly uniform.
- A. Statement 1 is true and Statement 2 is false.
B. Statement 1 is false and Statement 2 is true.
C. Both statements are true.
D. Both statements are false.
35. Consider statements 1 and 2.
1. 3 ppm of fluoride is optimum in preventing DMFT yet minimizing fluorosis.
 2. Bones containing too much fluoride tend to be brittle.
- A. Statement 1 is true and Statement 2 is false.
B. Statement 1 is false and Statement 2 is true.
C. Both statements are true.
D. Both statements are false.
36. Which of the following is (are) **true**?
1. Fluoride can be absorbed in the oral mucosa.
 2. In blood, most fluoride is bound to protein.
 3. Fishes and tea have higher fluoride contents than most other foods.
- A. Only 1
B. Only 2
C. 1 and 2
D. 2 and 3
E. 1, 2 and 3
37. Which of the following (is)are **true**?
1. Fluoride can inhibit carbohydrate metabolism in oral microorganisms.
 2. The higher the concentration of fluorapatite the higher the adherence of pellicle to the tooth surface.
 3. Fluorapatite is less acid-resistant than hydroxyapatite.
- A. Only 1
B. 1 and 2
C. 1 and 3
D. 2 and 3
E. 1, 2 and 3

38. Consider statements 1 and 2.
1. The greater the vasculature (of bone or teeth), the greater the incorporation of fluoride.
 2. The deposition of fluoride is not dependent on the age of the individual.
- A. Statement 1 is true and Statement 2 is false.
B. Statement 1 is false and Statement 2 is true.
C. Both statements are true.
D. Both statements are false.
39. Which three systems are the **most** involved in organ communication?
1. respiratory
 2. endocrine
 3. gastrointestinal
 4. nervous
 5. vascular
- A. 1, 3 and 5
B. 1, 2 and 4
C. 2, 3 and 4
D. 2, 4 and 5
E. 3, 4 and 5
40. Which of the following would be affected if a person had diabetes?
1. carbohydrate metabolism
 2. protein/amino acid metabolism
 3. lipid metabolism
 4. nucleic acid metabolism
- A. Only 1
B. 1 and 2
C. 1 and 3
D. 1, 2 and 3
E. 1, 2, 3 and 4
41. Which organ/tissue is capable of doing more different metabolic pathway reactions than any other organ/tissue in the body?
- A. adipose
B. liver
C. RBC
D. muscle
E. kidney

47. Explain how a diet high in protein would affect this patient. (2.5 pts)

48. How could this patient be treated? Discuss the pros and cons of different treatments and explain the biochemical basis for their actions. (6.5 pts)

DABC 711 - Human Biochemistry Case Study for Exam 2

A 56 year-old distinguished member of the medical faculty was awarded an honorary degree four days before admission to the hospital. Following the award ceremony he spent the evening with friends where, as he put it, the "conviviality flowed extensively." The following morning he noticed a dull pain in the upper left flank, which worsened until hospitalization was required.

Physical examination revealed no overt signs of disease. The patient was in good health, the only previous complaint being metatarsal arthralgia, which was presumed to be the result of golf and tennis. On admission the patient had a temperature of 39°C and a pulse rate of 90. Blood tests for BUN and creatinine were 6.7 mmol/L and 78 µmol/L, respectively. A urine sample obtained on admission had a pH of 4.5 and was positive for protein. Microscopic examination of the centrifugal sediment from the sample revealed the presence of some fine crystalline material and numerous casts. A 24-hr urine sample was then collected; it contained 115 mg of protein and 1.52 g (9 mmol) of uric acid. The serum uric acid content was measured and found to be 0.70 mmol/L (11.8 mg/dl).