TMSCA MIDDLE SCHOOL SCIENCE TEST #11 ©

FEBRUARY 15, 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

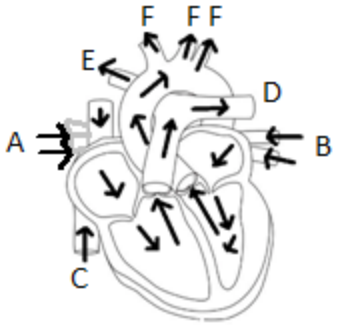
1A 1												3A 13	4A 14	5A 15	6A 16	7A 17	8A 18
1 H 1.01	2A 2																2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3B 3	4B 4	5B 5	6B 6	7B 7	8	8B 9	10	1B 11	2B 12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 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

2019-2020 TMSCA Middle School Science Test #11



1. In the diagram of the heart shown above, where is the blood going at points E and D?
   A. to the body
   B. to the lungs
   C. to the heart
   D. to the brain

2. Is the blood leaving points E and D oxygenated or not?
   A. not oxygenated, headed to the lungs
   B. partly oxygenated, headed to the body
   C. extremely oxygenated, just came from lungs
   D. none of the above

3. Which of the following is one of the most successful invasive plants in Texas?
   A. Canada wildrye
   B. Common bermudagrass
   C. Little bluestem
   D. Little barley

4. Which of the following cells usually live the longest?
   A. skin cells B. nerve cells C. red blood cells D. white blood cells

5. What happens when saturated air is cooled below the dewpoint?
   A. evaporation B. sublimation C. transpiration D. condensation

6. When one or more electrons are shared between atoms, what type of bond is formed?
   A. covalent bond
   B. ionic bond
   C. electrical bond
   D. transfer bond

7. When tectonic plates slide past each other like at the San Andreas Fault, this is called what?
   A. convergent B. divergent C. subduction D. transform

8. Which of the following would be a reasonable mass of an average 12-year-old human child?
   A. 400 kg B. 6,780 grams C. 8000 ounces D. 42 kg

9. The pathogen, RSV, that affects the respiratory system is most likely spread by what?
   A. only through oxygenated blood
   B. through a used needle
   C. contact with infected blood products
   D. an infected person's coughing, sneezing, or contact with virus

10.

Diagram A

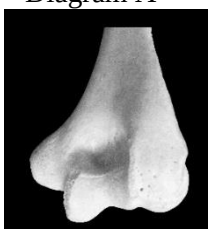


Diagram B

Above is the posterior view of the ends of two human limb bones.
Which statement below about these diagrams would be true?

A. Diagram A is the end of the humerus bone, while Diagram B is the end of the femur.
B. Diagram A is the end of the femur bone, while Diagram B is the end of the humerus.
C. Diagram A shows the end of the bone that connects the femur to the knee.
D. Diagram B shows the end of the bone that connects the humerus at the elbow.

11. What does the prefix "hetero" mean?

A. equal B. break C. different D. many

12. Two students devised a way to measure the volume of a small type of bead with an irregular shape. First, they filled a beaker with 100mL of water. Second, they placed 100 of the identical irregular shaped beads in the beaker of water until all were submerged. Third, they noted the water level now to be at the 145mL mark on the beaker. Which explanation describes why the students used 100 beads instead of just one bead?

A. With 100 beads, your sample size is larger and more reliable.
B. Using 100 beads makes it easier to see a difference in the change of the water level.
C. Using 100 beads matches up with the 100mL of water in the beaker.
D. None of these make any sense.

13. Nitrate and Phosphate containing detergents and fertilizers were released into a neighborhood pond. An algal bloom followed this action. The pond then went through a process of what in which it was "nutrient poor" and then become "nutrient rich"?

