TMSCA MIDDLE SCHOOL SCIENCE STATE TEST©

APRIL 27, 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

2018 – 2019 TMSCA Middle School Science Test - State

1. Edwin found an irregular shaped rock and wanted to find the density of the rock. He measured the mass to be ¾ kg. When he placed the rock in a graduated cylinder filled to the 250 mL mark, the water level rose to 485 mL. Which mineral in this chart has the closest density to Edwin's rock?
   A. halite
   B. calcite
   C. quartz
   D. fluorite

DENSITY CHART

ALL DENSITIES ARE IN GRAMS PER CUBIC CENTIMETER

DENSITY	MINERAL
2 . 16	halite
2 . 32	gypsum
2 . 65	quartz
2 . 72	calcite
3 . 18	fluorite

2. In the microbiology lab, the researcher wanted to make sure not to contaminate the materials with any unwanted bacteria, so she sterilized her lab instruments before starting the experiment with what tool?
   A. Petri dish
   B. stereoscope
   C. spectrometer
   D. autoclave

3. Which of the following cloud words are correctly matched?
   A. Stratus: rain, Cirrus: sheet-like, Cumulus: wispy, Nimbo: rain
   B. Stratus: wavy, Cirrus: wispy, Cumulus: puffy, Nimbo: rain
   C. Stratus: sheet-like, Cirrus: puffy, Cumulus: wispy, Nimbo: rain
   D. Stratus: sheet-like, Cirrus: wispy, Cumulus: puffy, Nimbo: rain

4. Calculate the concentration of a solution in which 2350 mg of salt is dissolved into 100 mL of water.
   A. 42.5 g/mL
   B. 23.5 g/mL
   C. 0.235 mL/g
   D. 0.0235 g/mL

5. During science class, the students were experimenting with bubble solution. They were trying to find out what recipe makes the bubbles last the longest. They kept these ingredients the same (water and detergent) in each recipe but added glycerin to one recipe and corn syrup to the next recipe. They had three solutions to test. Solution 1 – water, detergent Solution 2 – water, detergent, glycerin Solution 3 – water, detergent, corn syrup
   Which of these would be a controlled variable in the experiment?
   A. the time that the bubbles lasted
   B. which solution will work the best
   C. the type of detergent to use in the experiment for each solution
   D. all of these would be controlled variables

6. How many electrons does an atom of Neon have?
   A. 20.18 B. 10 C. 9 D. 8

7. Complete this analogy: moon is to Earth as _____ is to Saturn.
   A. Io B. Deimos C. Rhea D. Callisto

8. This famous scientist won a Nobel Prize in 1983 for work involving genetic transposition.
   A. Barbara McClintock
   B. Gregor Mendel
   C. James Watson
   D. Thomas Hunt Morgan

9. Which of the following is most likely the molecular formula for corn syrup?
   A. CH_3COOH
   B. $Ca(OH)_2$
   C. $NaHCO_3$
   D. $C_6H_{14}O_7$

10. Which of the following scientific laws deals with thermodynamics?
   A. Hubble's Law
   B. Archimedes Principle
   C. Heisenberg's Uncertainty Principle
   D. Dulong and Petit's Law

11. A make-believe creature called "Genetosaurus" was used in Benny's class to study genetics. In a Genetosaurus, the allele for green skin color (G) is dominant over the allele for brown skin (g). The allele for large nostils (N) is dominant over the allele for small nostrils (n). What would be a genotype for a Genetosaurus that is brown-skinned with large nostils?
   A. BBNN
   B. Ggnn
   C. ggNn
   D. ggnn

12. A scientist who would be familiar with evolution, animal studies, genetics, and ecology would most likely be a what?
   A. Cytologist
   B. Epidemiologist
   C. Ethologist
   D. Analytical chemist

13. What do most scientists believe is the reason Earth's atmosphere has the current percentage of oxygen?
   A. the rainforests and plants of the world
   B. agricultural practices
   C. burning of fossil fuels
   D. tiny organisms called cyanobacteria or blue-green algae

14. An input force of 30 N is applied to a machine to produce an output force of 60 N. What is the mechanical advantage?
A. 1800 B. 2 C. ½ D. 3

