T M S C A M I D D L E S C H O O L

S C I E N C E

T E S T # 1 1 ©

F E B R U A R Y 1 3 , 2 0 2 1

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 1.01	2A 2																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	8	8B 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 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•cal/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

2020-2021 TMSCA Middle School Science Test #11

1. If you place water, corn oil, rubbing alcohol, and maple syrup in a graduated cylinder, what order would they settle from top to bottom?

A. maple syrup, water, corn oil, rubbing alcohol
B. rubbing alcohol, water, corn oil, maple syrup
C. maple syrup, corn oil, water, rubbing alcohol
D. rubbing alcohol, corn oil, water, maple syrup

Substance	**Density**
Water	.997 g/mL
Corn oil	0.920 g/mL
Rubbing alcohol	0.786 g/mL
Maple syrup	1.37 g/mL

2. Samuel saw a video showing a person who lived in a city that sat on the equator. In the video, the person was flushing a toilet in a house that was just north of the equator and then was flushing a toilet in a house just south of the equator. In the first house, the water flushed counter-clockwise and in the second, it flushed clockwise. Samuel showed the video to his teacher. Which of these statements would be the correct one for the teacher to reply?

A. The toilets flush this way because of the Coriolis effect.
B. The toilets flush this way because the latitude causes a change in the water flow.
C. If you see it on a video, then it must be true.
D. The toilets are too small to be affected by the Coriolis effect.

3. Which is the negative terminal of a battery?

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

4. Which of the following statements below is true?

A. Weight is measured with a balance; mass is measured with a spring scale
B. Weight and mass should both be measured with a spring scale
C. Mass is measured with a balance; weight is measured with a spring scale
D. Mass and weight always should be measured with a balance, never a spring scale

5. Friction is a force that is what?

A. Is harmful to automobiles
B. Is useful to automobiles
C. Both A and B
D. Neither A or B

6. We received the 1962 Nobel Prize in Medicine for discovered the structure of DNA. We used Wilkins's and Franklin's research to help make this discovery. Who are we?

A. Darwin and Wallace
B. Britt and Moser
C. McClintock and Morgan
D. Crick and Watson

7. What two factors effect gravitational pull?

A. weight and size B. distance and volume C. height and mass D. mass and distance

8. Which is longer, a kilometer or a mile?

A. they are the same
B. a mile is longer
C. a kilometer is longer
D. it is impossible to tell with this information

9. Some clouds form as air moves over mountains, is cooled, and condensation takes place. These clouds don't move like other clouds, but are just "reformed" in the same place and stay there. This type of cloud has often been thought to be a UFO because of its saucer-like shape. These are called what?

A. Lenticular
B. Kelvin-Helmholtz
C. Nimbostratus
D. Mammatus

10. Which of the following cloud words are correctly matched?

A. Stratus: sheet-like, Cirrus: wispy, Cumulus: puffy, Nimbo: rain,
B. Stratus: wavy, Cirrus: wispy, Cumulus: puffy, Nimbo: rain
C. Stratus: sheet-like, Cirrus: puffy, Cumulus: wispy, Nimbo: rain
D. Stratus: rain, Cirrus: sheet-like, Cumulus: wavy, Nimbo: wispy

11. Earthquakes happen when what?

A. the tectonic plates bump into each other and bounce off
B. a slip occurs along a fault line
C. the mantle and the crust crash into each other
D. the inner core of the earth moves fast enough to cause waves

12. The magnitude and intensity are measured when an earthquake happens. Which statement below is correct about these two measurements?

A. Magnitude is measured on the Mercalli scale and intensity is on the Richter scale.
B. Magnitude measures the amount of shaking, while intensity measures the size of the Earthquake.
C. Intensity measures the amount of shaking and depends on your location, while magnitude measure the size of the earthquake.
D. The two measurements are exactly the same.

13. Which of the following statements is true?

A. Most native fish in Texas prefer water temperature between 4 to 38 degrees Celsius.
B. Most native fish in Texas are tropical or subtropical.
C. Very few aquatic organisms in Texas are poikilothermic.
D. Turbidity of water is measured with a pH meter.

14. Which of the following is an example of a carnivore?

A. muskrat B. bats C. river otter D. raccoon

15. Which of the following equations shows a chemical change?

A. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + energy is released

B. $2H_2O + 2H_2O + C_{12}H_{22}O_{11} \rightarrow C_{12}H_{22}O_{11} + 4H_2O$

C. $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow 2C_6H_{12}O_6$

D. Both B and C

16. Calvin was testing water for dissolved oxygen levels. He found a quiet still pond at a local park (Site A). The pond appeared to have no incoming source of water; it collects water when it rains, but has no connecting stream. He also found an area at a different park with a waterfall that fed into a collection pond (Site B). For six weeks, he tested the water for dissolved oxygen, twice a day and recorded his information. (units – mg/L)

Week	Site A (morning)	Site A (evening)	Site B (morning)	Site B (evening)
1	7.65	6.53	11.01	10.65
2	7.45	6.43	11.23	10.98
3	7.89	7.12	11.24	10.79
4	7.65	6.98	11.60	11.01
5	7.51	6.55	11.34	11.20
6	7.65	7.40	11.27	11.10

What would be a reasonable conclusion that he could make with this data?

