TMSCA MIDDLE SCHOOL SCIENCE TEST #10 ©

FEBRUARY 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.

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

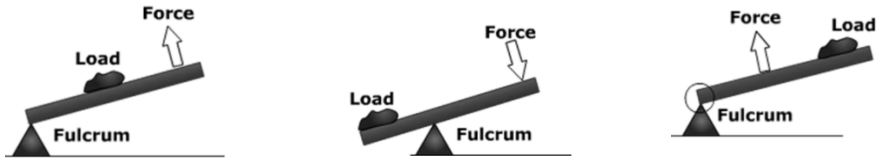
2018 – 2019 TMSCA Middle School Science Test # 10

1. Complete this analogy: radius is to ulna as tibia is to _____.
   A. fibula B. humerus B. femur C. clavicle

2. A table tennis, soccer, or tennis player can improve his/her game is he/she understands how to "spin" the ball when hitting it with the paddle. This has to do with what?
   A. the magnus effect
   B. drag force
   C. gravitational curving
   D. buoyancy force

3. What type of reaction does this chemical equation illustrate?
   $2NH_3 \rightarrow N_2 + 3H_2$
   A. synthesis B. combustion C. decomposition D. none of these

4. The alkali metals are found in what group on the periodic table?
   A. 7A B. 2A C. 1A D. 8A



5. Look at the three examples of levers above. Which statement below about the levers is correct?
   A. Example A is an example of a Class 3 lever.
   B. Example B is an example of a Class 3 lever
   C. Example C is an example of a Class 3 lever
   D. All are considered Class 3 levers

6. Cameron's class was discussing forces in class. When Cameron's teacher pushed a pencil with a force that caused the pencil to roll across the desk, this was demonstration what?
   A. an unbalanced force causing the pencil to move
   B. an equal and opposite reaction force
   C. gravitational force
   D. balanced forces causing motion

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

8. What rodent is considered a keystone species for a riparian ecosystem?
   A. beaver B. fish C. muskrat D. raccoon

9. In chemistry, a mole is a what?
   A. The amount of substance containing the same number of chemical units as exactly 15 grams of Carbon 15.
   B. The SI base unit for measuring an amount of a substance.
   C. Is equal to 6.02×10^{32}
   D. an electrically charged particle with a specific mass

10. A tarantula hawk (wasp) stings a spider to paralyze it and then drags it to a burrow, lays a single egg that will eventually hatch, and seals off the hole. When the egg hatches into a larva, it will feed on the spider. This is an example of what type of relationship?
    A. Mutualism B. Parasitism C. Commensalism D. Instinct

11. Which element is the most abundant element in the human body and in the Earth's crust?
    A. Carbon B. Oxygen C. Hydrogen D. Nitrogen

12. You have four mineral samples in front of you that are not labeled but are found on this chart. Use the clues to identify each mineral.

Mineral	Color of Streak	**Hardness**
Pyrite	black	6 – 6.5
Hematite	reddish	5 – 6.5
Magnetite	black	6
Goethite	yellow/brown	5 – 5.5

Mineral A does not have a black streak and has a hardness of 5.3
Mineral B does not have a yellow/brown streak and has a hardness of 6.
Mineral C has a reddish streak.
Mineral D has a black streak and is harder than goethite.

   A. **Mineral A** (Goethite) **Mineral B** (Pyrite) **Mineral C** (Hematite) **Mineral D** (Magnetite)
   B. **Mineral A** (Hematite) **Mineral B** (Magnetite) **Mineral C**(Pyrite) **Mineral D** (Goethite)
   C. **Mineral A** (Goethite) **Mineral B** (Magnetite) **Mineral C**(Hematite) **Mineral D**(Pyrite)
   D. **Mineral A (**Goethite) **Mineral B** (Pyrite) **Mineral C** (Magnetite) **Mineral D** (Hematite)

13. Coral is classified as which of the following?
    A. plant B. an animal C. a plankton D. non-living

14. When tectonic plates pull apart, the place where they break apart from each other is called what?
    A. divergent boundary
    B. convergent boundary
    C. stress zone
    D. transform boundary

15. Which of the following is not an isotope of Hydrogen?
    A. Monoterium
    B. Deuterium
    C. Tritium
    D. Protium

16.

