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 ©

O C T O B E R 1 7 , 2 0 2 0

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.

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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

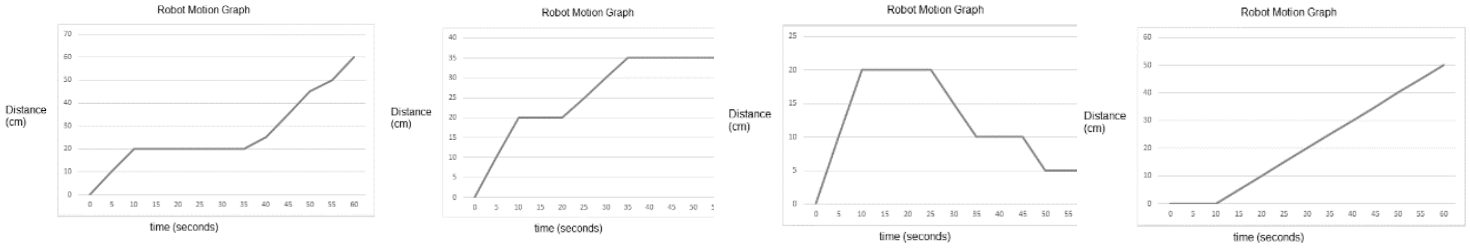
2020-2021 TMSCA Middle School Science Test #1

1. What was found in the rock layers between the Cretaceous and Paleogene Periods all around the world providing evidence of a possible species extinction theory?

A. Plutonium B. Uranium C. Iridium D. Iron

2. Elias built a small robot. He set the robot on a straight-line course to test how well it would move. First, his robot started off a fairly good pace, but then it had a problem and stopped. After not moving forward for a few seconds, it began moving again, but at a slower pace. Next, it completely broke and stopped moving. Which graph below shows the motion of Elias's robot?

A. B. C. D.



3. Repairman Bob had to pick up a broken air conditioner from a local store and deliver a new one. When he got to the store, there were 12 steps that he would need to climb. He could carry the 150-pound new air conditioner up the steps one at a time or he could use a ramp and slide the unit up the ramp. What should Bob do to reduce the amount of force needed to lift the air conditioner into the store?

A. take the steps, because using the ramp will not change how much work he will do
B. take the steps, because a ramp will just get in the way and will not reduce the force
C. use the ramp, because even though it will take more force, the distance will decrease
D. use the ramp, because it will reduce the amount of force to move the air conditioner unit

4. Which human body systems help with transporting oxygen and carbon dioxide?

A. Circulatory and Respiratory
B. Digestive and Endocrine
C. Integumentary and Skeletal
D. Endocrine and Digestive

5. Samuel found a box that had been buried 100 years ago in his backyard. When he dug it up, he found several metal items. Item A was rusty, item B was as shiny as it was 100 years ago, and item C was tarnished. Which of the following is most likely true about the items?

A. Item A has iron in it. Item B is gold. Item C is silver.
B. Item A is silver. Item B is stainless steel. Item C is gold.
C. Item A is gold. Item B is silver. Item C is stainless steel.
D. Item A has iron in it. Item B is silver. Item C is gold.

6. Which of the elements below can be used as a disinfectant?

A. Chlorine B. Iodine C. Bromine D. All of these

7. What is not a commonly listed advantage for recycling metal?

A. conserves natural resources
B. reduces landfill wastes
C. emits more carbon dioxide to atmosphere
D. uses less energy in processing

8. What part of an atom is electrically negative?

A. neutron B. electron C. proton D. nucleus

9. Which reason below best explains why we should keep our ozone layer around Earth?

A. The ozone layer is important in the process of photosynthesis.
B. The layer of ozone gas reflects heat energy back to Earth helping to warm our planet.
C. Ozone is made of oxygen which we need to breathe in order to stay alive.
D. The ozone gas absorbs most of sun's UV radiation which damages DNA in living cells.

10. In science lab, Janell's group had been given 4 wooden solid cubes of equal size and shape. (4.5cm by 4.5cm) Their task was to identify the type of wood for the cubes' composition. On first look, the cubes looked exactly the same, except each was painted with a different color, yellow, red, blue, and green. Using the information given below in the charts, what should their answer be?

