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 U N E - U P T E S T ©

2 0 1 9

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

2018 – 2019 TMSCA Middle School Science Test – Tune Up

1. Complete this analogy: carpal is to hand as tarsal is to _____.
   A. leg B. arm C. foot D. shoulder

2. Two students were looking at cells under a microscope. Student A commented that the cell she was looking at had no nucleus or membrane-bound organelles. Student B said that the cell he was looking had a well-defined nucleus and membrane-bound organelles. Which of the following is true about the cells?
   A. Student A was looking at a eukaryotic cell.
   B. Student B was looking at a prokaryotic cell.
   C. Student A was looking at a prokaryotic cell.
   D. Student B was looking at bacteria.

3. According to this chart, the density of water depends on what?
   A. the amount of water
   B. the temperature of the water
   C. both A and B
   D. neither A or B

Density and Weight of Water at Standard sea-level Atmospheric Pressure

Temperature °F/°C	Density grams/cm^3	Weight pounds/ft^3
32°/0°	0.99987	62.416
39.2°/4.0°	1.00000	62.424
40°/4.4°	0.99999	62.423
50°/10°	0.99975	62.408
60°/15.6°	0.99907	62.366
70°/21°	0.99802	62.300
80°/26.7°	0.99669	62.217
90°/32.2°	0.99510	62.118
100°/37.8°	0.99318	61.998
120°/48.9°	0.98870	61.719
140°/60°	0.98338	61.386
160°/71.1°	0.97729	61.006
180°/82.2°	0.97056	60.586
200°/93.3°	0.96333	60.135
212°/100°	0.95865	59.843

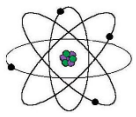
4. The prefix “semi” means which of the following?
   A. half
   B. large
   C. long
   D. all

5. Earth’s storms, clouds, and other weather events take place in what layer of the atmosphere?
   A. stratosphere
   B. ionosphere
   C. mesosphere
   D. troposphere

6. An atom contains 12 neutrons and has an atomic mass of 23. What element is this?
   A. Calcium B. Magnesium C. Chlorine D. Sodium

7. Jennifer was planning a science project. She wants to test to see if there is more lead found in the soil in urban gardens than in rural gardens.
   What would be a reasonable, testable hypothesis for her project?
   A. If soil samples are taken from gardens found in an urban area of more than 2,500 people and soil samples are taken from gardens found in rural areas of less than 2,500 people, then the lead residue content will more likely be found in urban garden soil.
   B. If soil samples are taken from both urban and rural gardens, then there will be lead residue in the soil in high amounts.
   C. If soil samples are taken from urban gardens, then lead samples might be found in the soil.
   D. If soil samples are taken from urban and rural gardens, then lead content can be tested in the soil samples.

8. What part of an atom is electrically positive?
   A. neutron
   B. electron
   C. proton
   D. nucleus



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 the following is a unicellular organism?
    A. dog
    B. daphnia
    C. tick
    D. amoeba

11. A low, horizontal cloud formation that is associated with the gust front of a thunderstorm is classified as what type of cloud?
    A. arcus
    B. cumulus
    C. lenticular cloud
    D. cirrus

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

13. People with an allergy to gluten usually have problems with what body system?
    A. integumentary
    B. endocrine
    C. respiratory
    D. digestive

14. The prefix "omni" means what?
    A. Earth B. small C. region D. all

15. Many times, paleontologists can learn by studying coprolites. What type of fossil are these?
    A. impressions of footprints from past creatures
    B. fossils that link evolutionary stages
    C. concretions of toe and limb bones
    D. the fossilized excrement left behind from ancient creatures

16. A measure of 3 mechanical horsepower would equal how many watts?
    A. 1,492 W
    B. 3,000 W
    C. 746 W
    D. 2,238 W

17. According to this Punnett square, the dad's genotype is considered to be what?
    A. Homozygous
    B. Heterozygous
    C. Codominant
    D. Phenotype

		Maternal	
		B	b
Paternal	B	BB	Bb
	b	Bb	bb

18. What was created to help chemists connect the large-scale world with the particulate world of atoms, molecules, and ions?
    A. the mole unit
    B. chemical recipes
    C. balanced equations
    D. none of these

19. What element makes up most of the Earth's atmosphere?
    A. Oxygen B. Nitrogen C. Hydrogen D. Helium

20. The root word "pict" means what?
    A. cut B. clean C. to paint D. to tie

21. When looking for a rainbow after a rain shower, where would you look?
    A. Look to the area perpendicular to the sun
    B. Look to the sky opposite of the sun
    C. Look below the sunlight
    D. There is no set direction to look.