Substance	**Refraction Index**
Vacuum	1
Air	-1
Water	1.33
Paraffin	1.44
Glass	1.52
Diamond	2.42

The refraction index is a ratio of the velocity of light through a vacuum to the velocity of light through that substance (of a greater density).
Why is the refraction index for diamond higher than for water?
A. the velocity of light through the diamond is less than it is through water
B. the velocity of light through the diamond is more than it is through water
C. the velocity of light through water and diamond are basically the same
D. the velocity of light cannot be calculated

17. Two students were studying two different organisms. Student A's organism has the ability to make its own food. Student B's organism does not have the ability to make its own food. Which of the following would be correct about the organisms?
    A. Student A's organism is heterotrophic.
    B. Student B's organism is autotrophic.
    C. Student B's organism is democratic.
    D. Student A's organism is autotrophic.

18. Which of the following statements about the Coriolis force is true?
    A. The Coriolis force only applies to stationary objects.
    B. The Coriolis force is very strong at the equator.
    C. The Coriolis force is weakest at the poles.
    D. Storms in the north swirl counter-clockwise

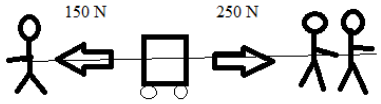
19. Who was the first American to orbit the Earth in 1962?
    A. Neil Armstrong
    B. Alan B Shepard
    C. Buzz Aldrin
    D. John Glenn

20. 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.

21. If you want to learn more about an element's reactivity and chemical properties, then it is helpful to know which of the following?
    A. the size of the nucleus
    B. the number of valence electrons
    C. neutrons
    D. the empty space in the atom

22. What is important about the Hertzsprung-Russell Diagram?
    A. It is a tool to compare the relationship between planets.
    B. It is a tool to measure the distances between stars.
    C. It is a tool to observe the space from beyond the atmosphere of Earth.
    D. It is a tool to aid in understanding stellar evolution.

23. Daniel pulled a cart with 150N of force to the left. David and Samuel pulled the same cart with 250N of combined force to the right. Which direction will the cart move and what is the net force? (disregard any surface friction)
    A. 100 N left
    B. 100 N right
    C. 400 N right
    D. 400 N left



24. Which of the following statements below is true?
    A. Weight is measured with a balance; mass is measured with a spring scale
    B. Weight and mass should both be measured with a spring scale
    C. Mass is measured with a balance; weight is measured with a spring scale
    D. Mass and weight always should be measured with a balance, never a spring scale

25. Darrin was working on a science fair project. He wants to build a robot out of recycled materials. Would his idea be a project with a testable hypothesis? (choose best answer)
    A. yes, his dependent variable would be the recycled materials
    B. yes, his hypothesis would be to build a robot
    C. no, if his robot does not work, you cannot test it
    D. no, his project is more of an engineering design project

26. What is the meaning of the prefix "cyclo"?
    A. circle B. crazy C. spin D. top

27. Jennifer conducted a science project in which she tested the soil in 3 rural gardens and in 3 urban gardens. She wanted to find out if there was a difference in the lead residue content of the soils. What would be the independent variable in her project?
    A. the amount of lead residue found in the soil
    B. the lead content
    C. the amount of soil
    D. whether the soil was from rural or urban gardens

28. The prefix "prim" means which of the following?
    A. last B. new C. first D. spark

29. What do some scientists feel are the results of the Chicxulub asteroid collision?
    A. Extinction of the dinosaurs
    B. Darkened skies
    C. Towering tsunami
    D. All of the above

