

REGIONAL COMPETITION - ROUND 12

TOSS-UP

1. ERSC; Multiple Choice: API Gravity is a measure of a liquid's:
- a) weight
 - b) density
 - c) color
 - d) viscosity

ANSWER: B--DENSITY

BONUS

1. ERSC; Multiple Choice: If a hydrocarbon has an API Gravity of 30, what will happen if it is mixed with water?
- a) the hydrocarbon will mix with the water
 - b) the hydrocarbon will sink to the bottom
 - c) the hydrocarbon will float on the water
 - d) the hydrocarbon will immediately evaporate

ANSWER: C--THE HYDROCARBON WILL FLOAT ON THE WATER

TOSS-UP

2. CHEM; Multiple Choice: The entropy of a system is a measure of:
- a) disorder
 - b) total energy
 - c) temperature
 - d) kinetic energy

ANSWER: A--DISORDER

BONUS

2. CHEM; Short answer: Name the chemical bond in which an electron pair is equally shared by two atoms.

ANSWER: A NONPOLAR COVALENT BOND

TOSS-UP

3. COMP; Short Answer: Express the binary number 01011 as a decimal number.

ANSWER: 11

BONUS

3. COMP; Short Answer: Express the decimal number 77 as a hexadecimal number.

ANSWER: 4D

TOSS-UP

4. BIOL; Multiple Choice: Transport that allows a cell to gain a higher concentration of a molecule than is outside the cell is called:
- a) active
 - b) passive
 - c) facilitated
 - d) diffusive

ANSWER: A--ACTIVE

BONUS

4. BIOL; Short Answer: Proteinsynthesis takes place within what cell structure?

ANSWER: CHLOROPLAST

TOSS-UP

5. PHYS; Multiple Choice: When a gyroscope is set in motion, the principle that is responsible for its maintaining a fixed orientation in space regardless of how its support is moved is:
- a) conservation of energy
 - b) conservation of angular momentum
 - c) conservation of linear momentum
 - d) conservation of torque

ANSWER: B--CONSERVATION OF ANGULAR MOMENTUM

BONUS

5. PHYS; Multiple Choice: A spherical convex mirror produces a virtual image:
- a) always
 - b) never
 - c) if the object is nearer to the mirror than the focal length
 - d) if the object is farther from the mirror than the focal length

ANSWER: A--ALWAYS

TOSS-UP

6. GENR; Multiple Choice: More expensive fuel, such as premium, uses the light ends (more volatile) of the distilled crude oil. The lightest of such fuels for automotive use is:
- a) kerosene
 - b) diesel fuel
 - c) gasoline
 - d) benzene

ANSWER: C--GASOLINE

BONUS

6. GENR; Multiple Choice: In September 1993 an earthquake occurred which had the highest death toll of any earthquake in the stable continental crust in recorded history, some 11,000 people. What country was it in?
- a) China
 - b) India
 - c) Iran
 - d) Turkey

ANSWER: B--INDIA

TOSS-UP

7. CHEM; Multiple Choice: Which of the following elements is assigned the highest electronegativity?
- a) Sodium
 - b) Cesium
 - c) Carbon
 - d) Fluorine

ANSWER: D--FLUORINE

BONUS

7. CHEM; Multiple Choice: A solution of sodium hydroxide is prepared by mixing 2.00 g of NaOH with 10.0 g of water. The mass/mass percent concentration of the solution is
- a) 80.0%
 - b) 16.7%
 - c) 20.0%
 - d) 8.26%

ANSWER: B--16.7%

TOSS-UP

8. ASTR; Multiple Choice: The shape of the Milky Way galaxy in which we reside is
- a) Elliptical
 - b) Conical
 - c) Spiral
 - d) Spherical

ANSWER: C--SPIRAL

BONUS

8. ASTR; Multiple Choice: The Magellanic Clouds are:
- a) irregular galaxies
 - b) spiral galaxies
 - c) elliptical galaxies
 - d) large clouds of gas and dust

