

**TMSCA MIDDLE SCHOOL  
SCIENCE  
TEST #6 ©  
DECEMBER 7, 2019**

**GENERAL DIRECTIONS**

1. About this test:
  - A. You will be given 40 minutes to take this test.
  - B. There are 50 problems on this test.
2. All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading.
3. If using a Scantron answer form, be sure to correctly denote the number of problems not attempted.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. On the back of this page is a copy of the periodic table of the elements as well as a list of some potentially useful information in answering the questions.
8. A simple scientific calculator with the following formulas is sufficient for the science contest: +, -, %, ^, log x, e<sup>x</sup>, ln x, y<sup>x</sup>, sin x, sin<sup>-x</sup>, cos x, cos<sup>-x</sup>, tan x, tan<sup>-x</sup>, with scientific notation and degree/radian capability. The calculator must be silent, hand-held and battery operated. The calculator cannot be a computer or cannot have built-in or stored functionality that provides scientific information and cannot have communication capability. If the calculator has memory, it must be cleared. Each student may bring one spare calculator. **NO GRAPHING CALCULATORS ARE PERMITTED.**
9. All answers within  $\pm 5\%$  will be considered correct.
10. All problems answered correctly are worth **FIVE** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
11. In case of ties, percent accuracy will be used as a tie breaker.

# Periodic Table of the Elements

1A 1 1 H 1.01	2A 2 4 He 4.00											3A 13 5 B 10.81	4A 14 6 C 12.01	5A 15 7 N 14.01	6A 16 8 O 16.00	7A 17 9 F 19.00	8A 18 10 Ne 20.18
3 Li 6.94	4 Be 9.01											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
11 Na 22.99	12 Mg 24.31	3B 3 21 Sc 44.96	4B 4 22 Ti 47.87	5B 5 23 V 50.94	6B 6 24 Cr 52.00	7B 7 25 Mn 54.94	8 26 Fe 55.85	9 27 Co 58.93	10 28 Ni 58.69	11 29 Cu 63.55	12 30 Zn 65.38	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
19 K 39.10	20 Ca 40.08	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.9	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (281)	111 Rg (281)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (289)	116 Lv (293)	117 Ts (293)	118 Og (294)

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

## OTHER USEFUL INFORMATION

Acceleration of gravity at Earth's surface,  $g = 9.81 \text{ m/s}^2$

Avogadro's Number,  $N = 6.02 \times 10^{23} \text{ molecules/mole}$

Planck's constant,  $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$

Planck's reduced constant,  $\hbar = h/2\pi = 1.05 \times 10^{-34} \text{ J}\cdot\text{s}$

Standard temperature and pressure (STP) is  $0^\circ\text{C}$  and 1 atmosphere

Gram molecular volume at STP = 22.4 liters

Velocity of light,  $c = 3.0 \times 10^8 \text{ m/sec}$

Absolute zero =  $0 \text{ K} = -273.15^\circ\text{C}$

Gas constant,  $R = 1.986 \text{ cal/K}\cdot\text{mole} = 0.082 \text{ liter}\cdot\text{atm/K}\cdot\text{mole}$

One Faraday = 96,500 coulombs ( $9.65 \times 10^4 \text{ C}$ )

Dulong and Pelil's constant =  $6.0 \text{ amu}\cdot\text{cal/gram}\cdot\text{K}$

Electron rest mass,  $m_e = 9.11 \times 10^{-31} \text{ kg}$

Atomic mass unit,  $m_u = 1.66 \times 10^{-27} \text{ kg}$

Boltzmann constant,  $k_B = 1.38 \times 10^{-23} \text{ J/K}$

Permittivity of free space  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$

Permeability of free space  $\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}$

1 Atmosphere =  $1.02 \times 10^5 \text{ N/m}^2 = 760 \text{ Torr} = 760 \text{ mmHg}$

1 Electron Volt =  $1.6 \times 10^{-19} \text{ Joules}$

Charge of an electron =  $-1.6 \times 10^{-19} \text{ coulombs (C)}$

1 horsepower (hp) =  $746 \text{ W} = 550 \text{ ft}\cdot\text{lb/s}$

Neutron Mass =  $1.008665 \text{ au}$

Proton Mass =  $1.007277 \text{ au}$

1 au =  $931.5 \text{ MeV}$

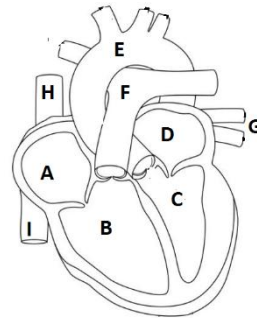
1 calorie =  $4.184 \text{ Joules (J)}$

Specific heat of water =  $4.18 \text{ J/g}\cdot^\circ\text{C}$

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1. Jelly-fish have stinging cells called what to help protect them from predators?  
A. nematocysts      B. mesoglea      C. stingers      D. blastocysts

