TMSCA MIDDLE SCHOOL SCIENCE TEST #2©

OCTOBER 26, 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^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)

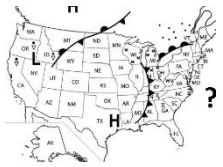
58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 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 ε_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

2019-2020 TMSCA Middle School Science Test #2

1. Nimbostratus clouds usually mean what type of weather?



   A. heavy steady rain
   B. fair weather
   C. violent storms
   D. warm temperatures

2. What is the difference between soft water and hard water?
   A. Soft water has less dissolved oxygen than hard water.
   B. Hard water contains more dissolved calcium and magnesium.
   C. Soft water does not produce more "suds" than hard water.
   D. Hard water is better on household appliances such as water heaters.

3. Which of the following checklists correctly show what tools are needed to do the following investigation? Anneliese is planning on doing a study on weather in her community. She plans to measure the temperature, wind speed, relative humidity, and precipitation for a period of 6 weeks.

A.

Tool	✓
Lab journal	✓
Beaker	
Meter stick	
Graduated cylinder	
Anemometer	✓
Psychrometer	
Hot plate	
Test tubes	
Spring scale	
Balance	
Microscope	✓
Thermometer	
Calculator	
Computer	
Spectroscope	✓
Timing device	
Rain gauge	

B.

Tool	✓
Lab journal	✓
Beaker	
Meter stick	
Graduated cylinder	✓
Anemometer	
Psychrometer	✓
Hot plate	
Test tubes	
Spring scale	✓
Balance	
Microscope	
Thermometer	
Calculator	
Computer	
Spectroscope	✓
Timing device	
Rain gauge	✓

C.

Tool	✓
Lab journal	✓
Beaker	
Meter stick	
Graduated cylinder	
Anemometer	✓
Psychrometer	✓
Hot plate	
Test tubes	
Spring scale	
Balance	
Microscope	
Thermometer	✓
Calculator	
Computer	
Spectroscope	
Timing device	
Rain gauge	✓

D.

Tool	✓
Lab journal	✓
Beaker	
Meter stick	✓
Graduated cylinder	
Anemometer	✓
Psychrometer	
Hot plate	
Test tubes	
Spring scale	
Balance	
Microscope	
Thermometer	✓
Calculator	
Computer	
Spectroscope	
Timing device	
Rain gauge	✓

4. Out of the following, which has the lowest frequency in the electromagnetic spectrum?
   A. ultraviolet B. gamma rays C. radio waves D. x-rays

5. The prefix “dino” means which of the following?

A. eats B. large C. terrifying D. moving

6. In medical terminology, the word “benign” means what?

A. extremely harmful B. not harmful to one’s health C. contagious D. dead

7. A class is planning to measure force. What tool should they have to help with measurements?

A. graduated cylinder B. electronic protractor C. tape measure D. spring scale

8. Earth’s geologic timeline is considered to be what?

A. evenly distributed between the different time periods
B. based on episodic events
C. 1,000-year increments
D. based on predictable events

9. Are diamonds and graphite both composed of carbon?

A. No, diamonds are clear and graphite is black in color
B. No, they are made of two different elements
C. Yes, they are both Carbon, but have distinct crystal structures
D. They are made of a different element other than Carbon.

10. Clues: a plant type, seedless, almost all have vascular tissue, includes ferns
What type of plant is this?

A. gymnosperm B. angiosperm C. bryophytes D. pteridophytes

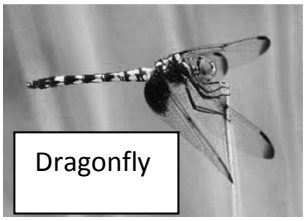
11. While looking at a living cell under magnification, Cedric saw a dark mass in the nucleus. This mass was made up of elongated thin strands. As the cell prepared to divide, this mass appeared denser and took the shape of rod-shaped structures. What is Cedric observing?

