Part 1 (200 questions - Multiple Choice with 4-5 options).  This packet is divided into 3 sections of 67 or 66 questions each. Please write your team number and bubble in the correct number.

1. If I drop a 50 g mass and a 100 g mass from the same height in a vacuum…

    a. The 100 g mass will hit the ground first because it falls faster.

    b. The 50 g mass will hit the ground first because gravity has to work less to move it.

    c. They will hit the ground at the same time because gravity acts on all objects the same.

    d. You can’t tell which will hit first because you don’t know their shapes.

1. 500 ml of a 50% saltwater solution is mixed with an unknown amount of 25% saltwater solution. This results in a 45% saltwater solution. How much 25% solution was added?

a. 300 mL

b. 150 mL

c. 200 mL

d. 125 mL

1. Which organelle can be described as the “powerhouse” of the cell?

    a. Chloroplast

    b. Lysosome

    c. Golgi apparatus

    d. Mitochondria

1. Who first proposed the idea of continental drift?  
   a. Alfred Wegener

    b. Charles Darwin

    c. Johann Wolfgang von Goethe

    d. Sadi Carnot

1. What process produces the most ATP during cellular respiration?
   1. Calvin cycle
   2. Electron transport chain
   3. Glycolysis
   4. Krebs cycle
   5. Mitochondria
2. Two liquids are combined in a beaker, and a solid is formed. What is this solid called?
3. A hydrate
4. A reactant
5. A salt
6. A solvent
7. A precipitate
8. The ISS is orbiting the earth. The space station is…
   1. Accelerating towards the earth at a rate of 9.8 m/s^2
   2. Accelerating towards the earth at a rate less than 9.8 m/s^2
   3. Accelerating towards the earth at a rate greater than 9.8 m/s^2
   4. Not accelerating, because there is no gravity in space
   5. Not accelerating, because it does not move closer to the earth
9. Trade winds are prevailing winds near the equator that blow....
10. From the northwest and southwest
11. From the northeast and southwest
12. From the northwest and southeast
13. From the northeast and southeast
14. From the north and the south
15. In what process are proteins synthesized using mRNA as a template?  
    a. Translation

    b. RNA replication

    c. DNA replication

    d. Reverse transcription

    e. Transcription

1. In the classification of matter, the two broadest categories are known as \_\_\_\_?

    a. Elements and compounds

    b. Pure substances and mixtures

    c. Pure substances and compounds

    d. Elements and mixtures

    e. Mixtures and compounds

1. A perpetual motion machine would violate which law(s) of thermodynamics?

    a. The first law of thermodynamics

    b. The second law of thermodynamics

    c. The third law of thermodynamics

    d. Both the first and second laws of thermodynamics

e. Both the first and third laws of thermodynamics

     12. Which part of Earth’s atmosphere is inhabited by the most humans?

a. Stratosphere

b. Troposphere

c. Exosphere

d. Mesosphere

e. Thermosphere

      13. Which two carbohydrates have the function of energy storage?

    a. Cellulose and Chitin

    b. Cellulose and Starch

    c. Cellulose and Glycogen

    d. Glycogen and Chitin

    e. Glycogen and Starch

      14. Two molecules have the same molecular formula. They both have double bonded carbon atoms with the same atoms bonded to them, but the atoms vary in their spatial arrangement. What type of isomers are the molecules described?

    a. Cis-trans isomers

    b. Diastereomers

    c. Enantiomers

    d. Structural isomers

    e. The molecules described are not isomers.

      15. The SI unit for force (1 kilogram \* meter per second squared) is known as what?

    a. Joule

    b. Watt

    c. Pascal

    d. Tesla

    e. Newton

    16. When water flows away from the shoreline towards the ocean at a perpendicular or acute angle to the shoreline it is called \_\_\_\_\_\_\_\_\_.

    a. An upwelling

    b. A downwelling

    c. A longshore current

    d. A rip current

    e. A surface current

17. Which of the following nucleic acids are **both** pyrimidines?

    a. Guanine and Cytosine

    b. Adenine and Uracil

    c. Thymine and Guanine

    d. Adenine and Guanine

    e. Cytosine and Uracil

18. A buffer is a solution that minimizes pH changes. How is a buffer created?

    a. The concentration of hydronium ions (H3O+) is increased in a strong base

    b. A strong base is mixed with a strong acid.

