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 # 4 ©

N O V E M B E R 9, 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 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

2019-2020 TMSCA Middle School Science Test #4

1. This element was produced over time by the radioactive decay of uranium and thorium. It is one of the noble gases. What element is this?
   A. Hydrogen B. Helium C. Neon D. Xenon

2. Cecily put a rock on her magazine to keep it from blowing away. Raphael wore baseball gloves when he was batting during the baseball game. The county worker put sand on the highways when it the weather was icy. These are all examples of how to do what?
   A. increasing friction between objects
   B. decreasing friction between objects
   C. keeping friction equal between objects
   D. none of the above

3. Javier put a beaker of a substance on the hot plate. He increased the temperature to 100 degrees Celsius. Exactly at that point, the substance began to change from a liquid to a gas. Which of the following is most likely in the beaker? (at sea level)
   A. ocean water B. pure water C. ethanol D. maple syrup

4. How many electrons are there in a neutral atom of iron?
   A. 8 B. 26 C. 52 D. 57

5. Clues: English scientist, studied electromagnetic induction and laws of electrolysis, invented a simple electric motor Who is this person?
   A. Michael Faraday
   B. Thomas Edison
   C. Ludwig Boltzmann
   D. Nikola Tesla

6. Which is the best definition of an Earthquake?
   A. a push of the tectonic plate into another plate
   B. shaking of the Earth when gravity pulls on rock
   C. a crack in the Earth's surface
   D. a vibration of Earth produced by the rapid release of energy

7. What connects the bone to muscle in humans?
   A. ligaments
   B. cartilage
   C. tendons
   D. epithelial tissue

8. The weather has been rainy for about 5 days. The winds have been out of the southwest. After the 5 days, the sky clears and the wind switches to being out of the northeast. The temperature is warmer now. What type of front most likely came through this area?
   A. warm front B. cold front C. neither of these D. occluded front

9. The tail of a comet is always pointed in a direction _____.
   A. opposite to the Sun
   B. toward the Sun
   C. perpendicular to the Sun
   D. in no relation to the Sun

10. A Moray Eel has a special adaptation when it comes to eating and capturing a prey. This creature has a second set of jaws inside its throat that can push forward to snatch the victim. What is this second set of jaws called?
   A. splenial B. surangular C. pharyngeal D. mandiblean

11. The ACL is something that athletes will sometimes damage while playing sports. What does ACL stand for?
   A. alternate cartilage ligament
   B. anti –cervical lumbar
   C. Achilles cartilage ligature
   D. anterior cruciate ligament

12. Felicity noticed that when she left her fruit juice outdoors on the picnic table one day, flies found it and drowned in the juice. That made her curious to know what type of fruit juice that flies would be more attracted to so she decided to test this with an experiment. She set up four "fly trap" containers with four different types of fruit juice inside. She left them exposed in an area with plenty of flies.
   What would be the dependent variable in her experiment?
   A. the time she leaves the containers exposed
   B. the number of flies caught in each container
   C. the type of juice that she uses in each container
   D. the color of each juice

13. Because this element is highly flammable, it was used in the 1920's (in powder form) to create a flash for photography. Its atomic weight is about 24. What is this element?
   A. Chromium B. Magnesium C. Manganese D. Cesium

14. The number of particles in a unit known as a "mole" is called what?
   A. Avogadro's Number
   B. 6.02×10^3 molecules/mole
   C. Both A and B
   D. Loschmidt

15. The American Lotus plant has large leaves that repel water extremely well. What word would describe this ability?

A. hydrophilic B. hydrophobic C. deliquescent D. absorbent

16. Clues: organelle of a cell, control center for cell, contains DNA What organelle is this?
A. mitochondrion B. nucleus C. endoplasmic reticulum D. Golgi body

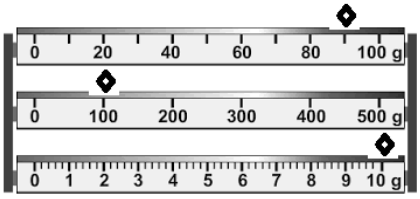
17. Chemicals produced in a gland, carried by the blood, that control important body activities are called what?
A. hemoglobin B. pheromones C. hormones D. homeostasis

18. What is the acceleration of gravity at the Earth's surface?
A. 9.81 m/s^2 B. 1.62 m/s^2 C. 8.87 m/s^2 D. 3.711 m/s^2

19. Beginning in the core of the sun, these particles then enter the radiative zone where they may stay for a very long time. After the radiative zone, they enter the convection zone, the solar atmosphere, and then on through the sun's corona. Finally, this particle makes it way toward Earth, which takes only about 8 minutes, where they are absorbed, reflected, or scattered. What are they?
A. electrons B. gnomons C. lumens D. photons

20. What do the eccrine glands do in the human body?
A. secrete oils to lubricate body
B. help maintain homeostasis
C. both B and D
D. mainly secrete salt water

21. Jasmine wrote down the mass of the object she was measuring on the triple beam balance as 190.10 g on her lab paper. Her lab partner, Zelly said "that's incorrect, it should be 200 g." Which person is right?



