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 # 7 ©

J A N U A R Y 1 6 , 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 #7

1. Geraldo planted a bean seed in a container of potting soil. He watered it regularly and before long, the bean grew to be 20 cm tall. Geraldo was wondering where the substance came from to compose the biomass that made up the bean plant. Which statement below is a reasonable explanation for his question?

A. The material to make the bean is a lot of carbon which came from the carbon dioxide in the air that was taken in for the process of photosynthesis.
B. The material to make the bean plant all comes from water that the plant absorbs and is then broken down through the process of photosynthesis.
C. The material to make the bean plant mostly came from the nitrogen in the soil.
D. The material to make the bean plant all came from within the seed only.

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

A. dragonfly B. butterfly C. bee D. beetle

3. What animal listed below is a herbivore when it's young and a carnivore when it's an adult?

A. opossum B. koala C. bullfrog D. beaver

4. This chemical reaction is an example of what type?

$2H_2O \rightarrow 2H_2 + O_2$

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

5. Bailey found an irregular shaped rock and wanted to find the density of the rock. She measured the mass to be 50 g. When she placed the rock in a graduated cylinder filled to the 50 mL mark, the water level rose to 65.7 mL. What mineral has the closest density to Bailey's rock?

A. gypsum B. quartz C. fluorite D. halite

DENSITY CHART

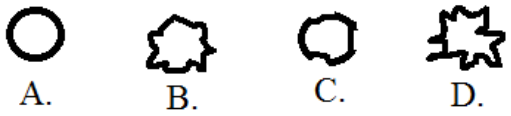
ALL DENSITIES ARE IN GRAMS PER CUBIC CENTIMETER

DENSITY	MINERAL
2 . 16	halite
2 . 32	gypsum
2 . 65	quartz
2 . 72	calcite
3 . 18	fluorite

6. In the prairie ecosystem, tall grasses, small shrubs, and various wildflowers are abundant. Can a prairie ecosystem be considered a climax community?

A. No, because there are no tall trees or forests.
B. No, because grass is never the final step in ecological succession.
C. Yes, because the climate may not allow for further succession; the ecosystem is stable.
D. Yes, because primary and secondary succession have both taken place in the prairie.

7. In geology class, students learn that sediments are made up of pieces of rock and can be carried by wind and water to new locations. Which sediment shown below has most likely traveled the furthest from its source?



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

A. dragonfly B. lady beetle C. moths D. scorpionfly

9. Which of the following processes involve a chemical change?

A. Dewdrops condensing on a plant in the early morning
B. Steam forming over a teapot on the hot stove
C. Dry ice "disappearing" after setting on a kitchen counter
D. Rust forming on an old bicycle that was left outside

10. Which of the elements below are found in the same period on the Periodic Table?

A. Lead and Tin
B. Iron and Cobalt
C. Calcium and Magnesium
D. Lithium and Sodium

11. What is the process of sediment being transformed into sedimentary rock?

A. lithification B. compaction C. sedimentation D. deposition

12. What are the atomic numbers of 3 electrolyte elements?

A. 6, 7, 9
B. 30, 48, 80
C. 1, 2, 3
D. 11,19, 20

13. I was an Austrian physicist who worked with radioactivity and nuclear physics. A colleague of mine, Otto Hahn, received a Nobel prize for work that we did, but I did not receive a Nobel prize. I do have an element named in my honor, number 109. Who am I?

A. Marie Curie
B. Rosalind Franklin
C. Katherine Johnson
D. Lise Meitner

14. This moon phase would be called what?

A. 1st quarter B. 3rd quarter C. waxing crescent D. waning gibbous

15. Which of the following is not a characteristic of the littoral zone in a body of water?
    A. sunlight penetrates to the bottom
    B. close to shore
    C. diversity of life
    D. extremely low dissolved oxygen

16. Bird eggs can come in different colors and patterns. If a bird egg is speckled and camouflaged such as a gull egg, it is most likely to be laid in what location?
    A. high in a spherical nest on a treetop
    B. inside the hole of a tree
    C. in a chicken coup
    D. on the ground

17. Scientists were trying to find out what causes locusts to gather in large groups (which can be devasting to crops). They know that insects emit pheromones that can communicate to others of their species. Knowing this, a group of scientists decided to try to locate the one chemical scent that these locusts use to aggregate. They isolated 6 scents that might be the possible one they use to get a group to gather together. They tested the scents on locusts separately to see if the locusts would gather in a large group. What would be the independent variable in this experiment?

