TMSCA MIDDLE SCHOOL SCIENCE TEST #13 ©

FEBRUARY 29, 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 #13

1. Mark and David were graduate students working on research of marine animals that live near the coral reef. They chose one area of the reef that was a refuge and had strict rules to prevent fishing in this area, and another area of the reef that was open to the public, including fishing within normal limits. For a period of 6 weeks, they would snorkel through these areas counting and recording the population for 7 identified species. What would be a reasonable hypothesis for this investigation?
    A. The open area and the protected area of the coral reef will contain species of fish that will be completely different.
    B. In the protected refuge area, there will be a higher population of each species than in the open area.
    C. In the protected refuge area, there will be a warmer temperature than in the open area.
    D. Out of the 7 identified species, the open area will only have 2 of them, but the refuge will have all 7.

2. In the investigation above, what is the independent variable?
    A. the temperature of water in both areas
    B. the areas chosen – the refuge and the open area
    C. the fishing regulations
    D. the population of the 7 identified species of fish

3. In the same investigation, what is the dependent variable?
    A. the two locations chosen
    B. the population counts of the 7 identified species of fish
    C. the amount of time spent snorkeling
    D. the six-week time period

4. Scientists call the fossilized remains of animal feces what?
    A. stromatolites B. trilobites C. both A and B D. coprolites

5. The SI unit for measuring force is noted by which of these symbols?
    A. N B. C C. F D. T

6. El Niño is associated with which ocean?
    A. Indian B. Atlantic C. Pacific D. Arctic

7. Lakes, ponds, and ephemeral pools are all part of what type of system?
    A. lotic B. lentic C. intermittent D. oligotrophic

8. What does the root word “vor” mean?
    A. turn B. under C. eat D. fire

Substance	Density	Volume
Ping Pong ball	0.0840g/cm^3	33.5 mL
Glycerin	1.260 g/cm^3	40 mL
Corn oil	0.91 g/cm^3	40 mL
Rubbing alcohol	0.791 g/cm^3	40 mL
Penny	7.14 g/cm^3	0.35 mL
Corn syrup	1.360 g/cm^3	40 ml

9. All of the substances in this chart were carefully poured or placed in a tall beaker that will hold 250 mL and allowed to settle out. If pure water was carefully added in to this arrangement, where would it settle in?
    A. just below the rubbing alcohol and above the corn oil
    B. it would sink to the very bottom of the beaker
    C. pure water be stay at the very top of the beaker
    D. just below the corn oil and above the glycerin

10. In the chart above, approximately what would be the mass of the penny?
    A. 20.4 g B. 0.05 g C. 2.5 g D. 1.0 g

11. Paleontology is what?
    A. The study of geology and history of how Earth was formed
    B. The study of the history of life on Earth based on the fossil records left behind
    C. The study of living things
    D. The study of material remains of past human life and activities

12. What bone is known as the "funnybone"?
    A. radius and the ulna
    B. patella touching the tip of the femur
    C. not a bone, but the ulnar nerve up pushing against the humerus
    D. fibula

13. A tsunami is not caused by which of the following?
    A. earthquakes
    B. volcanic eruptions near water
    C. glaciers melting
    D. landslides into water bodies

14. According to current science, which statement below would be incorrect?
    A. A radioactive isotope decays at the same rate.
    B. The element used in radiometric dating is always Uranium.
    C. Radioactive dating allows scientists to assign an age to a rock or mineral.
    D. Certain isotopes are unstable and will release energy.

15. Human blood is red because of the oxygen and the iron-rich hemoglobin and blue when it reaches your hands. What is wrong about this statement?
    A. Human blood is not blue; it is naturally red.
    B. Human blood is red because of the plasma, not oxygen.
    C. Human blood is not actually red; it is blue in the whole body.
    D. Blood has no color.