A. Jasmine is correct and her friend is not.
B. Zelly is correct and Jasmine is not.
C. Both are incorrect, it should be 195 g.
D. Both are correct, just writing them differently.

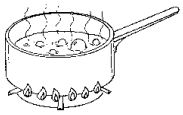
22. What element along with Carbon is a key component in making the non-slip Teflon used in pans?
A. Fluorine B. Iron C. Cobalt D. Copper

23. Around the Indian Ocean and South Pacific Ocean area, what we call a "hurricane" would be called what instead?

A. typhoon B. also, a hurricane C. depression D. cyclone

24. What three factors may affect the temperature at which water boils?

A. size of container, amount of water
B. the burner type, the material used in container
C. Both A and B
D. atmospheric pressure, elevation, impurities



25. On the geologic time scale, time is divided up groups called Eons. Which list below is the correct order of these eons from earliest to most recent?

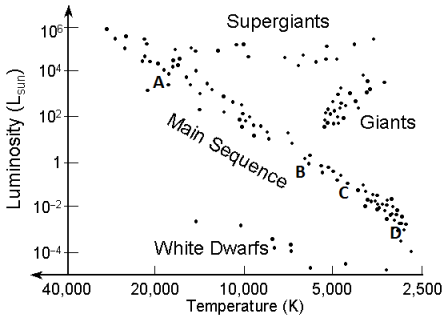
A. Hadean, Archean, Proterozoic, Phanerozoic
B. Hadean, Proterozoic, Phanerozoic, Archean
C. Archean, Hadean, Proterozoic, Phanerozoic
D. Phanerozoic, Proterozoic, Archean, Hadean

26. The largest phylum of animals on Earth include what?

A. Mollusks B. Annelid worms C. Echinoderms D. Arthropods

27. Using this H-R Diagram, which letter would most likely show the placement of our sun?

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

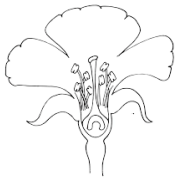


28. Simple machines make everyday tasks easier. Which of the following are considered simple machines?

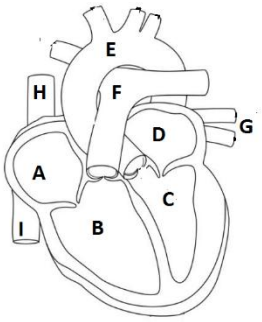
A. inclined plane
B. trebuchet
C. lever
D. Both A and C

29. Samuel found this unlabeled drawing and wanted to put it in his science Journal. He was trying to decide what section of plants it should go in. Which section should he place it in?

A. Angiosperms
B. Pteridophytes
C. Bryophytes
D. Gymnosperms



30. Which labeled part of this diagram of the heart shows the main artery that supplies oxygenated blood to the rest of the body?



A. Part H
B. Part F
C. Part E
D. Part B

31. Sara found a chart with the names of the Celestial objects missing. Using her knowledge of the objects, she filled in the names. Which would be the chart with the correct names?

A.

Celestial Object	Acceleration due to gravity
Earth	8.87 m/s^2
Mars	3.711 m/s^2
Venus	9.81 m/s^2
Moon	1.62 m/s^2
Jupiter	25.95 m/s^2

B.

Celestial Object	Acceleration due to gravity
Mars	8.87 m/s^2
Moon	3.711 m/s^2
Venus	9.81 m/s^2
Jupiter	1.62 m/s^2
Earth	25.95 m/s^2

C.

Celestial Object	Acceleration due to gravity
Venus	8.87 m/s^2
Earth	3.711 m/s^2
Mars	9.81 m/s^2
Jupiter	1.62 m/s^2
Moon	25.95 m/s^2

D.