A. the death of the cell
B. the production of ribosomes
C. DNA in chromosomes
D. cytoplasm reorganizing for separation

12. Which of the following is specialized vascular tissue in plants?

A. phloem B. xylem C. Both A and B D. Neither A or B

13. What do you call the young of this organism?



A. naiads
B. caterpillars
C. maggots
D. pups

14. Currently, Earth is home to approximately how many active volcanoes?
    A. 100 B. 500 C. 1500 D. 10,000

15. Which of the following are not correctly matched with the right number of atoms?
    A. CH_4 (5 atoms)
    B. NaClO H_2O_2 (7 atoms)
    C. $C_2H_4O_2$ (8 atoms)
    D. $NaHCO_3$ (7 atoms)

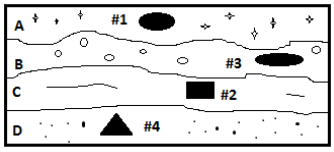
16. The branch of science that deals mainly with glands and the hormones they produce?
    A. immunology
    B. hormology
    C. pathology
    D. endocrinology

17. What macroalgae provides a floating habitat for juvenile fish, shrimp, worms, and crabs in the ocean?
    A. Coral reef B. Kale C. Microphytes D. Sargassum

18. Which of the following describes the meaning of the prefix "blasto-"?
    A. budding B. explosive C. rough D. very large

19. Most cells in the human body range from what to what in size?
    A. 1 mm to 20 mm B. 5 µm to 20 µm C. 1 nm to 5 nm D. 1 cm to 20 cm

20. Which of the following units is not used to measure volume?
    A. liter B. mL C. kg D. m^3

21. 

    A paleontologist was collecting fossils on an exposed hillside. The hill had visible layers which he labeled A, B, C, and D. While digging, he found 4 fossils, one in each layer. Using the Law of Superposition, which of the following most likely shows the age of the fossils from oldest to youngest?
    A. fossils 1,2,3,4
    B. fossils 4,2,3,1
    C. fossils 1,3,2,4
    D. fossils 4,1,2,3

22. Measles is caused by a what?
    A. bacteria B. virus C. vaccine D. fungus

23. In the state of Texas, which constellation listed below is visible year-round on a clear night?
    A. Scorpius B. Leo C. Orion D. Ursa Major

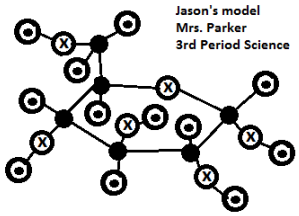
24. When using a pulley to reduce the amount of force needed to lift an object, you will also need to know about what "extra force" with real-world pulleys?
    A. it will always take more energy
    B. friction between rope and pulley
    C. you need to add the force plus the distance
    D. the pulley is not really reducing any force applied

25. Streamflow in a river is important to help determine which of these listed below?
    A. making flood forecasts
    B. making decisions about location of wastewater treatment plants
    C. understanding what riparian life is in the area
    D. all of these

26. The prefix "asper" adds what meaning to the word?
    A. soft B. high C. rough D. beautiful

27. What is the difference between magma and lava?
    A. they are exactly the same
    B. magma is molten rock on the surface, lava is molten rock under the Earth's surface
    C. magma is molten rock under the surface, lava is molten rock on the Earth's surface
    D. magma is molten rock and lava has cooled into rock

28. Jason made a model. In the model, the black circles stand for Carbon, the circles with an "x" are Oxygen, and the circles with center dots are Hydrogen. What molecule does this represent?
    A. propane
    B. graphite
    C. glucose
    D. methane



29. Which of these is the SI base unit for measuring mass?
    A. pound B. ton C. gram D. none of these

30. Felicity noticed that when she left her fruit juice outdoors on the picnic table one day, flies found it drowned in the juice. That made her curious to know what type of fruit juice that flies would be more attracted to so she decided to test this with an experiment. She set up four "fly trap" containers with four different types of fruit juice inside. She left them exposed in an area with plenty of flies. What would be the best possible hypothesis for her experiment?
    A. If containers of juice are left outside, flies will find them.
    B. Apple juice has a stronger odor than cranberry juice.
    C. Cranberry juice is a brighter color than apple juice.
    D. More flies would be attracted to the apple juice.

