

**TMSCA MIDDLE SCHOOL
SCIENCE
TEST #4 ©
NOVEMBER 10, 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, ln x, 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 $\pm 5\%$ 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 1 H 1.01	2A 2 4 He 4.00											3A 13 5 B 10.81	4A 14 6 C 12.01	5A 15 7 N 14.01	6A 16 8 O 16.00	7A 17 9 F 19.00	8A 18 10 Ne 20.18
3 Li 6.94	4 Be 9.01											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
11 Na 22.99	12 Mg 24.31	3B 3 21 Sc 44.96	4B 4 22 Ti 47.87	5B 5 23 V 50.94	6B 6 24 Cr 52.00	7B 7 25 Mn 54.94	8 8 26 Fe 55.85	9 9 27 Co 58.93	10 10 28 Ni 58.69	11 11 29 Cu 63.55	12 12 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
19 K 39.10	20 Ca 40.08	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, $g = 9.81 \text{ m/s}^2$

Avogadro's Number, $N = 6.02 \times 10^{23} \text{ molecules/mole}$

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

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

Standard temperature and pressure (STP) is 0°C and 1 atmosphere

Gram molecular volume at STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^8 \text{ m/sec}$

Absolute zero = $0 \text{ K} = -273.15^\circ\text{C}$

Gas constant, $R = 1.986 \text{ cal/K}\cdot\text{mole} = 0.082 \text{ liter}\cdot\text{atm/K}\cdot\text{mole}$

One Faraday = 96,500 coulombs ($9.65 \times 10^4 \text{ C}$)

Dulong and Pelil's constant = $6.0 \text{ amu}\cdot\text{cal/gram}\cdot\text{K}$

Electron rest mass, $m_e = 9.11 \times 10^{-31} \text{ kg}$

Atomic mass unit, $m_u = 1.66 \times 10^{-27} \text{ kg}$

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

Permittivity of free space $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$

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

1 Atmosphere = $1.02 \times 10^5 \text{ N/m}^2 = 760 \text{ Torr} = 760 \text{ mmHg}$

1 Electron Volt = $1.6 \times 10^{-19} \text{ Joules}$

Charge of an electron = $-1.6 \times 10^{-19} \text{ coulombs (C)}$

1 horsepower (hp) = $746 \text{ W} = 550 \text{ ft}\cdot\text{lb/s}$

Neutron Mass = 1.008665 au

Proton Mass = 1.007277 au

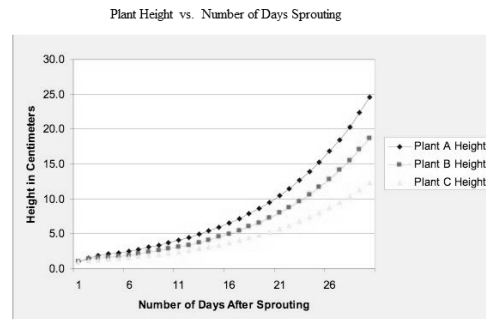
1 au = 931.5 MeV

1 calorie = 4.184 Joules (J)

Specific heat of water = $4.18 \text{ J/g}\cdot^\circ\text{C}$

2018-2019 TMSCA Middle School Science Test #4

1. Organisms that get energy from consuming other organisms are called what?
 - A. heterotrophic
 - B. autotrophic
 - C. eukaryotic
 - D. somatic
2. What part of an atom is electrically negative?
 - A. neutron
 - B. electron
 - C. proton
 - D. nucleus
3. Complete this analogy: wildebeest is to savannah as bison is to _____.
 - A. rainforest
 - B. prairie
 - C. tundra
 - D. mountains
4. What is the best description of weather?
 - A. the condition of the atmosphere at a given place and time
 - B. the long-term conditions of the atmosphere in an area
 - C. the temperature of the air
 - D. the amount of precipitation in an area over time
5. Josie is working on a project for the science fair. She has collected data as shown below. What can she conclude from this data?
 - A. After 11 days, Plant C has clearly grown the tallest.
 - B. After 21 days, the three plants slowed their growth considerably.
 - C. After 26 days, Plant A has clearly taken the lead in height.
 - D. By day 40, Plant C will most likely catch up with Plant A and B.