Celestial Object	Acceleration due to gravity
Venus	8.87 m/s^2
Mars	3.711 m/s^2
Earth	9.81 m/s^2
Moon	1.62 m/s^2
Jupiter	25.95 m/s^2

32. The mineral quartz is made of what two elements?
A. Iron and Magnesium
B. Silicon and Oxygen
C. Magnesium and Oxygen
D. Carbon and Silicon

33. Which of the following would be the best example of convection?
A. warming French fries under a heat lamp
B. cooking a hamburger on a grill
C. the sunlight warming your face
D. boiling water in a pan

34. What statement about bones in not true?
    A. During a human's life, his/her bones are active, living tissues.
    B. Bones are mostly made of a protein called collagen.
    C. Human bones store both calcium and silicon
    D. Marrow in bones produces red and white blood cells.

35. A snake was coiled up in the middle of a dirt road resting in a grass patch. It has a triangular shaped head, fangs, and a rattle at the end of its tail. The field guide information matched it to a Western Diamondback Rattlesnake. Which of the following is not true about this snake?
    A. It has neurotoxic venom.
    B. It has heat sensing "pits" to help hunt prey.
    C. Its young are born live, these snakes are ovoviviparous.
    D. It is poisonous.

36. Which of the following statements is false when discussing chemical reactions?
    A. The products are the substances that result from the change.
    B. The reactants are the substances that undergo the change.
    C. This symbol → stands for "energy".
    D. Each symbol may have a coefficient if needed.

37. Chicken Pox is caused by a what?
    A. bacteria B. virus C. fungus D. erythrocytes

38. The Earth has a 23.5-degree tilt which causes what?
    A. winds moving from west to east
    B. earthquakes
    C. tectonic plate movement
    D. seasons

39. What is considered to be the universal donor blood type?
    A. type A B. type B C. type O – D. type O +

40. A neutral atom has an atomic mass of 59 and 31 neutrons. What element is this?
    A. Nickel B. Germanium C. Cobalt D. Praseodymium

41. In science class, students were doing a lab activity. They set up a balance scale. On side A of the balance scale, they placed an unburned match and on the other, side B, another unburned match. The scale is balanced. Next, they strike the match on the side B of the balance and let it burn for a few seconds before it was snuffed out. Would the scale now be balanced and why or why not?
    A. Yes, because the burned match did not lose its mass
    B. Yes, because you cannot destroy matter, it is still there
    C. No, because side B would have more mass because of the extra carbon
    D. No, because side A would have more mass, the burned match released mass

42. Which two planets in our solar system have over 94% of their atmosphere composed of Carbon Dioxide?
    A. only Venus, there are not two planets
    B. Earth and Venus
    C. Jupiter and Saturn
    D. Venus and Mars

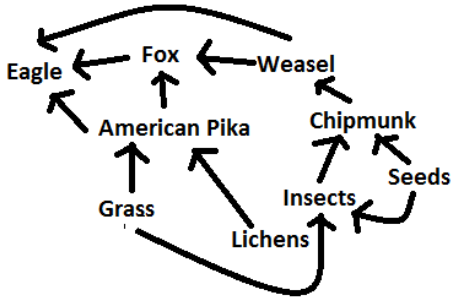
43. Hurricanes develop where?
    A. over the oceans B. over the land C. over the poles D. over rocks

44. Geothermal energy is considered to be which type of energy?
    A. Permeable B. Fossil fuel C. Nonrenewable D. Renewable

45. Which of these foods is not a good source of protein?
    A. chicken meat B. eggs C. apple D. lentils

46. Mycology is the study of what?
    A. grasses B. symbiotic relationships C. fungi D. selfies

47. Using this food web diagram, what organism(s) would be considered tertiary consumers?
    A. fox, American Pika, insects
    B. eagle, weasel, fox
    C. grass, lichens, seeds
    D. grass, American Pika, fox



48. At the dentist office, some people choose to use this gas as an anesthetic to feel less pain. In addition, this gas can be used as a propellant in aerosol cans as well as a power boost in racing cars. What is this gas?
    A. nitrous oxide N_2O B. methane CH_4 C. propofol $C_{12}H_{18}O$ D. oxygen O_2

49. The bright spots on either side of the sun caused by the sunlight as it is refracted when passing through ice crystals are called what?
    A. parhelion B. parapet C. crepuscular D. anticrepuscular

50. Which is younger, a rock that formed in the Holocene, Miocene, or Eocene epoch?
    A. Eocene
    B. Miocene
    C. Holocene
    D. none of the above

2019 - 2020 TMSCA Middle School Science Test #4 - Key

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