TMSCA MIDDLE SCHOOL SCIENCE TEST #7 ©

JANUARY 12, 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)

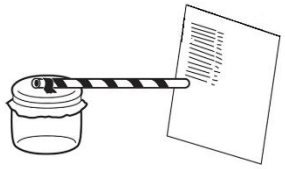
58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 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 # 7

1. A science class was constructing a weather instrument using a jar, balloon, straw, paper, and tape. The balloon was stretched over the jar opening and fastened. The straw was taped to the top of the balloon. A scale was taped to the wall next to the instrument. What type of instrument were they making?
   A. barometer
   B. hydrometer
   C. anemometer
   D. thermometer



Time of Reading	**Power (watts)**
6:00am	HA – 30 VA - 2
12:00pm	HA – 52 VA – 8
6:00pm	HA – 140 VA – 43
	HA (horizontal axis) VA (vertical axis)

2. In this chart, which type of wind turbine has more electricity generation, a horizontal wind turbine (MUST be facing into the wind) or a vertical axis wind turbine (does not have to face into the wind)?
   A. horizontal axis
   B. vertical axis
   C. difficult to tell with this chart
   D. they are the same

3. Knowing root words in science can be very helpful. What does the root word "stella" mean?
   A. star
   B. space
   C. far away
   D. planet

4. A contact force between surfaces when sliding or attempting to slide across each other is called what?
   A. normal
   B. compression
   C. tension
   D. friction

5. Which of the following is not an example of a troglophile?
   A. crickets
   B. earthworms
   C. millipedes
   D. Texas blind salamander

6. Students in Mr. Sherwood's class were studying about the rock cycle. They took some old crayons for make a model. First, they took they crayons and rubbed them on a cheese grater to make shavings of the wax. They took the shavings and collected them in the bottom of a cup. They compacted the shavings down until they were squeezed together into one piece again. Next, they took the cup and heated it so that the wax melted into a liquid. When the liquid cooled off, it became hard like a crayon once again.
   Which statement about this activity is not true about the model?
   A. When the pieces were collected and compacted, this represented the formation of metamorphic rock.
   B. When the crayon was melted, then cooled and reformed, this represented the formation of igneous rock.
   C. The crayons represented different types of rock.
   D. The shavings of the crayons represented weathered rock.

7. Which of the following shows an inorganic compound?
   A. $CaCO_3$ B. C_3H_8 C. C_2H_6 D. $C_6H_{12}O_6$

8. Which of the following scientists became well-known for discovering lots of iridium worldwide that led to the theory explaining the extinction of the dinosaurs with an asteroid impact?
   A. Alvarez
   B. Hutton
   C. Schmidt
   D. Lyell

9. Name the element that has 15 protons and in group 5A on the Periodic Table.
   A. Silicon B. Potassium C. Antimony D. Phosphorus

10. What structure on the underside of leaf allows for the exchange of gases?
    A. Phloem B. Xylem C. Cambium D. Stomata

11. 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 will not bond if it is not balanced

12. Sicily was building molecules in science class. She built one that looked like the model above that contained Carbon, Hydrogen, and Oxygen. Which of the following is most likely her model?
    A. starch
    B. benzene
    C. glucose
    D. methane

13. One night while camping, Tim looked up and saw a milky white streak of stars in the night sky. Tim's dad told him that they were looking at the Milky Way galaxy. Which of the following statements is not true regarding this galaxy?
    A. The Milky Way galaxy is a barred-spiral galaxy.
    B. The Milky Way galaxy is composed of billions of stars.
    C. Our sun is part of the Milky Way galaxy.
    D. The Milky Way galaxy is about 1.5 million light years in diameter.

14. What two factors effect gravitational pull?
    A. weight and size
    B. distance and volume
    C. height and mass
    D. mass and distance

15. The root word "phago" means what in regard to science?
    A. eat B. rest C. tube D. long

16. Zebra mussels reached North America in the mid 1980's in the ballast water of a ship. Since then, they have caused serious problems in aquatic ecosystems. They are an example of what?
    A. An alien organism
    B. An exotic species
    C. A native species
    D. An invasive species

17. A marble was timed as it rolled continuously along a 5-meter ramp. It completed the distance in 2 seconds. What was its average speed?
    A. 2.5 cm/s
    B. 0.4 cm/s
    C. 10.0 m/s
    D. 2.5 m/s