6. When an ancient living thing gets trapped in tree resin and is preserved for many years, this can form a fossil. The ancient tree sap that traps the living thing is called what?
 - A. amber
 - B. mold
 - C. cast
 - D. Petrification

18-19 TMSCA MSSC Test #4

7. In chemistry, a mole is a what?
- A. The amount of substance containing the same number of chemical units as exactly 12 grams of Carbon 12.
 - B. The SI base unit for measuring an amount of a substance.
 - C. Is equal to 6.02×10^{23}
 - D. All of these
8. Fibonacci numbers are involved in many growth processes. The number of clockwise spirals that are seen in this plant are usually consecutive Fibonacci numbers. What plant(s) shows these numbers?
- A. the heads of sunflowers
 - B. pine cones from pine trees
 - C. pineapples
 - D. all of these
9. Which of the following elements are diatomic?
- A. Nitrogen and Hydrogen
 - B. Oxygen and Bromine
 - C. both A and B
 - D. only Nitrogen, but not Hydrogen
10. The human genome project was completed in June of 2000. What was the human genome project?
- A. competition to find the structure of DNA
 - B. A global effort to collect DNA from all humans on the planet
 - C. A project to study human genes and how they have changed
 - D. International collaborative project to map and understand all human genes

11. This chart shows the speed of sound through different mediums; however, there is a mistake.

What is the mistake? (cannot be true)

Material	m/s
Steel	5200
Silver	3650
Air	330
Water	152

- A. steel is too high B. air should be more C. water should be more than air D. all are correct
12. If a person needs to move a fairly heavy object to a height of 2 meters with less force than lifting the object directly upward, he/she could use what simple machine?
- A. an inclined plane
 - B. truck
 - C. hydraulic lift
 - D. pascal


18-19 TMSCA MSSC Test #4

13. Avogadro's Number is equal to what?
- A. 6.02×10^{23} particles
 - B. 1 mole
 - C. Both A and B
 - D. The number of particles in 12 grams of any element.
14. Cnidarians are interesting invertebrates with radial symmetry. Which of the following is not a cnidarian?
- A. Jellyfish
 - B. Hydra
 - C. Sea Anemone
 - D. Planarian
15. The largest group of animals on Earth are what?
- A. Mollusks
 - B. Annelid worms
 - C. Echinoderms
 - D. Arthropods
16. Some areas of Texas have dry climates and get little rainfall or have precipitation only at certain times of the year. In these areas, there are streams that flow less than 30 days a year. These streams are called what?
- A. perennial streams
 - B. ephemeral streams
 - C. intermittent streams
 - D. creeks
17. If a person has a "hysterectomy", what organ has been removed?
- A. spleen
 - B. gall bladder
 - C. uterus
 - D. liver
18. Samuel has 3 cups to choose from for holding his hot chocolate. He does not want for his hand to get hot when he picks up the cup to take a drink and wants to know which is the best cup to use. What would be the best and safest plan to test this?




- A. Take all three cups and place hot chocolate (of the same temperature) in each. Place a thermometer in each of the three cups. Determine which one keeps the hot chocolate the warmest for 5 minutes.
- B. Place hot chocolate (of the same temperature) in each of the 3 cups. Place a thermometer against the outside of the three cups. Determine which cup stays the coolest on the outside for a time period of 5 minutes. Record the data.
- C. Place hot chocolate (of the same temperature) in each of the 3 cups. Hold each cup with your hand and feel how hot it gets. Determine which cup did not burn your hand.
- D. Take each cup, one at a time. Put hot chocolate in it. Measure the time it takes for the hot chocolate to get cold. Record in a chart. Repeat for each.

