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 M E E T ©

2 0 1 8 - 2 0 1 9

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							8B									A
1 H 1.008	2A											3A	4A	5A	6A	7A	2 e 4.003
3 Li 6.941	4 Be 9.012											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 23.00	12 Mg 24.31	3B	4B	5B	6B	7B				1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	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 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)		109 Une (267)									

Lanthanides	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
Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	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 (260)

OTHER USEFUL INFORMATION

Acceleration of gravity at Earth's surface, $g = 9.81\ m/s^2$

Avogadro's Number, $N = 6.02 \times 10^{23}$ molecules/mole

Planck's constant, $h = 6.63 \times 10^{-34}$ J•s

Planck's reduced constant, $\hbar \equiv {}^{h}/_{2\pi} = 1.05 \times 10^{-34}$ J•s

Standard temperature and pressure (STP) is 0°C and 1 atmosphere

Gram molecular volume at STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^{8}$ m/sec

Absolute zero = 0 K = –273.15°C

Gas constant, R = 1.986 cal/K•mole = 0.082 liter•otm/K•mole

One Faraday = 96,500 coulombs (9.65×10^{4} C)

Dulong and Petit's constant = 6.0 amu•cal/gram•K

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

Atomic mass unit, $m_a = 1.66 \times 10^{-27}$ kg

Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K

Permittivity of free space $\varepsilon_0 = 8.85 \times 10^{-12}\ C^2/N \cdot m^2$

Permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ T•m/A

1 Atmosphere = $1.02 \times 10^{5}\ N/m^2$ = 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

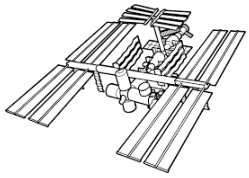
1 au = 931.5 MeV

1 calorie = 4.184 Joules (J)

Specific heat of water = 4.18 J/g•°C

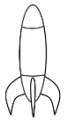
2018 – 2019 TMSCA Middle School Science Kick Off Test

1. Mark and Scott Kelly were both astronauts for NASA and are also identical twins. NASA conducted an experiment with Scott Kelly spending about a year on the International Space Station, while his brother, Mark, stayed on Earth. Afterwards, their DNA was compared for differences. What would any differences in their DNA be called?



   A. dependent variable
   B. independent variable
   C. controlled variable
   D. hypothesis

2. Destiny's class was learning about Newton's Laws of Motion. They were launching rockets that they built in class. Destiny learned that when the rocket was placed on the launch pad, it would not go anywhere until an unbalanced force acted upon the rocket. Which law of motion does this illustrate?



   A. Newton's first law
   B. Newton's second law
   C. Newton's third law
   D. None of the above

3. A mountain lion was observed near a lake. This mountain lion was unusually all black in color. What is this condition called?
   A. leucism B. melanism C. albinism D. xanthochromism

4. Which two sciences areas of study would be most important to a paleontologist?
   A. physics and biology
   B. chemistry and physics
   C. geology and chemistry
   D. biology and geology

5. 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. none of these

6. During a lab, students were trying to identify 4 unknown white substances. Here are the results of their tests:

Substance	Reacts with water added	Reacts with vinegar added	Turned dark with iodine
A	no	yes	no
B	no	no	yes
C	no	no	no
D	yes	yes	no

According to these results, which list below is most likely correct?

   A. Substance A is baking soda, B is cornstarch, C is sugar, and D is baking powder
   B. Substance A is cornstarch, B is sugar, C is baking powder, and D is baking soda.
   C. Substance A is sugar, B is baking powder, C is baking soda, and D is cornstarch
   D. Substance A is baking powder, B is baking soda, C is cornstarch, and D is sugar.

7. When coral along the Great Barrier Reef near Australia stay too warm for an extended amount of time, this heat wave can cause them to eject the algae that live inside them. Which of the following is a result of this happening?

A. The coral flourishes and grows new branches.
B. The coral goes through the next stage in their life cycle.
C. The coral may turn bone-white and die.
D. The algae die immediately.