2. Which chamber of this heart diagram has the function of pumping the oxygenated blood to the rest of the body?



- A. Part A  
B. Part B  
C. Part C  
D. Part D

3. Cone-bearing plants are most likely to be pollinated by what?  
A. bees      B. wind      C. butterflies      D. bats

4. The science teacher made a set of cards showing the phases of mitosis. Janice and her lab partner were putting them in the correct order of occurrence. Below is the layout of the cards. Are they correct?

- A. Yes, they are correct.  
B. Yes, but they left out a phase.  
C. No, Metaphase and Anaphase should come before Telophase  
D. No, Prophase is not in the correct place, it should follow Metaphase



5. What term below describes the relation between absolute temperature and the kinetic energy contained in each molecule of an ideal gas?

- A. Planck's constant  
B. Boltzmann's constant  
C. Avogadro's number  
D. Faraday




6. Which part of the atom is essential to identify the type of element?  
A. protons      B. neutrons      C. electrons      D. energy

7. Which tool below do astronomers use to classify stars?

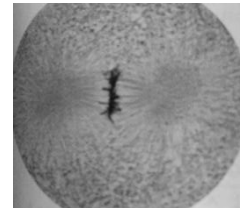
- A. Beaufort Scale  
B. Ashkin-Teller Model  
C. Halley's Diagram  
D. Hertzsprung-Russell Diagram

8. Andrew was in terrible pain after he tore his ACL while playing soccer. What is the ACL?  
A. a tendon      B. a ligament      C. cartilage      D. muscle

9. The study of the history of life on Earth based on the fossil records left behind is called what?  
A. Biology      B. Paleontology      C. Evolution      D. Archaeology
10. What type of lens would work best for correcting the vision of a person with hypermetropia?  
A. concave    B. convex    C. thick on the outside edges    D. bifocal
11. Minerals are naturally occurring, solids with a definite chemical composition and ordered internal structure, but are also what?  
A. inorganic      B. synthetic      C. abrasive      D. Both A and B
12. An unexpected observation in the 1920's by this person led to the discovery of penicillin. Who is this person?  
A. Richet    B. Pasteur    C. Bohr    D. Fleming
- 
13. A serious allergic reaction to a substance which can cause constriction of the airways, hives and itching, weak and rapid pulse and can be life-threatening is called what?  
A. hypertension    B. atherosclerosis    C. tachycardia    D. anaphylaxis
14. What can this symbol  $\Delta$  mean in physics?  
A. 3 x      B. force      C. velocity      D. change in variable
15. One of the most important rules to remember in the science lab when any incident takes place is to do what?  
A. always call 911 for emergency help immediately  
B. ask for help from your lab partner  
C. take charge and fix the problem yourself  
D. inform the teacher of what happened
16. One of the most common minerals found on Earth, silicon dioxide, is known as what?  
A. feldspar      B. calcite      C. quartz      D. neodymium
17. Which of the following is not a compound?  
A.  $C_4H_{10}$     B.  $C_2H_6O$     C. NaCl    D. Fe
18. "Translucent" is to "diaphaneity" as "metallic" is to what?  
A. nonmetallic      B. opaque      C. color      D. luster
19. What is the difference between the classical approach to science and the empirical approach to science?  
A. empirical approach uses "reason" and classical approach uses "data and analysis"  
B. both empirical and classical approaches use evidence collected to proof ideas  
C. classical approach uses "reason" and empirical approach uses "data and analysis"  
D. there are no differences, they are the same

20. If a 50 N force is applied to an object to the right at the same time a 20 N force is applied to the same object to the left, what is the direction of movement.
- A. ←                      B. →                      C. stationary                      D. none of these
21. Which of these foods is a good source of carbohydrates?
- A. meat                      B. pasta                      C. fish                      D. blue cheese
22. A researcher was observing cattle and egret relationships. She noticed that snowy egrets and cattle egrets both hang around cattle and eat the bugs that cattle disturb from the ground. However, she noticed that cattle egrets will pick off the ticks and pesky insects from the backs of the cattle, but she has never observed snowy egrets doing this behavior. What could she infer from this observation?
- A. cattle egrets and cattle – mutualistic relationship  
 B. snowy egrets and cattle – commensalism relationship  
 C. both A and B  
 D. neither A and B

23. What phase of mitosis is shown in this microscope photo of a cell?



- A. Prophase  
 B. Anaphase  
 C. Telophase  
 D. Metaphase

24. This chart shows the acceleration due to gravity on the surface of these celestial bodies. Using this chart, what would be a reasonable answer to the sun's acceleration due to gravity?

