TMSCA MIDDLE SCHOOL SCIENCE TEST #9 ©

JANUARY 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

2018 – 2019 TMSCA Middle School Science Test # 9

1. Complete this analogy: polar bear is to tundra as poison dart frog is to _____.
   A. rainforest B. prairie C. tundra D. mountains

2. Which of the following bones would be classified as "short bones?"
   A. the femur
   B. the cranial bones
   C. the vertebrae
   D. the carpals

3. 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

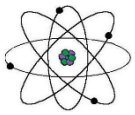
4. At a nuclear power plant, there are usually towers visible with white "smoke" coming out the top. What exactly is the "smoke" leaving the top of the towers?
   A. It is actual smoke from the burning reaction taking place.
   B. It is toxic emissions being filtered before being released.
   C. It is water droplets that condensed from water vapor while cooling.
   D. It is radiated steam that is released from the process.

5. Which of the following would not be considered a testable hypothesis?
   A. If I brush my teeth every day, then I will have no cavities.
   B. If I add fertilizer to my tomato plants, then I will have bigger tomatoes.
   C. If a ball is bounced on wood or concrete, it will bounce higher on concrete.
   D. If a person learns to read by 6 years old, he/she will read better.

6. The condition of the atmosphere at a given place and time is called what?
   A. temperature
   B. meteorology
   C. weather
   D. climate

7. Solar winds from the sun can cause disturbances in which of the following?
   A. Earth air currents including the jet stream
   B. tides and ocean waves
   C. earthquakes, tsunamis, hurricanes, volcanos
   D. satellites, spacecraft, and the Earth's electric-power grid

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



9. The human genome project was completed in June of 2000. What was the human genome project?
   A. competition to find the structure of DNA
   B. a global effort to collect DNA from all humans on the planet
   C. a project to study human genes and how they have changed
   D. none of these

10. One of the missions of the Parker Space Probe visiting the sun is to take observations of why there is such a difference between the corona's temperature and the surface of the sun's temperature. What is the difference in these temperatures?
   A. The sun's surface is much hotter. It is 2 million degrees F, while the corona is only 10,000 degrees F.
   B. The corona is much hotter. It is 2 million degrees F, while the sun's surface is only 10,000 degrees F.
   C. The corona is much cooler than the sun's surface, at 10,000 degrees F because is cooled by the solar winds.
   D. The sun's surface is slightly cooler than the corona because of the solar flares and prominences.

11. Cnidarians are interesting invertebrates with radial symmetry. Which of the following is a cnidarian?
   A. starfish
   B. shrimp
   C. sea anemone
   D. Planarian

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

13. Just after a first quarter or third quarter moon, what takes place?
   A. spring tides
   B. neap tides
   C. meteor shower
   D. aurora

14. Which of the following cells usually live the longest?
    A. red blood cells
    B. white blood cells
    C. skin cells
    D. nerve cells

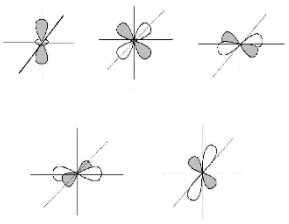
15. Lenticular clouds look like what?
    A. wispy, thin curls
    B. breaking ocean waves
    C. a UFO (flying saucer)
    D. a cylinder along the horizon

16. The boundary between Earth's crust and mantle was discovered by a Croatian seismologist in 1909. This boundary, named after this scientist, is called what?
    A. Moho
    B. Lithosphere
    C. Croviate
    D. Gambert

17. What type of reaction takes place when the candy "Mentos" is placed inside a full soda bottle?
    A. chemical reaction
    B. physical reaction
    C. scientific reaction
    D. None of the above

18. A sand dollar belongs to which phylum listed below?
    A. Mollusca
    B. Cnidaria
    C. Chordata
    D. Echinodermata

19. This diagram was found in a chemistry textbook. What would be the best title of this diagram?
    A. Diatomic Molecules
    B. Atomic Orbitals
    C. Mole Conversion
    D. Balloon Animals



20. Which scientist below won the Nobel prize in physics in 1921 for services in Theoretical Physics and discovery of the law of photoelectric effect?
    A. Stephen Hawking
    B. Albert Einstein
    C. Isaac Newton
    D. Niels Bohr

21. The suffix "saur" means which of the following?
    A. taste
    B. monster
    C. lizard
    D. bitter

22. Which of the following plants are hydrophytes?
    A. yucca
    B. prickly pear
    C. tomato
    D. Pickerelweed

23. Which of the following is an example of a simple machine called a lever?
    A. ramp
    B. axe
    C. merry-go-round
    D. boat oar

24. Which of the elements below are found in the same period on the Periodic Table?
    A. Lead and Tin
    B. Iron and Argon
    C. Zinc and Tin
    D. Potassium and Calcium

25. Which of the following belongs in kingdom animalia?
    A. algae
    B. fungus
    C. phytoplankton
    D. Zooplankton

26. What is the difference between a rotation and a revolution when discussing space objects?
    A. a revolution is one complete turn on an axis
    B. a rotation is one complete trip around another object
    C. a revolution is one complete trip around another object
    D. none of these

