TMSCA MIDDLE SCHOOL

SCIENCE

TEST #4 ©

NOVEMBER 11, 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.

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Periodic Table of the Elements

1A 1																	8A 18
1 H 1.01	**2A** 2											**3A** 13	**4A** 14	**5A** 15	**6A** 16	**7A** 17	**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	8B 8	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, $N = 6.02 \times 10^{23}$ molecules/mole

Planck's constant, $h = 6.63 \times 10^{-34}$ J•s

Planck's reduced constant, $\hbar = h/2\pi = 1.05 \times 10^{-34}$ J•s

Standard temperature and pressure (STP) is 0°C and I atmosphere

Gram molecular volume al STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^8$ 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, $m_e = 9.11 \times 10^{-31}$ kg

Atomic mass unit, $m_u = 1.66 \times 10^{-21}$ kg

Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K

Permittivity of free space $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2/N•m^2

Permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ T •m/A

1 Atmosphere= 1.02×10^5 N/m^2 = 760 Torr = 760 mmHg

1 Electron Volt - 1.6×10^{-19} Joules

Charge of on electron"' -1.6×10^{-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

1. An enzyme aids in the chemical reaction by _____.
A) increasing the activation energy   **C)** lowering the activation energy
B) producing more reactants   **D)** producing less reactants

2. A virus is not considered to be living because of which of the following?
A) lacks genetic material   **C)** does not have a scientific name
B) is unable to evolve   **D)** is unable to reproduce outside of a host cell

3. The kind of animal life that a particular ecosystem can contain is primarily reliant on _____.
A) the temperature   **C)** the plant life present
B) the amount of precipitation   **D)** the type of soil composition

4. Gametes are also known as _____.
A) diploid cells   **B)** sex cells   **C)** 2n cells   **D)** sporangia

5. The purpose of a _____ is to speed up a chemical reaction.
A) catalyst   **B)** solute   **C)** base   **D)** inhibitor

6. A paramecium is best described as a(n)
A) archaebacteria   **B)** eubacteria   **C)** zooflagellate   **D)** algae

7. Due to the Coriolis effect an object moving longitudinally in the Southern hemisphere will appear to
A) stay straight on   **B)** deflect to the   **C)** deflect to the left.   **D)** move backwards.
   track.   right.

8. The Earth currently has a tilt of approximately
A) 23.5°.   **B)** 74.5°.   **C)** 13.5°.   **D)** it is not tilted.

9. Which of the following represents an element?
A) HCl   **B)** Cu   **C)** $AgNO_3$ **D)** NaOH

10. As water moves through the xylem of a plant shoot system to the leaves it will go through _____ and phase change to water vapor.
 A) decomposition   **B)** translocation   **C)** transpiration   **D)** nondisjunction

11. When the chromosomes fail to separate from each other during anaphase leading to multiple copies of genetic material in a cell this is called?
 A) translocation   **B)** crossing over   **C)** nondisjunction   **D)** parthenogenesis

12. A known characteristic of life would include:
 A) must contain genetic material.   **C)** must be able to go through sexual
 B) must contain a nucleus.   reproduction.
                                                D) must contain a cell wall.
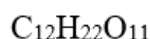
13. What is the maximum number of protons a neutral atom of neon can have?
 A) 20   **B)** 10   **C)** 15   **D)** 30

14. Mass is a _____ property.
 A) natural   **B)** chemical   **C)** physical   **D)** electrical

15. Given the following formula how many atoms comprise one molecule of maltose?

$$C_{12}H_{22}O_{11}$$

 A) 12   **B)** 22   **C)** 45   **D)** 46

16. After a scientific experiment has completed the data collected as a final result would be best described as the _____.
 A) independent   **B)** constant   **C)** control group   **D)** dependent
    variable   variable

17. During a covalent bond the electrons are _____.
 A) shared equally   **C)** completely transferred
 B) divided up equally   **D)** never in contact with another atom

18. Saturn has a satellite larger than Mercury called
 A) Titan   **B)** Demos   **C)** Phoebe   **D)** Rhea

19. Pressure is measured by
 A) mass * area.   **C)** force * acceleration.
 B) force/area.   **D)** acceleration/ area.

20. Which of the following principles does not apply to how fluids act?
 A) Pascal   **B)** Archimedes   **C)** Bernoulli   **D)** Symbiosis

21. Which of the following is not a type of friction?
 A) static   **B)** electrical   **C)** sliding   **D)** fluid

22. How is weight measured?
 A) mass * acceleration due to gravity   **C)** gravitation force / mass
 B) mass / acceleration due to gravity   **D)** volume * mass