22. When fast-moving particles from space collide with oxygen and nitrogen in Earth's atmosphere, they impart energy to these molecules. This energy "excites" the gas molecules that will eventually lead to a photon emission. What phenomenon does this create?
    A. neutrino
    B. sunspot
    C. meteorite
    D. aurora

23. What is considered 0^{o} latitude?
    A. prime meridian
    B. equator
    C. Tropic of Cancer
    D. Tropic of Capricorn

24. In a vascular plant, the tissue that carries water to the cells is called what?
    A. Phloem B. Xylem C. Cambium D. Stomata

25. An example of a "ball and socket" joint in humans would be found where?
    A. knee
    B. wrist
    C. head
    D. hip

26. Which female scientist won the Nobel Prize in chemistry in 1911?
    A. Caroline Herschel
    B. Barbara McClintock
    C. Rosalind Franklin
    D. Marie Curie

27. Which planet is tilted 98 degrees on its axis so that it basically rotates on its side?
    A. Uranus
    B. Mercury
    C. Mars
    D. Venus

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28. One adaptation of birds is the number of ovaries in females. Most female birds have how many functional ovaries?
    A. one B. two C. three D. four

29. At most power plants, energy is obtained by burning a fuel to heat water that produces steam which will turn a turbine to generate electricity. Which type of power plant below does not burn a fuel?
    A. coal power plants
    B. natural gas power plants
    C. nuclear power plants
    D. oil power plants

30. When observing the trophic levels and the energy relationships, about how much energy is passed from one level to the next? (as from producers to primary consumers, primary to secondary, and so on.)
    A. 90%
    B. 50%
    C. 25%
    D. 10%

31. When coral along the Great Barrier Reef near Australia stay too warm for an extended amount of time, this heat wave can cause them to eject the algae that live inside them. Which of the following is a result of this happening?
    A. The coral flourishes and grows new branches.
    B. The coral goes through the next stage in their life cycle.
    C. The coral may turn bone-white and die.
    D. The algae die immediately.

32. Which term describes a very strong dust or sand storm?
    A. hoodoo
    B. arroya
    C. loess
    D. haboob

33. The scientist keeps the freezer at 273^{o} K. What would this be converted to Celsius? (approximate)
    A. 0^{o} C B. 32^{o} C C. 13^{o} C D. -18^{o} C

34. What is the SI unit to measure frequency?
    A. watt B. volt C. hertz D. wavelength

35. The prefix “prim” means which of the following?
    A. last B. new C. first D. spark

36. On Earth, what is the rarest occurring pigment found in nature?
A. red B. blue C. purple D. green

37. Kenneth was testing which type of battery lasts the longest in his flashlight. He used three different brands of batteries and times how long they would continually keep the flashlight shining. Here are his results.

Battery Brand	Start time	End time
A	Day 1 -3:00pm	Day 10 – 4:15am
B	Day 1 -3:00pm	Day 14 – 5:30pm
C	Day 1 -3:00pm	Day 7 – 1:45pm

Which battery lasted the longest?
A. A
B. B
C. C
D. both A and B

38. Which Russian chemist helped organize the early periodic table?
A. Yuri Gagarin
B. Dimitri Mendeleev
C. Nicolay Semenov
D. Vladimir Putin

39. When tectonic plates come together, the place where they meet is called what?
A. divergent boundary
B. convergent boundary
C. stress zone
D. transform boundary

40. A crow flew by my neighbor's tree. This crow was completely white with pink legs, bill, eyes, and feet. This crow is an example of which of the terms below?
A. leucism B. melanism C. albinism D. xanthochromism

41. Motion involves an object's change in position relative to what?
A. the friction that slows it down
B. the direction that it is moving
C. an object's mass and gravity
D. a reference point over a period of time

42. Which word pair below is incorrectly matched?
A. Celiac disease: gluten
B. Diabetes: bacteria
C. Lung cancer: tobacco
D. Mesothelioma: asbestos

43. Which statement about tigers is true?

A. Tigers dislike water and will avoid it.
B. Tigers are fast runners and can reach speeds of 65 mph.
C. No two tigers have the same pattern of stripes.
D. Tigers live in North America.

44. Which two animals below are both examples of mammals?
A. crocodile and alligator
B. cow and egret
C. armadillo and shrew
D. echidna and minnow

45. Look at this chemical equation: $\_\_N_2 + \_\_H_2 \rightarrow \_\_NH_3$ Which equation below is the correct balanced equation?
A. $2N_2 + 3H_2 \rightarrow 2NH_3$
B. $2N_3 + 3H_2 \rightarrow 2NH_3$
C. $N_2 + 4H_2 \rightarrow 2NH_3$
D. $N_2 + 3H_2 \rightarrow 2NH_3$

46. Granite is made up of these two minerals and a few more. What two minerals?
A. galena and graphite
B. baryte and gypsum
C. hematite and halite
D. feldspar and quartz

47. The Law of Conservation of Energy states that energy _____.
A. can be conserved if all types of energy are utilized.
B. can be created by taking mass and converting it to energy.
C. can be destroyed when the mass is more than the volume.
D. can neither be created or destroyed, it just changes form.

48. The prefix "solu" means which of these?
A. tighten B. loosen C. combine D. taste

49. Out of the 8 main moon phases, what happens right after a full moon?
A. half moon
B. waning crescent
C. waxing gibbous
D. waning gibbous

50. Which of the following is a true fact about tornados?
A. tornados path of movement is predictable
B. the duration of tornados is 10 to 20 minutes
C. tornados are measured using the Richter scale
D. a tornado over water is called a waterspout

2018 - 2019 TMSCA Middle School Science Test – Tune Up- Key

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