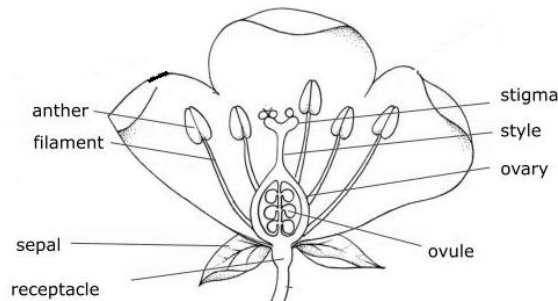
- A. 74.59 m/s<sup>2</sup>  
 B. 10.88 m/s<sup>2</sup>  
 C. 5013 m/s<sup>2</sup>  
 D. 274.13 m/s<sup>2</sup>

Celestial Object	Acceleration due to gravity
Venus	8.87 m/s <sup>2</sup>
Mars	3.711 m/s <sup>2</sup>
Earth	9.81 m/s <sup>2</sup>
Moon	1.62 m/s <sup>2</sup>
Jupiter	25.95 m/s <sup>2</sup>

25. Oxygen is given off as a waste product of photosynthesis. Which of the following releases the most oxygen for the Earth's atmosphere?
- A. plants in the rainforest  
 B. diatoms in the ocean  
 C. volcanoes  
 D. animals of the crust


26. Scientific statements are attempts to describe or explain observations in the natural world. For a statement to be “scientific”, it should be what?
- A. published on the internet
  - B. testable
  - C. reproducible
  - D. Both B and C
27. Which of these have the shortest wavelength?
- A. radio waves
  - B. gamma rays
  - C. ultraviolet light
  - D. infrared waves
28. In science class, students were given a small strip of paper that was treated with a chemical called PTC. They were instructed to taste the strip of paper. To some of the students, the strip tasted bitter, while others did not taste anything at all on the strip. What were the students trying to discover?
- A. the difference in tasting PTC between males and females
  - B. the similarities in the way people taste PTC
  - C. the inherited genetic trait of tasting PTC
  - D. none of the above
29. The best meaning of metabolism is which statement below?
- A. Body’s ability to maintain balance
  - B. Helps to control the coordination of chemical processes
  - C. chemical processes that occur in living organisms to maintain life
  - D. protection of the body by burning off diseases

30.



In this diagram, the anther and the filament make up a structure called what?

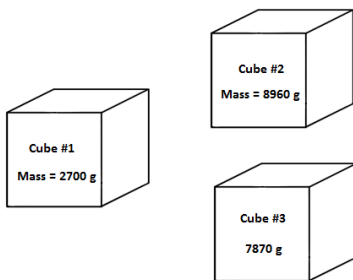
- A. pistil
  - B. stamen
  - C. pedestal
  - D. none of these
31. As you move from left to right on the Periodic Table of the Elements, the \_\_\_\_\_ increases.
- A. atomic number
  - B. number of protons
  - C. Both A and B
  - D. only the atomic mass

32. Scientists can learn the most about the history of the Earth's atmosphere from studying which of the following?
- A. Greenland ice cores
  - B. caves in Africa
  - C. the thermal vents in the ocean
  - D. mountain layers
33. Which of these is correctly matched?
- A. speed (distance/ mass)
  - B. velocity (change in mass/change in speed)
  - C. acceleration (change in time/change in distance)
  - D. none of these
34. Energy stored in the foods that you eat is what type?
- A. mechanical energy
  - B. chemical energy
  - C. light energy
  - D. heat energy
- 
35. What do most scientists believe happened on the last day of the Cretaceous period?
- A. a catastrophic volcano erupted setting off a massive tsunami
  - B. solar radiation fried the Earth from a massive eruption on the sun
  - C. nothing major, it was just an ordinary day
  - D. a massive asteroid collided with the Earth
36. According to current science, which of the following would not be true?
- A. Black holes can be as massive as 40 billion of our suns.
  - B. Black holes can be found by tracking the movement of stars around it.
  - C. Black holes release radiation, according to Hawking.
  - D. Black holes are composed of empty space.
37. When defining the term "matter", what two words are the best choices to use?
- A. volume and mass
  - B. energy and change
  - C. property and state
  - D. gas and liquid
38. Which of the elements below are found in the same period on the Periodic Table?
- A. Lead and Tin
  - B. Iron and Argon
  - C. Zinc and Tin
  - D. Potassium and Calcium