15. What type of lever is the tab (that opens it) on a soft drink can?
A. first class B. second class C. third class D. Both A and B

16. What important living organisms help stabilize the coastline, reduce erosion, and provide food and shelter for other living things?
A. sea horses B. crabs C. turtles D. mangroves

17. The focus of an earthquake is basically the same as what?
A. epicenter B. hypocenter C. seismic wave D. fault

18. Which of the following is an example of a troglobite?
A. cave snail
B. earthworms
C. millipedes
D. bats

19. Which of these listed is an allotrope of oxygen?
A. ozone B. oxides C. rust D. carbon dioxide

20. During 2011, Texas had the worst wildfire season in the state's history. After the fires, what type of ecological succession took place in these areas affected?
A. primary succession B. secondary succession C. tertiary succession D. none

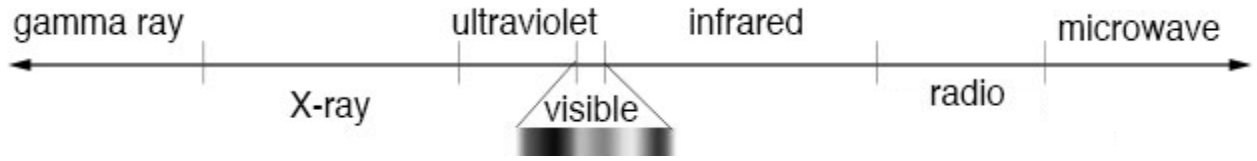
21. When ammonium nitrate is dissolved in water in a flask, the flask felt cold. What type of reaction is this?
A. endothermic
B. exothermic
C. thermosynthetic
D. not a reaction

22. A soccer player can cause a ball to curve in flight if he/she kicks the ball off-center. This would be an example of what?
A. doppler effect B. gravitational curving C. magnus effect D. drag force

23. Mammatus clouds that form about the same time as a storm are caused by what?
A. rising air B. sinking air C. tornadic activity D. hailstones

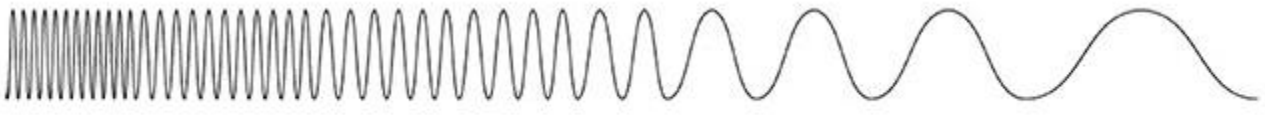
24. The poison ivy rash is caused by what?
A. a virus B. a bacteria C. allergic reaction D. fungus

25. Look at the diagram showing the electromagnetic spectrum.



What is not correct on this diagram?

A. X-ray and gamma ray should reverse position
B. infrared and ultraviolet should reverse position
C. visible light should be removed
D. radio and microwave should reverse position

26. 

Above is a drawing illustrating the wavelengths of the electromagnetic spectrum.
In what position would you find the highest energy?

A. far left B. middle C. right D. far right

27. Look at the table of SI Base Units.
The table contains a mistake.
Where is the mistake?

A. gram should be kilogram
B. time should be hour
C. luminous intensity does not have an SI Unit
D. no mistake on the table

SI Base Units

Base Quantity	Name	Symbol
Length	meter	m
Mass	gram	g
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

28. The Axolotl is an unusual animal because of which of the following reasons?

A. It is a reptile with amphibian like characteristics.
B. It is a fish that can walk on land.
C. It is an amphibian than has amazing regenerative abilities.
D. It is a bird that can swim faster than a human.

29. Sammy saw a bird sitting in a tree in his backyard. The bird's eyes, bill, and bare parts were the normal color for this species of bird, but the bird's black feathers were not the normal black. They appeared to be white. What genetic mutation would this bird be considered to have?