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

31. When Monarch butterflies migrate to Mexico in the fall, they have a suspended development of their reproductive organs and focus their energy on flying, eating, and resting. This state is called reproductive what?
    A. diapause B. freeze C. stestisanimy D. repose

32. Which word below refers to the peak on an individual tooth?
    A. cusp B. cingulum C. orbit D. none of these

33. Which of the following would describe the word "anterior"?
    A. back B. middle C. front D. side

34. Inherited traits include which of the following?
    A. eye color B. freckles C. cleft chin D. all of these

35. Complete this analogy: moon is to Earth as Phobos is to _____.
    A. Saturn B. Mars C. Jupiter D. Deimos

36. If a solution has a pH of 8, this means the solution is what?
    A. slightly basic
    B. slightly acidic
    C. the solution has been diluted
    D. dangerously acidic, do not touch

37. A hedgehog belongs to which phylum listed below?
    A. Mollusca
    B. Cnidaria
    C. Chordata
    D. Echinodermata

38. Decomposers benefit an ecosystem by doing mostly what?
    A. filtering out pollutants
    B. preventing organisms from becoming too populated
    C. returning nutrients to the soil
    D. replenishing moisture to the atmosphere

39. If you compare the cell to a city, what organelle would have a job similar to a "power plant"?
    A. Golgi apparatus
    B. nucleus
    C. mitochondria
    D. cytoplasm

40. Which of the following equations is not a balanced equation?
    A. $H_2 + Cl_2 \rightarrow 2HCl$
    B. $N_2 + 3H_2 \rightarrow 2NH_3$
    C. $2C_2H_6 + 7O_2 \rightarrow 2CO_2 + 6H_2O$
    D. $2Al + 3H_2SO_4 \rightarrow 3H_2 + Al_2(SO_4)_3$

41. What is true about how the moon revolves around the Earth?
    A. the revolution takes exactly 31 days
    B. the same side of the moon always faces Earth
    C. plane of moon's orbit is at a 25 degree angle to plane of Earth's orbit around sun
    D. the moon passes between the Earth and sun twice a month

42. Genetic variation is important for a species to continue to survive. Which of the following methods of reproduction produces the most genetic variation?
    A. cloning
    B. budding
    C. fragmentation
    D. sexual

43. In Alaska, 1964, there was an 8.6 (on the Richter scale) earthquake. In Oklahoma, 2016, there was a 5.6 (on the Richter scale) earthquake. How many times bigger in magnitude was the Alaska earthquake than the Oklahoma earthquake?
    A. 3 times B. 10 times C. 1000 times D. 100 times

44. Blood is grouped according to the ABO antigens. People who have 0- type blood are an example of what?
    A. universal donor
    B. universal recipient
    C. polygenic
    D. recessive

45. Which of these is correctly matched?
    A. speed (distance/time)
    B. velocity (change in distance/change in speed)
    C. acceleration (change in time/change in velocity)
    D. none of these

46. Which of the following conditions involves inflammation in veins?
    A. Arthritis B. Osteoporosis C. Periosteum D. Phlebitis

47. An atom or molecule with a net charge that is either positive or negative is called what?
    A. isotope B. ion C. neutron D. electron

48. What is one way you can tell the age of most birds?
    A. observing its eyes
    B. feather molting patterns
    C. its size and weight
    D. the beak color and condition

49. Hurricanes develop where?
    A. over the oceans
    B. over the land
    C. over the poles
    D. over islands

50. Which statement below would be true? (use the chart)
    A. A cubic foot of water at 60^{o} C would weigh more than a cubic foot of water at 21^{o}C
    B. A cubic foot of water at 0^{o}C weighs less than a cubic foot of water at 4^{o}C
    C. A cubic foot of water at 4^{o}C weighs less than a cubic foot of water at 10^{o}C
    D. A cubic foot of water at 0^{o}C weighs less than a cubic foot of boiling water.

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

Temperature	Density	Weight
°F/°C	grams/cm^3	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

2018 - 2019 TMSCA Middle School Science Test # 10- Key

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