TMSCA MIDDLE SCHOOL SCIENCE TEST #12 ©

FEBRUARY 22, 2020

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

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1. Which of these is the base SI unit for measuring length?
   A. millimeter B. inch C. mile D. meter

2. Monarch butterflies contain a toxic chemical which is a cardenolide. What can these chemicals do if ingested by a monarch predator?
   A. destroy liver cells
   B. interfere with the work of the lungs
   C. nothing, they are basically harmless
   D. affect the function of the heart

3. Most organisms that live in aquatic environments are cold-blooded, meaning that they assume the temperature of their environment. What is another way to say "cold-blooded"?
   A. poikilothermic B. homeothermic C. fervid D. none of these

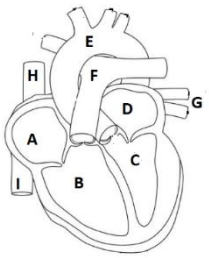
4. Rainbow trout are not native to Texas. However, people love to fish for these species so the state sees that some are stocked in Texas ponds or lakes at certain times of the year. Rainbow trout do not survive well above water temperatures above 20^{o} C. When should these fish be stocked in Texas?
   A. spring B. summer C. fall D. winter

5. Organisms that obtain their energy from dead organisms are called what?
   A. decomposers B. detritivores C. carnivores D. Both A and B

6. What can be the product of atmospheric instability and wind shear?
   A. veer B. rain C. tornado D. monsoon

7. If the winds of a storm over the ocean are below 74 mph, it is classified as what?
   A. typhoon B. major hurricane C. hurricane D. tropical depression

8. What aquifer contains about 90% of the total water in Texas aquifers?
   A. Ogallala B. Trinity Group C. Gulf Coast D. Edwards



9. Why is chamber "C" surrounded by thick muscle?
   A. because this is the aorta and must carry the majority of the blood
   B. this chamber doesn't get as much exercise as the other chambers of the heart
   C. because this is the left ventricle which must be strong enough to pump blood to the entire body
   D. chamber C is not thicker than the others

10. When one or more electrons from one atom are transferred to another atom, what type of bond is formed?
    A. covalent bond B. ionic bond C. electrostatic bond D. transformational bond

11. Naphthalene is a substance that has a very low melting point. It also is used as a repellent to some insects. What is this also known as?
    A. DEET B. DDT C. lavender oil D. moth balls

12. Look at this list of terms: diaphysis, epiphysis, metaphysis, periosteum
    What is the commonality of this list?
    A. processes of tissue growth
    B. parts of the foot
    C. names of bone parts
    D. layers of the skin tissues

13. A weather balloon is used to go up into the atmosphere to collect information for weather forecasting. When it goes up into higher altitudes, the pressure is lower, but the volume of air in the balloon becomes greater. Scientists must be careful to not fill the balloon with too much gas when launching or it might pop when it gets higher into the atmosphere. This is a good example of what?
    A. Charles's Law B. Boyle's Law C. Pascal's Law D. Ohm's Law

14. Which is not true about the differences between plasma and gases?
    A. plasma has a definite shape or volume, but gases do not
    B. plasma conducts electric current, gases do not
    C. plasma is found in lightning
    D. electric fields affect plasma, but not gases

15. Which statement below is correctly matched with the types of rocks and how they are formed?
    A. igneous – lava or magma that is cooled and solidified
       sedimentary – made from igneous rocks that have undergone extreme pressure
       metamorphic – made from bits and pieces of deposited rock
    B. sedimentary - made of sediments with pressure over time
       igneous – made from heat and pressure underground
       metamorphic – made from lava formations
    C. igneous – lava or magma that is cooled and solidified
       sedimentary – made from sediments that have melted and reformed
       metamorphic – made from bits and pieces of weathered rock
    D. igneous – lava or magma that is cooled and solidified
       sedimentary – made of sediments with pressure over time
       metamorphic – made with heat, pressure, and chemical processes on the other rock types

