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

S C I E N C E

K I C K - O F F T E S T ©

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.

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 Kick-off Test

1. Which statement about burrowing owls is not true?

A. their habitat is found in prairies, deserts, and agricultural areas
B. they place animal dung at the entrance of their burrows before laying eggs
C. if a human touches a baby owl, the parents will abandon it because of smell
D. they have a higher tolerance to carbon dioxide levels than other birds

2. Nickolas conducted a science project in which he tested the soil in different regions of his city. He wanted to find out if there was a difference in the lead residue content of the soils. It is most important that he does what?

A. take a photo of each sample
B. place the soil samples in non-contaminated containers
C. get a friend to help him with the project
D. use the same shovel at each site to collect the soil

3. Luis was investigating whether the type of floor affects the bounce of a basketball. He bounced a basketball on 3 different surfaces (wood, concrete, and rubberized) and wrote down his personal observations of how the bounce felt. He came to the conclusion that basketballs bounce better on the wood floor. What important part(s) are missing from his investigation for it to be more definitive?

A. the brand of basketball he used
B. the location where he did the testing
C. the amount of air that is in his basketball
D. quantitative data from the investigation

4. The human genome project was completed in June of 2000. What was the human genome project?

A. International competition to find the structure of DNA
B. a global effort to collect DNA from all humans on the planet
C. a project to study human genes and how they have changed
D. worldwide project with a goal of mapping all of the genes of human beings

5. I developed the theory that infections are caused and spread by microorganisms. I developed a vaccine for rabies. I invented a way to kill microorganisms found in milk. Who am I?

A. Oersted B. Salk C. Watson D. Pasteur

6. Which of the following is an artificial satellite of Earth?

A. International Space Station B. the atmosphere C. the Moon D. the Sun

7. What element makes up about 78% of the Earth's atmosphere?

A. Oxygen B. Nitrogen C. Hydrogen D. Helium

8. In a satellite elliptical orbit, the closest approach to the planet is called the _____ and the farthest point of the satellite orbit is called the _____.

A. perigee, apogee
B. parallax, azimuth
C. azimuth, parallax
D. apogee, perigee

9. Caleb loves to see the hummingbirds come to feed on flowers in his garden. Because of his interest, he decided to conduct an experiment to see if there is a correlation between time of day and number of hummingbirds feeding on various types of nectar producing flowers. What are the most important observations Caleb should record in his journal for his experiment?

A. time the birds are observed feeding, number of birds observed, type of flowers
B. type of flower the birds are feeding on, weather conditions
C. number of birds observed feeding, species of birds, color of flowers
D. time the birds stay at each flower, drawings of the birds

10. During the time of a pandemic, experts talk about "flattening the curve". What does this mean?

A. This involves increasing the number of positive virus cases so that the graph evens out with all communities.
B. This involves slowing the rate of infection of the virus in the community to reduce the climbing rate of positive cases which aids with healthcare facility capacity.
C. This involves making sure that all the positive virus cases are in the local healthcare facilities so that the virus can be controlled at a more even rate.
D. This involves reducing the number of virus tests that are being taken in the community.

11. What is the SI unit and symbol for measuring electrical resistance?

A. ohm – Ω B. watt – W C. pascal – Pa D. farad - F

12. In a wind turbine, the motion of the blades causes the generator to turn which begins the electrical current. What energy transformations are occurring with these actions?

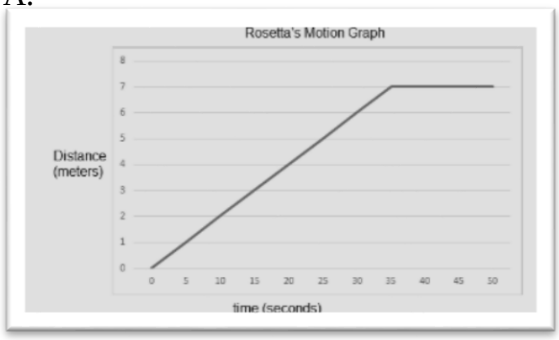
A. electrical energy to potential energy to heat energy
B. kinetic energy to potential energy to electrical energy
C. mechanical energy to mechanical energy to electrical energy
D. chemical energy to mechanical energy to electrical energy

13. Which list below shows what are considered to all be nonrenewable resources?

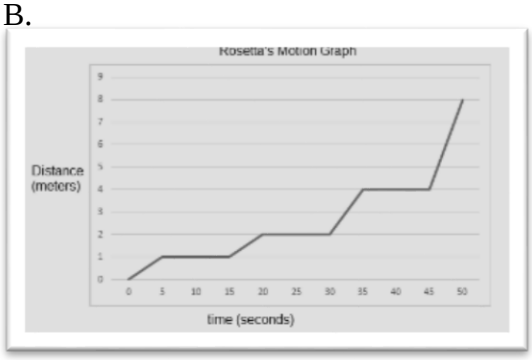
A. wind, solar, biofuels
B. ethanol, biogas, clean coal
C. coal, oil, natural gas
D. minerals, sunlight, nuclear

14. Rosetta was excited about using the motion detector for making graphs in science class. Her teacher instructed her on how to use it and then told her to walk a sample path. First, she walked forward 1 meter, then stopped, then she walked backward 1 meter, and stopped. Next, she walked at a fast pace forward 8 meters. Which graph below shows the results of Rosetta's walk?

