

TMSCA MIDDLE SCHOOL SCIENCE REGIONAL TEST© MARCH 27, 2021

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																8A																			
1																2																			
H 1.01																He 4.00																			
3		4																5		6		7		8		9		10							
Li 6.94		Be 9.01																B 10.81		C 12.01		N 14.01		O 16.00		F 19.00		Ne 20.18							
11		12		3B		4B		5B		6B		7B		8B		1B		2B		13		14		15		16		17		18					
Na 22.99		Mg 24.31		3		4		5		6		7		8		9		10		Al 26.98		Si 28.09		P 30.97		S 32.07		Cl 35.45		Ar 39.95					
19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36	
K 39.10		Ca 40.08		Sc 44.96		Ti 47.87		V 50.94		Cr 52.00		Mn 54.94		Fe 55.85		Co 58.93		Ni 58.69		Cu 63.55		Zn 65.38		Ga 69.72		Ge 72.64		As 74.92		Se 78.96		Br 79.90		Kr 83.80	
37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54	
Rb 85.47		Sr 87.62		Y 88.91		Zr 91.22		Nb 92.91		Mo 95.94		Tc (98)		Ru 101.07		Rh 102.91		Pd 106.42		Ag 107.87		Cd 112.41		In 114.82		Sn 118.71		Sb 121.76		Te 127.60		I 126.90		Xe 131.29	
55		56		57		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86	
Cs 132.91		Ba 137.33		La 138.9		Hf 178.49		Ta 180.95		W 183.84		Re 186.21		Os 190.23		Ir 192.22		Pt 195.08		Au 196.97		Hg 200.59		Tl 204.38		Pb 207.20		Bi 208.98		Po (209)		At (210)		Rn (222)	
87		88		89		104		105		106		107		108		109		110		111		112		113		114		115		116		117		118	
Fr (223)		Ra (226)		Ac (227)		Rf (261)		Db (262)		Sg (266)		Bh (264)		Hs (277)		Mt (268)		Ds (281)		Rg (281)		Cn (285)		Nh (286)		Fl (289)		Mc (289)		Lv (293)		Ts (293)		Og (294)	

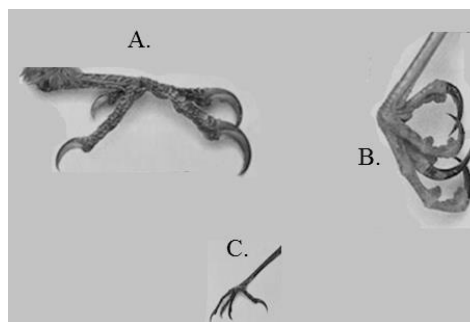
Specific heat of water = $4.18 \text{ J/g} \cdot ^\circ\text{C}$

2020-2021 TMSCA Middle School Science Test – Regional

1. When discussing weather phenomenon, what is a “derecho”?
- A. slow moving, devastating rain storms that cause major flooding
 - B. a huge wave of devastating water that occurs in a bay or lagoon area
 - C. a line of intense, long-lived, fast moving windstorms that can cause major damage
 - D. a type of cloud that is high, wispy, and composed of ice crystals

2. Which of three bird feet types would belong to a woodpecker that climbs straight up the tree bark?

- A. A
- B. B
- C. C
- D. none of these



3. Owls cannot chew their food because they do not have teeth and cannot digest bones, fur, and feathers. Because of this, they expel little packets of compacted bones, fur, and feathers. These little packets are called what?

- A. coprolites
- B. regurgitate
- C. pellets
- D. vomit

4. What is the buoyancy organ that most bony fish have which allows it to move up or down in the water?

- A. pharynx
- B. air bladder
- C. operculum
- D. gills

5. Jennifer was working in the garden with her grandmother. Jennifer noticed that her grandmother has a funny looking scar on her arm so she asked her grandmother about it. Grandmother said that was from a vaccination she got when she was a kid, but now they no longer give this vaccine to kids because the disease was eradicated. What disease did Jennifer’s grandmother get vaccinated for? (This disease was officially eradicated in 1979 by a collaborative global vaccination project.)