A. Yellow (Ash), Red (Bamboo), Blue (Aspen), Green (Cedar)
B. Yellow (Aspen), Red (Cedar), Blue (Bamboo), Green (Ash)
C. Yellow (Bamboo), Red (Ash), Blue (Cedar), Green (Aspen)
D. Yellow (Aspen), Red (Bamboo), Blue (Ash), Green (Cedar)

Cube color	**Mass**	**Side**
Yellow	38.3 g	4.5 cm
Red	29.2 g	4.5 cm
Blue	64.7 g	4.5 cm
Green	45.6	4.5 cm

Tree type	**Wood Density**	**Color?**
Ash	.71 g/cm^3	
Aspen	.42 g/cm^3	
Bamboo	.32 g/cm^3	
Cedar	.50 g/cm^3	

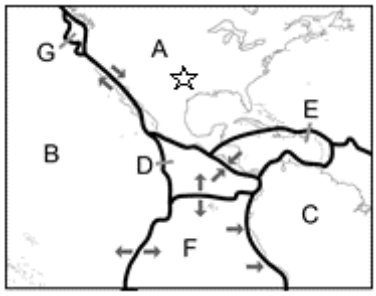
11. Using the information from Janell's cube ID task above, which of the cubes would float on water?

A. blue and green
B. red and yellow
C. none of them will float
D. both A and B

12. Propane fuel is commonly used in cooking and heating. What is its chemical formula?

A. CO_2 B. $C_6H_{12}O_6$ C. $C_6H_8O_7$ D. C_3H_8

13. The diagram to the right is a map showing some of the tectonic plates of the world. Which list below correctly names plates A, B, and C?



A. A- Eurasian, B-Atlantic, C- Africa
B. A-Asian, B-Pacific, C-Australian
C. A – Juan de Fuca, B- San Andreas, C-Arabian
D. A-North American, B- Pacific, C- South American

14. According to the diagram, what type of plate boundary is happening between plate B and A?
A. convergent B. divergent C. transform D. extensional

15. According to the diagram, what type of plate boundary is happening between plate D and F?
A. convergent B. divergent C. transform D. extensional

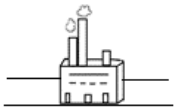
16. Choose the best true or false answer for this statement. The type of material used in making a guitar string affects the frequency and pitch of the sound made when it is plucked.
A. True, the denser the material, the slower the string will vibrate
B. False, the density of the material does not affect the sound
C. False, the type of material only affects the tension
D. True, the denser the material, the faster the string will vibrate

17. The Golgi apparatus in a cell does which of the following?
A. provide energy
B. modify proteins
C. control reproduction
D. provide the interior framework for the cell

18. 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. Fragmentation C. Sexual D. Budding

19. When a scientist gathers data during research through observation and experimentation this is called what?
A. variance data B. controlled variables C. empirical data D. theoretical curves

20. Which list below contains some naturally occurring carbon sinks?
A. ocean, plants, soil
B. valleys, canyons, trenches
C. mines, wastewater plant, windmills
D. fossil fuels, forest fires, respiration



21. Name the element that has 50 protons and in group 4A on the Periodic Table.
A. Tin B. Antimony C. Strontium D. Selenium

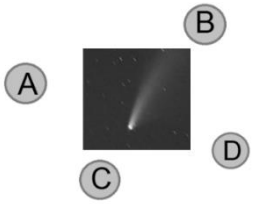
22. The primary function of a flower on a plant is carry out what?
    A. seed dispersal B. photosynthesis C. water collection D. reproduction

23. Leucism, albinism, melanism, and xanthochroism have which of the following in common?
    A. all involve the study of invertebrates
    B. are characteristics of a specific turtle species
    C. color variations in organisms
    D. have nothing in common

24. During what stage of mitosis, do the chromatids (chromosomes) move to opposite poles of the cell? A. Anaphase B. Prophase C. Interphase D. Metaphase

25. An atom or molecule that has an electric charge due to the loss or gain of one or more electrons is called what?
    A. positive B. transient C. isotope D. ion

26. Where would the location of the sun most likely be in relationship to this comet?
    A. position A
    B. position B
    C. position C
    D. position D



27. I lived during the time of 287 to 212 B.C. I discovered that if you place an object in water, it will displace a volume of water that is equal to its own volume. Who am I?
    A. Eureka B. Alvarez C. Boyle D. Archimedes

28. Which statement about genetics is true?
    A. The more complex an organism, the more genes that is contains.
    B. There are 23 pairs of chromosomes in human somatic cells.
    C. Both steps of gene expression take place inside the nucleus of the cell.
    D. Transcription takes place outside the nucleus of a cell.

29. Evidence suggests and most scientists agree that the Earth formed about how long ago?
    A. 93 million years ago
    B. 4.6 billion years ago
    C. 500 billion years ago
    D. 8,000 years ago

30. In geology, the term “unconformity’ is used when what?
    A. lava flows cut through younger layers
    B. rock layers are missing in a geologic cross-section
    C. unusual weathering patterns in the rock
    D. scientists don’t agree on what formed the rock

31. Anthropogenic factors would include what example below?

A. drilling oil wells B. hurricanes C. atmospheric pressure D. excessive rainfall

32. The SI unit for measuring energy or work is what?

A. Newton – N B. Pascal – Pa C. Farad – F D. Joule – J

33. The asteroid belt falls between what two planets in our solar system?

A. Mars and Jupiter B. Earth and Mars C. Venus and Earth D. Jupiter and Saturn

34. What process is illustrated by the steps shown below?

A. the translation of DNA
B. transcription
C. the making of mRNA
D. both A and C

35. It's daytime and the moon is blocking the sunlight from where you are standing. You are experiencing a what?

A. solar eclipse B. lunar eclipse C. gibbous moon D. waxing moon

36. Jared wanted to help his mom and dad with the recycling of plastic bottles. His mom asked him to wash out the bottles before putting them in the recycling bin. While Jared was washing the bottles with hot water, he noticed that when he returned the lid to the empty bottle and set it aside, the bottle would contract and look like it had been squished. What was causing this phenomenon?