39. Tetherball is a playground game that involves a ball hanging from a rope on a pole. During the game, a player will start the ball in motion which will continue until the opposing player stops the ball and starts it in the opposite direction. The player, who gets the ball to wrap all around the pole in the direction that they push the ball, wins the game. When the ball wraps around the pole, which of the following statements is correct?



- A. As the ball wraps around the pole, its orbital radius decreases and its angular velocity increases.
- B. As the ball wraps around the pole, its orbital radius increases and its angular velocity decreases.
- C. As the ball wraps around the pole the orbital radius and angular velocity stay the same.
- D. none of the above
40. Jesse needed to move a large box from once side of the room to the other. Jesse applied 100 N of force on the box to move it. His friend pushed with 150 N of force. The box moved 0 meters. How much work was done on the box?
- A. 250 J                      B. 150 J                      C. 100 J                      D. 0 J
41. Which of the following is an example of sublimation?
- A. Ice melting into a puddle of water
- B. A poster changing color after exposure to the sun for a week.
- C. Salt dissolving in a cup of water
- D. Dry ice changing to gas after setting on counter for a few hours
42. This chart shows the density of several metals.



Metal	Density g/cm <sup>3</sup>
Aluminum	2.70
Copper	8.96
Gold	19.32
Iron	7.87
Silver	10.49

- A. Cube #1 -Aluminum      Cube #2 – Copper      Cube #3 – Silver
- B. Cube #1 -Gold              Cube #2 - Iron              Cube #3 - Copper
- C. Cube #1 – Silver              Cube #2 – Copper              Cube #3 - Aluminum
- D. Cube #1 -Aluminum      Cube #2 – Copper              Cube #3 – Iron



43. Paleontologists are closely studying this bone found in mammals to try to understand its importance in the evolution of mammal chewing ability. What is this bone?  
A. navicular      B. tibia      C. hamate      D. hyoid
44. What organelle is the “powerhouse” of the cell?  
A. Endoplasmic reticulum    B. Lysosomes    C. Golgi body    D. Mitochondria
45. Which of these causes sound to travel at a faster speed through air?  
A. cooler temperature of the air it travels through  
B. warmer temperature of the air it travels through  
C. low atmospheric air pressure  
D. higher magnitude of the sound
46. In west Texas, a wildfire burned about 3,000 acres of ranchland. After the fire, what type of ecological succession should take place?  
A. primary succession  
B. secondary succession  
C. climax succession  
D. no succession will take place
47. What is the chemical process in which plants convert solar energy to food?  
A. cellular respiration  
B. photomorphogenesis  
C. transpiration  
D. photosynthesis
48. Which term below is the visual method of showing how many valence electrons are in an atom and how they are arranged when bonds form?  
A. Thomson structure  
B. Lewis dot diagram  
C. cross-linking  
D. Both A and C
49. Currently, what is the only insect that is known to be able to see in 3-D?  
A. praying mantis  
B. ant  
C. honey bee  
D. butterfly
50. Carbon atoms have a special role in chemistry because of what true reason?  
A. Its atomic weight is more than potassium, but less than Nitrogen  
B. It has four bonding sites which allows it to form a variety of molecules  
C. It has four naturally occurring isotopes.  
D. It is the basis for inorganic chemistry.

**2019 - 2020 TMSCA Middle School Science Test #6 - Key**

- |       |       |       |
|-------|-------|-------|
| 1. A  | 18. D | 35. D |
| 2. C  | 19. C | 36. D |
| 3. B  | 20. B | 37. A |
| 4. C  | 21. B | 38. D |
| 5. B  | 22. C | 39. A |
| 6. A  | 23. D | 40. D |
| 7. D  | 24. D | 41. D |
| 8. B  | 25. B | 42. D |
| 9. B  | 26. D | 43. D |
| 10. B | 27. B | 44. D |
| 11. A | 28. C | 45. B |
| 12. D | 29. C | 46. B |
| 13. D | 30. B | 47. D |
| 14. D | 31. C | 48. B |
| 15. D | 32. A | 49. A |
| 16. C | 33. D | 50. B |
| 17. D | 34. B |       |