# T M S C A  M I D D L E  S C H O O L

# S C I E N C E

# T E S T  # 2 ©

# O C T OB E R  2 8, 2 0 1 7

## 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, $e^x$, lnx, $y^x$, sin x, $\sin^{-x}$, cos x, $\cos^{-x}$, tan x, $\tan^{-x}$, 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 ± 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 | | | | | | | | | | | | 3A 13 | 4A 14 | 5A 15 | 6A 16 | 7A 17 | 8A 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H 1.01 | 2A 2 | | | | | | | | | | | | | | | | 2 He 4.00 |
| 3 Li 6.94 | 4 Be 9.01 | | | | | | | | | | | 5 B 10.81 | 6 C 12.01 | 7 N 14.01 | 8 O 16.00 | 9 F 19.00 | 10 Ne 20.18 |
| 11 Na 22.99 | 12 Mg 24.31 | 3B 3 | 4B 4 | 5B 5 | 6B 6 | 7B 7 | 8 | 8B 9 | 10 | 1B 11 | 2B 12 | 13 Al 26.98 | 14 Si 28.09 | 15 P 30.97 | 16 S 32.07 | 17 Cl 35.45 | 18 Ar 39.95 |
| 19 K 39.10 | 20 Ca 40.08 | 21 Sc 44.96 | 22 Ti 47.87 | 23 V 50.94 | 24 Cr 52.00 | 25 Mn 54.94 | 26 Fe 55.85 | 27 Co 58.93 | 28 Ni 58.69 | 29 Cu 63.55 | 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 |
| 37 Rb 85.47 | 38 Sr 87.62 | 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 m/s$^2$**
**Avogadro's Number, N = 6.02 x 10$^{23}$ molecules/mole**
**Planck's constant, $h$ = 6.63 x 10$^{-34}$ J•s**
**Planck's reduced constant, $\hbar = h/2\pi$ = 1.05 X 10$^{-34}$ J•s**
**Standard temperature and pressure (STP) is 0°C and I atmosphere**
**Gram molecular volume al STP = 22.4 liters**
**Velocity of light, c = 3.0 x 10$^8$ m/sec**
**Absolute zero= 0 K = -273.15°C**
**Gas constant, R = 1.986 col/K•mole = 0.082 liter•otm/K•mole**
**One Faraday= 96,500 coulombs (9 .65 x 10$^4$ C)**
**Dulong and Pelil's constant= 6.0 amu•cal/gram•K**
**Electron rest mass, $m_e$ = 9.11 x 10$^{-31}$ kg**
**Atomic mass unit, $m_u$ = 1.66 x 10$^{-21}$ kg**
**Boltzmann constant, $k_B$ = 1.38 x 10$^{-23}$ J/K**
**Permittivity of free space $\varepsilon_0$ = 8.85 x 10$^{-12}$ C$^2$/N•m$^2$**
**Permeability of free space $\mu_0 = 4\pi$ x 10$^{-7}$ T •m/A**
**1 Atmosphere= 1.02 x 10$^5$ N/m$^2$ = 760 Torr = 760 mmHg**
**1 Electron Volt - 1.6 x 10$^{-19}$ Joules**
**Charge of on electron"' -1.6 x 10$^{-19}$ coulombs (C)**
**1 horsepower (hp) = 746 W = 550 ft•lb/s**
**Neutron Moss= 1.008665 au**
**Proton Mass= 1.007277 au**
**1 au= 931.5 MeV**
**1 calorie= 4.184 Joules (J)**
**Specific heal of water= 4.18 J/g• °C**

2017-2018 TMSCA Middle School Science Test #2

1. What is the maximum number of protons a neutral atom of potassium can have?
**A)** 47 **B)** 107 **C)** 57 **D)** 67

2. In regards to moon phases, when it is waxing it may appear as if it is _____.
**A)** getting smaller **B)** getting larger **C)** moving farther away **D)** getting closer

3. What is true about force?
**A)** the SI unit is a Newton/$m^2$
**B)** it describes magnitude and direction
**C)** net force is described as inertia
**D)** it is qualitative data

4. The direction and magnitude of a displacement describes
**A)** speed. **B)** a vector. **C)** inertia. **D)** force.

5. The gelatinous material within a cell that holds the organelles is called the
**A)** cell membrane. **B)** glyoxysomes. **C)** cytoplasm. **D)** chromoplast.

6. If you are consuming spinach, what part of the plant are you eating?
**A)** the root **B)** the stem **C)** the leaf **D)** the flower

7. Which of the following is true of RNA?
**A)** single-stranded
**B)** deoxyribose sugar
**C)** found only in the cytoplasm
**D)** does not carry genetic information

8. Which of the following would you find in the brain?
**A)** hypothalamus **B)** thyroid **C)** nephron **D)** Cowper's gland

9. Blood traveling to the body from the heart leaves through what structure?
**A)** right atrium **B)** left ventricle **C)** left atrium **D)** right ventricle

10. Which of the following is not part of the carbon cycle?
**A)** decomposition **B)** photosynthesis **C)** combustion **D)** condensation

11. What would not be considered a characteristic of life?
**A)** genetic material **B)** ability to move **C)** reproduction **D)** respond to stimuli

12. If a scientist wanted to examine a yeast cell, what would he use?
**A)** a stereoscope **B)** a microscope **C)** a hand lens **D)** the naked eye

13. The tree-like extensions of the neuron are called
**A)** axons. **B)** myelin sheath. **C)** cell body. **D)** dendrites.