16. During research, sometimes the processes or samples being studied are "in vivo". What does this mean?
    A. inside the living organism
    B. inside a vacuum
    C. in a manufacturing factory
    D. inside a test tube

17. When two plates collide with each other they are called what?
    A. divergent B. convergent C. subduction D. transform

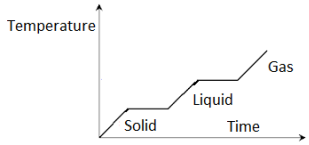
18. A scientist who studies bacteria, viruses and algae is called a what?
    A. pathologist B. clinician C. microbiologist D. specialist

19. Which statement(s) below about the ocean is/are true?
    I. The ocean waters cover around 71% of Earth's surface.
    II. The Earth's largest mountain chain is mostly under the ocean.
    III. The Pacific Ocean has the most islands.
    IV. The salinity of the ocean is uniform at 35ppt.

    A. I and II only B. III only C. IV only D. I, II, and III

20. Who was the scientist who suggested that a single supercontinent existed in Earth's past?
    A. Alfred Wegener B. Charles Lyell C. James Hutton D. Charles Darwin

21. In this graph, what is happening during the flat line between solid and liquid?



    A. freezing B. boiling C. melting D. nothing is happening

22. Which of the common substances below are correctly matched?
    A. acetic acid – vinegar
    B. sodium bicarbonate – baking powder
    C. magnesium sulfate – sugar
    D. ferric oxide – laughing gas

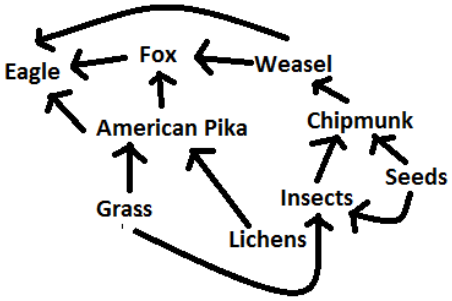
23. Which statement below describes a "monocot"?
    A. one seed leaf or one embryonic leaf in their seeds
    B. two embryotic leaves or cotyledons
    C. woody plants
    D. plants with jointed stems and broad leaves

24. Buffalograss send out aboveground prostrate stems that produce new plants and store food. What are these called?
    A. rhizomes B. forbs C. spikelets D. stolons

25. Which explanation is true about coral and bleaching?
    A. When coral goes through one stage of its life cycle, it turns bone white which only lasts a few weeks.
    B. Bleaching in coral happens when the organisms become over-populated.
    C. Excessive salt content in the water can cause coral to look extremely white, which is called bleaching.
    D. When coral becomes too hot and stressed, they "kick out" the symbiotic algae that lives on the coral which makes the coral look bleached white.

26. What is the name of the organism that has a symbiotic relationship with coral?
    A. zooxanthellae B. multi-celled algae C. bacillus D. Both A and B

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



28. What do you call the young of this organism?
    A. naiads
    B. caterpillars
    C. maggots
    D. tadpoles

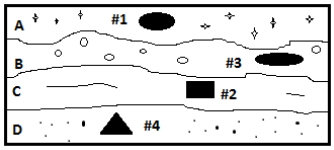

Plains Leopard Frog

29. Earth is home to approximately how many active volcanoes?
    A. 1500 B. 500 C. 100 D. 10,000

30. About how much of the Earth's water is considered available for human use?
    A. about 50% B. 97% C. 3% D. <1 %

31. How many valence electrons does an oxygen atom contain?
    A. 2 B. 8 C. 6 D. 0

32.



A paleontologist was collecting fossils on an exposed hillside. The hill had visible layers which he labeled A, B, C, and D. While digging, he found 4 fossils, one in each layer. Which statement below is true about the fossils found?

A. Fossil #2 in layer C is younger than fossil #1 in layer A.
B. Fossils found in layer B are older than fossils found in layer D.
C. Fossil #2 in layer C is younger than fossil #4 in layer D.
D. Fossil #3 in layer B is older than fossil #4 in layer D.