A. albinism B. melanism C. leucism D. xanthochromism

30. Which of the following is a correct unit for measuring density?

A. kg/m
B. g/mL
C. m/s^2
D. mL/kg

31. Name the element that is in group 6A on the periodic table and contains 45 neutrons.
    A. Silicon
    B. Selenium
    C. Tin
    D. Bromine

32. Wind is caused by what?
    A. changes in currents because of the Earth's rotation
    B. low pressure areas moving to high pressure areas
    C. the massive energy from the oceans
    D. uneven heating of the Earth by the sun

33. About how many years ago do scientists believe that there was one super continent called Pangaea and one ocean called Panthalassa?
    A. 2.5 billion years
    B. 10 million years
    C. 250 million years
    D. 10,000 years

34. The "Ring of Fire" is considered to be what?
    A. a circular area of earthquake activity around the Atlantic Ocean
    B. a ring of intense geothermal heat found in the Earth's crust
    C. a place where three tectonic plates are diverging; causing volcanic unrest
    D. a string of volcanos and seismic activity, or earthquakes, located around edge of Pacific Ocean

35. Which pairs of body systems and organs are true and correctly matched?
    A. excretory – kidney, urethra integumentary – heart, blood vessels
    B. endocrine – liver, gall bladder circulatory – lungs, stomach, vessels
    C. digestive – stomach, intestines nervous – brain, sensory organs
    D. integumentary – skin cell, hair endocrine – hormones, red blood cell

36. Which bacteria morphology listed below is rod-shaped?
    A. cocci B. bacilli C. spirilla D. prokarya

37. Which of the following have only one proton in their nucleus?
    A. Hydrogen B. Deuterium C. Tritium D. all of these

38. If an artery that carries oxygen rich blood to the brain is somehow blocked, what event could occur?
    A. heart attack B. high blood pressure C. pulmonary embolism D. stroke

39. When the spine doctor was examining his patient's backbone, he found a problem in the third vertebrae from the neck going down. This would be considered which section of vertebrae?
    A. lumbar
    B. thoracic
    C. cervical
    D. coccygeal

40. During the beginning of the Paleozoic era, there was an event called the "Cambrian Explosion". What happened during this event?
    A. an asteroid landed in the Pacific Ocean
    B. a huge expansion in biodiversity
    C. a large number of land-walking animals developed
    D. an expansion of angiosperms

41. Which of these would make a good insulator of electricity?
    A. copper pan
    B. sea water
    C. silver ring
    D. diamond

42. 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.

43. A fish was swimming down a 75-meter stretch of a river. Its average speed was 12 km/hr. How many seconds did it take to complete the stretch of river?
    A. 22.5 seconds
    B. 6.25 seconds
    C. 900 seconds
    D. 45.0 seconds

44. This table shows some of the Major Meteor Showers.
    What meteor shower would be happening during the spring season?
    A. Lyrids B. Perseids C. Leonids D. Geminids

Shower	**Approximate Dates**	**Associated Comet**
Quadrantids	Jan. 4-6	
Lyrids	April 20-23	Comet 1861 I
Perseids	August 12	Comet 1862 I
Leonids	November 18	Comet 1866 I
Geminids	Dec. 4-16	

45. The Monarch butterfly's scientific name is *Danaus plexippus.* The Queen butterfly's scientific name is *Danaus gilipus.* Which statement below is true about these two butterflies?
    A. They will be able to reproduce together and produce offspring.
    B. They are in the same species.
    C. Both butterflies belong to the same sub-species.
    D. They belong to the same genus.

46. What part of a microscope is responsible for the magnification of the specimen?
    A. stage
    B. ocular
    C. objective lens
    D. Diaphragm

47. Which of the following organisms listed do NOT reproduce both asexually and sexually?
    A. Monarch butterfly
    B. starfish
    C. sea anemones
    D. potatoes

48. Some areas of Texas have dry climates and get little rainfall or have precipitation only at certain times of the year. In these areas, there are streams that flow less than 30 days a year.
    These streams are called what?
    A. perennial streams
    B. ephemeral streams
    C. intermittent streams
    D. Creeks

49. Some animals go through a period of dormancy during the winter to help them survive.
    What term would describe what a Texas horned lizard does to survive the extreme cold?
    A. estivation
    B. brumation
    C. hibernation
    D. torpidity

50. If a scientist wants to have a better understanding of the glacial and climatic history of an area, he/she may want to study the tree rings and subfossil wood in that area. This study is called what?
    A. carpology
    B. loraxology
    C. botany
    D. dendrochronology

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

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