TMSCA MIDDLE SCHOOL SCIENCE TEST #6 ©

DECEMBER 2, 2017

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. Flowering plants called angiosperms are grouped into two large categories based on how many _____ they have.

A) seeds **B)** petals **C)** species **D)** cotyledons

2. In regards to moon phases, when it is waning it may appear as if it is _____.

A) getting smaller **B)** getting larger **C)** moving away **D)** getting close

3. Density is a _____ property.

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

4. During an ionic bond the electrons are _____.

A) shared equally **B)** destroyed **C)** transferred completely **D)** divided up equally

5. Two water molecules will bond together by what type of bond?

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

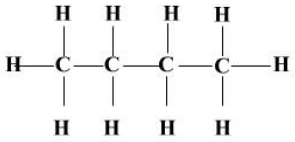
6. What is true about the gravitational force between objects?

A) the greater the distance between the stronger the force
B) the smaller the mass of the objects the stronger the force
C) the more matter in the objects the stronger the force
D) mass does not affect the gravitational force

7. How does the density of water compare to the density of floating stick?

A) the floating stick has a lower density
B) the floating stick has a greater density
C) they have the same density
D) the water has a lower density

8. How many bonds does each carbon appear to have in the molecule below?



A) 3 **B)** 4 **C)** 2 **D)** 12

9. When collecting data a student records the change in mass in grams. This is what type of data?

A) qualitative **B)** quantitative **C)** inferior **D)** independent

10. What is true about air resistance?

A) it is a type of static friction
B) it is a downward force
C) it works unopposed to gravity
D) as surface area of an object increases so does the air resistance

11. If a student is walking down a 200 m hallway and gets to their class in 6 minutes, what is their speed?

A) 200 m/min **B)** 300 m/min **C)** 33.33 m/min **D)** 0.03 m/min

12. To balance the equation below what coefficients are necessary?

$$\_\_NaOH + H_2SO_4 \rightarrow Na_2SO_4 + \_\_H_2O$$

A) 2, 1 **B)** 2, 2 **C)** 4, 3 **D)** 1, 2

13. In the image below what are the "dots" surrounding the element symbol representing?

A) Valence electrons **B)** Number of protons **C)** Number of neutrons **D)** Isotopes

14. What type of weather pattern will form a tornado?

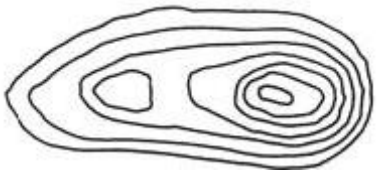
A) Cold fronts **B)** Warm fronts **C)** Stationary front **D)** Occluded front

15. Landforms created by shear stress would include

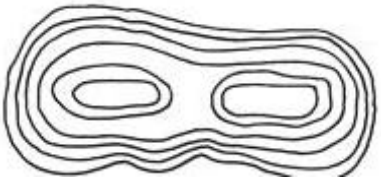
A) Mountains **B)** Volcanoes **C)** Continental rifts **D)** Faults

16. Match the correct topography map with the image below

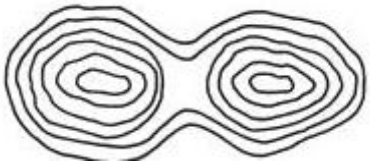
A)



B)



C)



D)

17. Which of the following can be found within a developing seed?

A) plumule **B)** radicle **C)** embryo **D)** all of the above

18. If you are consuming broccoli, what part of the plant are you eating?
A) the stem **B)** the flower **C)** the leaf **D)** the root

19. What type of marsupial has a baby known as a joey?
A) a koala **B)** a kangaroo **C)** a sugar glider **D)** a wallaby

20. Which of the following is true of DNA?
A) single stranded **B)** contains Uracil **C)** contains genes **D)** contains ribose

21. A neuron consists of all of the following except:
A) a dendrite. **B)** an axon. **C)** a myelin sheath. **D)** an iron rich core.

22. The region of the kidney that is responsible for the filtration of blood is the
A) bulbourethral gland. **B)** Islets cells. **C)** nephron. **D)** oviduct.

23. Blood traveling to the lungs leaves through what structure?
A) left ventricle **B)** left atrium **C)** right ventricle **D)** right atrium

24. What enzyme is present within the mouth that aids in the breakdown of starches?
A) catalase **B)** amylase **C)** pepsin **D)** lignin

25. *Panthera tigris* and *Panthera leo* belong to the same?
A) genus **B)** species **C)** group **D)** population

26. Which of the following is not considered an organelle?
A) lysosome **B)** peroxisome **C)** ribosome **D)** mitochondria

27. According to the endosymbiotic theory, what organelle is theorized to have once been a bacterial cell?
A) mitochondria **B)** vacuole **C)** rough ER **D)** Golgi apparatus

28. Denitrification and nitrogen fixation are processes found in the nitrogen cycle that are carried out by
A) algae. **B)** fungi. **C)** animals. **D)** bacteria.