18. After whirling the thermometers on a psychrometer, Robyn found the dry-bulb thermometer had a reading of 6^{o}C and the wet-bulb thermometer had a reading of 10^{o}C. Robyn was able to find the relative humidity to be what?
    A. 20%
    B. 19%
    C. 33 %
    D. 46%

Dry Bulb Temperature (Celsius)	Difference Between Wet-bulb and Dry-bulb Temperatures (°C)													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
-20	100	28												
-18	100	40												
-16	100	48												
-14	100	55	11											
-12	100	61	23											
-10	100	66	33											
-8	100	71	41	13										
-6	100	73	48	20										
-4	100	77	54	32	11									
-2	100	79	58	37	20	1								
0	100	81	63	45	28	11								
2	100	83	67	51	36	20	6							
4	100	85	70	56	42	27	14							
6	100	86	72	59	46	35	22	10						
8	100	87	74	62	51	39	28	17	6					
10	100	88	76	65	54	43	33	24	13	4				
12	100	88	78	67	57	48	38	28	19	10	2			
14	100	89	79	69	60	50	41	33	25	16	8	1		

19. Which of the following is a compound?
    A. H_2
    B. Cl
    C. H_2O_2
    D. Fe

20. Lance was using an instrument to measure wind speed. As part of the procedure, he held this instrument above his head. What instrument was he using?
    A. anemometer
    B. sling psychrometer
    C. hydrometer
    D. dry bulb barometer

21. A place that naturally or artificially absorbs or stores the atmospheric carbon is commonly called what?
    A. carbon tank
    B. greenhouse effect
    C. garage
    D. carbon sink

22.

Planet	**Axial tilt -degrees**
Earth	23.45
Uranus	97.77
Jupiter	3.13
Saturn	26.73
Mercury	0
Venus	177.36
Mars	25.19

According to the chart above, which two planets would most likely have very little change in seasons on the planet based on their axial tilt?
    A. Mars and Saturn
    B. Uranus and Venus
    C. Mercury and Jupiter
    D. All the planets have very visible change in their seasons.

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

24. An atom of sodium has 11 protons and 10 electrons. This means the net charge is what?
    A. 1 + (cation) B. 1 - (anion) C. Neither A or B D. Both A and B

25. The prefix "pend" means which of these?
A. after B. before C. carry D. hang

26. What percent of the offspring have homozygous genotypes?
A. 25% B. 50% C. 75% D. 100%

		Maternal	
		B	b
Paternal	B	BB	Bb
	b	Bb	bb

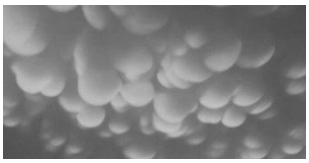
27. Which of the following shows evidence that a physical change took place?
A. ice melting into a puddle of water
B. a poster changing color after exposure to the sun for a week.
C. bubbles forming when two substances are combined
D. instant color change when drops of a substance are added to another

28. Calculate the concentration of a solution in which 45 g of salt is dissolved into 2 L of water.
A. 90 mL/g
B. 0.0225 g/mL
C. 225 mL/g
D. 22.5 g/mL

29. Cells come in all sizes and shapes. What is the longest cell in the human body?
A. blood cells
B. skin cells
C. muscle cells
D. neurons

30. What is a prestellar object that radiates infrared radiation, but is not hot enough to begin nuclear fussion?
A. Black hole
B. Neutron star
C. Red dwarf
D. Protostar

31. This type of cloud forms usually around the same time as a storm. Interestingly enough, these are formed from sinking air instead of rising air. What type of cloud is this?
A. Lenticular
B. Kelvin-Helmholtz
C. Mammatus
D. Cirrus



32. Animals have interesting behavior adaptations. For instance, a Texas horned lizard will squirt blood out of their eye for what reason?
A. to distract the predator so they can attack
B. to scare the predator and encourage them to stay away
C. to become more camouflaged with their surroundings
D. the "blood" is actually a poison that can injure the predator

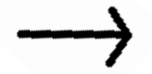
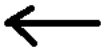
33. What is the difference between velocity and speed?
    A. velocity is just speed, but with a formula
    B. velocity includes direction
    C. speed includes acceleration
    D. velocity is much faster