- A. polio
- B. rabies
- C. chicken pox
- D. smallpox

6. If an insect belongs to the order Mantodea, then it may be a what?

- A. grasshoppers
- B. praying mantis
- C. butterflies
- D. wasps

7. A carnivorous animal that primarily eats fish is called a what?

- A. piscivore
- B. herbivores
- C. omnivores
- D. detritivores

8. One base is missing from this list of bases that make up DNA. Which one is missing?
cytosine, guanine, thymine, _____

- A. uracil B. albuterol C. epinephrine D. adenine

9. Sicily was conducting an experiment with Monarch butterflies. She wanted to find out what concentration of sugar water they preferred the most. She obtained 5 various containers and put 100 mL of water in each. She added different amounts of sugar to each container and then stirred. Next, she placed each container in a different place in the butterfly house. One was in the sun, one was in the shade, and the others were randomly placed about the space. For two hours a day for a week, she observed the Monarchs to see which container they would eat from and recorded the data. What would you suggest Sicily do to improve her scientific investigation?

- A. Sicily should not use Monarch butterflies because they are poisonous for people to touch.
B. Sicily should have used more than 100 mL of water in the containers.
C. Sicily should place the containers in the same area in the butterfly house.
D. Sicily should use the same amount of sugar in the containers.

10. What is a reasonable explanation for crayfish making these mud chimneys?

- A. to trap their favorite prey (raccoons)
B. to increase carbon dioxide levels in their tunnels
C. to protect them from predators
D. to attract catfish to their tunnels

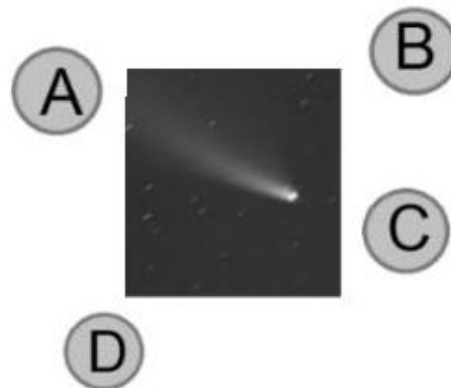


11. Genetic variation is important for a species to continue to survive. Which of the following methods of reproduction produces little genetic variation?

- A. sexual B. budding C. parthenogenesis D. Both B and C

12. Which letter would represent the position of the sun in this diagram of a comet?

- A. A
B. B
C. C
D. D



13. Students were conducting an investigation on the properties of water. They poured a cup of water down a string into a bowl. The water appeared to “cling” to the string as it went into the bowl. What does this investigation demonstrate?

- A. water has the property of static
- B. water is composed of hydrogen and oxygen molecules
- C. water is the universal solvent
- D. water has the property of adhesion

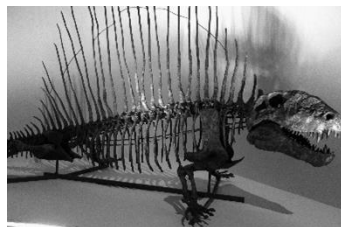
14. Thunder and lightning frightened a herd of bison and started a stampede. The bison covered a distance of 1.7 miles in 6 minutes. What was the average speed of the bison?

- A. 28 miles per hour
- B. 35 miles per hour
- C. 10 miles per hour
- D. 17 miles per hour



15. The photo shows a dimetrodon skeleton. Sometimes fossil skeletons are found “articulated”. What does articulated mean?

- A. upside down
- B. taken apart into pieces
- C. scattered in no particular order
- D. arranged in the correct order



16. A protozoan parasite that infects Monarch butterflies and causes them to fail to emerge properly from their pupal state is what?

