TMSCA MIDDLE SCHOOL
SCIENCE
REGIONAL TEST©
MARCH 2, 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.

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Periodic Table of the Elements

1A 1																	8A 18
1 **H** 1.01	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	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	8B 8	8B 9	8B 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, $N = 6.02 \times 10^{23}$ molecules/mole

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

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

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

Gram molecular volume al STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^8$ 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, $m_e = 9.11 \times 10^{-31}$ kg

Atomic mass unit, $m_u = 1.66 \times 10^{-21}$ 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 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

1. The first human to journey into space on April 12, 1961 was which of the following?
    A. Neil Armstrong   B. Buzz Aldrin   C. Alan B. Sheppard   D. Yuri Gargarin

2. Look at this map below. Which side view matches the topographical view on the map?

3. Students at Midland Middle School put together a special instrument built from an old cardboard
    cereal box and a piece of diffraction grating during a special program on astronomy. The instrument
    was used to look at different light sources and compare their spectra. What is this instrument called?
    A. radio spectrascope   B. LUX meter   C. spectroscope   D. diffractoscope

4. When studying about the solar system, the teacher showed the class a large round blob of modeling
    clay. Next, the teacher said, "If this blob represents all the mass of everything in the solar system,
    how much of this would represent the sun?" What would be the correct answer?
    A. 75%   B. 56.4%   C. 85%   D. 99.85%

5. A rancher bought a bull that historically fathers small "birth weight" calves. Having a small birth
    weight is beneficial to safe "birthing" of calves in new cow mothers (heifers) which assists with calf
    and mother survival. This would be an example of what?
    A. selective breeding   B. domestic calving   C. genetic modification   D. none of these

6. All living things are composed of what?
    A. tissue   B. organs   C. cells   D. blood

7. How do oceans aid in the formation of hurricanes?
    A. the salt in the oceans provides extra energy which aids in hurricane formation
    B. the oceans have currents that rotate counter-clockwise and help with hurricane formation
    C. oceans release energy in the force of waves that help fuel hurricanes
    D. hurricanes need the energy from the rising warm, moist air over the oceans in order to form

8. During a lab activity, one student forgot to pull back her long hair. While she was using a Bunsen
    burner, her hair caught on fire. What safety procedure should her lab partner follow?
    A. get the fire extinguisher immediately
    B. call 9-1-1 and then get the fire extinguisher
    C. immediately tell the teacher and get the fire blanket to put over her head.
    D. put her head in the eye-wash station and pour water over her head

9. During mitosis, the chromatids (chromosomes) move to opposite poles of the cell during what stage?
   A. Prophase
   B. Metaphase
   C. Interphase
   D. Anaphase

10. Which of these show the correct order of eras from most recent to oldest on the
    Geologic Time Scale?
    A. Paleozoic, Mesozoic, Cenozoic
    B. Cenozoic, Mesozoic, Paleozoic
    C. Mesozoic, Cenozoic, Paleozoic
    D. Paleozoic, Cenozoic, Mesozoic

11. What human body system would be most affected by Psoriasis?
    A. skeletal   B. circulatory   C. nervous   D. integumentary

12. What element is the second highest gas found in the Earth's atmosphere?
    A. Oxygen   B. Nitrogen   C. Hydrogen   D. Helium

13. A loose collection of rocky material dust, water ice, and frozen gases that orbits the sun and is
    sometimes called a "dirty snowball" is a _____.
    A. asteroid
    B. meteor
    C. dwarf plane
    D. comet

14. Avogadro's Number is equal to what?
    A. 6.02×10^{23} particles
    B. 1 mole
    C. Both A and B
    D. The number of particles in 12 grams of any element.

15. What part of a microscope is where you place the specimen to be observed?
    A. stage   B. ocular   C. base   D. diaphragm

16. Which of the following has the most effect on climate of an area?
    A. population
    B. topography and distance from equator
    C. number of forests located here
    D. soil type

17. A Paleontologist is a scientist who studies what?
    A. artifacts from the past
    B. fossils from past living things
    C. tectonic plates of the Earth
    D. processes of how the Earth was formed

18. What is one big difference between mechanical and electromagnetic waves?
    A. Mechanical waves can travel through every type of medium.
    B. Electromagnetic waves can only travel through water.
    C. Mechanical and Electromagnetic waves are not different.
    D. Electromagnetic waves can travel through empty space.