33. A patient in the hospital was having problems with her pancreas. What specialist would this patient need to see?

A. immunologist
B. neurologist
C. pathologist
D. endocrinologist

34. Which of the following units can be used to measure volume?

A. liter B. mL C. m^3 D. all of these

35. Mumps is caused by a what?

A. bacteria B. virus C. vaccine D. fungus

36. Beatrice was riding her bicycle around the trail in her local park. The trail is 27 miles long. It took her 2.5 hours to complete the trail. What was her average speed?

A. 0.09 mph
B. 13.1 mph
C. 20 mph
D. 10.8 mph

37. Which of the following is not an invasive species in Texas?

A. giant reed (Arundo donax)
B. black-chinned hummingbird (Archilochus alexandri)
C. zebra mussels (Dreissena polymorpha)
D. saltcedar trees (Tamarix ramosissima)

38. Photosynthesis is a process important to most all life on Earth. This process involves various structures found in plants. When light strikes this structure in a chloroplast, energy is transferred to electrons in chlorophyll. What plant structure would this be?

A. stomata B. stamen C. sepal D. thylakoids

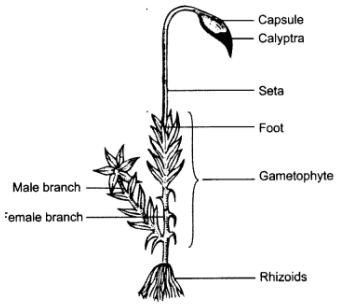
39. Which of the following statements is true when discussing chemical reactions?
    A. The reactants are the substances that result from the change.
    B. The products are the substances that undergo the change.
    C. This symbol → stands for "yields".
    D. Each symbol must have a coefficient.

40. How many electrons does a neutral atom of Calcium have?
    A. 40 B. 27 C. 20 D. 17

41. Many elements on the Periodic Table have special uses. This one is used in smoke detectors and has 148 neutrons. What is it?
    A. Einsteinium 253 B. Uranium 235 C. Plutonium 239 D. Americium 243

42. Simple machines make everyday tasks easier. Which of the following is not considered a simple machine?
    A. inclined plane B. wheel and axle C. wheelbarrow D. wedge

43. Susanna found this unlabeled drawing and wanted to put it in her science Journal. She was trying to decide what section of plants it should go in. Which section should she place it in?
    A. Angiosperms
    B. Pteridophytes
    C. Bryophytes
    D. Gymnosperms



44. The adrenal glands found above both kidneys release hormones to control how the body responds to stress situations. Which hormones below are released in emergency stressful situations?
    A. cortisol and insulin
    B. estrogen and progesterone
    C. epinephrine and norepinephrine
    D. thyroxine and serotonin

45. Which organism below is a member of the Cnidaria Phylum?
    A. Sea Star B. Snail C. Sponge D. Jellyfish

46. A chemical reaction in which a substance loses one or more electrons is called what? (paired with another reaction in which the electron(s) are gained)
    A. oxidation B. reduction C. condensation D. precipitation

47. Which statement below is not true?
    A. An atom is the smallest particle into which an element can be divided and still have properties of that element
    B. Molecules that contain only two atoms are diatomic molecules.
    C. A chemical bond is the force of attraction between atoms.
    D. Not all electrons are identical.

48. When Jasmine's teacher passed out light sticks to her class, she instructed the class to design an experiment to test whether the light stick loses mass when it is activated. The light stick contains two chemicals that are separate. When the insides are snapped, the chemicals mix, giving off light. What would be a reasonable step in this investigation?
    A. Open up the light stick and find out what chemicals are inside it.
    B. Find the volume of the light stick.
    C. Find the mass of the light stick before activating it.
    D. Activate the stick in a darkened room.

49. If a lake is "nutrient poor", it is considered to be what?
    A. oligotrophic
    B. mesotrophic
    C. eutrophic
    D. emergent

50. Which planet(s) in our solar system have over 94% of the atmosphere composed of Carbon Dioxide?
    A. Venus
    B. Mars
    C. Saturn
    D. Both A and B

2019 - 2020 TMSCA Middle School Science Test #13 - Key

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