Lightening Round

**TOSS UP**

1. MATH: *Short Answer:* Element x has a half-life of 15 days. Giving your answer in terms of e and ln, how many grams of the element will remain after 7 days if you start with an initial sample of 100 grams?

ANSWER: 100e7(1n0.5/15)

**TOSS UP**

2. PHYSICS: *Short Answer:* A bal is thrown upwards with an initial speed of 5 m/s. If g=10 m/s2, what is the maximum height the ball will reach?

ANSWER: 1 meter

**TOSS UP**

3. PHYSICS: *Multiple Choice:* If heat is added to a system, which of the following must be true?

W) the pressure will increase

X) the entropy will increase

Y) the volume will increase

Z) the mass will increase

ANSWER: X) the entropy will increase

**TOSS UP**

4. PHYSICS: *Short Answer:* What equation gives the relationship between the temperature and volume of a gas?

ANSWER: Charles' Law

**TOSS UP**

5. PHYSICS: *Short Answer:* Calculate the efficiency of a heat engine which has a hot reservoir at 1000K and cold reservoir at 800K

ANSWER: 20%

**TOSS UP**

6. PHYSICS: *Short Answer:* How many Joules are needed to raise the temperature of a 1 kg substance 30 K if its specific heat capacity is 0.1 J/gᵒC?

ANSWER: 3,000 J

**TOSS UP**

7. PHYSICS: *Multiple Choice:* If g=10 m/s2, how long must a pendulum be to have a period of 1 second?

W) 5/2π2 m

X) 1/2π2 m

Y) 10/π2 m

Z) 1/π2 m

ANSWER: W) 5/2π2 m

**TOSS UP**

8. PHYSICS: *Short Answer:* What is the moment of inertia of a solid cylinder with a radius of 2 meters and a mass of 200 grams?

ANSWER: 0.4 kg∙m2

**TOSS UP**

9. PHYSICS: *Short Answer*: An 1kg object moving at 5 m/s collides and sticks to a 9kg object at rest. What is the speed of the two objects after collision?

ANSWER: 0.5 m/s

**TOSS UP**

10. CHEMISTRY: *Short Answer:* Four monosaccharides are joined together to produce two polysaccharides. How many molecules of water are produced as a result?

ANSWER: 2

**TOSS UP**

11. BIOLOGY: *Multiple Choice:* Which of the following would least affect enzyme activity?

W) temperature

X) concentration of enzyme

Y) concentration of substrate

Z) dissolved oxygen

ANSWER: Z) dissolved oxygen

**TOSS UP**

12. BIOLOGY: *Short Answer:* In which stage of cellular respiration is pyruvic acid broken down broken down to produce energy, which is then stored in ATP?

ANSWER: Krebs cycle or citric acid cycle

**TOSS UP**

13. PHYSICS: *Short Answer:* Calculate the efficiency of a heat engine with a hot reservoir at 500K and a cold reservoir at 200 K

ANSWER: 60%

**TOSS UP**

14. PHYSICS: *Multiple Choice:* A 24 kg mass is suspended from a 10m spring with spring constant 6 N/m undergoes simple harmonic motion. In terms of π, what is its frequency?

W) 2π Hz

X) 4π Hz

Y) 1/2π Hz

Z) 1/4π Hz

ANSWER: Z) 1/4π Hz

**TOSS UP**

15. PHYSICS: *Multiple Choice:* Giving your answer in simplest radical form, what will the displacement of a spring where k=50 N/m if 50 n of force is applied?

ANSWER: m

**TOSS UP**

16. PHYSICS: *Short Answer:* What is the process of energy loss in a wave due to internal factors called?

ANSWER: damping

**TOSS UP**

17. PHYSICS: *Multiple Choice:* Which of the following devices is used to directly measure electromotive force?

W) Ammeter

X) Resistor

Y) Voltmeter

Z) Transistor

ANSWER: Y) Voltmeter

**TOSS UP**

18. BIOLOGY: *Multiple Choice:* Which of the following colors of light is the human eye most sensitive to?

W) red

X) green

Y) blue

Z) violet

ANSWER X) green

**TOSS UP**

19. BIOLOGY: *Short Answer:* Which gland located in the region of the chest secretes the hormone Thymosin which functions to stimulate the immunological activity of lymphoid tissue?

ANSWER: Thymus

**TOSS UP**

20. MATHEMATICS: *Short Answer:* What mathematical constant can be given as

and is sometimes referred to as Euler's (reads as Oiler's) number?

ANSWER: e

**TOSS UP**

21. BIOLOGY: *Multiple Choice:* Substrate is to padlock as enzyme is to

W) locksmith

X) key

Y) keyhole

Z) amphoteric substance

**TOSS UP**

22. PHYSICS: *Short Answer:* Two wave crests 45ᵒ out of phase pass a point 4 seconds apart. What is the period of the wave?

ANSWER: 32 seconds

**TOSS UP**

23. CHEMISTRY: *Short Answer:* How many liters of NaOH must be reacted with 500 mL of HCl in order to fully neutralize the solution?

ANSWER: 0.5 L

**TOSS UP**

24. BIOLOGY: *Short Answer:* What polysaccaride is synthesized through the combination of two glucose molecules and is facilitated by the enzyme maltase?

ANSWER: maltose

**TOSS UP**

25. PHYSICS: *Short Answer:* Two 2-ohm resistors are wired in parallel and connected to a 9-volt battery. How much charge flows past a given point on the circuit in 3 seconds?

ANSWER: 27 Coulombs