



TMSCA MIDDLE SCHOOL SCIENCE TEST #10 © FEBRUARY 6, 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.

1A 1																	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	8A 18
1 H 1.01																	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, $g = 9.81 \text{ m/s}^2$

Avogadro's Number, $N = 6.02 \times 10^{23}$ 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 K = -273.15°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 (9.65×10^4 C)

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

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

Atomic mass unit, $m_u = 1.66 \times 10^{-27}$ 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 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 heat of water = $4.18 \text{ J/g} \cdot ^\circ\text{C}$

2020-2021 TMSCA Middle School Science Test #10

1. On a rare occasion, you might see a type of cloud that is associated with thunderstorms and is found low to the horizon. It looks like a long tube and is caused by cooler air lifting warm moist air. It is not attached to the base cloud. What is this cloud called?

- A. shelf cloud -type of arcus cloud
- B. crepuscular cloud
- C. lenticular cloud
- D. roll cloud - type of arcus cloud



2. A family of white blood cells also known as lymphocytes are extremely important in the immune system. This family includes what?

- A. epithelial
- B. pluripotent
- C. T cells
- D. erythrocytes

3. The Hubble Space Telescope does what to help scientists learn more about the universe?

- A. is broken and no longer works, too expensive to fix
- B. takes digital photos of space and sends them to Earth through radio waves
- C. uses a specialized refracting telescope to view into space in real-time
- D. emits a large laser powered beam into space to collect data

4. Coelomate comes from a Greek work “koilia” which means “body cavity”. What animal below is considered to be an example of an “acoelomate”?

- A. humans
- B. jellyfish
- C. raccoon
- D. roundworm

5. What is a main difference between eukaryotic and prokaryotic cells?

- A. prokaryotic cells have DNA
- B. eukaryotic cells have a nucleus
- C. prokaryotic cells have membrane bound structures
- D. eukaryotic cells have a cell wall

6. Flowering plants have been on Earth since what period of time?

- A. Devonian
- B. Precambria
- C. Permian
- D. Cretaceous

7. Monarch butterfly caterpillars have tiny hairs scattered evenly all over their bodies. These hairs help with the sense of touch for the butterfly. What are these hairs called?

- A. tactile setae
- B. ommatidia
- C. proboscis
- D. sensory tarsi

8. Which of the following listed below is an insect?

- A. spider
- B. pillbug
- C. scorpion
- D. earwig

9. Recently, people living in a local community noticed that they were seeing coyotes in town more often. One nearby university decided to conduct a study to compare what urban (city) coyotes eat to what suburban (edge of the city) coyotes eat. They collected scat (poop) from coyotes in both areas. After disinfecting and washing out the unwanted parts, the study came up with these results:

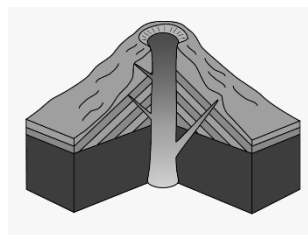
Coyote location	Rabbit parts	Cat parts	Fruits	Dog food	Garbage	Rodent parts
Site A - Urban	39	67	48	51	38	41
Site B - Urban	38	78	54	43	32	49
Site C - Suburban	57	34	36	33	15	26
Site D - Suburban	78	22	46	25	23	24

Using the information, what would be a reasonable conclusion to make from the data?

- A. Urban coyotes seem to eat less garbage than suburban coyotes.
- B. Suburban coyotes seem to eat more garbage than urban coyotes.
- C. Urban coyotes seem to eat less cats than suburban coyotes.
- D. Suburban coyotes seem to eat more rabbits than urban coyotes.

10. While studying the volcano, the volcanologist came across a crack that had gases escaping from it. What is this crack called?

- A. disturbance
- B. fumerole
- C. lahar
- D. caldera



11. What group does the element Magnesium belong to?

- A. 2
- B. 5
- C. 1A
- D. 17

12. What do you call a combination of two or more substances that have not chemically combined, maintain their properties, and can be physically separated?

