CHEM 351
FALL 2004
TEST #5

NAME:_____

Circle the letter corresponding to the best answer for each of the following:

Which of the following nitrogen bases is not present in RNA?

a) Adenine
b) Uracil
c) Cytosine
d) Thymine

Which of the following macromolecules is the last source of energy via catabolic pathways in muscle cells?

a) polysaccharides
b) proteins
c) triglycerides
d) polynucleotides

What is the sequence of the RNA coded by the small section of DNA with the base sequence ACTGATT?

a) AATCAGT
b) AAUCAGU
c) UGACUAA
d) TGACTAA

Which of the following is not true of the Watson-Crick DNA?

a) parallel nucleotide strands
b) complementary base compositions of strands
c) 34 Å per turn of the helix
d) 10 base pairs per turn of the helix

5. Which of the following is the immediate energy source for polysaccharide synthesis?

a) ATP b) CTP c) GTP d) UTP

6. The nitrogen bases of nucleic acids have a useful absorption maxima in the UV at?

a) 220 nm b) 240 nm c) 260 nm d) 280 nm

Anabolism is?

a) divergent
b) regulated by feedback inhibition
c) energetically uphill
d) all of the above

8. An immediate source of high energy bonds in mammalian muscle cells is?

a) phosphocreatine
b) glucose-6-phosphate
c) pyrophosphate
d) phosphohistidine

9. Many biosynthetic reactions are made irreversible via the action of the enzyme?

a) Pyrophosphatase
b) Adenylate Kinase
c) Creatine Kinase
d) Nucleosidediphosphokinase

Consider the three DNA molecules below in answering questions 10-13:

DNA	Mole Fraction of dGMP
A	0.10
B	0.20
C	0.30

10. What is the mole fraction of d CMP in DNA B?

a) 0.10 b) 0.20 c) 0.30 d) 0.40

11. What is the mole fraction of d AMP in DNA A?

a) 0.10 b) 0.20 c) 0.30 d) 0.40

12. Which DNA would have the lowest melting point?

a) A
b) B
c) C
d) can not be determined

13. Which DNA would exhibit the greatest amount of hypochromicity?

a) A
b) B
c) C
d) can no be determined

14. Which of the following is the rationale for the high free energy of hydrolysis of phosphoenolpyruvate to pyruvate?

a) electrostatic repulsion in the reactant
b) tautomerization of the product
c) resonance stabilization of the product
d) all of the above

15. Which of the following is <u>not</u> a component of a nucleotide?

a) a nitrogen base
b) a ribose
c) a phosphate
d) all of the above are components of nucleotides

Complete the following questions as directed:

26. Draw a GC base pair using dotted lines to show hydrogen bonding.

17. If the standard free energy of hydrolysis for pyrophosphate is -33.6 kJ/mole, what is the value of the equilibrium constant for the reaction?

18. Orc muscle cells typically contain 2.50×10^{-3} M ATP, 3.50×10^{-4} M ADP and 2.00×10^{-2} M phosphate. Given that the standard free energy of hydrolysis of ATP is -30.50 kJ/mole, what is the free energy of hydrolysis under physiological conditions. Note Orc's have a body temperature of 30 °C.

19. Given the following standard free energies of hydrolysis:

Compound	ΔG°, kJ/mole
ATP	-30.50
Sucrose	-27.60
Glucose-6-PO_4	-13.80
Fructose-6-PO_4	-15.90

What is the standard free energy change for the reaction below?

Glucose-6-PO_4 + Fructose $\rightarrow$ Sucrose + PO_4

20. Write an equation for the overall reaction which will occur spontaneously and calculate ΔE° and ΔG° when the Fe^{3+}/Fe^{2+} and NAD^+/NADH half-reactions are coupled under standard conditions at 25 °C.

21. How can high concentrations of acetylCoA, with a standard free energy of hydrolysis of -32 kJ/mole, exist in cells?