23. If a car continues on the street at a constant 20 mph and goes from traveling North to South what have they changed?
 A) acceleration   **B)** displacement   **C)** velocity   **D)** all of the above

24. In the equation below what is the correct number of oxygen atoms in the reactants?

$$NaHCO_3 \ + \ HC_2H_3O_2 \quad \rightarrow \quad NaC_2H_3O_2 \ + \ H_2O \ + \ CO_2$$

A) 3   **B)** 6   **C)** 5   **D)** 2

25. Trade winds, westerlies, and easterlies are examples of
A) Prevailing winds   **B)** Jet streams   **C)** Local winds   **D)** Coriolis effect

26. During what stage of thunderstorm development would you see lightning?
A) Cumulus stage   **B)** Mature stage   **C)** Dissipation stage   **D)** Precipitation
                                                                                                 stage

27. As a population reaches its carrying capacity, what else has probably increased?
A) niches   **B)** habitat   **C)** demographics   **D)** density

28. Which of the following would not be found within a developing seed?
A) endosperm   **B)** radicle   **C)** embryo   **D)** terminal
                                                                                                 meristem

29. If you are consuming a tomato, what part of the plant are you eating?
A) the stem   **B)** the root   **C)** the fruit   **D)** the flower

30. Information in the form of hormones and electrical impluses travel through what organ system?
A) circulatory   **B)** nervous   **C)** immune   **D)** excretory

31. The kidneys release a hormone called erythropoietin that signals the bone marrow to produce what?
A) calcium   **B)** platelets   **C)** antibodies   **D)** red blood cells

32. *Panthera tigris* and *Panthera leo* do not belong to the same?
A) genus   **B)** class   **C)** family   **D)** species

33. The largest organelle in a plant cell is the
A) nucleus   **B)** vacuole   **C)** lysosome   **D)** chromosome

34. According to Mendelian inheritance, the phenotypic trait of an individual is inherited
A) by the dominant parent.   **C)** by the recessive parent.
B) by both parents equally.   **D)** codominantly.

35. Sexual reproduction can occur through all of the following processes except:
A) mitosis.   **B)** conjugation.   **C)** fertilization.   **D)** none of the
                                                                                                 above.

36. Blood and epithelium are both examples of
A) organs   **B)** systems   **C)** cells   **D)** tissue

37. The process by which amoebas ingest their food is known as
  A) adhesion.   **B)** pinocytosis.   **C)** phagocytosis.   **D)** osmosis.

38. Glucose molecules that are produced by green plants are generated in the
  A) mitochondria.   **B)** cytoplasm.   **C)** chloroplast.   **D)** lysosome.

39. The nucleotide of a DNA molecule is composed of
  A) carbon, oxygen, nitrogen, phosphorus, and hydrogen.
  B) carbon, hydrogen, iron, nitrogen, potassium and oxygen.
  C) carbon, oxygen, iron, phosphorus, and hydrogen.
  D) carbon, oxygen, hydrogen, iron, and nitrogen.

40. Bile is created by what organ?
  A) small intestine   **B)** liver   **C)** kidney   **D)** pancreas

41. An individual with blood type A can receive a blood transfusion from which of the following blood groups?
  A) O   **B)** B   **C)** AB   **D)** None of the above

42. The measurement of a light-year is approximately
  A) 9.5 trillion years
  B) 9.5 trillion hours
  C) 9.5 trillion kilometers/hour
  D) 9.5 trillion kilometers

43. Which of the following is not a physical property?
  A) color   **B)** boiling point   **C)** hardness   **D)** flammability

44. Proton: nucleus :: Electron: _____
  A) nucleus   **B)** positive   **C)** neutral   **D)** cloud area

45. The mass of a calcium atom is due primarily to the mass of its
  A) protons, only.   **B)** neutrons, only.   **C)** protons and electrons.   **D)** protons and neutrons.

46. Given the structural formula for ethyne:

$$H-C\equiv C-H$$

  What is the total number of electrons shared between the carbon atoms?
  A) 6   **B)** 2   **C)** 4   **D)** 3

47. The elements from which two groups of the Periodic Table are most similar in their chemical properties?
  A) 1 and 2   **B)** 1 and 17   **C)** 2 and 17   **D)** 17 and 18

48. An isotope differs from a neutral atom in that it has a
  A) different number of protons.   **C)** different number of neutrons.
  B) different number of electrons.   **D)** different number of positrons.

49. Which group is known as the noble gases?
  A) Group 1   **B)** Group 15   **C)** Group 16   **D)** Group 18

50. What happens to the particles of a gas as temperatures increase?
  A) they condense and move slower   **C)** they spread out and move faster
  B) they condense and move faster   **D)** they spread out and move slower

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