



**Physical Science Examination  
Middle School Division  
IAC Nationals 2023**

Name \_\_\_\_\_

School \_\_\_\_\_

Grade \_\_\_\_\_

**Instructions – Mark your answers on the scantron provided. Correct answers are worth 2 points. Incorrect answers are worth –1 point. Questions left blank are worth 0 points. Write the answer to your tiebreaker question on the back of your scantron.**

1. What are common units used in the USA to measure speed?

- A. Miles per hour
- B. Centimeters squared
- C. Inches per day
- D. Kilograms

2. What is the smallest unit of matter that still has the properties of an element?

- A. Molecule
- B. Atom
- C. Water
- D. Stainless steel

3. What is the order of visible light from largest to smallest wavelength?

- A. Blue, Indigo, Violet, Red, Orange, Green, Yellow
- B. Yellow, Red, Green, Violet, Indigo, Orange, Blue
- C. Red, Orange, Yellow, Green, Blue, Indigo, Violet
- D. Red, Violet, Green, Orange, Indigo, Yellow, Blue

4. The electromagnetic spectrum contains a range of energies. Which type of electromagnetic radiation has the highest amount of energy?

- A. Radio waves
- B. Infrared
- C. Ultraviolet
- D. Gamma

5. Shining light through a prism results in

- A. A brighter light focused to a point
- B. White light separating into a rainbow of colors
- C. White light separating into only long wavelengths
- D. Light only emerges under blacklight exposure

6. The amount of matter (atoms, molecules etc.) making something up is called

- A. Volume
- B. Mass
- C. Area
- D. Circumference

7. When a ball is thrown into the air, it is called a

- A. Projectile
- B. Missile
- C. Directive
- D. Umbra

8.. Adding the primary colors of red, green and blue produce

- A. Yellow light
- B. Pink light
- C. Black light
- D. White light

9.. When a car is moving at the same speed without changing direction, we say it is moving with

- A. Constant velocity
- B. Faster and faster acceleration
- C. Stationary
- D. Floating

10.. What is the difference between speed and velocity?

- A. Velocity measurements include direction
- B. Velocity and Speed have different magnitudes
- C. Speed measurements include direction
- D. There is no difference between the two

11. A wave is a disturbance that travels through matter transferring

- A. Water
- B. People
- C. Energy
- D. Animals

12. Mechanical waves travel through a medium. Which of the following is NOT a medium?

- A. Water
- B. Air
- C. Mountains
- D. Energy

13. Waves in the ocean are mostly generated by
- Whales
  - Wind
  - Hurricanes
  - Large boats.
14. Light is a form of
- Matter
  - Mass
  - Energy
  - Medium
15. What is able to travel the fastest in the Universe?
- Cheetahs
  - Maserati Sports car
  - Matter
  - Light
16. Light travels in a straight line called a
- Ray
  - Arc
  - Parabola
  - Wave
17. When light is refracted it
- Curves clockwise
  - Bends
  - Continues in a straight line
  - Curves counter-clockwise
18. Sound begins with a
- Vibration
  - Medium
  - Wind
  - People
19. Which of the following would be the hardest to stop because it has more momentum?
- A toddler running
  - A big dog running
  - A truck
  - A bicycle
20. Which has more mass?
- A mouse
  - A puppy
  - A sugar cube
  - A moose
21. The amount of space something takes up is called
- Mass
  - Volume
  - Matter
  - Weight
22. Which of the following has the most volume?
- A 2-liter bottle of soda
  - A small coke from McDonalds
  - A 1-liter bottle of water
  - A very large weather balloon
23. Energy that moving objects have is
- Kinetic energy
  - Potential energy
  - Spring energy
  - Elastic energy
24. Which of the following does NOT have potential energy?
- A ball kicked into the air
  - A rock on the edge of a cliff
  - A soccer ball on the ground
  - A yo-yo going up and down
25. Where on a ride does a roller coaster have the most potential energy?
- At the top of the first hill
  - At the bottom of the first hill
  - In the loop-de-loop
  - At the end of the ride
26. A push or pull in physics is called
- An annoyance
  - A force
  - A play
  - A transfer of energy
27. Which of Newton's Laws of Motion states "For every action there is an equal and opposite reaction?"
- Newton's First Law
  - Newton's Second Law
  - Newton's Third Law
  - None of them
28. If a force makes something move a distance then \_\_\_\_\_ is done
- Power
  - Energy
  - Potential energy
  - Work
29. Which has more power?
- A person lifting a set weight for a set distance
  - 1 person lifting twice as much weight but half the distance of the other
  - 1 person lifting the same weight twice the distance of another
  - 1 person holding a box while carrying it across the room, while another holds a similar box while standing

