T M S C A   M I D D L E   S C H O O L
S C I E N C E
S T A T E   T E S T ©
A P R I L   2 2 ,   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.

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Periodic Table of the Elements

1A																	8A
1 H 1.008	2A											3A	4A	5A	6A	7A	2 He 4.003
3 Li 6.941	4 Be 9.012											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 23.00	12 Mg 24.31	3B	4B	5B	6B	7B	8B		1B	2B		13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	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 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)	109 Une (267)										

Lanthanides	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
Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	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 (260)

OTHER USEFUL INFORMATION

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

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

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

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

Standard temperature and pressure (STP) is 0°C and 1 atmosphere

Gram molecular volume at STP = 22.4 liters

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

Absolute zero = 0 K = -273.15°C

Gas constant, $R = 1.986$ cal/K•mole = 0.082 liter•atm/K•mole

One Faraday = 96,500 coulombs (9.65×10^4 C)

Dulong and Petit's constant = 6.0 amu•cal/gram•K

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

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

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

Permittivity of free space $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2/N•m^2

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

1 Atmosphere = 1.02×10^5 N/m^2 = 760 Torr = 760 mmHg

1 Electron Volt = 1.6×10^{-19} Joules

Charge of an electron = -1.6×10^{-19} coulombs (C)

1 horsepower (hp) = 746 W = 550 ft•lb/s

Neutron Mass = 1.008665 au

Proton Mass = 1.007277 au

1 au = 931.5 MeV

1 calorie = 4.184 Joules (J)

Specific heat of water = 4.18 J/g•°C

2016-2017 TMSCA Middle School Science State Championship Test

1. The unequal sharing of electrons gives the water molecule a slight _____ charge near its oxygen atom and a slight _____ charge near its hydrogen atom.
    A. negative;   B. positive;   C. polar; ambient   D. ambient; polar
    positive   negative

2. In Mendel's F1 results, the ratio of dominant traits to recessive traits for each characteristic is about __.
    A. 2:1   B. 3:1   C. 3:2   D. 4:1

3. A substance that helps to cause or control the speed of chemical changes in living things is called a/an _.
    A. enzyme   B. vitamin   C. mineral   D. waste

4. Most electromagnetic radiation is blocked by the Earth's atmosphere. Which of these wavelengths is blocked?
    A. visible light   B. infrared   C. gamma rays   D. radio

5. Living bone cells are found in the _____.
    A. cartilage   B. marrow   C. surrounding   D. hard, bony
                                               membrane   layer

6. The outermost layer of the sun's atmosphere is the _____.
    A. photosphere   B. chromosphere   C. corona   D. core

7. Identify the feedback mechanism that involves the endocrine system, the digestive system, and the circulatory system in controlling blood sugar.
    A. reflex   B. glucose control   C. medulla   D. peripheral

8. If an artery carrying blood to the brain is blocked, the result is _____.
    A. a heart attack   B. low blood   C. a stroke   D. a transfusion
                         pressure

9. If you find a flowering plant that has large, brightly colored flowers, you can conclude that the pollen of these flowers is primarily carried by _____.
    A. water   B. animals   C. the wind   D. people only

10. The suffix *–ide* can be used in the name of _____ compounds.
    A. covalent   B. ionic   C. metallic   D. both A and B

11. Urine passes from the bladder into the _____ which carries the urine out of the body.
    A. urethra   B. ureter   C. kidneys   D. artery

12. What would be the most likely outcome if the liver is damaged?
    A. fewer nutrients in the body   C. less oxygen in the body
    B. toxins build up in the body   D. more nutrients in the body

13. Which type of electromagnetic wave travels the fastest in a vacuum?
    A. radio waves   B. visible light   C. gamma rays   D. they all travel
                                                                     the same speed

14. A student working with an archeologist found shark fossils on top of a Texas mountain. The evidence
     suggest that that mountain was once _____.
     A. below a waterfall   C. covered by the ocean
     B. near a freshwater lake   D. part of a riverbed

15. The coldest biome is the _____.
     A. grassland   B. desert   C. tundra   D. deciduous
                                                                 forest

16. A cereal box has a mass of 340 g. Its dimensions are 27 cm x 19 cm x 6 cm. What is the density of the
     box?
     A. 0.110 g/cm^3 B. 3078 cm^3 C. 1.10 g/cm^3 D. 110 g/cm^3

17. The general role of osmosis in a living cell is to _____.
     A. rid the cell of wastes   C. maintain water balance
     B. provide food   D. provide energy to do work

18. The group of metals that are soft enough to be cut with a knife are the _____ metals.
     A. alkali   B. alkaline-earth   C. transition   D. lanthanide

19. The first scientist to explain why planets revolved around the sun was _____.
     A. Galileo   B. Copernicus   C. Kepler   D. Newton   .