16. Pollution that comes from many different sites throughout the watershed and is difficult to trace back to its source, such as waste from yards or pesticides, is called what?
    A. runoff
    B. non-point source pollution
    C. channelization
    D. point source pollution

17. A high-grained metamorphic rock with coarse, crystalline altered rock in bands is most likely what?
    A. granite B. quartzite C. shale D. gneiss

18. A scientist who studies cells is called a what?
    A. pathologist B. clinician C. cytologist D. specialist

19. Which statement below about the ocean is not true?
    A. The ocean waters cover around 71% of Earth's surface.
    B. The Earth's largest mountain chain is mostly under the ocean.
    C. The Pacific Ocean has the most islands.
    D. The salinity of the ocean is uniform at 35ppt.

20. There are how many major groups of blood types?
    A. 2 B. 5 C. 3 D. 4

21. A traumatic brain injury caused by a severe blow to the head or body can make the head and brain move rapidly back and forth. When this happens, it can change the chemistry of the brain and can stretch brain cells causing damage. What is this called?
    A. dementia B. a concussion C. Huntington's disease D. a stroke

22. Clues: a research scientist, collects and analyzes data from ice cores, soil, water, air, and even plant life to find patterns in weather over time
    Who would this best describe?
    A. climatologist B. botanist C. meteorologist D. seismologist

23. Hurricane Dorian started out with wind speeds of 90 mph. Eventually, it caused devastation to the Bahamas and had a sustained wind speed of 183 mph.
    What category would it be?
    A. Category 3, the average of both speeds
    B. Category 1 through 3
    C. There is no way of telling without more information.
    D. It began as Category 1 and progressed to a Category 5

Wind Speeds	**Category**
74-95 mph	1
96-110 mph	2
111- 129 mph	3
130-156 mph	4
>156 mph	5

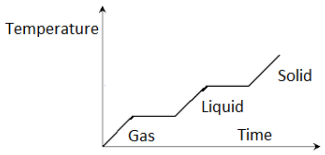
24. Light will travel in a straight line unless it is what?
    A. reflected B. refracted C. scattered D. all of these

25. Genny used an electric blender to make a breakfast smoothie. When she plugged in the blender and pushed the on button, the blender mixed her smoothie. What energy transformations took place when she turned it on?
    A. electrical energy → potential energy → light energy
    B. electrical energy→ kinetic energy → sound energy
    C. kinetic energy → sound energy → chemical energy
    D. chemical energy → thermal energy → sound energy

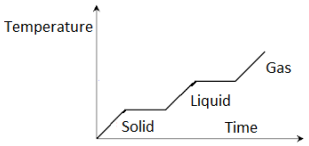
26. Which of the following is not a disadvantage of using fossil fuels?
    A. fossil fuels are nonrenewable
    B. fossil fuels cause damage if spilled during transport
    C. fossil fuels can be used to generate electrical energy and make products
    D. fossil fuels produce smog when burned

27. Which graph below correctly shows the typical heating curve of matter?

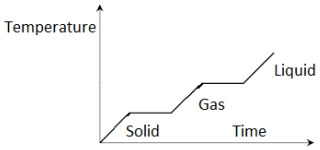
A.



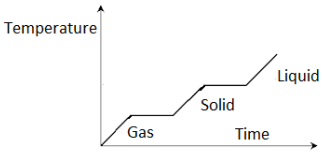
B.



C.

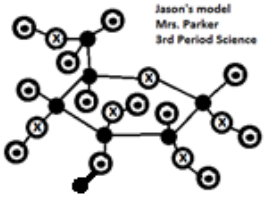


D.



28. What is the temperature to which air must be cooled at a constant pressure for it to become completely saturated with water?
    A. relative humidity
    B. dewpoint
    C. boiling point
    D. wind chill

29. Jason made a model of glucose. In the model, the filled black circles stand for Carbon, the circles with an "x" are Oxygen, and the circles with center dots are Hydrogen. His teacher said he needed to fix one mistake on the model. What is the mistake?
    A. There are not enough hydrogen atoms.
    B. There are too many carbon atoms.
    C. There are not enough carbon atoms.
    D. There are too many oxygen atoms.