18-19 TMSCA MSSC Test #4

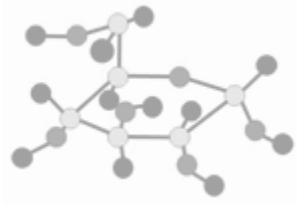
19. Which of these show the correct order of eras from most recent to oldest on the Geologic Time Scale?
- A. Paleozoic, Mesozoic, Cenozoic
 - B. Cenozoic, Mesozoic, Paleozoic
 - C. Mesozoic, Cenozoic, Paleozoic
 - D. Paleozoic, Cenozoic, Mesozoic
- 
20. Which human body systems help protect the internal organs?
- A. Immune and Respiratory
 - B. Digestive and Endocrine
 - C. Integumentary and Skeletal
 - D. Endocrine and Digestive
21. Elements on the Periodic Table found in Group 8A are known as what?
- A. Halogens
 - B. Alkali metals
 - C. Noble gases
 - D. Alkali earth metals
22. A make-believe creature called “Genetosaurus” was used in Benny’s class to study genetics. In a Genetosaurus, the allele for green skin color (G) is dominant over the allele for brown skin (g). The allele for large nostrils (N) is dominant over the allele for small nostrils (n). What would be the genotype for a Genetosaurus that is green-skinned with small nostrils?
- A. GGNN
 - B. GgNn
 - C. ggnn
 - D. Ggnn
23. Destiny’s class was learning about Newton’s Laws of Motion. They were launching rockets that they built in class. Destiny’s rocket has a mass of 4 g and her friend’s rocket had a mass of 40 g. Which rocket will take more force to launch with the same acceleration?
- A. Destiny’s rocket
 - B. Destiny’s friend’s rocket
 - C. Both are the same
 - D. None of the above
24. A dramatic decline in Bald Eagle populations that was related to egg production was caused by what?
- A. Excessive hunting
 - B. Disease
 - C. Environmental contaminants
 - D. A break in the natural food chain
25. A Paleontologist is a scientist who studies what?
- A. artifacts from the past
 - B. fossils from past living things
 - C. tectonic plates of the Earth
 - D. processes of how the Earth was formed

18-19 TMSCA MSSC Test #4

26. On a windy day, you might see clouds that look like breaking ocean waves, but in the sky. These clouds are formed when two layers of the atmosphere contain air that are moving at different speeds. This type of cloud is named what?
- A. Cirrostratus
 - B. Newton- Hertz
 - C. Lenticular
 - D. Kelvin-Helmholtz
27. Which statement below about koalas is false?
- A. Koalas are specialist species; they eat exclusively eucalyptus leaves.
 - B. Koalas are not considered bears, they are actually marsupials.
 - C. Koalas rarely drink water.
 - D. Koalas get by on only 1 hour of sleep a day.
- 
28. The Lanthanides on the Periodic Table of the Elements include which of these elements?
- A. Mercury, Tungsten, Tin
 - B. Neon, Argon, Krypton
 - C. Sodium, Potassium, Cesium
 - D. Neodymium, Promethium, Cerium
29. Words that start with the prefix “pulmo” relate to what organ?
- A. heart
 - B. lung
 - C. stomach
 - D. liver
30. Students were measuring pH of the water after a rain. What is pH?
- A. A measure of the salts within a solution
 - B. A measure of the conductivity of water based on hydrogen ions
 - C. Number from 0-14 describing the acid in the water
 - D. The relative measure of hydrogen ion concentration within a solution
31. When a structure of a living thing is buried in sediment, dissolved by underground water, and then the hollow space is filled with mineral matter, what type of fossil is created?
- A. a mold
 - B. a cast
 - C. an impression
 - D. track

18-19 TMSCA MSSC Test #4

32.



This model of a glucose molecule has limitations. What is a limitation of using this model?

- A. It shows three elements and the number of atoms that make up the molecule.
 - B. It only shows 6 atoms of Carbon.
 - C. It shows the chemical bonds as “sticks” connecting the circular oversized atoms.
 - D. It shows which element bonds with what element in the molecule.
33. A thermostat in a home helps to control the temperature and keep it stable. Which part of the human body acts as a “thermostat” for the body?
- A. hypothalamus
 - B. pituitary gland
 - C. amygdala
 - D. hippocampus
34. The Earth’s tilt on its axis is responsible mainly for which of the following?
- A. seasons
 - B. winds moving from west to east
 - C. earthquakes
 - D. tectonic plate movement
35. A large gray cat was resting on a cat tower’s top shelf. The cat is in a state of equilibrium. The force applied by gravity on the cat on the shelf and the force applied by the shelf to the cat are what?
- A. The forces are the same, and are also in the same direction
 - B. The forces are the same, but in opposite directions.
 - C. The force that gravity applies to the cat on the shelf is slightly more than the force of the shelf to the cat.
 - D. The force that the shelf applies to the cat is more than the force of gravity on the cat.
36. Out of the 8 main moon phases, what happens next after a new moon?
- A. half moon
 - B. waning crescent
 - C. waxing gibbous
 - D. waxing crescent