- A. *Pseudogymnoascus destructans*
- B. *Naegleria fowleri*
- C. *Plasmodium falciparum*
- D. *Ophryocystis elektroscirrha*

17. The Hertzsprung-Russell diagram is used to show all of the following about stars except what?

- A. intrinsic brightness and surface temperature
- B. absolute magnitude and spectral type
- C. luminosity and surface temperature or color
- D. the photon absorption rates

18. Monarch butterflies go through which type of metamorphosis?

- A. incomplete
- B. complete
- C. partial
- D. Both A and C

19. There is a reddish substance of a waste product that Monarch butterflies expel when they leave the chrysalis. What is this substance called?

- A. pheromones
- B. glycosides
- C. meconium
- D. alkaloids

20. Monarch butterflies migrate from Canada to Mexico during the fall to overwinter in warmer temperatures. Researchers want to know what the monarch butterflies use in order to orientate their flight direction. Maybe they use the position of the sun, features of the landscape, the magnetic field, or something that we don't know about yet to help them know which way to fly. What would be the most reasonable testable hypothesis for this investigation?

- A. When monarch butterflies see a body of water, they will fly over it.
- B. Every year, the monarch butterflies come to the same tree in my backyard.
- C. When a monarch butterfly comes near a magnet, it flies in a sporadic manner 75% of the time.
- D. When given several choices of sunlight angles, the monarch butterflies will choose to fly with the sun is at 57 degrees above the horizon at noon.

21. How many neutrons would a neutral atom of Iron have?

- A. 26
- B. 56
- C. 30
- D. 82

22. Which of the following shows a pair of inorganic compounds?

- A. NaCl CaCO₃
- B. C₃H₈ C₂H₇O₄P
- C. C₂H₆ CH₄ N₂O
- D. C₆H₁₂O₆ H₂O

23. Why does Earth have a "leap year"?

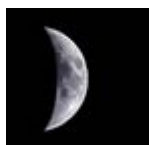
- A. because the sun has a slight wobble
- B. to line up the planets with their revolutions around the sun
- C. to celebrate an extra day as Earth Day in the calendar
- D. to synchronize the human calendar year with the solar year

24. What is the axial tilt of planet Earth?

- A. 23.5 degrees
- B. 25 degrees
- C. 90 degrees
- D. 28.2 degrees

25. What is the name of this moon phase?

- A. waxing crescent
- B. waning crescent
- C. 1st quarter
- D. waning gibbous



26. The “far side” of the moon is what?
- A. changes depending on where you are located on Earth
 - B. the side of the moon that never faces Earth because of the moon’s rotation and revolution around the Earth.
 - C. where the aliens live
 - D. the side of the moon that never receives sunlight
27. Which statement below best describes a cloud in weather?
- A. a large mass of water vapor suspended in the air formed by wind
 - B. an invisible mass of air containing particles of matter including smoke
 - C. a visible mass of water droplets, ice crystals, or a mixture suspended in the air
 - D. a collection of ice crystals that is held aloft by wind currents in the sky
28. What person is given credit for developing the first true battery?
- A. Heinrich Hertz
 - B. Nikola Tesla
 - C. Thomas Edison
 - D. Alessandro Volta
29. When observing properties of light waves of the electromagnetic spectrum, which of the following statements below is true?
- A. When the wavelength increases, the frequency will also increase.
 - B. The wavelength and frequency have no connection to each other.
 - C. When the wavelength increases, the frequency will decrease.
 - D. The wavelength and frequency of waves are equal to each other.
30. Which of the following is not an example of a man-made plasma?
- A. lightning
 - B. neon light
 - C. welding arc
 - D. fluorescent light
31. How many milliliters are there in 5 kilometers?
- A. 1 million
 - B. 5 million
 - C. 500,000
 - D. there is no way to tell with this information
32. I was a pioneer of modern atomic theory. I also identified that red-green color blindness was hereditary. The law that states that the total pressure of a mixture of gases is equal to the partial pressures of the individual gases that make it up is named after me. Who am I?
- A. John Dalton
 - B. Democritus
 - C. Niels Bohr
 - D. Ernest Rutherford
33. The prefix “macro” means what?
- A. small
 - B. large
 - C. crisp
 - D. taste