30. With rising sea levels, flooding along coastline cities such as Boston is becoming a problem. Which choice below would provide an environmentally friendly way of protecting the city from flooding?
    A. building a concrete seawall around Boston Harbor
    B. installing pumps to remove flood water
    C. building more parks with green spaces and wetlands to absorb flood waters
    D. waterproofing lower floors of buildings and raising electrical equipment

31. What makes hard water "hard"?
    A. Hard water is very pure and has no ions.
    B. Hard water contains dissolved calcium and magnesium.
    C. Hard water has a high salinity.
    D. Hard water contains alcohol.

32. A 200 lb. magician had a bed full of thousands of nails pointing up. He gently laid down on the bed without a single nail piercing his skin. Why is this possible?
    A. The magician's weight causes centripetal force on the nails so they do not break the skin.
    B. The nails do not have a sharp enough point to pierce the skin of the magician.
    C. If the magician was 30 lbs. heavier, the nails would break his skin, but the number is just right.
    D. The magician's weight applies a force, but it is spread over a wide area to reduce pressure from each nail.

33. When the forces applied to an object are balanced, the forces produce a net force of what?
    A. negative force
    B. zero
    C. 10 x the amount applied
    D. it depends on the amount of force

34. What does the prefix "hyper" mean?
    A. over B. under C. outside D. around

35. Which of these is the SI base unit for measuring mass?
    A. pound B. ton C. gram D. none of these

36. Which of the following does not belong to the order Lepidoptera?
    A. Butterfly B. Moth C. Both A and B D. Dragonfly

37. Regulus is the brightest start in what constellation?
    A. Scorpius B. Leo C. Orion D. Ursa Major

38. Which of the following animals do not live naturally in Texas?
    A. horned lizards B. peccary C. cobra D. black bears
39. What does the root word "morph" mean?
    A. raise B. throw C. same D. form

40. Calculate the concentration of a solution in which 90g of salt is dissolved into 6 L of water.
    A. 15 mL/g B. .06 g/mL C. 67 mL/g D. 0.015 g/mL

41. Which of the following organisms do not show bilateral symmetry?
    A. insects B. humans C. orchids D. daisies

42. Which of the following organisms do not show radial symmetry?
    A. sea urchins B. daisies C. orchids D. sea stars

43. When learning about botany, I came across the word "bract". What does this mean?
    A. a modified leaf that bears a flower
    B. the flat part or broad part of a leaf
    C. the leafstalk that connects the blade to the stem
    D. a winged fruit

44. Which of the following items is not used to make a seismograph?
    A. recording device B. timer C. seismometer D. compass

45. A cottonwood tree's leaf has a flat petiole. What is a petiole?
    A. a winged fruit
    B. the leafstalk that connects the blade to the twig
    C. the broad part of a leaf
    D. a modified leaf that bears a flower

46. "Spring tides" occur when what happens?
    A. during a full moon
    B. during the months of April, May, and June
    C. during a new moon
    D. Both A and C

47. Which of the following energy sources are renewable?
    A. coal B. oil C. biomass D. natural gas

48. To reduce automobile emissions that can be harmful, this device was added to automobiles beginning in the 1970s. What is this device?
    A. alternator B. spindle C. camshaft pushrod D. catalytic converter

49. Which of the following are intrusive igneous rocks?
    A. pumice, scoria, and coal
    B. limestone, shale, and conglomerate
    C. granite, diorite, and gabbro
    D. rhyolite, andesite, and basalt

50. During research, sometimes the samples are taken and studied “in vitro”. What is this?
    A. inside a living thing
    B. in a manufacturing factory
    C. inside a refrigerator
    D. in glass or a test tube

2019 - 2020 TMSCA Middle School Science Test #12 - Key

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