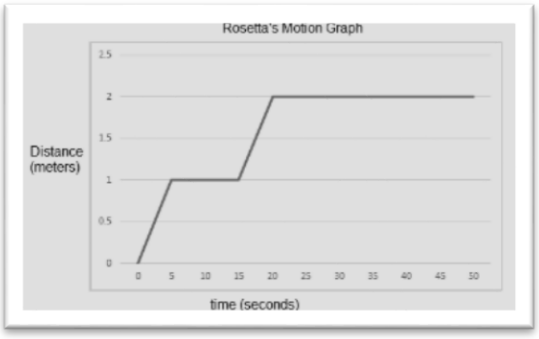
A.



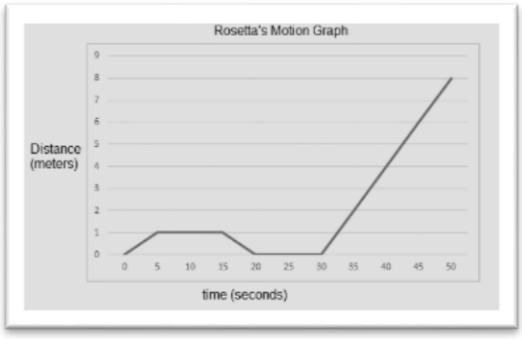
B.



C.



D.



15. Danielle's class was learning about potential and kinetic energy. They built a miniature roller coaster for a marble. At what place on the roller coaster will the marble have the most gravitational potential energy?

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

16. Which of the following is not considered a simple machine, but is a compound machine?

A. inclined plane B. screw C. pulley D. scissors

17. Farmers in the state of Iowa recently reported widespread damage to their corn crops in which complete fields of almost ready to harvest corn were "flattened" by a phenomenon after a storm came through their area. What is most likely the cause of this damage to the crops?

A. a derecho B. a series of waterspouts C. delinquent aliens D. a tsunami

18. A scientist that studies the atmosphere and conditions is called a what?

A. Climatologist B. botanist C. cytologist D. meteorologist

19. One base is missing from this list of bases that make up DNA. Which one is missing? Cytosine, thymine, adenine, and what?

A. uracil B. phosphate C. ovaltine D. guanine

20. While walking on a cool October morning, Cassie saw a spider web that was covered with water droplets, called "dew". What is needed for dew to form?

A. The amount of water vapor in the air is sufficient
B. The air temperature has reached the correct temperature
C. The barometric pressure has fallen to acceptable levels
D. Both A and B

21. What type of air mass would form over the Gulf of Mexico and move north?

A. Maritime tropical B. Maritime polar C. Continental tropical D. Continental polar

22. Which of the following scientists made a major contribution in the field of chemistry?

A. Stephen Hawking B. Marie Curie C. Alfred Wegener D. Ptolemy

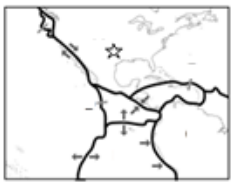
23. What is the best method to identify which mineral is calcite and which is feldspar?

A. Check to see which one will sink in water.
B. Color is always a good way to tell minerals apart.
C. Check to see if they can be picked up by a magnet.
D. Put a few drops of vinegar on each. The calcite will bubble, and feldspar will not.

24. When the moon is at 1st quarter or last quarter phase, which of these happens on Earth?

A. Neap tides B. Lunar eclipse C. Solar eclipse D. Spring tides

25. The star on this map represents Texas. What is the proper name of the tectonic plate Texas rests on?



A. Caribbean
B. Lone star plate
C. Juan de Fuca
D. North American

26. Which statement below is not a reason that birds sing?

A. proclaim and defend territory
B. to attract a mate
C. to communicate
D. to regulate their body temperature

27. Which statement below about Monarch butterflies is not true?

A. Monarch butterflies are classified in Nymphalidae family
B. the super generation of Monarch butterflies can travel up to 3,000 miles
C. Monarch butterflies have reduced forelegs that are "brush-like"
D. all Monarch butterflies live about 1 month

28. A scientist who would be familiar with mitochondria, lysosomes, Golgi apparatus, endoplasmic reticulum, and other organelles would most likely be a what?

A. Cytologist B. Epidemiologist C. Ethologist D. Analytical chemist

29. I discovered that white light is composed of all the colors of the rainbow. I also developed calculus. I lived in the late 17^{th} and early 18^{th} century. Who am I?

A. Mendeleev B. Newton C. Meitner D. Gauss

30. Roberta likes to explore near a creek by her home. One day she found some interesting looking small towers build out of mud. What are these mud towers?