- A. elements
- B. compounds
- C. mixtures
- D. molecules

13. A chemical reaction in which there is a substitution of one element for another in a compound is called what?

- A. decomposition
- B. combination
- C. replacement
- D. oxidation/reduction

14. If one ounce of weight is equal to 28.3 grams, then how many grams are in 1 pound? (1 pound is 16 ounces)

- A. 1.76875 grams
- B. 0.56537102 grams
- C. 1,000 grams
- D. 452.8 grams

15. The prefix “terra” means what?

- A. water
- B. under
- C. ground
- D. cloud

16. When two blocks of the earth pushing against each slip at a fault, the energy built up by the pressure where the blocks meet is released. This is called what?

- A. tsunami B. seismogram C. earthquake D. magnewave event

17. The color appearance of a river or stream is determined by what?

- A. corrosion
B. the suspended sediment the stream carries
C. the dissolved load of the stream
D. the alluvium

18. Changes in normal surface temperatures of the ocean can impact global weather and climate. Two important terms describing temperature changes in the equatorial Pacific are El Nino and La Nina. Which statement below describes these phases?

- A. El Nino is the warm phase and La Nina is the cold phase.
B. El Nino is the cold phase and La Nina is the warm phase.
C. El Nino is the dry phase and La Nina is the wet phase.
D. El Nino is the wet phase and La Nina is the dry phase.

19. In lab class, students were told to measure the pH of several unknown substances and then decide if the substances were acids or bases. Here is the list when they finished the investigation. Their teacher instructed them to look it over carefully before turning it in. Should they make any corrections?

- A. No, everything is correct as it is.
B. Yes, they have mislabeled substances B and C
C. Yes, they have mislabeled substances A and D
D. Yes, they have mislabeled substances B, C, and E

Substance	pH	Acid or Base?
A	6.1	acid
B	7	base
C	10	acid
D	4	acid
E	7.6	base

20. Which of these has the most effect on the climate of a country?

- A. Population B. distance from the equator C. biodiversity D. soil type

21. A type of chemical reaction in which two or more simple substances, either elements or simple compounds are directly joined is called what?

- A. decomposition
B. combination or synthesis
C. replacement
D. oxidation/reduction

22. Which of the following statements is not true about insects?

- A. One type of cicada has a life cycle of around 17 years.
B. One of the largest known insects was an ancient dragonfly.
C. Insects have no brains.
D. The shading of an adult louse depends on hair color of human's head where it lives.

23. Capillaries are important to exchange gases, nutrients, wastes, and hormones between veins and arteries. What connects the veins to the capillaries?

- A. smooth tissue B. arterioles C. venules D. valves

24. What is the main fuel used by brain cells?

- A. carbon dioxide B. glucose C. protein D. fat

25. What tool is used to measure lung capacity?

- A. Secchi meter B. psychrometer C. spirometer D. Both A and B

26. Which statement below about birds is not true?

- A. Birds do not have true teeth.
B. Most birds have a structure called a pygostyle to support the tail feathers.
C. Birds forelimbs are adapted for flight.
D. Pterosaurs are bird ancestors.

27. What is the significance of a bee visiting a flower to that particular plant?

- A. there is no significance
B. the flower benefits from the bee spit
C. the bee moves pollen to other flowers to aid in reproduction
D. the bee eats the nectar of the flower which triggers the flower to produce more seeds

28. Which statement below is not a reason why fish swim in groups called schools?

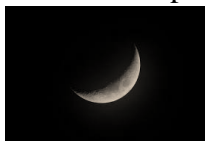
- A. to save energy
B. makes it easier to find and share food
C. to teach the young how to hunt
D. as a defense mechanism against predators

29. I was born in New Zealand in 1871. I won a Nobel prize in Chemistry in 1908. I discovered that an atom is made of mostly empty space. I also studied about the chemistry of radioactive substances. Who am I?