ANSWER: A--IRREGULAR GALAXIES

TOSS-UP

9. BIOL; Multiple Choice: NAD and NADP are coenzymes of:
- a) cytochromes
 - b) oxidation/ reduction
 - c) photosynthesis
 - d) facilitated transport

ANSWER: B--OXIDATION/REDUCTION

BONUS

9. BIOL; Short Answer: The Calvin-Benson cycle is found in what part of the chloroplast?

ANSWER: STOMA

TOSS-UP

10. MATH; Short Answer: What is the prime factorization of 48?

ANSWER: (2) (2) (2) (2) (3) OR 2 TO THE FOURTH POWER AND (3)

BONUS

10. MATH; Short Answer: What is the smallest prime number that is greater than 48?

ANSWER: FIFTY THREE (53)

TOSS-UP

11. PHYS; Multiple Choice: Refrigeration effect in a home freezer is produced by:

- a) boiling of a liquid
- b) addition of a rock salt
- c) freezing of a liquid
- d) cooling of a gas

ANSWER: A--BOILING OF A LIQUID

BONUS

11. PHYS; Short Answer: Who first observed the photovoltaic effect, the physical phenomenon that converts sunlight to electricity?

ANSWER: (EDMUND) BECQUEREL, A FRENCH PHYSICIST IN 1839

TOSS-UP

12. CHEM; Short Answer: The maximum number of electrons that can occupy a single orbital is

ANSWER: TWO (2)

BONUS

12. CHEM; Multiple Choice: The number of orbitals in an f subshell is

- a) 1
- b) 2
- c) 3
- d) 7

ANSWER: D--7

TOSS-UP

13. COMP; Multiple Choice: How many bytes are needed to represent one alphabetic character in ASCII code?
- a) 1
 - b) 2
 - c) 3
 - d) 4

ANSWER: A--1

BONUS

13. COMP; Multiple Choice: What is the binary representation of the hexadecimal number "A"?
- a) 1111
 - b) 1010
 - c) 1110
 - d) 0001

ANSWER: B--1010

TOSS-UP

14. BIOL; Short Answer: What is the term that describes the behavior of an organism that risks or sacrifices its life or reproductive potential for another member of its social group?

ANSWER: ALTRUISM or ALTRUISTIC BEHAVIOR

BONUS

14. BIOL; Short Answer: Anaerobic cellular respiration only results in a net gain of how many ATP?

ANSWER: TWO

TOSS-UP

15. ASTR; Multiple Choice: Comets that orbit the sun are thought to arise from
- a) the asteroid belt
 - b) the Oort Cloud
 - c) the rings of Saturn
 - d) interstellar dust

ANSWER: B--THE OORT CLOUD

BONUS

15. ASTR; Multiple Choice: When light photons leave the vicinity of a star, the photons
- a) go faster than the speed of light
 - b) gain energy in the star's gravitational field
 - c) lose energy in the star's gravitational field
 - d) undergo no change in energy

ANSWER: C--LOSE ENERGY IN THE STAR'S GRAVITATIONAL FIELD

TOSS-UP

16. PHYS; Short Answer: In N-type semiconductors the majority of the carriers are:

ANSWER: ELECTRONS

BONUS

16. PHYS; Short Answer: A 50 kilogram ice skater glides across the ice in a straight line at 7 meters per second. If she bends down and scoops up a 20 kilogram child standing on the ice, what will be the final speed of the skater and the child?