A. Site A has more dissolved oxygen in the mornings than Site B does.

B. During the six-week period, Site B has more dissolved oxygen in the evening than it does in the morning.

C. The quiet still pond had more dissolved oxygen than the waterfall fed pond.

D. The waterfall fed pond had more dissolved oxygen than the quiet still pond.

17. What is a possible explanation for these results?

A. The quiet still ponds contain more dissolved oxygen because when water moves, oxygen is released into the atmosphere.

B. The waterfall fed ponds contain more dissolved oxygen because the waterfall agitates the water which speeds up oxygen diffusion.

C. Both ponds should be equal because oxygen dissolves in water the same no matter the conditions.

D. There is no way to explain the data presented except for human error.

18. Martha's mom is a scientist who studies freshwater. She uses her knowledge of geology, chemistry, physics, and biology to help manage aquatic systems. One job she is working on is to find out why there is too much phosphorus in a nearby lake. What is she called?

A. limnologist B. cytologist C. oceanographer D. hydrogeologist

19. A cone-shaped volcano with steep sides is called a what?

A. stratovolcano B. composite volcano C. shield volcano D. Both A and B

20. Eris went to an observatory and got to see Jupiter and the Galilean moons through a powerful telescope. She remembered the name of Io, Europa, and Ganymede, but couldn't remember the last one. What moon did she forget?

A. Titan B. Deimos C. Phobos D. Callisto

21. What phase would take place directly after this phase in the photo?

A. waxing crescent
B. 3rd quarter
C. 1st quarter
D. none of these

22. On a sunny day, the science teacher pointed to a plastic bag that she had placed over a green tree leaf and secured with a rubber band early that morning. Inside the plastic bag were small droplets of water. The teacher was most likely explaining what?

A. Water from the leaf "transpired" and collected 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.

23. What coefficients would make this chemical equation balanced?

____H_2SO_4 → ___H_2O + ___SO_3

A. 2,2,1 B. 1,1,2 C. 1,1,1 D. 3,3,2

24. What list correctly shows the six most common elements found in living things?

A. Carbon, Hydrogen, Oxygen, Phosphorus, Nitrogen, Sulfur
B. Carbon, Helium, Osmium, Potassium, Sodium, Argon
C. Carbon, Sulfur, Nitrogen, Oxygen, Potassium, Hydrogen
D. Carbon, Silicon, Copper, Zinc, Iron, Hydrogen

25. Which of the following scientists did not make a major contribution in the field of chemistry?

A. Antoine Lavoisier
B. Joseph Priestley
C. Ptolemy
D. Ernest Rutherford

26. Coral is classified as belonging to what kingdom?

A. animalia B. plantae C. fungi D. protozoa

27. A research group was planning an investigation on the effect of vaping on lung capacity. The group set up a testing group of people who vape on a regular basis and a group of people who have never practiced vaping. They want to measure the lung capacity of each group.
What would be a reasonable hypothesis for this investigation?

A. The group that vapes will have more people because it is very popular.
B. The group that does not vape will have a larger lung capacity.
C. The group that vapes will be able to test lung capacity much faster.
D. The group that does not vape will do a better job with the testing.

28. Which of the list below shows the correct matching of the flower part and its function?
A. sepals- protect buds, petals- attract pollinators, stamens-male, pistils- female
B. sepals- attract pollinators, petals-female, stamens-male, pistils-protect buds
C. sepals- male, petals-female, stamens-protect buds, pistils-attract pollinators
D. sepals-female, petals-male, stamens- attract pollinators, pistils-protect buds

29. Monarch butterflies have aposematic coloring. What does this mean?
A. They blend in with their environment.
B. They have three colors in the schematic.
C. They are brightly colored to warn predators of possible toxicity.
D. They can change their colors to match the environment.

30. Which of the following list of insects all go through complete metamorphosis?
A. dragonflies, lice, bees, wasps
B. grasshoppers, termites, dragonflies, cockroaches
C. flies, butterflies, bees, beetles
D. praying mantises, crickets, lice

31. The following insects all have a "queen" in their colony?

A. ants and termites
B. bees and wasps
C. dragonflies and damselflies
D. Both A and B

32. If an insect belongs to the order Hemiptera, then it may be a what?
A. bee B. bed bug C. wasp D. katydid

33. This disease occurs when the arteries harden and narrow due to the build-up of plaque on the walls of the arteries. What is it?
A. atherosclerosis B. congenital C. arrhythmia D. thrombosis

34. Josephine was having trouble breathing. Her respiratory passages were inflamed and swollen. She has mucous starting to collect in her lungs and the muscles that surround her bronchial tubes are tightening. What most likely is happening to Josephine?

A. She is hyperventilating.
B. She is having an asthma attack.
C. She is having a heart attack.
D. She is suffering from Graves' disease.

35. The canal on the side of most fish that is lined with special sensory structures is called what?

A. pectoral fin B. lateral line C. gill D. operculum

36. Which of the descriptive characteristics below is not one of fish?

A. vertebrate B. has gills C. invertebrate D. aquatic

37. What is a substance that is produced by living organisms that serves as a catalyst for chemical reactions in the body?

