

BASIS PEORIA SCIENCE BOWL

ROUND ROBIN ROUND 3

TOSS-UP

1) Biology – *Multiple Choice* What is the main protein of the extracellular matrix?

W) Elastin
X) Collagen
Y) Keratin
Z) Globulin

ANSWER: X) Collagen

BONUS

1) Biology – *Short Answer* What protein in the bloodstream is primarily responsible for regulating oncotic pressure?

ANSWER: Albumin

TOSS-UP

2) Chemistry – *Short Answer* Which halogen is the strongest oxidizer?

ANSWER: FLUORINE

BONUS

2) Chemistry – *Multiple Choice* Which of the following is the strongest reducing agent?

W) Na
X) Fr
Y) Ca
Z) Br

ANSWER: X

TOSS-UP

3) Physics – *Multiple Choice* Which of the following is not an overtone of a pipe closed at both ends with a fundamental frequency of 672 Hz?

W) 1344 Hz
X) 2016 Hz
Y) 2351 Hz
Z) 3360 Hz

ANSWER: Y) 2351 Hz

BONUS

3) Physics – *Short Answer* The German scientist Herman von Helmholtz wrote a book, *On The Sensations of Tone*, in which he described a device able to pick out specific frequencies from a complex sound. What is the term for this device, which consists of a rigid container of a known volume, nearly spherical in shape, with a small neck and hole in one end and a larger hole in the other end to emit the sound?

ANSWER: HELMHOLTZ RESONATOR

TOSS-UP

4) Math – *Multiple Choice*Which of the following is not a parallelogram.

W) Rhombus
X) Rectangle
Y) Kite
Z) Square

ANSWER: Y) KITE

BONUS

4) Math – *Short Answer* Find the area of a rhombus with diagonals that measure 12 and 8.

ANSWER: 48

TOSS-UP

5) Earth and Space – *Short Answer* What is formed when a cold front catches up to a slower warm front?

ANSWER: OCCLUDED FRONT

BONUS

5) Earth and Space – *Short Answer* What type of cloud is composed of large, dense, globular masses at medium altitudes?

ANSWER: ALTOCUMULUS

TOSS-UP

6) Energy – *Short Answer* Provide the last name of this scientist, who theorized an engine with a perfectly reversible closed thermodynamic cycle.

ANSWER: Carnot

BONUS

6) Energy – *Short Answer* The second step of the carnot cycle involves the expansion of an adiabatic gas, which performs work on its surroundings. What physical property directly decreases as a result of this process?

ANSWER: Temperature

TOSS-UP

7) Biology – *Multiple Choice* Which of the following muscles is responsible for flexing the trunk of the body?

W) Quadriceps femoris
X) Trapezius
Y) Latissimus dorsi
Z) Rectus abdominis

ANSWER: Z) Rectus abdominis

BONUS

7) Biology – *Multiple Choice* Which of the following muscles is responsible for the action of plantar flexion of the foot?

W) Quadriceps femoris
X) Tibialis anterior
Y) Gastrocnemius
Z) Hamstrings

ANSWER: Y) Gastrocnemius

TOSS-UP

8) Chemistry – *Short Answer* What intermolecular force is responsible for the higher boiling point of CCl4 relative to CHCl3?

ANSWER: LDFs

BONUS

8) Chemistry – *Short Answe*r Solubility of ionic solids in water is based on the formation of what type of intermolecular force?

ANSWER: ION DIPOLE INTERACTION

TOSS-UP

9) Physics – *Multiple Choice* A bullet is launched from a horizontal gun on Earth with negligible air resistance. Which of the following is true about the bullet?

W) Momentum stays constant
X) Total velocity stays constant
Y) Y-velocity stays constant
Z) X-velocity stays constant

ANSWER: Z) X-VELOCITY STAYS CONSTANT

BONUS

9) Physics – *Multiple Choice* A bullet is fired from a gun with an initial velocity of 9.8 meters per second on Earth. Assuming no air resistance, A: Give the angle at which the bullet should be launched for maximum range, and B: Find the range when the bullet is launched at this angle in meters to one decimal place.

ANSWER: I) 45 DEGREES, II) 9.8

TOSS-UP

10) Math – *Short Answer* What is the 3d analog of a parallelogram?

ANSWER: PARALLELEPIPED

BONUS

10) Math – *Short Answer* What is the length of the man diagonal of a cube with side length 3. Give your answer in simplified radical form.

ANSWER: $3\sqrt{3}$

TOSS-UP

11) Earth and Space – *Short Answer* In large stars, iron is created through the fusion of what element?

ANSWER: SILICON

BONUS

11) Earth and Space – *Short Answer* How many red giant phases will the sun go through over the course of its life?

ANSWER: TWO

TOSS-UP

12) Energy – *Short Answer* Name the charges of the cathode and anode in an electrolytic cell, respectively.