34. Jalen wanted to find out the answer to this question, "Does the surface affect the bounce of a basketball?" He chose 5 surface types and tested the bounce of a basketball on each surface. What was his independent variable?
    A. the basketball size
    B. the height of the bounce on each surface
    C. the air in the basketball
    D. the 5 surface types

35. When comparing a cell to a city, the "post office" would be what part of the cell?
    A. Endoplasmic reticulum
    B. Mitochondria
    C. Cell Membrane
    D. Golgi apparatus

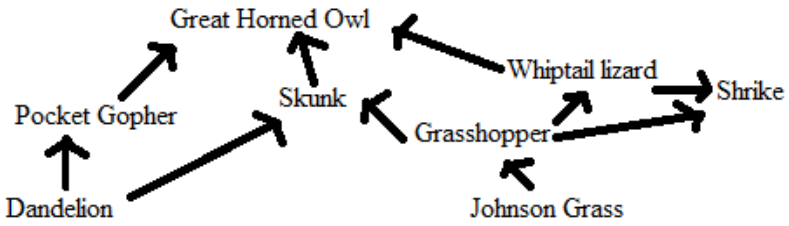
36. If the National Weather Service issues a "Red Flag Warning", what does this mean?
    A. the wind is above 30 mph
    B. the relative humidity is extremely high
    C. temperature is over 100 degrees F
    D. weather conditions are conducive to extensive wildfire occurrences

37. The root word "rupt" means which of the following?
    A. change
    B. bother
    C. green
    D. break

38. If a 20 N force is applied to an object to the right at the same time a 20 N force is applied to the same object to the left, what is the direction of movement.
    A.  B.  C. stationary D. none of these

39. Which list below shows the correct relationship sequence?
    A. organelle; cell; tissue; organ; system; organism
    B. organism; organ; system; tissue; cell; organelle
    C. system; tissue; cell; organ; organelle; organism
    D. cell; tissue; organelle; organ; organism; system

40.



If the population of grasshoppers increased dramatically, what would be a reasonable result?

A. The Skunk and Whiptail lizard population might decrease.
B. The Johnson Grass population might decrease, and Shrike population might increase.
C. The Great Horned Owl population would be unaffected, but the Pocket Gopher population would increase significantly.
D. There would be no change in populations.

41. Which of the following statement on stars is false?
   A. T Tauri stars are stars reaching the end of the star life cycle.
   B. Mass and gravity are important factors in the formation of stars.
   C. Our sun is considered to be only a medium-sized star in the galaxy.
   D. Stars are composed of mostly hydrogen and helium gases.

42. Which of the following statements about wind is correct?
   A. Wind moves from areas of low pressure to areas of high pressure
   B. Wind is named from the direction it blows to, not from.
   C. Wind is caused by the uneven heating of the Earth's surface by the sun.
   D. Wind is measured by an instrument called a psychrometer.

43. One crystal structure of a mineral may change to another crystal structure of that same mineral when there are variations in what?
   A. water and climate
   B. elements
   C. temperature or pressure
   D. size and mass

44. The root word "quad" means which of the following?
   A. sturdy B. three C. strong D. four

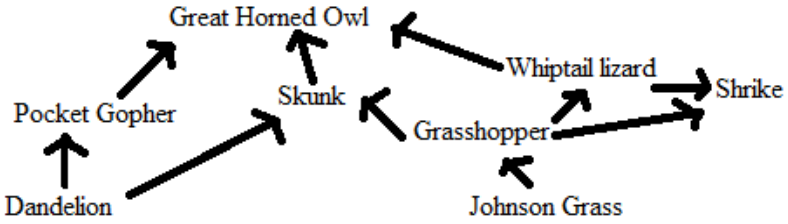
45. Research has shown that a plant contains a hormone that is extensively involved in stem and root growth. What is this hormone?
   A. indole acetic acid
   B. ethylene
   C. abscisic acid
   D. stomata

46. What is the approximate atomic mass for Gold?

A. 79 B. 69 C. 47 D. 197

47. How many neutrons would a neutral atom of Aluminum have?
A. 26
B. 40
C. 27
D. 14

48.



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. Shrike

49. In biology, DNA is an extremely important molecule. What does DNA stand for?
A. deadly nut allergy
B. deoxyribonucleic alkali
C. distinctive nucleic acid
D. deoxyribonucleic acid

50. 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

2018 - 2019 TMSCA Middle School Science Test # 7 - Key

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