TMSCA MIDDLE SCHOOL SCIENCE TEST #3 ©

NOVEMBER 3, 2018

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

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1. Which of the following is not always true about tornados?
   A. sometimes tornados are called twisters
   B. the duration of tornados is 10 to 20 minutes
   C. tornados are measured using the Fujita scale
   D. a tornado over water is called a waterspout

2. Which person listed below made contributions to the science of genetics?
   A. Alfred Wegener
   B. Albert Einstein
   C. Gregor Mendel
   D. Mario Molina

3. Why are most bird bones hollow?
   A. to make them lightweight
   B. to obtain enough oxygen to assist with flight
   C. to assist in reproduction
   D. none of the above

4. Which of the following statements about the Coriolis force is untrue?
   A. The Coriolis force applies to movement on rotating objects.
   B. The Coriolis force is zero at the equator.
   C. The Coriolis force is weakest at the poles.
   D. Storms in the north swirl counter-clockwise.

5. Earthworms waste products are called what?
   A. dirt
   B. grits
   C. castings
   D. They do not give off waste.

6. Ammonia is composed of what two elements?
   A. Nitrogen and Hydrogen
   B. Carbon and Sulfur
   C. Argon and Nitrogen
   D. Hydrogen and Carbon

7. Elements on the Periodic Table found in Group 1A are known as what?
   A. Halogens
   B. Alkali metals
   C. Noble gases
   D. Actinides

8. 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**
Goethite	Yellow or brown	5 – 5.5
Sphalerite	White, yellow, or brown	3.9- 4.1
Biotite	Colorless	2.8 – 3.2
Graphite	Black	2.23

Mineral A has a yellow streak and a hardness of 4.
Mineral B does not have a black streak or a hardness less than 3.
Mineral C is harder than Graphite and does not have a brown streak.
Mineral D has a hardness of less than 2.5.

A. **Mineral A**-Sphalerite **Mineral B** –Graphite **Mineral C** –Biotite **Mineral D** -Goethite
B. **Mineral A**-Sphalerite **Mineral B** –Goethite **Mineral C** –Graphite **Mineral D** -Biotite
C. **Mineral A**-Goethite **Mineral B** –Sphalerite **Mineral C** –Biotite **Mineral D** -Graphite
D. **Mineral A**-Sphalerite **Mineral B** –Goethite **Mineral C** –Biotite **Mineral D** -Graphite

9. A little creature known as a "water bear" does something amazing when conditions become too dry, too hot, or too cold for it to survive. It goes into a form of extreme hibernation called what?
   A. cryptobiosis
   B. metabolism
   C. cryogenics
   D. symbiosis

10. A scientist that focuses on the spread of disease is called what?
   A. Cytologist
   B. Epidemiologist
   C. Ethologist
   D. Analytical chemist

11. Along the coast of Florida, people are concerned about the red tide this year. The term "red tide" is a common name for what?
   A. pollution released by local factories
   B. a school of small red fish that have over-populated
   C. the tide when it brings in too much zooplankton from the sea
   D. harmful algal bloom

12. Ohm's Law involves which of the following?
   A. sunlight
   B. electrical resistance
   C. stellar measurement
   D. subatomic particles

13. A kangaroo was headed down a 30-meter stretch of a dirt road. Its average speed was 15 m/s. How many seconds did it take to complete the stretch of road?
    A. 1 second
    B. 2 seconds
    C. 3 seconds
    D. 450 seconds

14. A polysaccharide is a carbohydrate with a molecule made up of several sugar molecules bonded together. What does the prefix "poly" mean?
    A. once B. twice C. many D. few

15. Some clouds form as air moves over mountains, is cooled, and condenses. These clouds don't move like other clouds but are "reformed" in the same place and stay there. This type of cloud has often been thought to be a UFO because of its saucer-like shape. These are called what?
    A. Lenticular
    B. Kelvin-Helmholtz
    C. Nimbostratus
    D. Mammatus

16. What is the most abundant gas found in Earth's atmosphere?
    A. Oxygen
    B. Hydrogen
    C. Nitrogen
    D. Helium

17. One theory explains that mitochondria and chloroplasts descended from bacteria. This is the theory of what?
    A. cyanobacteria
    B. exocytosis
    C. coevolution
    D. endosymbiosis

18. Which of the following elements are known as alkali metals?
    A. Hydrogen, Sodium, Potassium
    B. Lithium, Sodium, Cesium
    C. Oxygen, Carbon, Helium
    D. Gold, Silver, Tin

19. With the drought across the western part of the country, many people were interested in putting in a "xeriscape" instead of a traditional lawn in their yards. What does the prefix "xer" meant?
    A. dry B. wet C. rocky D. green

20. What was found in the rock layers between the Cretaceous and Paleogene Periods all around the world that is of scientific significance in regard to possible species extinction?
    A. Copper B. Uranium C. Iridium D. Iron

21. What unit of measure would be most precise to measure the length of a butterfly wing?
    A. deciliter
    B. milligram
    C. centimeter
    D. millimeter

22. The diagram of this hot air balloon shows the forces acting upon the balloon. The net force acting on this balloon would be in what direction?

A.  B.  C.  D. 

23. Out of all the types of galaxies, what type is the Milky Way?
    A. barred-spiral B. elliptical C. irregular D. pancake

24. Alkali gets its name from the Arabic word "al qali" which means what?
    A. metal B. reactive C. ashes D. weak liquid

25. People who have AB type blood are an example of what?
    A. codominance
    B. incomplete dominance
    C. polygenic
    D. recessive

26. Parkinson's disease can cause the condition called "bradykinesia". What does the prefix "brady" meant?
    A. increased B. neutral C. fast D. slow

27. A class conducted an experiment to test what contaminants could be filtered from water using several different filter types. The chart shows the results.