    A. the time it took for the locusts to gather
    B. the number of locusts that gathered
    C. the room in which the testing was done
    D. the six types of scents

18. Which of the following is not a chemical change?

    A. red paper turning pink after being exposed to the sunlight
    B. rust forming on a bicycle
    C. boiling liquid water to form water vapor
    D. $C_2H_4O_2 + NaHCO_3 \rightarrow NaC_2H_3O_2 + H_2O + CO_2$

19. Which of the following statements below is true?
    A. A compound is made of exactly 2 different elements.
    B. An element is made of atoms of the same type.
    C. A molecule made of 3 atoms is called a diatomic molecule.
    D. Water molecule is made of two atoms of oxygen and one atom of hydrogen.

20. 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

21. Which characteristic(s) below belong to some amphibians?
    A. invertebrates
    B. develop in an amniotic sac
    C. can breathe through their skin
    D. all of these

22. Zane saw a sign on a gas station with an outline of a dinosaur. He pointed it out to his brother Zack. Zach said that gasoline is made from petroleum which comes from the remains of dinosaurs. Zane was confused because he didn't think that was true. Which brother is correct?
    A. Zane is correct, today's gasoline is formed from dinosaur remains
    B. Zach is correct, today's gasoline from petroleum was not formed from dinosaur remains
    C. Gasoline is a fossil fuel, so Zane must be correct.
    D. Neither are correct. Petroleum is formed in other ways.

23. Which bird below became extinct in the 17th century due to human interference?
    A. ivory-billed woodpecker
    B. Dodo bird
    C. passenger pigeon
    D. blue-footed booby

24. Which statement below about "what mineral will scratch what" is true?
    A. talc will scratch gypsum
    B. orthoclase will scratch corundum
    C. corundum will scratch topaz
    D. calcite will scratch apatite

25. Which statement about calcium is not true?
    A. Calcium has an atomic number of 20.
    B. Calcium's atomic mass is 40.08.
    C. The chemical symbol for Calcium is "Ca"
    D. Calcium is a member of Period 3.

26. All of these are factors that can lower the dissolved oxygen in bodies of water are listed below, except for which one?
    A. lack of agitation from wind or waves can lower dissolved oxygen
    B. too many fish for the size of the pond using the oxygen
    C. higher water temperatures hold less dissolved oxygen
    D. increase in photosynthesis from aquatic plants

27. A measure of 2 mechanical horsepower would equal how many watts?

A. 1,492 W B. 3,000 W C. 746 W D. 373 W

28. You and your friend are trying to move a big box located on the floor. You push on the box with a force of 25 N toward the door. Your friend pulls on the box with a force of 35 N toward the same door. What is the net force acting on the box by you and your friend?

A. 10 N to the door
B. 60 N to the door
C. 60 N away from the door
D. -10 N away from the door

29. Which of the following famous scientists did not contribute to work in the area of physics?

A. Isaac Newton
B. Hans Christian Oersted
C. Alexander Fleming
D. Robert Goddard

30. Cranial is to skull as femoral is to what?

A. breast B. chest C. thigh D. stomach

31. Oncology is to cancer as Hematology is to what?

A. blood B. liver C. brain D. bladder

32. Ryan was conducting an investigation to find out which areas in his home use the most water. For two weeks, he monitored the water use in the toilet, washing machine, dishwasher, shower, and kitchen sink. See his results in the chart.

On average, which area used the most water?

A. toilet
B. washing machine
C. shower
D. dishwasher

Areas	Week 1	Week 2	Average
Toilet	703	678	
Washing machine	290	265	
Dishwasher	44	39	
Shower	158	170	
Kitchen sink	10	18	
Totals	1,205	1,170	

33. Which area average composed 23% of total water average usage?

A. toilet B. washing machine C. dishwasher D. shower

34. What area average composed about 58% of the total water average usage?

A. toilet B. washing machine C. dishwasher D. shower

35. A complete set of genes or genetic material in an organism or a cell is known as a what?

A. genome B. allele C. chromosome D. enzyme

36. What are the two "paired" fins that are found on most fish?

A. pectoral and pelvic
B. dorsal and caudal
C. caudal and pectoral
D. pelvic and anal

37. This part of the circulatory system is close to almost every cell in the human body. They exchange gases, nutrients, and hormones from the blood to the body's cells. What are they?