ANSWER: 5 METERS PER SECOND

TOSS-UP

17. CHEM; Multiple Choice: Which of the following molecules will exhibit hydrogen bonding?

- a) CH₄ (C H 4)
- b) NH₃ (N H 3)
- c) PH₃ (P H 3)
- d) HBr (H B R)

ANSWER: B-- NH₃

BONUS

17. CHEM; Multiple choice: The bonding in acetylene, C₂H₂, is best described as

- a) 5 sigma bonds
- b) 2 sigma and 3 pi bonds
- c) 5 pi bonds
- d) 3 sigma bonds and 2 pi bonds

ANSWER: D-- 3 SIGMA BONDS AND 2 PI BONDS

TOSS-UP

18. ERSC; Multiple Choice: Which is the most abundant (by volume %) mineral group in the Earth's crust?

- a) forms of silica (i.e., quartz, opal, cristobalite, etc)
- b) clays
- c) feldspars
- d) carbonates

ANSWER: C--FELDSPARS

BONUS

18. ERSC; Multiple Choice: Feldspars are:

- a) sulfides
- b) tectosilicates
- c) inosilicates
- d) oxides

ANSWER: B--TECTOSILICATES

TOSS-UP

19. GENR; Short Answer: Silicon is being used in new compounds to raise the operating temperature of advanced automotive engines, making them more efficient. Name one of these compounds.

ANSWER: SILICON NITRIDE OR SILICON CARBIDE

BONUS

19. GENR; Short Answer: Within 10%, what is the average capacity of modern nuclear power plants, in megawatts?

ANSWER: 900 MEGAWATTS (ACCEPT 800 TO 1,000 MEGAWATTS)

TOSS-UP

20. PHYS; Short Answer: At time $t=0$, a body has a velocity of 3 meters per second, EASTWARD; at time $t=3$ seconds, its velocity is 15 meters per second WESTWARD. What is the MAGNITUDE of the body's average acceleration?

ANSWER: 6 METERS PER SECOND SQUARED

BONUS

20. PHYS; Short Answer: A wave and its reflection produce a standing wave with the distance from NODE to nearest ANTINODE of 4 meters. The wavelength of this wave is:

ANSWER: 16 METERS

TOSS-UP

21. BIOL; Multiple Choice: The final acceptor for hydrogen molecules at the end of the respiratory chain is:
- a) citrate
 - b) glucose
 - c) water
 - d) oxygen

ANSWER: D-- OXYGEN

BONUS

21. BIOL; Short Answer: What is the theoretical maximum number of ATP that may result from breakdown of one glucose molecule?

ANSWER: 38

TOSS-UP

22. CHEM; Multiple Choice: A pi bond is the result of the
- a) overlap of two s orbitals
 - b) overlap of an s and a p orbital
 - c) overlap of two p orbitals along their axes
 - d) sideways overlap of two parallel p orbitals

ANSWER: D-- SIDEWAYS OVERLAP OF TWO PARALLEL P ORBITALS

BONUS

22. CHEM; Multiple Choice: Carbon monoxide has ten bonding electrons and four antibonding electrons. Therefore, it has a bond order of
- a) 3
 - b) 7
 - c) 1
 - d) 5/2

ANSWER: A-- 3

TOSS-UP

23. PHYS; Short Answer: The wave nature of electrons was first EXPERIMENTALLY verified by two scientists. Name either one.

ANSWER: DAVISSON AND GERMER

BONUS

23. PHYS; Short Answer: Sam is pulling a 40 kilogram cart with a horizontal force of 100 newtons. The force of friction on the cart is 20 newtons. The acceleration of the cart is:

ANSWER: 2 METERS PER SECOND SQUARED (ACCEPT PER SECOND PER SECOND)

TOSS-UP

24. MATH; Short Answer: What is the sum of the first 20 positive integers?

ANSWER: 210

BONUS

24. MATH; Short Answer: What is the sum of the first 20 odd integers?

ANSWER: 400

TOSS-UP

25. BIOL; Multiple Choice: Chargaff found that the amount of guanine in DNA always equals the amount of:

- a) uracil
- b) adenosine
- c) cytosine
- d) thymine

ANSWER: C-- CYTOSINE

BONUS

25. BIOL; Short Answer: Plasmids that are carrying a foreign gene contain what kind of DNA?

ANSWER: RECOMBINANT