Filter type	Contaminant 1	Contaminant 2	Contaminant 3	Contaminant 4	Contaminant 5
A	no	yes	no	yes	no
B	yes	yes	yes	yes	no
C	no	yes	yes	no	no

What filter would be best for cleaning water assuming the contaminants are equal in toxicity?

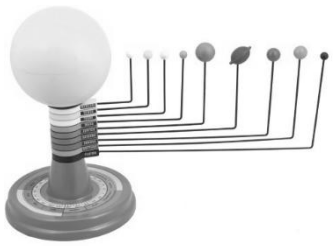
A. Filter A
B. Filter B
C. Filter C
D. Both A and C

28. Dew will form under what conditions?
    A. The amount of water vapor in the air is sufficient
    B. The temperature of the air is at the right measure
    C. The barometric pressure has fallen to acceptable levels
    D. Both A and B

29. Recently, crows have been trained to pick up trash in a park in France. When they bring in a cigarette butt, a device gives them a bird food treat. This is an example of what?
    A. instinct
    B. learned behavior
    C. imprinting
    D. innate behavior

30. What part of a microscope controls the amount of light that is allowed through the state area?
    A. coarse-adjustment knob
    B. ocular
    C. stage clips
    D. diaphragm

31. Look at this model of the solar system. What are some of the limitations with this model?
    A. not proportional size and distance of the planets from the sun
    B. the alignment of the planets in a single line in orbit
    C. order of the planets from the sun
    D. both A and B



32. Samantha placed two containers side by side and labeled them container A and B. Container A was filled with 500 mL of fresh water. Container B was filled with 500 mL of sea water (salt added). If Samantha places the same toy boat in A and then in B, explain what she should observe.
    A. The toy boat will float at the same position in both containers because it is less dense than water.
    B. The toy boat will float lower in container A than in B.
    C. The toy boat will float higher in container B than in A.
    D. The toy boat will sink in container B, but float in container A.

33. Which of the compounds are composed of the most atoms?
    A. $NaHCO_3$
    B. NaClO H_2O_2
    C. $C_2H_4O_2$
    D. CH_4

34. Coral and zooxanthellae have a symbiotic relationship. The coral provides protections for the algae and the algae provide nutrients for the coral. What type of relationship do they have?
    A. mutualism
    B. parasitism
    C. commensalism
    D. xanthophylism

35. Out of the following waves on the electromagnetic spectrum, which has the longest wavelength?
    A. ultraviolet light
    B. infrared waves
    C. gamma rays
    D. radio waves

36. Mark and Scott Kelly were both astronauts for NASA and identical twins. NASA conducted an Experiment with both brothers. Scott Kelly spend about a year on the International Space Station, while Mark, stayed back on Earth. Afterwards, their DNA was compared for differences. The fact that Mark did not go into space for this experiment is called the what?
    A. dependent variable
    B. independent variable
    C. controlled variable
    D. hypothesis

37. Words that start with the prefix "neph" are related to what?
    A. heart B. lung C. kidney D. liver

38. Which of the following is not an actual current name of a constellation?
    A. Lionius B. Hercules C. Cygnus D. Orion

39. Look at this chemical equation: $\_\_N_2 + \_\_H_2 \rightarrow \_\_NH_3$
    Find the molar ratio for this as a balanced equation.
    A. 1:3:2 B. 1:2:2 C. 2:3:2 D. 2:1:3

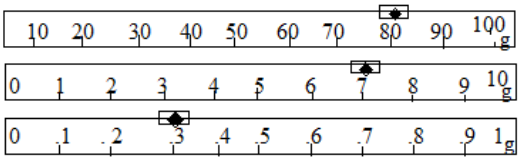
40. The prefix "dendr" helps to show that dendrology is the scientific study of what?
    A. power B. trees C. horses D. skulls

41. Ticks attach themselves to a host and feed on the blood. This is an example of what type of relationship?
    A. mutualism B. parasitism C. commensalism D. instinct

42. Which inner planet rotates clockwise instead of counter-clockwise (in our solar system)?
    A. Uranus
    B. Mercury
    C. Mars
    D. Venus

43. The freezer at the local grocery store is kept at 0^o F. What would this be converted to Kelvin?
    A. 255^o K B. 273^o K C. 32^o K D. -18^o K

44. Antwone was measuring the mass of an object in science class. Below is the reading on the balance scale. What is the mass?



    A. 807 g
    B. 87.3 g
    C. 3780 g
    D. 90 g

45. Which word pair below is incorrectly matched?
    A. Celiac disease: gluten
    B. Diabetes: pancreas malfunction
    C. Lung cancer: smoking
    D. Parkinson's disease: asbestos

46. What type of air mass would form over the Gulf of Mexico and move north?
    A. maritime tropical
    B. maritime polar
    C. continental tropical
    D. continental polar

47. Changes in normal surface temperatures of the ocean can impact global weather and climate. Two important terms describing temperature changes in the equatorial Pacific are El Nino and La Nina. Which statement below describes these phases?
    A. El Nino is the warm phase and La Nina is the cold phase.
    B. El Nino is the cold phase and La Nina is the warm phase.
    C. El Nino is the dry phase and La Nina is the wet phase.
    D. El Nino is the wet phase and La Nina is the dry phase.

48. According to this Punnett square, the mom'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

49. Why must a chemical equation be balanced?
    A. so that the reaction won't blow up
    B. because the elements won't line up if it is not balanced
    C. because of the law of conservation of mass
    D. the elements won't bond if it is not balanced

50. A tiny water creature has been extirpated from the wetland. What does "extirpated" mean?
    A. eaten almost to extinction by local predators
    B. no longer found in the area they used to inhabit
    C. brought in by outside means
    D. completely became extinct on the planet

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