14. When will you see the nuclear membrane breakdown in the cell cycle?
**A)** Interphase **B)** Prophase **C)** Metaphase **D)** Anaphase

15. Meiosis is cell division that specifically occurs in
**A)** sex cells **B)** somatic cells **C)** epithelial cells **D)** muscle tissue

16. What is the maximum number of electrons a neutral atom of lithium can have?
**A)** 1 **B)** 2 **C)** 3 **D)** 4

17. Which of the following represents a salt?
**A)** B **B)** $N_2O$ **C)** $C_6H_{12}O_6$ **D)** $CaCl_2$

18. The chromosomes are moved into place at the metaphase plate by microtubules called _____.
**A)** flagella **B)** centrioles **C)** spindle fibers **D)** kinetochores

19. Which of the following is a legume?
**A)** peanut **B)** leek **C)** cabbage **D)** strawberry

20. Within a water molecule what type of bond is between the hydrogen and oxygen atoms?
**A)** ionic **B)** metallic **C)** hydrogen **D)** covalent

21. How does pressure change as water depth increases?
**A)** it increases
**B)** it decreases
**C)** it will remain the same up to 1,000 feet
**D)** it only changes every 100 feet

22. Air resistance is what type of friction?
**A)** static **B)** fluid **C)** sliding **D)** rolling

23. The distance between the starting and end points and the direction describes
**A)** speed. **B)** velocity. **C)** displacement. **D)** direction.

24. Weather is a region's
**A)** long-term, prevailing atmospheric conditions
**B)** atmospheric conditions on a given day
**C)** number of seasonal daylight hours
**D)** lack of ocean currents

25. If you are consuming a carrot, what part of the plant are you eating?
**A)** the root **B)** the stem **C)** the leaf **D)** the fruit

26. As part of the carbon cycle this process serves to place carbon based molecules back into the soil for plants to assimilate.
**A)** decomposition **B)** evaporation **C)** combustion **D)** photosynthesis

27. An example of an individual's phenotype is
**A)** AA **B)** hair color gene **C)** blue eyes **D)** dominant allele

28. What nitrogenous base is utilized during the synthesis of RNA, but not in the synthesis of DNA?
**A)** cytosine **B)** guanine **C)** uracil **D)** thymine

29. If a nitrogenous base is deleted from the nucleotide sequence of a DNA molecule, what is the result?
**A)** non-disjunction **B)** mutation **C)** clone **D)** hybridization

30. When human skeletal muscles are lacking oxygen they will produce
**A)** lactic acid. **B)** glucose. **C)** oxygen. **D)** ethanol.

31. Which organelle is correctly paired with its function?
**A)** nucleus- provides carbohydrates for fermentation
**B)** chloroplast- serves as a site for photosynthesis
**C)** centriole- synthesizes digestive enzymes
**D)** lysosome- packages cellular products

32. In humans, excess glucose is stored as a polysaccharide known as
**A)** glycerol. **B)** cellulose. **C)** chitin. **D)** glycogen.

33. Which of the following is considered an exception to the cell theory because of its lack of a cellular component?
**A)** bacteria **B)** algae **C)** moss **D)** virus

34. What structure is primarily responsible for maintaining a cell's homeostasis?
**A)** cell membrane **B)** cell wall **C)** centriole **D)** chromosomes

35. What would be considered a chemical change?
**A)** icebergs melting
**B)** molten metal is formed into a statue
**C)** yeast cells create carbon dioxide and ethanol from sugar
**D)** olive oil and vinegar are mixed to create dressing

36. What organism is responsible for the breakdown of rock material during a primary succession?
**A)** algae **B)** moss **C)** bacteria **D)** lichens

37. Amoebas move with the use of
**A)** cilia. **B)** flagella. **C)** pili. **D)** pseudopods.

38. Pollen is created in the
**A)** pistil. **B)** filament. **C)** ovary. **D)** anther.

39. Of the following what would be a good example of stored potential energy?
**A)** a ball rolling down a hill
**B)** a rollercoaster moving through a loop
**C)** the spring in a pinball machine
**D)** a burning candle

40. While you are traveling down the highway and look at your speedometer and see you are traveling 23 km/h, you are seeing your _____ speed.
**A)** constant **B)** instantaneous **C)** average **D)** decreased

41. Which of the following has a shorter wavelength than x-rays?
**A)** gamma rays **B)** microwaves **C)** visible light **D)** ultraviolet

42. The arrival of seismic waves in order from first to last would be?
**A)** P, Surface, S waves **B)** Surface, P, S waves **C)** P, S, Surface waves **D)** S, P, Surface waves

43. In what state of matter will you find particles that vibrate in place?
**A)** solid **B)** liquid **C)** gas **D)** plasm

44. Which of the following planets is considered an ice giant?
**A)** Uranus **B)** Saturn **C)** Venus **D)** Mars

45. The Earth is approximately _____ miles away from the Sun.
**A)** 9 million **B)** 930 million **C)** 93 million **D)** 93 billion

46. The function of the _____ is to remove water from the digested food matter.
**A)** stomach **B)** small intestine **C)** large intestine **D)** liver

47. Fossil formation would best be found in
**A)** igneous rock. **B)** magma. **C)** sedimentary rock. **D)** S horizons.

48. A type of wave that carries energy through Earth's rock layers is called _____ waves.
**A)** seismic **B)** transverse **C)** electrical **D)** electromagnetic

49. In an experiment, three test tubes containing the same amount of cow liver, in grams, each receive a varying amount of hydrogen peroxide. Test tube one receives 1 ml, test tube 2 receives 2 ml and test tube 3 receives 3 ml. The result is a varying amount of temperature increase and bubbling. What would be the dependent variable in this lab?
**A)** the 2 ml of hydrogen peroxide **C)** the cow liver
**B)** the change in temperature and bubbling **D)** the three test tubes

50. Two water molecules will bond together by what type of bond?
**A)** covalent **B)** ionic **C)** hydrogen **D)** metallic

# 2017-2018 TMSCA Middle School Science Test 2

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