A. emergent activity
B. eutrophication
C. succession
D. nitrification

14. A line of thunderstorms is called what?

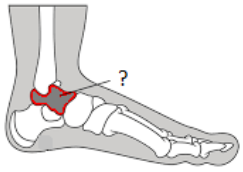
A. squall line B. a depression C. roll cloud D. storm surge

15. If the Earth's crust is about 3.0 g/cm^3, what would be reasonable for the density of the Earth's core?

A. 0.1 g/cm^3 B. 2.0 g/cm^3 C. 12.0 g/cm^3 D. 2,000 g/cm^3

16. Distances in space can be quite large. Astronomers need special units to measure these distances. Which of the following are units that are used to measure these distances?
    A. astronomical unit B. parsec C. light-years D. all of these

17. What bone is shown in this diagram of the foot?
    A. talus B. tibia C. cuboid D. phalange



18. What are considered creeping, underground stems with joints and leaflike scales?
    A. stolons B. raceme C. forbs D. rhizomes

19. Selena was measuring the pH of several different substances in open containers labeled A, B, C, and D. The chart shows the data she collected.

Container	pH
A	4.6
B	8.8
C	6.8
D	9.2

    Selena was very confused because she was told that one of the containers had distilled water. She was expecting to find a neutral pH, but did not. What is a reasonable explanation about what happened?
    A. Container A is the distilled water - the container probably had soap in it leftover which lowered the pH.
    B. Container B is the distilled water – the open container allowed for Nitrogen in the air to raise the pH.
    C. Container C is the distilled water – the open container allowed for CO_2 in the air to make the water slightly acidic.
    D. Container D is the distilled water because it is closest to neutral.

20. Which chemical equation below is balanced?
    A. $CaCO_2 + 2CO_2 + H_2O \rightarrow Ca + 4HCO_3$
    B. $CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$
    C. $CaCO_2 + CO_2 + H_2O \rightarrow Ca + 2HCO_3$
    D. $CaCO_4 + CO_3 + 2H_2O \rightarrow 2Ca + 2HCO_2$

21. Which of the following soil types are best for growing grain crops?
    A. ultisols B. vertisols C. entisols D. mollisols

22. Which of the following tasks would be accomplished by a civil engineer?
    A. designing a city water system
    B. supervising the process of purifying a substance
    C. developing a new bridge
    D. Both A and C

23. In medical terminology, the word “malignant” means what?
    A. infectious B. hereditary C. contagious D. cancerous

24. A scientist who studies the causes and effects of diseases which many times involves examining tissue samples in a laboratory is called a what?

A. pathologist B. clinician C. cytologist D. specialist

25. A scientist can calculate how much a planet weighs by knowing what?

A. its distance from Earth
B. the sun's mass
C. the number of moons that orbit the planet
D. time it takes objects to orbit around the planet and the distance the objects are from the planet

26. The common center of mass that planets and their sun actually orbit around is called the what?

A. the orbital plane B. natural satellite C. revolution mass D. barycenter

27. What statement about bones is true?

A. Bones are not living tissue.
B. Bones are mostly made of keratin.
C. Human bones store both calcium and silicon.
D. Marrow in bones produces red and white blood cells.

28. Which organisms do not have "bioluminescence"?

A. scorpions B. fireflies C. anglerfish D. moon jellyfish

29. One of the most problematic aquatic plants in Texas is Giant Salvinia, an invasive plant from southern Brazil. This plant will outgrow and replace native plants in the Texas aquatic ecosystems. What other problem(s) does this plant cause?

A. gives off a toxin into the water which poisons the invertebrates
B. inhibits angling, boating, and recreational activities on the water
C. Both B and D
D. blocks sunlight which decreases dissolved oxygen in the water

30. Which formula below is the correct one for the mineral fluorite?

A. FeS_2
B. $(Mg,Fe)_2SiO_4$
C. $CaCO_3$
D. CaF_2

31. What do most scientists believe happened on the last day of the Cretaceous period?

A. nothing major, it was just an ordinary day
B. solar radiation fried the Earth from a massive eruption on the sun
C. a massive asteroid collided with the Earth
D. a catastrophic volcano erupted setting off a massive tsunami

32. Which of the following lists include all sedimentary rocks?

A. sandstone, gneiss, schist, marble
B. quartzite, slate, conglomerate, limestone
C. limestone, shale, conglomerate, sandstone
D. marble, limestone, granite, pumice

33. What type of clouds look are caused by a difference in wind speed or direction between two atmospheric currents causing complex evaporation and condensation patterns that look like breaking waves?