19. Which of the following is the process in which certain living cells engulf other cells or particles?
    A. pinocytosis
    B. inundation
    C. verberosis
    D. phagocytosis

20. A group of students were testing the strength of 3 different types of tape. They designed an experiment to see which tape could hold the most weight before it would drop. Here are the results: (averages are rounded to tenths place)

Tape Sample	Test 1	Test 2	Test 3	Average Weight
A	16 g	17 g	16 g	16.3 g
B	23 g	23 g	24 g	23.3 g
C	18 g	19 g	20 g	18.0 g

Using the results, which tape sample was the strongest?
A. Tape A   B. Tape B   C. Tape C   D. Both A and C

21. There was a mistake when the students were calculating the average weight. What is the mistake?
    A. Test Sample A's average is too high.
    B. Test Sample B's average is too low.
    C. Test Sample C's average is too low.
    D. There are no mistakes.

22. Which statement about the experiment from question 20 is true?
    A. The students found that Tape A is the strongest tape sample out of the 3 tested.
    B. By using qualitative data, the students conclude that Tape B is the strongest tape.
    C. Tape C and Tape A are not worth using for the amount of money they cost.
    D. The students gathered empirical evidence that supports Tape B as the strongest tape.

23. What does the prefix "pter" mean?
    A. having wings or fins
    B. terrifying
    C. standing or staying
    D. middle

24. Which of the following chemical formulas contain the most atoms?
    A. $11H_2O_2$
    B. $4NaCl$
    C. $C_{12}H_{22}O_{11}$
    D. Both A and B

25. Which list below shows substances that are all acidic?
    A. orange juice, sodium hydroxide, ammonia
    B. milk, vinegar, apples
    C. urine, bananas, oven cleaner
   D. toothpaste, soapy water, bleach

26.

Fruit	kilocalories	mass
Watermelon	100	250 g
Strawberries	100	294 g
Cantaloupe	100	268 g
Peach	100	245 g

Using this chart and your useful information sheet, how many Joules would there be in 250 g of watermelon?
   A. 4.184 J
    B. 418,400 J
    C. 100 J
    D. 418.4 J

27. Rangiroa, an island found in the South Pacific, is a ring-shaped island formed from coral. What type of land form is Rangiroa?
    A. oceanic   B. tidal   C. barrier   D. atoll

28. Calcite is a mineral with a chemical composition of $CaCO_3$. This qualifies calcite to be in what group?
    A. halides   B. carbonates   C. silicates   D. oxides

29. What part of the eye is made of a layer of light sensitive cells that send messages to the optic nerve?
    A. lens   B. cornea   C. retina   D. iris

30. This diagram shows a ball hanging and swinging from a rope. If the ball was held at point A, and then released, swings to point C, and then reverses the swing, what is the point of maximum kinetic energy?
    A. point A   B. point B   C. point C   D. there is none
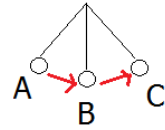
31. The process of studying the ocean floor layers by driving a long, hollow pipe into the ocean floor is called what?
    A. dredging   B. coring   C. basin mining   D. sledging

32. Using the graph to the right, who won this race?
    A. Runner A
    B. Runner B
    C. Runner C
    D. Runner A and C tied