8. 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

9. 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

10. Name the element that has 50 protons and in group 4A on the Periodic Table.

A. Strontium B. Tin C. Antimony D. Selenium

11. A tick called "the longhorn tick" has been causing problems for livestock in several states. This tick originally from East Asia reproduces in an unusual way. The female lays eggs that hatch into healthy offspring even though they have not been fertilized by a male. This is known as what?

A. Parthenogenesis
B. Fragmentation
C. Oogenesis
D. Embriosis

12. All of the following are true about the Axolotl except for which of the following?

A. It is an amphibian that has amazing regenerative abilities.
B. It is an amphibian that is critically endangered.
C. It is an amphibian that is an example of neoteny.
D. It is an amphibian that lays eggs as a reptile.

13. In the electromagnetic spectrum, waves are arranged by the size of the wavelengths. Which list below is a correct arrangement from longest to shortest wave?

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, infrared, ultraviolet, visible light, microwave, radio waves
D. radio waves, infrared, microwaves, ultraviolet, visible light, gamma rays, x-rays

14. Which of these would make a good insulator of electricity?

A. copper pan
B. sea water
C. gold ring
D. diamond

15. If an elephant and a mouse were both dropped from a 20-story building at the same time (hypothetically of course, it would be cruel otherwise) with no air resistance, which one would hit the ground first?

A. The elephant has a greater mass and would hit the ground first.
B. The mouse has a smaller mass and would hit the ground first.
C. Both the elephant and the mouse would hit the ground at the same time.
D. The elephant would fall faster at first than the mouse because it has a greater mass, but the mouse would eventually catch up because of its smaller size and would hit first.

16. A free-falling object only under gravity's pull has a downward acceleration of what on Earth?

A. 9.8 m/s^3
B. 10 x 8 cm/s^2
C. 9.8 m/s
D. 9.8 m/s^2

17. The prefix "ign" is Latin with what meaning?

A. Under B. Begin C. Fire D. Death

18. What is a pre-stellar object that radiates infrared radiation, but is not hot enough to begin nuclear fussion?

A. Black hole
B. Neutron star
C. Red dwarf
D. Protostar

19. Which of the following scientists listed below, did not make their contribution to Astronomy?

A. Annie Jump Cannon
B. Nicolas Copernicus
C. Edmund Halley
D. Mary Leakey

20. Complete this analogy: cardiac is to heart tissue as smooth is to _____ tissue.

A. stomach B. skin C. nervous D. blood

21. If an artery that carries oxygen rich blood to the brain is somehow blocked, what event could occur?

A. heart attack B. high blood pressure C. pulmonary embolism D. stroke

22. Complete this analogy: wildebeest is to savannah as polar bear is to _____.

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

Density is a physical property that can help with Identification. Lee has a mineral that has a mass of 139.2 g and a volume of 60 mL. What would most likely be his mineral?

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

23.

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

24. Which Ecoregion of Texas listed below receives the least amount of annual rainfall?
    A. Edward's Plateau
    B. Rolling Plains
    C. Pineywoods
    D. Trans Pecos

25. A measure of 4 mechanical horsepower would equal how many watts?
    A. 2,984 W
    B. 3,000 W
    C. 746 W
    D. 373 W

26. When Mendeleev first developed his periodic table, he left many places blank or put a dash in the spot because he realized that there were what?
    A. elements with names too long to fit in his chart
    B. elements with valence electrons that were positively charged
    C. undiscovered elements that should go in that spot
    D. all of these

27. Maria was building a volcano for her science project. She wanted to build a volcano that erupted just like Mt. St. Helens did in 1980. What type of volcano should she build?
    A. shield B. lava dome C. cinder cone D. stratovolcano

28. If 1 gram calorie is equal to 4.184 Joules, about how many gram calories would 10 Joules equal?
    A. 2.39 B. 41.84 C. 20 D. none of these

29. Reed measured the wind speed to be 45.7 kpm. What instrument did he most likely use to get this

measurement?

A. barometer B. psychrometer C. anemometer D. hygrometer

30. Organisms that are the first species to inhabit a rocky area on the Earth's surface would benefit most by being which of these?

