TMSCA MIDDLE SCHOOL SCIENCE TEST #7 ©

JANUARY 13, 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. Sugar molecules can be transferred from the mesophyll cells in a leaf to what vascular tissue to be transported to the roots?

A) xylem **B)** stomata **C)** phloem **D)** plumule

2. Which of the following biomolecules would have a double helix structure?

A) carbohydrates **B)** nucleic acids **C)** lipids **D)** proteins

3. Flammability is a _____ property.

A) chemical **B)** physical **C)** electrical **D)** classical

4. A neutral chlorine atom would have how many valence electrons?

A) 17 **B)** 35 **C)** 7 **D)** 3

5. Made mostly of gases and conduct electricity poorly are characteristics of what type of elements?

A) metals **B)** semimetals **C)** alkali metals **D)** nonmetals

6. Which of the following planets is not gaseous?

A) Venus **B)** Jupiter **C)** Saturn **D)** Neptune

7. A situation that causes a returned equal and opposite reaction is best supported by

A) Boyle's law **C)** Work
B) Law of conservation of energy **D)** Newton's third law

8. The electrons shared between the atoms of a CH_4, methane, form a _____ bond.

A) ionic **B)** covalent **C)** hydrogen **D)** metallic

9. The transformation of metamorphic rock to _____ requires erosion and deposition.

A) sedimentary rock **B)** igneous rock **C)** metallic rock **D)** molten rock

10. All of the following are characteristics of animal cells except:

A) a rigid cell wall **B)** lysosomes **C)** cytoskeleton **D)** mitochondria

11. Units such as, °C, °F, and K are used to identify

A) weight **B)** speed **C)** density **D)** temperature

12. The Fujita scale measures the intensity of

A) tornadoes **B)** hurricanes **C)** earthquakes **D)** thunderstorms

13. Currently the atmosphere is made up of approximately how much oxygen?

A) 20% **B)** 95% **C)** 70% **D)** less than 1%

14. The actual appearance of an organism is referred to as a(n)

A) allele **B)** phenotype **C)** genotype **D)** gamete

15. Light is energy we can see that is carried in a form of particles called
A) particles **B)** protons **C)** photons **D)** ions

16. Which of the following is not an appropriate measurement used in science?
A) cm **B)** J **C)** N **D)** lbs

17. Each of the following are characteristics of living things expect:
A) DNA **B)** movement **C)** metabolism **D)** adaptation

18. What would be true of an atom if it lost an electron?
A) it would become more negative **C)** it would become more positive
B) nothing would change **D)** it would lose a proton as well

19. The formula for water is
A) HO. **B)** H_2O. **C)** O_3. **D)** HO_2.

20. Which of the following properties would describe water?
A) polar **B)** nonpolar **C)** organic **D)** ionic

21. A cell membrane has all of the following except:
A) cholesterol **B)** phospholipids **C)** proteins **D)** nucleic acids

22. Which trophic level would you most likely find a grasshopper?
A) primary consumer **B)** producer **C)** secondary consumer **D)** decomposer

23. A relationship where an organism benefits from one organism while the other organism does not benefit or get harmed is
A) mutualism. **B)** parasitism. **C)** commensalism. **D)** amensalism.

24. Which of the following is NOT a source of food for animals?
A) Fats **B)** Proteins **C)** Minerals **D)** Carbohydrates

25. How many different types of nucleotides are used to make DNA molecules?
A) One **B)** Two **C)** Four **D)** Twenty

26. The *Rana bwana* and *Rana maculate* frogs are most similar to one another at what taxonomic level?
A) species **B)** genus **C)** family **D)** kingdom

27. Three amino acids are coded by how many codons?
A) 9 **B)** 12 **C)** 3 **D)** 6

28. A glass thermometer has a colored liquid inside it. The level of colored liquid rises when the thermometer is placed in hot water. Why does the level of liquid rise?

A) Water molecules are pushed into the thermometer.
B) Heat molecules push the molecules of the liquid upward.
C) Heat causes the molecules of the liquid to get farther apart.
D) The molecules of the liquid break down into atoms and take up more space.

29. A student placed a liquid in a jar and sealed it. Then she heated the liquid and it turned into a gas. If the number of atoms in the sealed jar stayed the same, what happened to the mass of the jar and everything inside it after she heated it?

A) The mass increased.
B) The mass decreased.
C) The mass stayed the same.
D) It depends on whether a chemical reaction occurred.

30. A student thinks that there are three variables (X, Y and Z) that may affect the result of her experiment. What should the student do to find the effect of variable X on the result of the experiment?

