TMSCA MIDDLE SCHOOL SCIENCE TEST #8 ©

JANUARY 20, 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 1.008	2A 2																2 He 4.003
3 Li 6.941	4 Be 9.012											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	8B 8	8B 9	8B 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 65.41	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 138.91	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 (272)	112 Cn (285)						

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	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•col/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 element is classified as a halogen?

A) chlorine **B)** argon **C)** sodium **D)** zinc

2. Which of the following is not a characteristic of living things?

A) reproduction **B)** movement **C)** adaptation **D)** DNA

3. The prefix *chromo-* used in science to form words such as chromotography means?

A) leaf **B)** color **C)** climbing **D)** silver

4. A unit by which mass is measured would be?

A) grams **B)** joules **C)** liters **D)** voltage

5. Which of the following scientists was awarded the Nobel Prize in 1911 for the discovery of radioactive elements such as radium and polonium?

A) Marie Curie
B) John Dalton
C) Dimitri Mendeleev
D) Antoine Lavoisier

6. A solution with a pH of 12 is:

A) weakly acidic **B)** strongly acidic **C)** weakly basic **D)** strongly basic

7. How many sulfur atoms are found in sulfuric acid, H_2SO_4?

A) 4 **B)** 2 **C)** 1 **D)** 6

8. What would be the appropriate chemical name for H_2O_2?

A) hydrogen monoxide **B)** hydrogen peroxide **C)** hydrogen oxide **D)** none of the above

9. What would sand and mud become when they form sedimentary rock?

A) sandstone **B)** limestone **C)** shale **D)** all of the above

10. All of the following could increase the rate at which a solid will dissolve except:

A) increase of temperature.
B) increase of surface temperature.
C) increase of stirring.
D) decrease of surface area.

11. Electric current may be expressed in which one of the following units?

A) coulombs/volt
B) joules/coulomb
C) coulombs/second
D) ohms/second

12. An impulse of 10 kilogram-meter per second acting on an object whose mass is 5 kilogram will cause a change in the objects velocity of:

A) 0.5 meters per second
B) 2 meters per second
C) 10 meters per second
D) 50 meters per second

13. The first law of thermodynamics is concerned with the conservation of
A) energy **B)** momentum **C)** charge **D)** matter

14. The change of a solid to a gas is called:
A) vaporization **B)** sublimation **C)** condensation **D)** deposition

15. In any collision, which of the following is conserved:
A) kinetic energy
B) velocity
C) momentum
D) potential energy

16. An inorganic compound lacks what element?
A) oxygen **B)** carbon **C)** hydrogen **D)** nitrogen

17. In an experiment, the reaction rate of photosynthesis was being investigating. 10 spinach discs were treated under same lights, but two different solutions of distilled water and sodium bicarbonate. What would be the independent variable in this lab?
A) the spinach discs
B) the light
C) rate of photosynthesis
D) the different solutions

18. What is the atomic number of an element that has six protons and eight neutrons?
A) 8 **B)** 14 **C)** 6 **D)** 2

19. At the bottom of a roller coaster the kinetic energy is _____ and the potential energy is _____.
A) High, low **B)** Low, low **C)** High, high **D)** Low, high

20. What lab equipment would be most helpful in measuring liquids?
A) Test tube and graduated cylinder
B) Graduate cylinder and beaker
C) Beaker and test tube
D) Erlenmeyer flask and test tube

21. John tries to move a box that weighs 250 N up a ramp and moves at a rate of 0.25 m/s2. If he wants to move the box at a rate of 0.35 m/s2 how will the force he is applying change?
A) It will decrease by 10 N
B) It will increase by 25 N
C) It will increase by 10 N
D) It will decrease by 25 N

22. Which quantity identifies an element?
A) atomic number
B) total number of valence electrons in an atom of the element
C) total number of neutrons in an atom of the element
D) mass number

23. Friction comes as the following forms except
A) Gravitational **B)** Static **C)** Sliding **D)** Air resistance

24. During the waxing phases of the moon what is occurring?

A) Less of the near side is lit
B) More of the near side is lit
C) A new moon is occurring
D) The east side of the moon is lit