A. enzyme B. hormone C. plasma D. blood

38. What bird became extinct in 1914 through anthropogenic extinction?

A. Dodo bird B. passenger pigeon C. auk D. puffin

39. Complete this analogy: radius is to ulna as tibia is to _____.

A. fibula B. humerus B. femur C. clavicle

40. Chemosynthetic bacteria live in places such as which of the following?

A. underside of plant leaves
B. common soil
C. under fingernails
D. volcanic vents on the bottom of the ocean floor

41. A plant hormone that prevents a plant from losing its leaves, inhibits a plant from sprouting, and causes the buds and seeds to stay dormant during drought conditions is called what?

A. indole acetic acid B. ethylene C. abscisic acid D. stomata

42. Communal living is a common adaptation in many species of animals. By living in a group, the animals benefit by all of these except which one?

A. help with finding food
B. help with spreading viruses
C. defense against predators
D. help with raising the young

43. Barry was testing how long batteries would last. He used three different brands of batteries and timed how long they would continually keep working. How long did Battery C last?

A. 135.25 hours
B. 115.25 hours
C. 220.25 hours
D. 145.75 hours

Battery Brand	Start time	End time
A	Day 1 -noon	Day 10 – 4:15am
B	Day 1 -noon	Day 14 – 5:30pm
C	Day 1 -noon	Day 7 – 1:45pm

44. Janice's little sister was conducting an experiment to see what type of metals would rust when exposed to the air. She set up 4 jars and placed a different type of metal nail in each jar (aluminum, ferritic stainless steel, iron, and copper). Unfortunately, she forgot to write down which jar had which type of metal nail in it. After 2 weeks, she checked the jars and found these results. Also, she decided to check if it could be picked up with a magnet to help with identification.

Jar	2 weeks later (rust or no rust?)	Picked up by magnet?	Type of metal?
A	Yes, rust formed	yes	
B	No, but blue green color	no	
C	no, looked the same	yes	
D	no, looked the same	no	

Which jar had what type of metal nail in it?

A. Jar A-aluminum nail, Jar B-copper nail, Jar C-iron nail, Jar D-ferritic stainless steel
B. Jar A-copper nail, Jar B-ferritic stainless steel, Jar C- aluminum nail, Jar C-iron nail
C. Jar A- ferritic stainless steel, Jar B-iron nail, Jar C- copper nail, Jar D- aluminum nail
D. Jar A- iron nail, Jar B- copper nail, Jar C-ferritic stainless steel, Jar D- aluminum nail

45. Why did jar A rust?

A. it contained enough iron and was exposed to moisture and oxygen
B. the lid was left off that jar
C. a chemical change occurred
D. Both A and C

46. Which of the following rocks formed at the surface of the Earth, not underground?

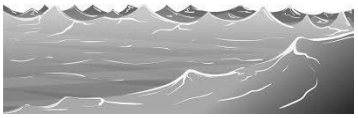
A. intrusive igneous rock
B. intrusive metamorphic rock
C. extrusive igneous rock
D. extrusive metamorphic rock

47. Earth's oceans contain about what percent of all the water on the planet?

A. 75 B. 56.5 C. 80.9 D. 96.5

48. Salt marshes, seagrass beds, and mangroves are important with what in our ocean ecosystems?

A. carbon sequestration and storage
B. carbon storage only
C. erosion control exclusively
D. none of these

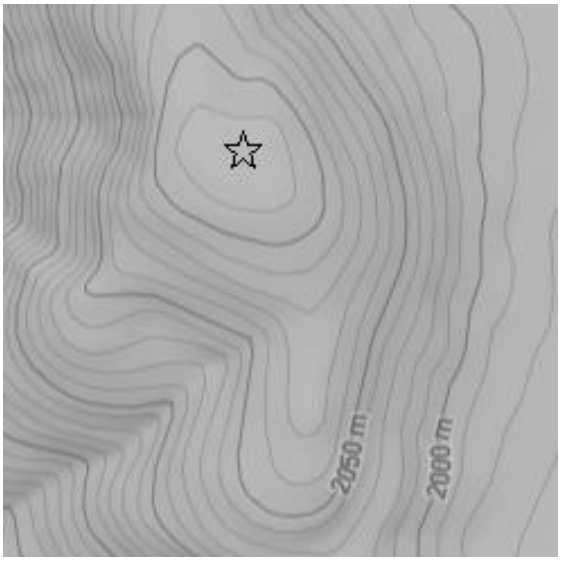


49. Which statement below is not true?

A. The moon's gravity affects tides on the Earth's oceans.
B. The moon reflects the light from the sun.
C. The moon rotates on its axis every 27.3 Earth days.
D. People in China and in the U.S.A. see different phases of the moon on the same day.

50. If each line on this map represents an equal rise in elevation, what elevation would the star on the map be?

A. 3000 m
B. 2075 m
C. 4020 m
D. 2110 m



2020 - 2021 TMSCA Middle School Science Test #11 - Key

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