18-19 TMSCA MSSC Test #4

37. Bernie and his friend, Elias, were discussing matter. Bernie said that air definitely has mass and is considered to be matter. Elias said that air has no mass and therefore, is not matter. What is the best and safest way Bernie can prove his point to his friend?
- A. Blow air bubbles in a container of water. When the air makes bubbles in the water, it shows that air is matter.
 - B. Pump air into a 2-liter bottle until it explodes.
 - C. Put a balloon on a balance scale and measure its mass. Blow up the balloon and place it on the balance scale to measure its mass. Subtract the mass of the balloon from the mass of the blown-up balloon. The difference (even though it may be small) is the mass of the air.
 - D. Pump air into a tire and then find the mass of the tire.
38. When learning about chemical bonding, which subatomic particle is most important?
- A. Protons
 - B. Neutrons
 - C. Electrons
 - D. Quarks
39. Genetic variation is important for a species to continue to survive. Which of the following methods of reproduction produces the most genetic variation?
- A. Cloning
 - B. Budding
 - C. Fragmentation
 - D. Sexual
40. On a sunny day at a nature center, the guide pointed to a plastic bag that had been placed over a green tree leaf and was secured with a rubber band. Inside the plastic bag were small droplets of water. The guide was most likely explaining what?
- A. Water from the leaf “transpired” and condensed on the inside of the bag.
 - B. Water droplets had “evaporated” from the air and condensed on the bag.
 - C. The plant had caused water to condense in the bag because it is less dense.
 - D. The plant had trapped water from the condensation of water vapor.
41. What does the prefix “pter” mean?
- A. having wings or fins
 - B. another species
 - C. standing or staying
 - D. middle
42. A science class was constructing a weather instrument using paper cups, straws, sticks, and tape. The cups were aligned in a circle and would spin on a central stick. What type of instrument were they making?
- A. barometer
 - B. hydrometer
 - C. anemometer
 - D. thermometer



18-19 TMSCA MSSC Test #4

43. During what stage of mitosis, do the chromatids (chromosomes) move to opposite poles of the cell?
- A. prophase
 - B. metaphase
 - C. interphase
 - D. anaphase

44. During a lab activity, Joseph recorded the following measurements for his group. What do these measurements show?

	Day 1	Day 2	Day 3	Actual Standard Value
Measurement 1	6.45	6.44	6.45	5.1
Measurement 2	8.001	8.001	8.002	8.000
Measurement 3	16.4	17.1	19.0	18.5
Measurement 4	3.22	3.22	3.22	5.55

- A. Measurement 1,2,4 are precise, but only 2 is considered accurate
 - B. Measurement 1,2,4 are accurate, but only 2 is precise.
 - C. Measurement 3 is both precise and accurate.
 - D. Measurement 4 is accurate, but not precise.
45. Which of the following shows a pair of inorganic compounds?
- A. NaCl CaCO₃
 - B. C₃H₈ C₂H₇O₄P
 - C. C₂H₆ CH₄ N₂O
 - D. C₆H₁₂O₆ H₂O
46. Which of the following is not a difference between plant and animal cells?
- A. A large central vacuole found in plants.
 - B. Chlorophyll is found in plants
 - C. A specialized organelle to digest and recycle a cell's used components.
 - D. Plants have cell walls
 - E.
47. What does the prefix "sess" mean?
- A. move
 - B. purple
 - C. sit
 - D. plenty
48. Which of the following conditions involves bone density?
- A. Arthritis
 - B. Osteoporosis
 - C. Periosteum
 - D. Phlebitis

18-19 TMSCA MSSC Test #4

49. Runoff water collects in a wetland which works as a filter for the water. Which is not a benefit of wetlands?
- A. Vegetation and soil in wetlands retain and process nitrogen and phosphorus.
 - B. Wetlands remove pollutants and excess nutrients.
 - C. Wetlands increase environmental problems such as algal blooms.
 - D. Wetlands store and slowly release surface water, rain, groundwater, and flood waters.
50. 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

18-19 TMSCA MSSC Test #4

2018 - 2019 TMSCA Middle School Science Test # 4 - Key

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