A. veins B. arteries C. capillaries D. lymph nodes

38. Elements on the Periodic Table found in Group 8A are known as what?

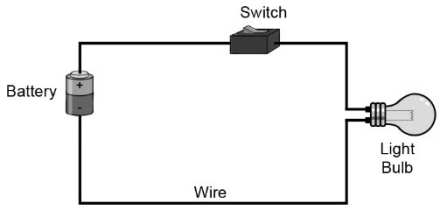
A. Halogens B. Alkali metals C. Noble gases D. Alkaline earth metals

39. Complete this analogy: Barbara McClintock is to corn as Thomas Hunt Morgan is to what?

A. fruit flies B. pea plants C. chimpanzees D. snails

40. This diagram represents a what? (light is on)

A. Closed electrical circuit
B. Parallel electrical circuit
C. Short electrical circuit
D. Both A and B



41. A carbon atom goes through a cycle and can be a part of many things in the cycle. Which of the following lists below shows places that a carbon atom might be?

A. power plant, swamp, coral reef
B. ozone, sodium, hydrochloric acid
C. gold, silver, tin, mercury
D. water, sand, marble, schist

42. Josephine got a note from an old friend who was angry with her and wrote some mean words. Josephine was so angry when she read the note, she ripped it into tiny pieces. Next, she wadded it up into a ball. And finally, she set the ball on fire with a match. Which statement below about this incident is true?

A. Only a physical change took place with the note
B. Only a chemical change took place with the note
C. Both a chemical change and physical changes took place with the note
D. No physical or chemical change took place with the note.

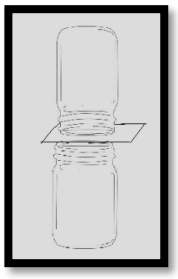
43. Which one of the following is not a correct unit of density?

A. kg per liter B. g per cm^3 C. g per mL D. kg per meter

44. When Jason got up to walk to school, it was hard to see too far ahead of him because of the dense fog. What type of cloud is fog?

A. stratus B. cumulus C. cirrus D. fog is not a cloud

45. A jar that was rinsed out with warm water and a jar that was rinsed out with cold water are placed mouth to mouth with an index card between them. The warm water rinsed jar was placed on the bottom and the cold rinsed jar on top. If smoke were placed inside the warm water rinsed jar and the index card was removed, what will the smoke do?



A. stay in the warm jar on the bottom of the stack
B. rise to the cold jar on the top of the stack
C. sink to the bottom of the warm jar on the bottom of the stack
D. nothing

46. The stigma, style, and ovary of a flower make up the what?

A. stamen B. pistil C. filament D. anther

47. Which is not a characteristic of mammals?

A. body covered in hair
B. four chambered heart
C. young nourished by milk from mammary glands
D. ectothermic

48. Jason was visiting his grandpa in the hospital. He heard the doctor mention a word with "pulmon" as part of it when he was talking about his grandpa's condition. Jason then assumed that his grandpa had a problem with what organ?

A. heart B. liver C. lungs D. pancreas

49. Which list below is a correct arrangement from shortest to longest wavelength in the electromagnetic spectrum?

A. infrared, visible light, ultraviolet, radio waves, microwaves, x-rays, gamma rays
B. radio waves, microwaves, infrared, visible light, ultraviolet, x-rays, gamma rays
C. gamma rays, x-rays, ultraviolet, visible light, infrared, microwaves, radio waves
D. radio waves, infrared, microwaves, ultraviolet, visible light, gamma rays, x-rays

50. Why do you get thirsty after eating a salty pretzel? When there is too much concentration of sodium and potassium in one's body fluids, a part of the brain triggers a feeling of thirst. What part of the brain is this?

A. medulla oblongata B. cerebellum C. hippocampus D. hypothalamus

2020 - 2021 TMSCA Middle School Science Test #7 – Key

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