Race Results

y-axis: seconds, x-axis: meters
Legend: Runner A, Runner B, Runner C
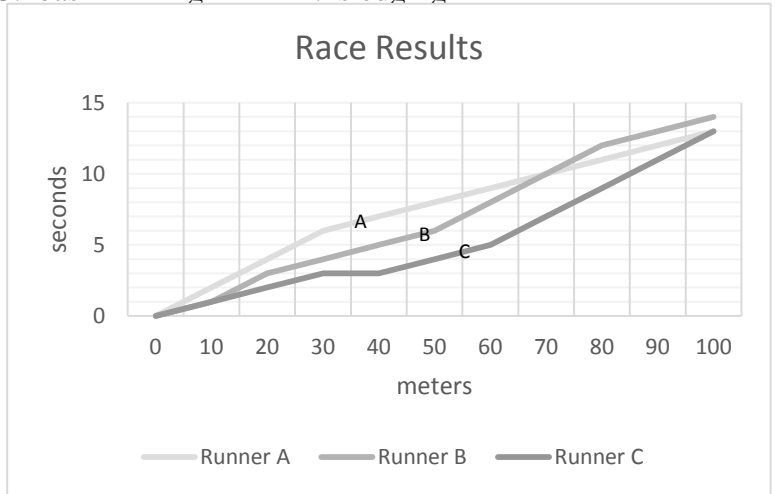
33. Which of the following statements is true (about this graph)?
    A. Runner B had the best overall time.
    B. Runner A passed Runner B at about the 70 m mark.
    C. Runner C came from behind to win the race.
    D. Runner A ran fast and then slowed down later in the race.

34. RNA molecules differ from DNA molecules. One way they differ is that RNA does not contain what nitrogenous base?
    A. adenine   B. guanine   C. cytosine   D. thymine

35. Which system transports nutrients to the body?
    A. respiratory   B. endocrine   C. circulatory   D. nervous

36. What enzyme in the liver helps to break down harmful hydrogen peroxide into water and oxygen?
    A. catalase   B. lipase   C. amylase   D. synthase

37. A bird's heart has how many chambers?
    A. 2   B. 3   C. 4   D. 5

38. Hanna and Jayden were playing tug of war with a rope. Hanna pulled on the rope with a force of 68 N south. Jayden pulled on the rope with a force of 74 N north. Who won the game and what was the net force?
    A. Hanna 6 N south
    B. Hanna 144 N south
    C. Jayden 6 N north
    D. Jayden 144 N south

39. In Geology, when you come upon a sudden change of depth in one or more of the physical properties of the material making up Earth's interior, this is called what?
    A. a discontinuity
    B. a distributary
    C. breccia
    D. drumlin

40. Which statement about silver is not true?
    A. Silver has an atomic number of 16.
    B. Silver's atomic mass is 107.9.
    C. The chemical symbol for Silver is "Ag"
    D. Silver is a member of Group 1B.

41. In 1795, a geologist from Scotland, James Hutton described in a book how the Earth processes that we see today are the same as those that happened in the past before we could observe these changes. This principle is known as what?
    A. Superposition   B. Uniformitarianism   C. Relativism   D. Catastrophism

42. Which person below was a Swedish chemist and also is noted for inventing dynamite?
    A. John Dalton
    B. Dimitri Mendeleev
    C. Antoine Lavoisier
    D. Alfred Nobel

43. The hypocenter of an earthquake is located where?
    A. the point on the surface of the earth above the focus point
    B. the area surrounding an earthquake where the damage occurs
    C. the point 10 meters under the spot were the waves begin
    D. at the focus or spot where the waves from the earthquake begin

44. Elements that are considered alkali metals are most likely to form bonds with what elements?
    A. noble gases   B. halogens   C. actinides   D. nothing

45. What type of clouds would you most likely see on a typical summer day? (cotton-like, fluffy)
    A. cirrus   B. stratus   C. nimbus   D. cumulus

46. When a person has "low blood sugar" they are considered to be what?
    A. hypoglycemic   B. hyperglycemic   C. diabetic   D. having a stroke

47. An ant is to Arthropoda as a snail is to _____.
    A. Chordata   B. Cnidaria   C. Mollusca   D. Gastropoda

48. Bird feathers are made up of what substances?
    A. carbohydrates   B. a protein called keratin   C. polymer called chitin   D. cartilage

49. What do you call the underground layer of water-bearing rock?
    A. aquifer   B. cavern   C. artesian well   D. spring

50. Besides iridium, what else is found in the boundary between the Cretaceous and Paleogene Periods
    that help to support the theory of the asteroid impact about 65 million years ago?
    A. microtektites, shocked quartz, and evidence of species extinction
    B. high iron content, microfossils, no plant evidence
    C. palladium, molten rock fragments, and evidence of intense heat
    D. evidence of continental drift, marine life mass extinction, and fulgurites

2018 - 2019 TMSCA Middle School Science Test - Regional- Key

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