31. Which of the following does not belong to the order Lagomorpha?
    A. Eastern Cottontail Rabbit
    B. Black-tailed Jackrabbit
    C. American Pika
    D. Capybara

32. Calculate the concentration of a solution in which 60g of salt is dissolved into 5 L of water.
    A. 300 mL/g
    B. 12 g/mL
    C. 12.5 mL/g
    D. 0.012 g/mL

33. Which of the following is not a covalent compound?
    A. water B. butter C. wax D. table salt

34. The word "abyssal" means what in relations to science?
    A. having to do with a slope
    B. relating to the bottom of the ocean
    C. shallow waters
    D. a tool to measure depth

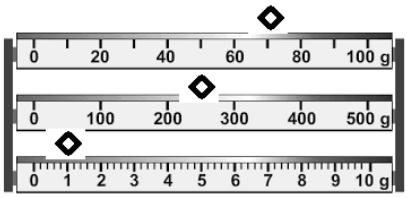
35. Which list below is in order of lowest wind speeds to highest wind speeds?
    A. hurricane, tropical storm, tropical depression, major hurricane
    B. major hurricane, hurricane, tropical storm, tropical depression
    C. tropical depression, tropical storm, hurricane, major hurricane
    D. tropical storm, tropical depression, hurricane, major hurricane

36. Birds with beaks that look like the one in this photo are adapted to eat what?
    A. nuts and berries B. seeds
    C. nectar D. insects

37. About how much of the Earth is covered in water?
    A. 50% B. 25% C. 71% D. 95 %

38. How many valence electrons does an oxygen atom contain?
    A. 6 B. 8 C. 10 D. 0

39. Joseph was using the triple beam balance in lab. Joseph wrote down the mass for this object to be 271 grams. Is he correct or incorrect and why?



    A. He is correct because 200 + 70 + 1 = 271
    B. He is incorrect because 65 + 250 + 1 does not equal 271.
    C. He is incorrect because he did not place the weight on the middle bar on the proper mark.
    D. He is close enough to be correct.

40. Coral found in the ocean is classified as which of the following?
    A. plant B. an animal C. a plankton D. non-living

41. Which of the following would best describe what a karyotype is?
    A. the substance that makes up your fingernails
    B. the genetic code as a result of a Punnett square
    C. a sing along of favorite science songs
    D. a picture of the chromosomes

42. When discussing foods, what does the acronym GMO stand for?
    A. General Macroplankton Operation
    B. Grand Mysticetes Organization
    C. Gene Managed Organization
    D. Genetically Modified Organism

43. Clues: are simple cells, have no nucleus, cannot carry out specialized functions, EXAMPLE- bacteria What type of cell is this?
    A. eukaryotic cell B. ribosomes C. vesicles D. prokaryotic cell

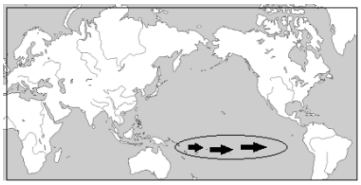
44. What is considered the simplest chemical element with the lowest mass?
    A. Carbon B. Oxygen C. Hydrogen D. Helium

45. The boundary between Earth's crust and mantle is called what?
    A. Seismo boundary B. Lithosphere C. Croviate D. Moho discontinuity

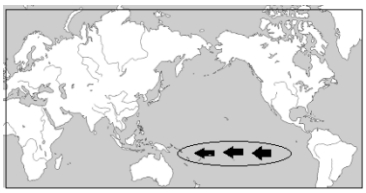
46. A scientist who studies the causes and effects of diseases which many times involves examining tissue samples in a laboratory is called a what?
    A. pathologist B. clinician C. cytologist D. specialist

47. Which of the following is a poor conductor of heat?
    A. frying pan
    B. aluminum
    C. rocks
    D. a neck scarf made from cloth

48. Which of the following maps below best shows the flow of warm surface water during El Niño?

A. 

C.

B. 

D. 

49. Which of these is the base SI unit for measuring length?
    A. millimeter B. inch C. mile D. none of these

50. Monarch butterflies contain a toxic chemical that makes undesirable to predators. They obtain this toxin from what?
    A. As a larva, they eat the leaves of Milkweed plants which contain cardenolides.
    B. They pick up toxins from pesticides found on ornamental plants.
    C. They only mimic another butterfly that is toxic, but are not toxic themselves.
    D. They sip nectar from toxic flowers which is then stored in their bodies.

2019 - 2020 TMSCA Middle School Science Test #2 - Key

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