- A. Thomas Hunt Morgan
B. Robert Boyle
C. Ernest Rutherford
D. John Dalton

30. Sandra took a photo of the moon shown below. What phase of the moon is this?

- A. waning crescent
B. gibbous
C. third quarter
D. waxing crescent



31. The level of glucose in your blood is very important. This level is controlled by what?

- A. hemoglobin B. sucrose C. adrenaline D. insulin

32. Which enzyme found in saliva helps to change starch into sugars?
A. trypsin B. lactase C. maltase D. Cas9
33. Some mammals are born precocial, such as a whale. What does this mean?
A. helpless when born
B. relatively well developed when born
C. short gestation period
D. reproduce at a rapid rate
34. One foot (English measurement) is what part of 1 mile?
A. 0.00018939 B. 0.0018939 C. 1/250 D. 5,280
35. Lightning struck a statue in a local park 5 years ago. There was a storm going on in that same park. Lily was playing in the park when the storm came along. She stood by the statue because she heard that lightning never strikes the same place twice. Which statement below is true about this situation?
A. Lily will be safe by the statue because what she heard it true.
B. Lily should go inside a building to get away from the storm; lightning can strike the same place more than once.
C. Lily should find a tree instead to be safe.
D. Lily should only worry about the lightning if she feels the hairs on her arm stand up.
36. Elements on the Periodic Table found in Group 1A are known as what?
A. Halogens B. Alkali metals C. Noble gases D. Actinides
37. Sammy wanted to find out which dog shampoo worked the best on his dog, Spot. He bought 3 different brands of shampoo. First, he had his dog go outside and roll in the dirt. Next, he shampooed the dog with the shampoo and recorded his observations of how shiny the fur looked, how easy it was to comb out the fur, and how the fur smelled. He repeated this with the other 2 shampoos. Which statement below about this investigation is true?
A. The independent variable would be the shininess of the dog's coat.
B. The dependent variable would be the different types of shampoo used.
C. The observations that Sammy is making are qualitative observations.
D. The observations that Sammy is making are quantitative observations.
38. Serena wanted to see if there was a correlation between the length of a catfish to its weight. While doing a survey of catfish caught at a local park, she measured the height and weight of each fish caught. Next, she wanted to graphically display the information. What type of graph would be the most reasonable to use for showing a correlation?
A. scatter plot B. line graph C. pie graph D. bar graph
39. Which of the following is a key component to the carbon cycle in the oceans?
A. viruses B. moon's gravity C. salt marshes D. Both A and C

40.



Midwest River runs through an area that has experienced changes over time. In this diagram, you see that the path changed due to the river during flood times making a shorter path to travel. In the second diagram, the areas labeled A and B were cut off from river channel. What are areas A and B now?

- A. ergs B. atolls C. aeolian lakes D. oxbow lakes

41. Which is the positive terminal of a battery?

- A. neutron B. electron C. cathode D. anode

42. Motion involves an object's change in position relative to what?

- A. the friction that slows it down
B. the direction that it is moving
C. an object's mass and gravity
D. a reference point over a period of time

43. Some type of change that occurs to a gene in an organism's DNA is called a what?

- A. mutation B. base edge C. snippet D. genome

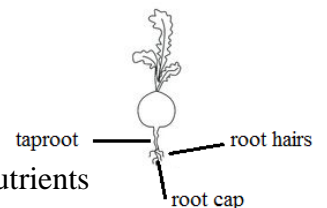
44. If an insect belongs to the order Diptera, then it may be a what?

- A. mosquito B. wasp C. dragonfly D. beetle

45. A radish has a large central root from which much smaller roots branch off.

It also has root hairs along the taproot. What is a benefit of having root hairs?

- A. an increase of photosynthesis taking place
B. a decrease in phloem production
C. causes more storage for starch and sugar for the plant
D. an increase in surface area along with the ability to absorb water and nutrients



46. Which of the compounds is composed of the most atoms?

- A. NaHCO_3
B. $\text{NaClO H}_2\text{O}_2$
C. $\text{C}_2\text{H}_4\text{O}_2$
D. CH_4

47. Which of the following diseases affect the respiratory system?

- A. asthma
B. emphysema
C. bronchitis
D. all of these

48. Which of the following places below have polar ice caps?
- A. Earth
 - B. Mars
 - C. Pluto
 - D. all of these
49. The boundary between Earth's crust and mantle was discovered by a Croatian seismologist in 1909. This boundary, named after this scientist, is called what?
- A. Moho B. Lithosphere C. Croviate D. Gambert
50. Josie had two minerals that were both colorless but couldn't tell them apart. One is calcite and one is halite. What would be a successful method that would reveal which is which?
- A. Place them both on a streak plate to check the color of their streak.
 - B. Measure the density. Halite's density is higher.
 - C. Check to see if they can be picked up by a magnet.
 - D. Measure the density. Calcite's density is higher.

2020 - 2021 TMSCA Middle School Science Test #10 - Key

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