20. _____ are high-relief landscape regions that must rise at least 600 m above the surrounding area
     and must have narrow summits and steep slopes.
     A. Mountains   B. Plateaus   C. Plains   D. Hachures

21. Vegetative propagation is a method of _____.
     A. reproducing plants asexually   C. reproducing plants sexually
     B. transferring pollen from one   D. tapping sap in the xylem
     plant to another   during the spring

22. The purpose of pasteurization is to _____.
     A. kill disease-causing bacteria in   C. produce immunity to a
     foods such as milk   disease
     B. purify a water supply by adding   D. discover the microorganism
     chemicals to it   that causes a particular disease

23. The Mercalli Scale measures _____.
     A. ocean wave height   C. cloud cover
     B. earthquake intensity   D. O_2 density in the atmosphere

24. Chromatin condenses and forms rod-like structures during _____.
     A. anaphase   B. telophase   C. interphase   D. prophase

25. All of the following can be classified into the five-kingdom system of classification except _____.
     A. an alga   B. a fungus   C. a bacterium   D. a virus

26.   Carbon dioxide is a gas at room temperature so it is most likely a /an _____ compound.
      A. metallic   B. atomic   C. covalent   D. ionic

27.   A/An _____ is a large area of flat land that is raised high above sea level.
      A. steppe   B. moorland   C. plateau   D. dominion

28.   Which of the following is not a characteristic of protists?
      A. heterotrophs   B. prokaryote   C. unicellular   D. multicellular

29.   Ammonia can be chemically broken down into hydrogen and nitrogen in the ratio of 3 parts hydrogen to
      1 part nitrogen. Ammonia is a/an _____.
      A. element   B. compound   C. precipitate   D. solution

30.   The underground point of origin of an earthquake is called the _____.
      A. epicenter   B. focus   C. vent   D. fault

31.   Most of the energy that enters an ecosystem is in the form of _____.
      A. chlorophyll   B. heat   C. sunlight   D. water

32.   Reptiles have scaly skin, kidneys, and eggs that have a shell. These three adaptations help the reptile
      conserve _____.
      A. water   B. oxygen   C. heat   D. waste

33.   When tension acts on rocks, the rocks are _____.
      A. pushed together   C. pulled apart
      B. tilted   D. pushed in two opposite, horizontal directions

34.   The largest population that an environment can support is its _____.
      A. carrying   B. community   C. limiting factor   D. ecosystem
      capacity

35.   A bird's heart has _____ chambers.
      A. one   B. two   C. three   D. four

36.   Which of the following is an example of a sedimentary rock?
      A. chalk   B. marble   C. granite   D. obsidian

37.   The doughnut-shaped region that traps particles from the solar wind is a/an _____.
      A. umbra   B. apogee   C. Van Allen belt   D. penumbra

38.   Which of the following is not part of the peripheral nervous sytem?
      A. spinal cord   B. axons   C. sensory   D. motor neurons
                                                      receptors

39.   Fats provide twice as much _____ as carbohydrates.
      A. waste   B. fiber   C. bile   D. energy

40. A great sea wave caused from an earthquake located in the ocean is called a/an _____.
   A. high tide   B. neap tide   C. secondary wave   D. tsunami

41. A resource that exists in such a large supply that it can be considered almost limitless is a/an _____ resource.
   A. reserve   B. nonrenewable   C. renewable   D. inexhaustible

42. The planet that seems to be tipped on its side is _____.
   A. Uranus   B. Jupiter   C. Neptune   D. Mars

43. A ridge deposited along the side of a glacier is called a _____.
   A. drumlin   B. terminal   C. lateral moraine   D. terrace
                          moraine

44. Multicellular algae are classified according to their _____.
   A. color pigments   C. method of reproduction
   B. spore structure   D. cell wall structure

45. Sugars are _____.
   A. saturated fats   C. complex carbohydrates
   B. simple carbohydrates   D. complete proteins

46. Minerals that form from solutions often occur underground in narrow bands called _____.
   A. veins   B. sediments   C. grains   D. gemstones

47. Of the following, _____ does not help the body maintain homeostasis.
   A. diarrhea   B. having fever   C. sweating   D. scratching

48. To find out what elements are in a star's atmosphere, scientists study its _____.
   A. action spectrum   B. parallax   C. absorption   D. magnitude
                                                 spectrum

49. One way the mosses and liverworts affect the soil is that they _____.
   A. provide water to the soil   C. help prevent erosion
   B. put minerals in the soil with their roots D. poison the soil with their spores

50. If a cell from an animal that lives in salt water is placed in pure, fresh water, _____.
   A. salt will diffuse out and the cell will become   C. all the organelles will disappear
   a fresh water cell
   B. the cell membrane will pull away from the   D. water will move into the cell and it will burst
   cell wall

2016-2017 Middle School Science State Championship Test
Answer Key

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