A. the warm air in the bottle was contracting and taking up less space
B. cheap plastic bottles
C. differences in air pressure on the inside and outside of the bottle
D. a change in the barometric pressure because of an incoming warm front

37. According to NASA, asteroids are classified by composition into three main groups. Which of the following is not one of these groups?

A. C (chondrite) type
B. S (stony) type
C. M (metallic) type
D. P (pallasite) type

38. A toy model of the SpaceX rocket was resting on a top shelf. The rocket is in a state of equilibrium. The force applied by gravity on the rocket on the shelf and the force applied by the shelf to the rocket 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 rocket on the shelf is slightly more than the force of the shelf to the rocket.
D. The force the shelf applies to the rocket is more than the force of gravity on the rocket.

39. Out of the following waves on the electromagnetic spectrum, which has the lowest amount of energy?

A. ultraviolet light B. infrared waves C. gamma rays D. radio waves

40. Which person below was a Swedish chemist and also is noted for inventing dynamite?

A. John Dalton B. Dimitri Mendeleev C. Antoine Lavoisier D. Alfred Nobel

41. Which of the following statements is true?

A. Genes are located on chromosomes.
B. Males have two X chromosomes.
C. Genes determine the language you speak.
D. The number of chromosomes is the same in all organisms.

42. Which of the following is not a characteristic of the halogens?

A. highly reactive
B. highly electronegative
C. may be harmful to biological organisms
D. can only be found in a gas state of matter

43. What was created to help chemists connect the large-scale world with the particulate world of atoms, molecules, and ions?

A. the mole unit B. chemical recipes C. balanced equations D. periodic table

44. Look at the chart showing the change in temperature over time for water heated in a beaker on a hot plate. Extrapolate what the temperature would most likely be at 8 minutes with the trend.

A. 70 B. 83 C. 60 D. 150

Time (minutes)	Temperature (degrees C)
0	18
1	23
2	28
3	37
4	45
5	56
6	67

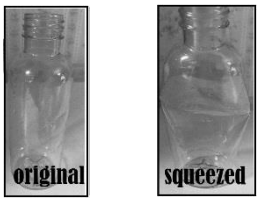
45. When layers of sedimentary rock are formed over time, the older layers of rock are deeper down in the Earth except when?

A. the law of superposition takes place
B. some event has disturbed the layers
C. it happens in the ocean floor
D. none of the above

46. Because of a variety of reasons, the “penny” is no longer made of just copper. Since 1982, the United States has been making pennies that are about 98% what?

A. Nickel B. Aluminum C. Tin D. Zinc

47. Izzy wanted to find out if a plastic bottle (with no cap) when squeezed, has a different circumference/distance around it. She placed a thin string around several different plastic bottles at the widest part of the bottle and measured the length of the string. She tried to place the string so that there were no gaps between the string and the bottle sides. Next, she squeezed the bottles in the same manner each time and measured again using the string. What would be a reasonable conclusion to her investigation?



Bottle	Length of string around bottle (cm)	Length of string around squeezed bottle (cm)
A	21.3	21.5
B	15.6	15.3
C	17.9	18.3

A. The distance around the squeezed bottles slightly decreased from the original bottle which shows that squeezing a bottle will change the distance around it.
B. The distance around the squeezed bottle slightly increased from the original bottle which shows that squeezing a bottle removes the air and causes the distance around to be longer.
C. The distances stayed the same when rounded to nearest whole number.
D. The amount of plastic that forms the bottle does not change; therefore, the distance around remains the same. Measurement differences are most likely due to human errors.

48. In Izzy's experiment, what is the dependent variable?
A. the length of the string (distance around bottle)
B. the manner of squeezing
C. the type of bottles (A, B, C)
D. whether the lid is on or off the bottle

49. Is the squeezing of the bottles a chemical or physical change?
A. neither a chemical or physical change
B. chemical, because the air is displaced
C. physical, because only the shape is changed
D. both a chemical and physical change

50. When discussing ecological succession, is it possible for a prairie to 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 primary and secondary succession have both taken place.
D. Yes, because the climate may not allow for further succession; the ecosystem is stable.

2020 - 2021 TMSCA Middle School Science Test #1 - Key

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