A. Lenticular
B. Mammatus
C. Cirrocumulus
D. Kelvin-Helmholtz

34. What does the prefix "sequ" mean?

A. under B. foot C. before D. follow

35. 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. elements with atomic weights which were unrecognizable

36. What is the name for large clouds of dust and gas in space?

A. dark matter B. nebulae C. clusters D. asteroids

37. What is function of the rods and cones in the eye?

A. rods – help in bright light cones – help see color
B. rods – help see motion cones – help to see in the dark
C. rods – help see color and high details cones – work in low light
D. rods – work in low light cones – help see color and high details

38. A Mycologist could possibly be found doing research on what?

A. toadstools B. stars and planets C. viruses D. dolphins

39. Mixing an acid and a base produces what?

A. hydroxide ions
B. hydrogen ions
C. a precipitate
D. salt and H_2O

40. The word SCUBA used to describe the activity involving people in water exploration actually is an acronym for what?
    A. it is not an acronym
    B. science container for underwater biology activity
    C. Science Concentrated Underwater Breathing Activity
    D. self-contained underwater breathing apparatus

41. Precipitation reaches the groundwater supply when it soaks into the ground and aquifers through the process of what?
    A. transpiration
    B. ephemeral activity
    C. buffering
    D. percolation

42. Specialized wetlands with green vegetation zones along the banks of creeks, rivers, and bayous are called what?
    A. bays B. estuaries C. riparian areas D. watersheds

43. What characteristics below are important to establishing the general characteristics of soil?
    A. parent soil material and climate
    B. topography and time
    C. organisms in and around the soil
    D. all of the above

44. Why do we see mostly "blue" in the sky during the daytime?
    A. Blue light travels in longer waves than all the other colors.
    B. The ocean is reflected into the sky which makes it look blue.
    C. The eye is only designed to see blue when it comes from that angle.
    D. Blue light is scattered more than the other colors because it travels in shorter waves.

45. Which of the following is an "exoplanet"?
    A. Pluto B. Mars C. 51 Peg b D. Venus

46. The mistletoe plant carries out photosynthesis; however, the mistletoe plant will attach itself to a host plant to take water and nutrients for itself.
    The mistletoe is considered to be a what?
    A. mutualyte
    B. epiphyte
    C. xerophyte
    D. hemiparasite

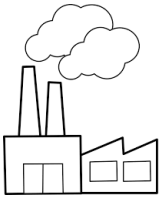
47. What blood type has neither the A nor B antigens on the red blood cells and both A and B antibody in the plasma?
    A. Group A B. Group B C. Group O D. Group AB

48. These are sometimes called “nurseries of the sea” because they may provide protected areas for organisms to reproduce and raise young. What are they?

A. riparian zones
B. watersheds
C. estuaries
D. gulfs

49. Students at Golden Middle School in the Texas Panhandle were testing the dissolved oxygen in the water at a nearby lake. They tested the water on the first Monday of each month at 10:00am. They noticed the levels of dissolved oxygen changed over the course of the year. Which statement below would most likely be true about what they observed?
    A. In the winter months when the temperature readings were much colder, the dissolved oxygen levels were higher than in the summer months.
    B. In the summer months when the temperature readings were much warmer, the dissolved oxygen levels were higher than in the winter months.
    C. The dissolved oxygen levels did not change very much at all over the year.
    D. The dissolved oxygen levels changed when the turtle population brumated for the winter.

50. Pollution that can be traced to a specific location, such as discharge from a factory or wastewater treatment facility is called what?



A. runoff
B. non-point source pollution
C. channelization
D. point source pollution

2019 - 2020 TMSCA Middle School Science Test #11 - Key

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