    c. The concentration of hydroxide ions (H3O+) is increased in a strong acid

    d. The concentration of hydroxide ions (OH−) is increased in a weak base

    e. A weak acid is mixed with one of its salts

19. What is the formula for velocity?

    a. Distance / Speed

    b. Speed / Time

    c. Time / Distance

    d. Distance / Time

    e. Speed / Distance

20. In the nitrogen cycle, which of the following is produced by ammonification?

    a. NH4+

    b. N₂

    c. NO2+

    d. NO3-

    e. N3H-

21. Which disease is caused by a parasite?

1. Salmonella
2. E. coli
3. Influenza
4. Chicken pox
5. Cyclosporiasis

22. Another term for swallowing food is?

1. Digestion
2. Ingestion
3. Deglutition
4. Peristalsis

23. In Snell’s Law (n1sinθ1 = n2sinθ2), what does “n” stand for?

1. Refractive index
2. Angle of incidence
3. Angle of refraction
4. Normal plane
5. Dispersion

24. Which type of rock is formed when magma cools and hardens?

1. Lava
2. Sedimentary
3. Metamorphic
4. Igneous
5. Crystalline

25. What is the building block for a protein?

1. Monosaccharide
2. Isomer
3. Glycerol
4. Amino acid
5. Nucleotides

26. What is the most electronegative element?

1. Chlorine
2. Fluorine
3. Oxygen
4. Bromine
5. Carbon

27. What is the SI unit for Energy?

1. Joule
2. Meters per second
3. Horse
4. Newton
5. Radians

28. What is the second layer of the earth, starting from the outside?

1. Inner core
2. Outer core
3. Mantle
4. Crust
5. Lithosphere

29. What is the C:H:O ratio in carbohydrates?

1. 1:1:1
2. 2:1:1
3. 2:1:2
4. 1:2:1
5. 2:2:2

30. Which of the following are three types of nuclear decay?

1. Alpha, delta, theta
2. Alpha, beta, gamma
3. Beta, gamma, theta
4. Alpha, beta, zeta
5. Alpha, gamma, delta

31. What is the heat of fusion for water?

1. 334 J/g
2. 2260 J/g
3. 300 J/g
4. 2200 J/g
5. 500 J/g

32. Where is the ozone layer located?

1. Exoshpere
2. Troposphere
3. Stratosphere
4. Mesosphere
5. Thermosphere

33. The principal driving force for protein folding is

1. Hydrophilic interactions
2. Hydrophobic interactions
3. Formation of disulfide bridges between cysteine residues
4. An increase in free energy of the protein and its surroundings

34. Under what conditions is a gas most ideal?

A) High Temperature and Low Pressure

B) Low Temperature and High Pressure

C) Low Temperature and Low Pressure

D) High Temperature and High Pressure

35. A man walks 30 m east and then 40 m north. What is his traveled distance and his displacement?

A.  0 m, 70 m

B.  20 m, 50 m

C.  30 m, 40 m

D.  70 m, 50 m

36. How long does it take for the Earth to go once around its axis?  
A.  12 hours  
B. 24 hours  
C.  1 week  
D.  1 year

37.  A peptide bond is formed through which process?

1. Hydrolysis
2. Protein synthesis
3. Dehydration synthesis
4. Cellular respiration

38.  What differs between isotopes of the same element??

1. Neutrons
2. Electrons
3. Protons
4. Atomic number

39. Who has more potential energy; a skier on top of a mountain or a skier at the mountain base?

1. The skier on the mountain top
2. The skier at the mountain base
3. They have equal potential energy
4. Neither have potential energy

40. The cycle of movement between warm magma and cool magma is known as….

1. Conduction cycles
2. Convection currents
3. Magma currents
4. Magma transfer

41. What color does the chemical Potassium Chloride (KCl) burn?

1. No change
2. Orange
3. Green
4. Purple

42. Which of the following scientists was awarded the Nobel Prize in 1911 for the discovery of the radioactive elements, radium and polonium?