30. Work done per unit of time is called
- Power
  - Energy
  - Wattage
  - Velocity
31. A measure of a substance's mass per volume is called
- Weight
  - Density
  - Energy
  - Joules
32. Particles of matter (atoms, molecules etc.) of a \_\_\_\_\_ are tightly packed together and have very little movement..
- Gas
  - Liquid
  - Plasma
  - Solid
33. Particles of matter (atoms, molecules etc.) of a \_\_\_\_\_ have high-energy and are not attracted to each other.
- Gas
  - Liquid
  - Solid
  - Aluminum
34. Which of the following is a liquid?
- Ice
  - Lemonade
  - Hail
  - Plain cereal
35. Three most common states of matter are
- Solid, volume, viscosity
  - Liquid, mass, buoyancy
  - Solid, liquid, gas
  - Shape, texture, hardness
36. Which state of matter has particles that can't be compressed (smashed together) and fills whatever container it is in
- Gas
  - Liquid
  - Solid
  - Plasma
37. When a substance changes from a solid to a liquid we say it has \_\_\_\_\_.
- Solidified
  - Vaporized
  - Melted
  - Frozen
38. In a roller coaster, which location has the greatest kinetic energy?
- At the top of the first hill
  - At the end of the ride
  - Being pulled up to the top of the first hill
  - At the bottom of the first hill
39. An example of a chemical change is
- Tearing paper
  - Breaking glass
  - Cooking eggs
  - Cutting grass
40. Which is an example of a physical change?
- Bike rusting
  - Melting ice
  - Frying French fries
  - Food rotting
41. What is the fourth state of matter?
- Plasma
  - Liquid
  - Gas
  - Solid
42. What is an example of a gas?
- Orange juice
  - Water vapor
  - Olive oil
  - Concrete
43. When water is heated and becomes water vapor, the process is called
- Evaporation
  - Freezing
  - Melting
  - Condensation
44. A change in \_\_\_\_\_ refers to a change in form from solid, to liquid or gas.
- Substance
  - Demeanor
  - State
  - Composition
45. Matter is anything that has \_\_\_\_\_ and takes up space.
- Volume
  - 3 states of matter
  - Low viscosity
  - Mass
46. Eliot played outside while eating her popsicle. Why was it melting?
- It absorbed too much heat
  - It gave off too much heat
  - It ran out of energy
  - It was broken

