***LEGIT LIGHTNING ROUND 6***

**TOSS-UP**

1) CHEMISTRY *Short Answer* What industrial process utilizes the ammonia formed from the Haber process to form nitric acid?

ANSWER: OSTWALD PROCESS

**TOSS-UP**

2) CHEMISTRY *Short Answer* By name or number, identify all of the following four compounds that are not strong acids.

I. nitric acid

II. chloric acid

III. hydrocyanic acid

IV. hydrofluoric acid

ANSWER: I, II AND IV

**TOSS-UP**

1. 3) BIOLOGY *Short Answer* What is the overall reaction of nitrogen fixation in the nitrogen cycle?

ANSWER: N2 + 3H2 == 2NH3

**TOSS-UP**

4) BIOLOGY *Short Answer*  What is the process by which bacteria and fungi use the amino acids they obtain through decomposition to synthesize their own proteins and to release excess nitrogen in the form of ammonium ions?

ANSWER: AMMONIFICATION

**TOSS-UP**

5) CHEMISTRY *Short Answer* What technique is used to separate air into liquid oxygen, liquid nitrogen and concentrated argon?

ANSWER: FRACTIONAL DISTILLATION (DO NOT ACCEPT DISTILLATION OR SIMPLE DISTILLATION)

**TOSS-UP**

6) CHEMISTRY *Short Answer* By name or number, identify all of the following four reactions that have a positive change in entropy.

I. 3H2 (g) + N2 (g) == 2NH3 (g)

II. Al (s) == Al 3+ (aq) + 3e-

III. The cell reaction for the Daniell cell.

IV. Ag+ + 2NH3 (l) == Ag(NH3)2 +

ANSWER: II ONLY

**TOSS-UP**

7) BIOLOGY *Short Answer* As opposed to the theory of natural selection, who developed the theory that evolution occurred by the inheritance of acquired characteristics?

ANSWER: JEAN-BAPTISTE LAMARCK

**TOSS-UP**

8) CHEMISTRY *Short Answer* What is the name of the specific thermodynamic cycle used to find the lattice CHEMISTRY of a specific compound?

ANSWER: BORN-HABER CYCLE

**TOSS-UP**

9) CHEMISTRY *Short Answer* By name or number, identify all of the following three statements that are true about the cell cycle.

I. At two points in the cell cycle, feedback from the cell determines whether the cycle will continue.

II. Special proteins regulate the “checkpoints” of the cell cycle.

III. Cancer results from damage to genes encoding proteins that regulate the cell division cycle.

ANSWER: II AND III

**TOSS-UP**

1. 10) CHEMISTRY *Short Answer*  By using a mathematical relation between the temperature at the hot source and the temperature of the cold sink of a Carnot engine, Kelvin was able to deduce that the zero of his scale occurred at a Carnot efficiency of what?

ANSWER: 1

**TOSS-UP**

11) CHEMISTRY *Short Answer* What is the name of the following expression: dS must be greater than or equal to (dq/T).

ANSWER: CLASIUS INEQUALITY

**TOSS-UP**

12) CHEMISTRY *Short Answer* What is the name of the empirical observation that a wide range of liquids give approximately the same standard entropy of vaporization at about 85 J/Kmol?

ANSWER: TROUTON’S RULE

**TOSS-UP**

13) CHEMISTRY *Short Answer* By name or number, identify all of the following four types of plants that can be used for industrial biomass.

I. switchgrass

II. hemp

III. corn

IV. miscanthus

ANSWER: ALL OF THEM

**TOSS-UP**

14) CHEMISTRY *Multiple Choice* Approximately what percent of the CHEMISTRY from the sun is absorbed by clouds, oceans and land masses?

W) 30%

X) 50%

Y) 70%

Z) 90%

ANSWER: Y) 70%

**TOSS-UP**

15) CHEMISTRY *Multiple Choice* As of 2006, what country is the world leader in the total installed capacity of solar hot water systems with 70 gigawatts installed?

W) Canada

X) Australia

Y) Japan

Z) China

ANSWER: Z) CHINA

**TOSS-UP**

16) CHEMISTRY *Multiple Choice*  Which of the following would have the greatest tendency to undergo a Sn1 reaction?

W) n-butane

1. X) isobutane

Y) pentane

Z) propane

ANSWER: X) ISOBUTANE

**TOSS-UP**

17) CHEMISTRY *Short Answer* Also known as black liquor, what is the largest source of CHEMISTRY from wood?

ANSWER: PULPING LIQUOR

**TOSS-UP**

18) CHEMISTRY *Short Answer* What type of electrolytic cell can be used to directly make hydrogen gas from plant matter?

ANSWER: MICROBIAL ELECTROLYSIS CELL

**TOSS-UP**

19) CHEMISTRY *Multiple Choice* About what percent of Earth’s geothermal CHEMISTRY originates from the radioactive decay of minerals?

W) 20%

X) 40%

Y) 60%

Z) 80%

ANSWER: Z) 80%

**TOSS-UP**

20) CHEMISTRY *Multiple Choice* Which of the following best explains why a more substituted carbocation is more stable?

W) The positive charge can be stabilized by being localized when the carbon carrying the positive charge is more substituted.

X) The positive charge can be stabilized through the sigma bonds of adjacent C-H bonds donating into the empty p-orbital of the carbon carrying the positive charge.

Y) The positive charge can be stabilized through intermolecular interactions with adjacent molecules when the carbon carrying the positive charge is more substituted.

Z) The positive charge can be stabilized through the formation of an ionic bond between a neighboring negative molecule and the carbon carrying the positive charge.

ANSWER: X) The positive charge can be stabilized through the sigma bonds of adjacent C-H bonds donating into the empty p-orbital of the carbon carrying the positive charge.

**TOSS-UP**

21) CHEMISTRY *Short Answer* In the second step of biochemical conversion, plant waste fermentation produces what acid?

ANSWER: ACETIC ACID (ACCEPT: ETHANOIC ACID)

**TOSS-UP**

22) CHEMISTRY *Multiple Choice* Which of the following is the best leaving group?

W) CN-

X) I-

Y) F-

Z) Br-

ANSWER: X) I-

**TOSS-UP**

23) CHEMISTRY *Short Answer* What value for l, or the orbital angular momentum quantum number, describes an orbital that can hold 10 electrons?

ANSWER: l = 2

**TOSS-UP**

24) CHEMISTRY *Multiple Choice* Biomass alcohol fuel, or ethanol, is derived primarily from which two plants?

W) sugarcane and corn

X) sugarcane and willow

Y) corn and switchgrass

Z) corn and hemp

ANSWER: W) SUGARCANE AND CORN

**TOSS-UP**

25) CHEMISTRY *Multiple Choice* The Haber process reaction has a change in enthalpy of -92.22 kJ/mol. Which of the following best describes the spontaneity of this reaction?

W) spontaneous at all temperatures

X) nonspontaneous at all temperatures

Y) spontaneous at high temperatures

Z) spontaneous at low temperatures

ANSWER: Z) SPONTANEOUS AT LOW TEMPERATURES