34. Why do people add rock salt to the ice bucket when making homemade ice cream?
- A. it helps by lowering the freezing point of the ice-salt mixture
 - B. it helps by raising the freezing point of the ice-salt mixture
 - C. it helps by slowing down the freezing process for the ice cream
 - D. it helps in no way, the rock salt companies just want to make money
35. The root word “acanth” means what?
- A. spiny
 - B. smooth
 - C. red
 - D. tall
36. Which element listed below has an extremely low boiling point?
- A. Sulfur
 - B. Iodine
 - C. Tungsten
 - D. Helium
37. An atom of hydrogen has 1 proton and 2 electrons. This means the net charge is what?
- A. 1 + (cation)
 - B. 1 - (anion)
 - C. 2+ (cation)
 - D. 2- (anion)
38. An atom or molecule with a net charge that is either positive or negative is called what?
- A. isotope
 - B. ion
 - C. neutron
 - D. electron
39. Which of the following shows evidence that a chemical reaction took place?
- A. ice melting into a puddle of water
 - B. a poster changing color after exposure to the sun for a week
 - C. salt dissolving in a cup of water
 - D. dry ice changing to gas after setting on counter for a few hours
40. If 1 kilometer is equal to 3,281 feet, how many feet are there in 5 kilometers?
- A. 16,405
 - B. 656.2
 - C. 15,300
 - D. there is no way to tell with this information
41. I discovered that mass is conserved when a chemical reaction takes place. I was a French chemist who worked during the late 18th century. Who am I?
- A. Niels Bohr
 - B. Louis Pasteur
 - C. Joseph Proust
 - D. Antonine Lavoisier
42. Jamie applied 100 N of force on the piano to push it to the east side of the room. Her friend pushed with 250 N of force. The piano did not move. How much work was done on the piano?
- A. 0 J
 - B. 100 J
 - C. 250 J
 - D. 350 J
43. Which of the following is not attracted to a magnet?
- A. iron
 - B. cobalt
 - C. aluminum
 - D. nickel

44. Which characteristic below does not describe a desert ecosystem?

- A. very few life forms
- B. low annual precipitation, less than 25 cm a year
- C. cover about 1/5 of Earth's land mass
- D. low humidity

45. This neutral atom has an atomic mass of 133 and 78 neutrons. What element is this?

- A. Platinum
- B. Neptunium
- C. Argon
- D. Cesium

46. An empty digital scale was on the lab table, but the reading on the scale was reading as below: What needs to be done before using this scale?



- A. throw away this scale and get a new one
- B. send it back to the place you bought it from
- C. turn it on/off again or push the tare button depending on the type of scale
- D. place your object on the scale and push the on/off or tare button to fix it

47. What moon phase would come next (#4)?

- A. full moon
- B. new moon
- C. waning crescent
- D. waning gibbous



1.



2.



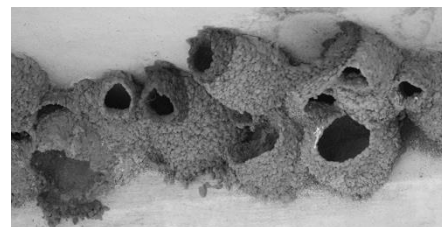
3.

?

4.

48. What animal would most likely be living in these structures that were found under a highway bridge overpass?

- A. yellow-jacket wasps
- B. cliff swallows
- C. flying squirrels
- D. burrowing owls



49. What letters are missing in this DNA sequence? (in order from left to right)

- A. G, U, C
- B. A, T, A
- C. G, A, C
- D. G, T, C



50. The Law of Conservation of Energy states that energy _____.

- A. can be conserved if all types of energy are utilized.
- B. can be created by taking mass and converting it to energy.
- C. can be destroyed when the mass is more than the volume.
- D. can neither be created or destroyed, it just changes form.

2020 - 2021 TMSCA Middle School Science Test- Regional - Key

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