27. Craig's class was creating genetic "monsters" to show how some traits are dominant and recessive. He tossed a coin to determine the traits of his creation. His monster was heterozygous for skin color. (G for green dominant, g for purple recessive). Also, his monster turned out to be homozygous dominant for eye shape. (L for large eyes, l for small eyes) Which phenotype below would show Craig's monster?
    A. purple skin, small eyes
    B. green skin, large eyes
    C. purple skin, large eyes
    D. green skin, small eyes

28. An isotope of hydrogen has 1 proton and 2 electrons. This means the net charge is what?
    A. 1 + (cation)
    B. 1 - (anion)
    C. 2 + (cation)
    D. 2 – (anion)

29. What is the SI unit to measure force?
    A. kilogram
    B. pounds
    C. newtons
    D. Hertz

30. 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. What is his independent variable?
    A. brand of battery
    B. time the battery lasted
    C. days the battery lasted
    D. time

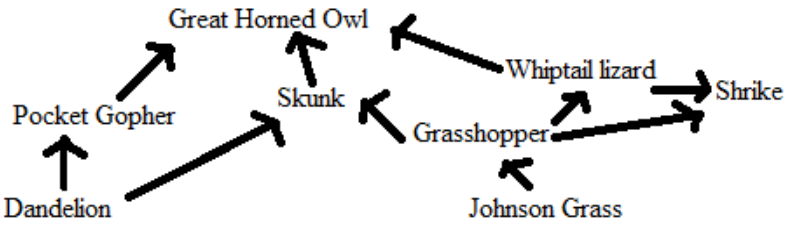
Battery Brand	**Start time**	**End time**
A	Day 1 -3:00pm	Day 10 – 4:15am
B	Day 1 -3:00pm	Day 14 – 5:30pm
C	Day 1 -3:00pm	Day 7 – 1:45pm

31. Which part of the human brain is the center of emotional processing?
    A. Hypothalamus
    B. Pituitary gland
    C. Amygdala
    D. Hippocampus

32. Which animal below is the largest carnivorous marsupial?
    A. kangaroo
    B. opossum
    C. Tasmanian devil
    D. wombat

33. Nimbostratus clouds usually mean what type of weather?
    A. warm temperatures
    B. violent storms
    C. fair weather
    D. gentle steady rain

34. Which of the following would be a reasonable density for the Earth's crust?
    A. 3.0 g/cm^3
    B. 33.0 g/cm^3
    C. 333.0 g/cm^3
    D. 3333.0 g/cm^3



35. In this food web diagram, which organism is shown to be both a secondary and tertiary consumer?
    A. Dandelion
    B. Whiptail lizard
    C. Great Horned Owl
    D. Skunk

36. In the same diagram, which animal is shown to be an omnivore?
    A. Great Horned Owl
    B. Pocket Gopher
    C. Whiptail lizard
    D. Skunk

37. How many electrons does an atom of Calcium have?
    A. 40 B. 27 C. 20 D. 17

38. Which of the following lists are all reptiles?
    A. ant, lizard, turtle, bird
    B. koala, beaver, tiger, emu
    C. anole, alligator, rattlesnake, gecko
    D. kangaroo, platypus, manta ray, shark

39. These prefixes are used quite often in science, but sometimes can be confused. Which is correct?
    A. "hypo" means over and "hyper" means under
    B. "hypo" means large and "hyper" means small
    C. "hypo" means under and "hyper" means over
    D. "hypo" means large and "hyper" means small

40. What coefficients would make this chemical equation balanced?

    ____NH_3 → ___N_2 + ___H_2

    A. 2,2,1
    B. 1,1,2
    C. 1,1,1
    D. 2,1,3

41. Looking at a cell under a microscope you see the chromosomes lined up along the equator of the cell. What phase of mitosis are you viewing?
    A. Prophase
    B. Metaphase
    C. Interphase
    D. Anaphase

42. What organelle helps to recycle used cell parts in a cell?
    A. Endoplasmic reticulum
    B. Mitochondria
    C. Golgi body
    D. Lysosomes

43. A hydrometer is used to measure what?
    A. humidity of the air
    B. water temperature
    C. relative density of liquids
    D. water pressure

44. What should be used to measure the absolute temperature of a volume of gas?
    A. ^{o}F B. ^{o}C C. $liters^{3}$ D. Kelvin

45. Which of the following organisms will not develop lungs?
    A. newts
    B. lampreys
    C. frogs
    D. salamanders

46. How many protons does an atom of the element Nitrogen have?
    A. 15 B. 10 C. 14 D. 7

47. What type of air mass would form over the snow-covered regions of northern Canada?
    A. Maritime tropical
    B. Maritime polar
    C. Continental tropical
    D. Continental polar

48. A fox was observed near the roadside This fox was unusually all black in color when it is normally red in color. What is this condition called?
    A. leucism B. melanism C. albinism D. xanthochromism

49. For a moving object to come to a complete stop, it must be what?
    A. able to overcome the force of friction
    B. acted upon by an unbalanced force
    C. have the force that moved it discontinue
    D. have its inertia taken away

50. Which of the following shows quantitative data?

A.

Sample A	56.8
Sample B	78.32
Sample C	98.1

C.

Sample A	red
Sample B	blue
Sample C	yellow

B.

Sample A	small
Sample B	medium
Sample C	large

D.

Sample A	warm
Sample B	cold
Sample C	hot

2018 - 2019 TMSCA Middle School Science Test # 9- Key

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