A. heterotrophic B. autotrophic C. eukaryotic D. somatic

31. A paleontologist found a small fossil of a tooth and couldn't tell if it had serrated edges or not. What tool should she use to check?

A. stereoscope
B. petri dish
C. graduated cylinder
D. autoclave

32. Who was the first woman to receive the Nobel Prize (1903)?

A. Caroline Herschel
B. Barbara McClintock
C. Rosalind Franklin
D. Marie Curie

33. In the microbiology lab, the researcher was getting ready to start an experiment that involved growing a particular strain of bacteria. What tool would she use to contain the colony growth?

A. Petri dish
B. stereoscope
C. spectrometer
D. autoclave

34. Which scientist below made contributions to the discovery of CFC's effect on ozone layer?

A. Alfred Wegener
B. Albert Einstein
C. Gregor Mendel
D. Mario Molina

35. What is one of the purposes of the Parker Space Probe going to the sun?

A. To find out how energy and heat move through the solar corona
B. To find out how far the sun is from the Earth
C. To find out what the sun is made of
D. To find out why the sun's surface is hotter than the corona

36. Which statement about oxygen is not true?

A. Air has more oxygen than water at the same temperature.
B. Oxygen is the 8^{th} element on the Periodic Table.
C. Oxygen has an atomic mass of 8.
D. Oxygen makes up 21% of Earth's atmosphere.

37. Scientists know the temperature of a substance is 30 degrees Celsius. What would this be converted to Kelvin?

A. 272.4
B. - 405
C. 303.15
D. It cannot be converted to Kelvin.

38. Complete this analogy: battery: flashlight mitochondrion: _____.
A. vacuole B. lysosome C. cell D. nucleus

39. If a calcium atom has 20 protons, how many neutrons does a neutral calcium atom have?
A. 20 B. 11 C. 12 D. 23

40. Jadeite was used in a popular glassware. One collector's piece has a density of 3.33 g/cm^3 and a mass of 30g. What would approximate volume of this piece equal?
A. 9 cm^3
B. .111 cm^3
C. 99.9 cm^3
D. 12 cm^3

41. Jason was looking for an element that is a non-metal and contains 9 protons. What would be the element that Jason is looking for?
A. Fluorine B. Beryllium C. Chlorine D. Argon

42. Cells come in all sizes and shapes. What is the largest cell in the human body?
A. blood cell
B. skin cell
C. sperm cell
D. female egg cell

43. Which of the following statements about the Coriolis force is true?
A. The Coriolis force applies to sessile objects.
B. The Coriolis force is zero at the equator.
C. The Coriolis force is weakest at the poles.
D. Storms in the south swirl counter-clockwise.

44. Cnidarians are interesting invertebrates with radial symmetry. Which of the following is a cnidarian?
A. jellyfish
B. sponge
C. amoeba
D. planarian

45. Which human body system help regulate hormonal body functions?
A. Immune
B. Digestive
C. Integumentary
D. Endocrine

46. On the pH scale, going from a 2 to a 4, does what to amount of acidity?
A. Increases the acidity 10 times
B. Increases the acidity 100 times

C. Decreases the acidity 10 times
D. Decreases the acidity 100 times

47. The Law of Conservation of Energy states that energy _____.
A. can be conserved if all types of energy are utilized.
B. can be created by taking mass and converting it to energy.
C. can be destroyed when the mass is more than the volume.
D. can neither be created or destroyed, it just changes form.

48. Many commercial airplanes fly mostly in the lower part of what layer of the atmosphere?
A. stratosphere
B. ionosphere
C. mesosphere
D. troposphere

49. What was developed to help to see clear views of deep space without the interference of Earth's atmosphere?
A. Gran Telescopio Canarias
B. Hubble Space Telescope
C. Hertzsprung-Russell Diagram
D. Galileo Telescope

50. Sometimes an element with a specific number of protons has another form containing a different amount of neutrons. This is known as a what of that element?
A. isotope B. ion C. neutrino D. electron

2018 - 2019 TMSCA Middle School Science Kick Off Test - Key

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