25. If a person is driving what would be the best way to determine how long it will take to reach your destination?

A) Average velocity
B) Average momentum
C) Average speed
D) Displacement

26. How does an astronauts weight and mass change when in orbit around the Earth in comparison to being on land?

A) Mass never changes and weight decreases
B) Mass and weight both decrease the farther away
C) Mass decrease and weight never changes
D) Neither mass or weight change because the distance from the Earth is not significant enough

27. As air pressure decreases what else occurs?

A) More molecules are present
B) A higher density of molecules occurs
C) An increase in nitrogen gases
D) An increase of altitude

28. During what stage of thunderstorm development would you see lightning?

A) Cumulus stage
B) Mature stage
C) Dissipation stage
D) Precipitation stage

29. Approximately what fraction of the Earth's surface is covered in oceans

A) 1/10 **B)** 3/10 **C)** 9/10 **D)** 7/10

30. Mary tried to lift her couch by exerting 500 Newton's of force but it doesn't budge. If the couch weighed 2,000 Newton's, how much work did she do:

A) 0 **B)** 50 watts **C)** 500 joules **D)** 2000 joules

31. What is the SI base unit for length?

A) liter **B)** meter **C)** feet **D)** inches

32. How many protons would you find in an ion of hydrogen?

A) 1 **B)** 0 **C)** 2 **D)** 3

33. Which of the following fossils is the oldest:

A) trilobite
B) snake
C) petrified wood
D) megalodon tooth

34. What is the most common term for the ratio of the output force to the input force of a simple machine?
A) mechanical advantage **B)** tension **C)** gravity **D)** potential energy

35. Which of the following is the hottest region of planet Earth:
A) the mantle **B)** the inner core **C)** the outer core **D)** the crust

36. Which of the following best describes a smaller stream that merges with a larger stream:
A) delta **B)** rip-rap **C)** streamer **D)** tributary

37. Which of the following is a structural adaptation of ducks that is most helpful in keeping them dry:
A) an oil-producing gland
B) hollow fur
C) darkly colored plumage
D) ability to float

38. Which of the following best describes how a sedimentary rock can form:
A) compaction and cementation
B) slow cooling and hardening of magma
C) fast cooling and hardening of magma
D) high temperature and pressure causing recrystallization

39. Place the following measurements in order from smallest to the largest?
A) microgram, kilogram, decigram, gram
B) gram, microgram, kilogram, decigram
C) decigram, kilogram, gram, microgram
D) microgram, decigram, gram, kilogram

40. The greatest geophysical impacts from the movement of Earth's lithospheric plates are most often seen and felt in which of the following areas:
A) at the center of the plates
B) at plate boundaries
C) evenly distributed throughout the entire plate
D) along riverbeds within the plates

41. What structure is responsible for the motility of a bacterium?
A) flagella **B)** pili **C)** pods **D)** pseudopods

42. A mangrove coast is likely to be found in which of the following locations:
A) Alaskan Peninsula
B) Hawaiian Islands
C) Florida
D) Maine

43. Which of the following is most important for climate because it transports large amounts of heat and moisture from the ocean to land:
A) tides **B)** monsoons **C)** longshore drift **D)** erosion

44. A doorknob are considered variations of what simple machine?
A) pulley **B)** wheel and axle **C)** lever **D)** ramp

45. How many valence electrons are in an oxygen atom, which resides in group 16 or 6A of the Periodic Table?
A) 5 **B)** 4 **C)** 2 **D)** 6

46. How many pairs of walking legs do arachnids have?
A) 4 **B)** 2 **C)** 6 **D)** 3

47. Which organism is considered a bivalve?
A) mussel **B)** squid **C)** octopus **D)** nautilus

48. Jerry has a mass of 100 kilograms. He runs with a velocity of 0.5 meters per second. What is his momentum?
A) 50 kg◦m/s **B)** 150 kg◦m/s **C)** 5 kg◦m/s **D)** 500 kg◦m/s

49. The most useful unit of concentration in the chemistry lab is:
A) mole fraction **B)** mass percent **C)** normality **D)** molarity

50. Which of the following is the location of the human thymus gland:
A) upper chest **B)** inguinal canal **C)** abdomen **D)** brain

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