ANSWER: Negative and positive

BONUS

12) Energy – *Short Answer* In a voltaic cell, what structure connects the anode and cathode? This structure's main function is to maintain charge balance within the cell.

ANSWER: Salt bridge

TOSS-UP

13) Biology – *Multiple Choice* Which of the following proteins are globular?

W) Insulin
X) Collagen
Y) Myosin
Z) Actin

ANSWER: W) Insulin

BONUS

13) Biology – *Short Answer* What are the two most common protein secondary structures?

ANSWER: Alpha helix and Beta pleated sheet

TOSS-UP

14) Chemistry – *Multiple Choice* Which of the following is the most electronegative?

W) Phosphorous
X) Nitrogen
Y) Sulfur
Z) Arsenic

ANSWER: X) Nitrogen

BONUS

14) Chemistry – *Short Answer* Which group in the periodic table has the lowest electronegativity?

ANSWER: Noble Gases

TOSS-UP

15) Physics – *Short Answer* What theorem states that if a particle is located inside of a uniform shell of matter, then that shell exerts no net gravitational force on the particle?

ANSWER: NEWTON'S SHELL THEOREM

BONUS

15) Physics – *Multiple Choice* Suppose a tunnel is drilled through a solid, uniform density sphere. A particle is dropped into the tunnel and falls past the midpoint of the tunnel. Which of the following is true of the force on the particle when it is *r* meters past the midpoint of the tunnel?

W) It is inversely proportional to *r* and in the same direction as the displacement
X) It is inversely proportional to *r* and in the opposite direction of the displacement
Y) It is directly proportional to *r* and in the same direction as the displacement
Z) It is directly proportional to *r* and in the opposite direction of the displacement

ANSWER: Z) IT IS DIRECTLY PROPORTIONAL TO *R* AND IN THE OPPOSITE DIRECTION OF THE DISPLACEMENT

TOSS-UP

16) Math – *Short Answer* How many unique diagonals does a regular heptagon have?

ANSWER: 14

BONUS

16) Math – *Short Answer* How many different lengths do the diagonals of regular heptagon have?

ANSWER: 2

TOSS-UP

17) Earth and Space – *Short Answer* In which constellation is the North Star?

ANSWER: URSA MINOR

BONUS

17) Earth and Space – *Short Answer* In which constellation is the center of the Milky Way?

ANSWER: SAGITTARIUS

TOSS-UP

18) Energy – *Multiple Choice* Wind power involves which of the following energy conversions?

W) Kinetic to chemical energy
X) Potential to chemical energy
Y) Kinetic to electrical energy
Z) Potential to electrical energy

ANSWER: Y) Kinetic to electrical energy

BONUS

18) Energy – *Short Answer* Name the 2 main types of wind turbines.

ANSWER: Horizontal - axis wind turbines and vertical - axis wind turbines

TOSS-UP

19) Biology – *Multiple Choice* What is the name of the lens in a microscope that is closest to a specimen?

W) Ocular lens
X) Convex lens
Y) Objective lens
Z) Concave lens

ANSWER: Y) Objective lens

BONUS

19) Biology – *Short Answer* What quantity is calculated by multiplying the magnification of the ocular lens and the magnification of the objective lens in a microscope?

ANSWER: Total Magnification

TOSS-UP

20) Chemistry – *Multiple Choice* Which of the following has the highest metallic character?

W) Calcium
X) Rubidium
Y) Strontium
Z) Barium

ANSWER: Z) Barium

BONUS

20) Chemistry – *Short Answer* Which of the alkali metals has the largest atomic radius?

ANSWER: Francium

TOSS-UP

21) Physics – *Multiple Choice* An object is 1 meter in front of a section of a spherical mirror with radius 1. Where is the image formed relative to the mirror?

W) 0.5 meters in front
X) 2 meters behind
Y) 1 meter in front
Z) There is no image

ANSWER: Y) 1 METER IN FRONT

BONUS

21) Physics – *Short Answer* What is the term for a spherical mirror with radius infinity?

ANSWER: PLANE MIRROR

TOSS-UP

22) Math – *Short Answer* Find the surface area of a cube with side length 4.

ANSWER: 96

BONUS

22) Math – *Short Answer* Find the surface area of a cylinder with radius 5 and height 6. Give your answer in terms of pi.

ANSWER: 110*pi

TOSS-UP

23) Earth and Space – *Multiple Choice* Which of the following rocks is made mostly of the mineral calcite?

W) Basalt
X) Granite
Y) Limestone
Z) Slate

ANSWER: Y) LIMESTONE

BONUS

23) Earth and Space – *Short Answer* Which of the following rocks is darkest in color?

W) Basalt
X) Rhyolite
Y) Granite
Z) Limestone

ANSWER: W) BASALT