29. Phosphorous is a necessary component to living things and can be found in which of the following?
A) DNA **B)** cell membrane **C)** ATP **D)** all of the above

30. During which stage of the cell cycle will DNA be replicated?
A) G1 **B)** Prophase **C)** S **D)** Cytokinesis

31. DDT was a government issued pesticide that are responsible for the near endangerment of
A) frogs. **B)** fish. **C)** the bald eagle. **D)** dolphins.

32. Asexual reproduction can occur through all of the following processes except:
A) budding. **B)** fragmentation. **C)** parthenogenesis. **D)** conjugation.

33. Of the following which is a necessary tissue for absorption of nutrients?
A) epithelial **B)** muscular **C)** nervous **D)** connective

34. The elements stored in living cells of organisms in a community will eventually be returned to the soil for use by other living organisms. This process is carried out by
A) producers. **B)** carnivores. **C)** herbivores. **D)** decomposers.

35. Which components of DNA are held together by weak hydrogen bonds?
A) phosphate and ribose **B)** adenine and thymine **C)** thymine and ribose **D)** cytosine and phosphate

36. A sequence of three nitrogenous bases in messenger RNA is known as
A) a polypeptide. **B)** a codon. **C)** a nucleotide. **D)** a gene.

37. Insufficient iodine in the diet may cause a goiter which is a disorder of the
A) thymus. **B)** thyroid. **C)** adrenal glands. **D)** pancreas.

38. The chemical process that builds proteins from many individual amino acids is known as
A) decomposition. **B)** synthesis. **C)** digestion. **D)** regulation.

39. What is the complementary strand to the following DNA sequence?
C-T-A-G-A-T-C-G-T-T

A) C-T-A-G-A-T-C-G-T-T
B) G-T-T-C-T-A-G-C-A-A
C) G-T-A-C-T-A-G-C-T-T
D) G-A-T-C-T-A-G-C-A-A

40. Celsius and Fahrenheit are scales used to measure temperature. Which of the following is also a scale used to measure temperature?
A) Richter **B)** Pascal **C)** Kelvin **D)** Newton

41. Erythrocyte: red blood cell :: _____ : white blood cell
A) platelet **B)** peroxisome **C)** phagocyte **D)** leukocyte

42. A nebula is
A) a star. **B)** a white dwarf. **C)** a supernova. **D)** a cloud of gas and dust.

43. The process by which natural forces move weathered rock and soil from one place to another is called
A) erosion. **B)** deposition. **C)** succession. **D)** transpiration.

44. According to Newton's second law of motion, force is equal to
A) mass divided by acceleration. **B)** acceleration divided by mass. **C)** mass times acceleration. **D)** acceleration times gravity.

45. What is the maximum number of electrons that can occupy the first energy level of an atom?
A) 2 **B)** 4 **C)** 8 **D)** 1

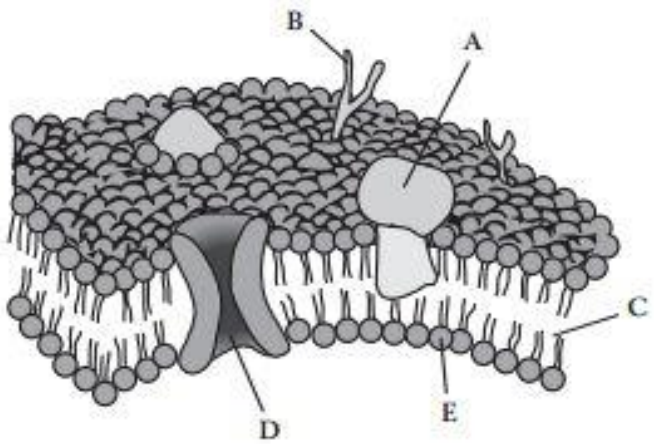
46. In which set do the elements exhibit the most similar chemical properties?
A) N, O, and F **B)** Hg, Br, and Rn **C)** Li, Na, and K **D)** Al, Si, and P

47. Which element is classified as a metalloid?
A) sulfur **B)** potassium **C)** barium **D)** boron

48. In an experiment, three test tubes containing the same amount of cow liver, in grams, each receive a varying amount of hydrogen peroxide. Test tube one receives 1 ml, test tube 2 receives 2 ml and test tube 3 receives 3 ml. The result is a varying amount of temperature increase and bubbling. What would be a constant in this lab?
A) the amount of cow liver
B) the amount of hydrogen peroxide
C) the amount of bubbling
D) the increase in temperature

49. The formula for ozone is
A) O. **B)** O_2. **C)** O_3. **D)** ClO.

50. In the diagram of the plasma membrane shown below, which structures are indicated by the letters C and D?



A) C-lipids; D-proteins
B) C-sugars; D-proteins
C) C-proteins; D-lipids
D) C-carbohydrates; D-lipids

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