A. small volcanoes formed by geologic activity
B. homes for crayfish
C. paper wasp houses
D. landforms created by erosion and weathering

31. An atom contains 12 neutrons and has an atomic mass of 23. What element is this?

A. Calcium B. Vanadium C. Chlorine D. Sodium

32. The principal was concerned about the light intensity in the classrooms and how if affected student performance in class. She decided to measure the light intensity in each classroom. What measurement unit could she use?

A. micron B. lux C. ampere D. decibels

33. Arif and Afan were working together on a science project. They wanted to know the light intensity in different areas of their city at night at three times to see what area would have the best star gazing. They collected the data in the chart below.

Park Name	**10:00pm Light intensity (lux)**	**Midnight Light intensity (lux)**	**2:00am Light intensity (lux)**
William's Park	380	307	300
South Creek Park	420	411	408
Red Cedar Park	315	315	279

According to this data, which park would have the best star gazing and at what time?

A. South Creek, 10:00pm
B. William's, 2:00am
C. South Creek midnight
D. Red Cedar, 2:00am

34. A domain of life that includes single-celled organisms that usually live in harsh environments is called what?

A. archaea B. eukarya C. protozoa D. unicellular

35. I specialized in the study of the genetics of plants, specifically corn. I found out that genes can switch their positions on chromosomes and won a Nobel Prize in 1983. Who am I?

A. McClintock B. Mendel C. Beadle D. Morgan

36. When writing a scientific name for an organism, you should do what?

A. always use capital letters
B. capitalize the genus, but not the species
C. write the species name first, then genus
D. Both A and C

37. White-nose syndrome in bats causes bat to die because why?

A. it disrupts their digestion and disturbs the bacteria balance in their intestines
B. it disturbs their hibernation and which causes them to use up too much energy
C. it infects their nose which causes them to suffocate
D. it affects their heart muscle and causes a cardiac arrest

38. What is a difference between millipedes and centipedes?

A. Centipedes have 100 legs and millipedes have 1,000 legs.
B. Centipedes are harmless and millipedes has a painful bite.
C. Centipedes are in the class Chilopoda and millipedes are in the class Diplopoda.
D. They are the same organism, just a different common name for them.

39. All of the following correctly describe a comet except for which one?

A. tail is composed of small rocks like Saturn's rings
B. core and coma form the head
C. orbit the sun
D. tail always points away from sun

40. Oxygen has three naturally occurring stable isotopes. Which means what?

A. Oxygen atom can have 8, 9, or 10 electrons in its nucleus with 9 protons.
B. Oxygen atom can have 8, 9, or 10 neutrons in its nucleus with 8 protons.
C. Oxygen atom can have more than 1 neutron for every 3 protons.
D. Oxygen atom can bond with only 3 other elements in nature.

41. Complete this analogy: wildebeest is to savannah as bison is to _____.

A. rainforest B. prairie C. tundra D. mountains

42. Many times, paleontologists can learn by the fossilized waste left behind from ancient creatures. What are these specimens called?

A. impressions B. coprolites C. dendrites D. concretions

43. Complete this analogy: beaver is to wetland as sea star is to _____.

A. river B. swamp C. reef D. tidal plain

44. According to evidence we have collected about the moon, which statement below about the moon is true?

A. the moon phases take 31 days
B. each year, the moon moves an inch closer to Earth
C. the moon is older than the Earth
D. the same side of the moon is always facing Earth

45. Entomology is the study of what?

A. birds B. insects C. the three groups of Diptera D. only ants and their allies

46. In order to demonstrate transpiration, you could do what?

A. watch a puddle of water on a warm sunny day
B. watch a car windshield "fog up" on a cold morning as you breathe
C. put a leaf in a glass of water and observe it give off bubbles
D. put a plastic bag over a leaf on a warm day to trap water droplets

47. Centipedes belong the Class – Chilopoda. What does the prefix "chilo" mean?

A. lip B. pain C. two D. dark

48. Gwendolynn was conducting a population count of people in her area to see if they were able to taste the chemical PTC (phenylthiocarbamide). In the past, results had shown that in her area, the majority of people were able to taste the chemical. According to her results, how many people in Region 2, were able to taste PTC?

A. 27.5
B. 55
C. 5,500
D. 145

Region	Participants	% Non-tasters of PTC
1	251	32.7
2	200	27.5
3	400	32.2
4	203	25.6

49. What would be a reasonable conclusion to reach based on her data? (Gwendolynn's)

A. In only 2 of the 4 regions studied, the percentage of tasters were above 30%.
B. In the 4 regions, the majority of people tested had the genetic ability to taste PTC.
C. At most, 25% of the participants could not taste PTC.
D. In the 4 regions studied, the people who could taste PTC most likely were not truthful.

50. Using the data from above, what would be a reasonable estimate for the number of non-tasters if there was a fifth region of the same area?

A. 28.3% B. .05% C. 39% D. 100%

2020 - 2021 TMSCA Middle School Science Kick-off Test - Key

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