1. Emil Fischer
2. John Dalton
3. Marie Curie
4. Dmitri Mendeleev

43. Which of the following scientists discovered hydrogen gas?

1. Cavendish
2. Pasteur
3. Williams
4. Fischer

44. How many electrons can occupy an “s” orbital?

1. One
2. Two
3. Three
4. Four

45. Which of the following is a type of non-vascular plant?

1. Ferns
2. Angiosperms
3. Conifers
4. Algae

46. What is the chemical name of H2SO3?

1. Sulfuric acid
2. Sulfurous acid
3. Sulfide
4. Sulfate

47. What is Fourier Transform Spectroscopy about?

1. Taking the final resulting wave and splitting it into what the original waves looked like before they were superimposed on each other.
2. Splitting electric fields in a magnetic field.
3. Observing electron transitions and determining the atom that the wave originated from.
4. Using light as a source to study the interactions between coherent light and matter.

48. A Lagrange point always refers to the:

1. Point at which the center of mass between two objects is located.
2. Point where the Roche lobes meet between two massive objects in space.
3. Area where the combined gravitational forces of two bodies equal the centrifugal force.
4. Satellite of any large body, manmade or natural, that revolves around this body with the same period as its rotation.

49. Which of the following is NOT a characteristic of mammals?

1. Are carnivores
2. Are vertebrates
3. Produce milk
4. Have hair

50. What group on the Periodic Table has the most reactive metals?

1. Rare Earth Metals
2. Alkaline-Earth Metals
3. Alkali Metals
4. Transition Metals

51. Which of the following is NOT a fundamental force?

1. Weak Force
2. Magnetism
3. Gravity
4. Strong Force

52. What is the most abundant element in the Earth's crust?

1. Oxygen
2. Iron
3. Silicon
4. Carbon

53. The condition in which the liver becomes infused with fibrous tissue and is unable to repair itself is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_

A. Hepatitis

B. Cirrhosis

C. Jaudice

D. Hepatoma

54. Which mineral has a metallic luster, a black streak and is an ore of iron?

A. Galena

B. Magnetite

C. Graphite

D. Pyroxine

55. Which rock is sedimentary in origin and formed as a result of chemical processes?

A. Granite

B. Shale

C. Breccia

D. Dolostone

56. Tearing paper into pieces is an example of what kind of change?

A. A change in mass

B. A physical change

C. A chemical change

D. A change in energy

57. If the salt content of a cell is greater than that of its surroundings, water will

1. Move into the cell through osmosis
2. Move out of the cell through osmosis
3. Move into the cell through diffusion
4. Move out of the cell through diffusion

58. Charles’ Law describes the relationship between

1. The pressure and volume of an ideal gas
2. The temperature and pressure of an ideal gas
3. The temperature and volume of an ideal gas
4. None of these things

59. A ball is thrown straight up in a frictionless vacuum. Assuming a gravitational constant of 9.8, which of the following best describes the ball at the apex of its flight?

1. It has no velocity but is accelerating downwards
2. It has kept its initial velocity and is undergoing no acceleration
3. It has no velocity and is undergoing no acceleration
4. None of these describe the ball

60. The approximate average temperature of Earth’s core is

1. 1,000 K
2. 3,000 K
3. 6,000 K
4. 12,000 K

61. The chemical equation for photosynthesis is:

1. 3CO2 + 3H2O —> C6H6O3 + 3O2
2. 6CO2 + 6H2O —> C6H12O6 + 6O2
3. CO2 + H2O —> C6H2O6 + 6O2
4. 6CO2 + 6H2O —> C2H12O2 + 6O2

62. The molar mass of Helium is

1. 3.8 u
2. 1 u
3. 4 u
4. 2 u

63. Trini adds 10 g of baking soda to 100 g of vinegar. The mixture begins to bubble. When the bubbling stops, Trini finds the mass of the resulting mixture. She determines its mass is 105 g. Why has the mass changed?

1. A gas has left the mixture
2. Vinegar evaporated during the experiment
3. Mixtures are always less massive than their parts
4. Mass is destroyed when vinegar reacted with baking soda

64. According to the 10% rule, how much energy is retained for tertiary consumers if 1,000,000J of sunlight are produced in the food web?

1. 10J
2. 100J
3. 10000J
4. 1000J

65. What colors show up during a gram staining?

1. Purple and Blue
2. Pink and Green
3. Green and Blue
4. Purple and Pink

66. What is Avogadro’s number rounded to 3 decimal points?

1. 6.022 \* 10^23
2. 6.052 \* 10^23
3. 6.037 \* 10^23
4. 6.019 \* 10^23

67. Which type of lever is a seesaw?

1. 1st class
2. 2nd class
3. 3rd class
4. It isn’t lever