A) Change variable X and keep variables Y and Z the same.
B) Change variables Y and Z at the same time and keep variable X the same.
C) Change variable X and Y at the same time and keep variable Z the same.
D) Change variables X, Y, and Z at the same time.

31. Which of the following is an example of a chemical reaction?

A) A marshmallow turning black when heated over a fire
B) A powder dissolving in water to make lemonade
C) An ice cube melting into a puddle of water
D) Salt crystals being crushed into a powder

32. Which of the following is NOT made up of atoms?

A) Heat **B)** A gas **C)** A cell **D)** A solid

33. In which state of matter are the molecules spaced farthest apart?

A) A gas **B)** A liquid **C)** A solid **D)** All are equal

34. Lysosome: digestive enzymes :: _____ : stores water

A) rough ER **B)** mitochondria **C)** chloroplast **D)** vacuole

35. Caddis fly larvae will cover themselves with twigs and small pebbles. What is the advantage of this behavior?

A) To keep warm **B)** To avoid predators **C)** To eat the twigs later **D)** To move easier

36. What is the driving force of surface ocean currents?

A) the density of the sea water
B) the global wind systems
C) the ocean currents move by themselves
D) the temperature of the seawater

37. Which element is classified as a noble gas?
A) calcium **B)** zirconium **C)** silicon **D)** argon

38. Cracks in a glacier's surface are known as
A) craters. **B)** pockets. **C)** canyons. **D)** crevasses.

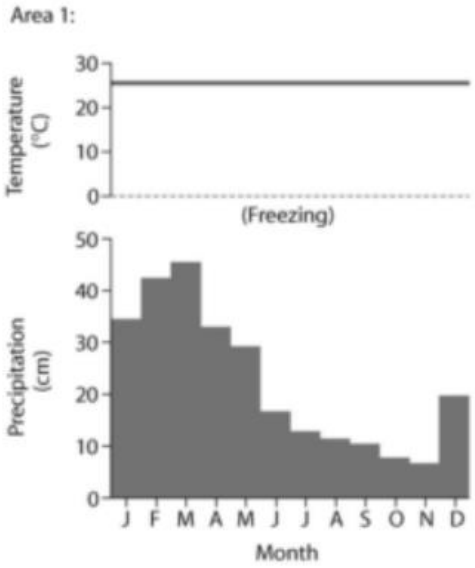
39. What concept best describes the actual amount of water vapor in the air?
A) relative humidity **B)** saturation **C)** condensation **D)** specific humidity

40. Cooler air
A) rises. **B)** sinks. **C)** is lighter than warm air. **D)** none of the above.

41. What causes wind?
A) high pressure
B) low pressure
C) weather patterns
D) air move from regions of high pressure to regions of low pressure

42. What is the most abundant greenhouse gas in the atmosphere?
A) oxygen **B)** carbon dioxide **C)** water vapor **D)** methane

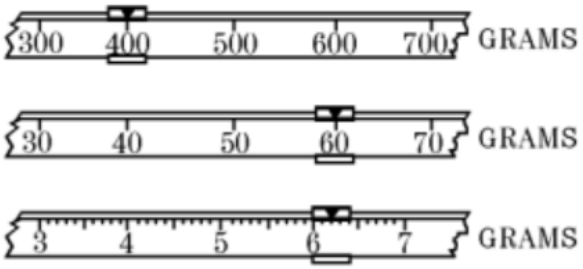
43. Using the graphs below, which terrestrial ecosystem is represented?



A) tundra **B)** tropical rainforest **C)** grassland **D)** taiga

44. In the modern periodic table, the elements are arranged in order by increasing
A) atomic number. **B)** mass number. **C)** oxidation number. **D)** valence number.

45. The diagram below represents a portion of a triple beam balance. What is the correct measurement on the diagram?



A) 460 g **B)** 466 g **C)** 460.2 g **D)** 466.2 g

46. Which quantity of heat is equal to 200. joules?
A) 2.00 kJ **B)** 20.0 kJ **C)** 200. kJ **D)** 0.200 kJ

47. Which element is a member of the halogen family?
A) K **B)** F **C)** Cl **D)** S

48. During all chemical reactions, mass and energy are all
A) formed **B)** conserved **C)** absorbed **D)** released

49. Which type of bond is present in copper wire?
A) covalent **B)** ionic **C)** hydrogen **D)** metallic

50. The atomic number of an atom is always equal to the total number of
A) neutrons in the nucleus
B) neutrons plus protons in the atom
C) protons in the nucleus
D) protons plus electrons in the atom

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