47. Which is NOT an example of a physical property?
- A. Texture
  - B. Mass
  - C. Color
  - D. Reactivity
48. Water boils at \_\_\_\_\_ degrees Celsius.
- A. 212
  - B. 200
  - C. 100
  - D. 50
49. Which is an example of an element?
- A. Heat
  - B. Aluminum
  - C. Mass
  - D. Vinegar
50. What happens when heat is removed from water vapor?
- A. It condenses
  - B. It evaporates
  - C. It sublimates
  - D. It doesn't change
51. Which of these are properties of matter that can be measured?
- A. Mass
  - B. Volume
  - C. Temperature
  - D. All of these
52. Plants take in \_\_\_\_\_.
- A. Helium
  - B. Carbon dioxide
  - C. Oxygen
  - D. Glucose
53. Plants give off
- A. Helium
  - B. Carbon dioxide
  - C. Oxygen
  - D. Glucose
54. What do we call anything that has mass and takes up space?
- A. Matter
  - B. Volume
  - C. Properties
  - D. Liquid
55. For photosynthesis to occur, plants need energy. This energy comes from
- A. Air
  - B. Earth's soil
  - C. Water
  - D. The Sun
56. Which of the following is a product of photosynthesis?
- A. Carbon Dioxide
  - B. Glucose
  - C. Carbon monoxide
  - D. None of the above
57. Which of the following is a description of evaporation?
- A. Liquid changes into a gas
  - B. Gas changes into a liquid
  - C. Liquid changes into a solid
  - D. A solid changes into a liquid
58. When water is heated, what happens to the particles of the water?
- A. The particles slow down and get closer together
  - B. The particles move slower and get further apart
  - C. The particles move faster and move closer together
  - D. The particles move faster and get further apart
59. The physical combination of two or more substances is a
- A. Mixture
  - B. Ionic compound
  - C. Molecule
  - D. Molecular compound
60. A material that allows electricity and heat to flow easily is a(n)
- A. Insulator
  - B. Conductor
  - C. Circuit
  - D. Contractor
61. If you were on the moon, which of the following would change?
- A. Mass
  - B. Weight
  - C. Weight and Mass
  - D. Volume
62. Which of the following describes a pulley?
- A. Two inclined planes
  - B. A bar that can be used to lift heavy objects
  - C. A lever with a fulcrum
  - D. A wheel with a groove for a rope
63. If an object is not moving, it will
- A. Start moving by itself
  - B. Not move even when a force is applied
  - C. Not move until a force makes it move
  - D. Start moving easily
64. Simple machines are designed to
- A. Increase potential energy
  - B. Make work easier
  - C. Increase kinetic energy
  - D. Decrease potential energy

65. An inclined plane
- Is a wheel with a groove for a rope
  - Uses a bar to lift heavy objects
  - Has a lever arm and fulcrum
  - Can be a ramp
66. An ionic compound is made because
- Elements share electrons between them
  - Two or more nonmetals join chemically
  - Two or more elements combine physically
  - Elements transfer electrons between them
67. A group of elements with a positive or negative charge is called a(n)
- Polyatomic ion
  - Monatomic ion
  - Multiple allele ion
  - Randomized ion
68. What do electrons need to jump to higher energy levels?
- More electrons
  - Additional energy levels
  - Energy
  - Less energy
69. The resistance to a current going through a wire depends directly on
- The length of the wire
  - The cross sectional area of the wire
  - Temperature
  - The current itself
70. The force applied to make an object rotate is called a(n)
- Normal force
  - Torque
  - Frictional force
  - Weight
71. When two objects collide elastically, there is
- A loss of energy
  - Deformation of the colliding objects
  - A collision where the two objects stick together
  - No loss of energy
72. Kinetic energy of an object depends directly on the
- The velocity
  - The volume
  - The square of the velocity
  - The tread on the tires
73. Gravitational force between two objects is inversely proportional to
- The mass of each object
  - The square of the distance between the objects
  - The gravitational constant
  - Acceleration due to gravity
74. When a chemical reaction is in equilibrium,
- The forward and reverse reactions occur at the same rate
  - The forward reaction proceeds faster
  - The reverse reaction proceeds faster
  - The activation energy gets higher and higher
75. Resonance is produced by
- Harmonics of the fundamental frequency
  - A difference in decibels
  - A pipe open at both ends
  - A forced vibration of the natural frequency

### Tiebreaker

This question will only be scored if there is a tie for placement on the exam. There is no penalty for a wrong answer to this question. Write your answer legibly on the back of your scantron.

Electron orbitals fill in what order of increasing energy? List them in terms of energy level and orbital.