TMSCA MIDDLE SCHOOL SCIENCE TEST#2 ©

OCTOBER 24, 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. Water molecules have the tendency to cling to the side of a glass container. This quality is explained as what?

A. ionic B. cohesion C. adhesion D. covalent

2. When organisms maintain stable internal conditions even though their environment around them may change, they described as having what?

A. homeostasis B. sepsis C. nonequivalence D. discordance

3. Which chamber of the heart pumps blood out to the body?

A. right ventricle B. left ventricle C. right atrium D. left atrium

4. In the electromagnetic spectrum, waves are arranged by the size of the wavelengths. Which list below is a correct arrangement? (longest to shortest wavelength)

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

5. Which of the following statement below is not true?

A. The stars of the Big Dipper are all about the same distance from Earth.
B. Polaris is one of the main stars in the Little Dipper constellation.
C. The stars Dubhe and Merak in the Big Dipper line up with the star Polaris.
D. The Big Dipper is part of a large constellation called Ursa Major.

6. What main artery in the human body of the heart carries blood from the left ventricle to circulation throughout the body?

A. atrium B. pulmonary C. carotid D. aorta

7. The heart is mostly made up of what?

A. cardiac muscle B. mitochondria C. fat D. blood

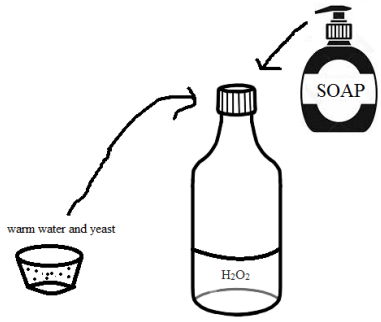
8. I was the first woman in America to be awarded a medical degree in 1849. I also opened my own college for woman who wanted to become doctors. Who am I?

A. Michaela Quinn B. Elizabeth Blackwell C. Barbara McClintock D. Marie Curie

9. Where in the human body would you find the navicular bone?

A. head B. thigh C. foot D. upper arm

10. In science class, the students did a fun investigation. They mixed together several ingredients that cause a tube of foamy bubbles to come out of the bottle in a tube-like manner. When they mixed the first ingredients, hydrogen peroxide with the squirt of soap, nothing happened. Why not?



A. no chemical reaction took place yet
B. the hydrogen peroxide must have been a bad batch
C. a chemical reaction happened, but no new substance formed
D. they did something wrong in the procedure

11. The students continued the experiment by adding the next ingredients, warm water and yeast. When they added these ingredients, the mixture began to bubble and then move its way out of the bottle in a tube-like fashion. What did the yeast and water do to the mixture?

A. the yeast did nothing, but the warm water reacted with the soap
B. the yeast reacts with the soap to form hydrogen gas, which causes the bubbles – H_2
C. the yeast has a chemical in it that acts as a catalyst to start the breakdown of the H_2O_2
D. the warm water had enough heat energy to start a chemical reaction

12. One of the students asked, "what if we don't put soap in with the hydrogen peroxide?" They tried it again without the soap. What most likely happened?

A. It worked the same, but was harder to clean up later.
B. The bubbles of oxygen gas escaped into the air and were not trapped by the soap.
C. The hydrogen gas bubbles had a slight explosion and escaped into the air.
D. The hydrogen gas bubbles escaped into the air because the soap could not trap it.

13. This system collects and recycles fluids from the cardiovascular system as well as helps with fighting infections. What system is it?

A. endocrine system
B. lymphatic system
C. ventricular system
D. atrial system

14. This disease occurs when the arteries harden and narrow due to the build-up of plaque on the walls of the arteries. What is it?

A. atherosclerosis B. congenital C. arrhythmia D. thrombosis

15. Which of these show the correct order of eras from most recent to oldest on the Geologic Time Scale?

A. Paleozoic, Mesozoic, Cenozoic
B. Cenozoic, Mesozoic, Paleozoic
C. Mesozoic, Cenozoic, Paleozoic
D. Paleozoic, Cenozoic, Mesozoic

16. Monarch butterflies contain a toxic chemical which is a cardenolide. How does the butterfly obtain this chemical?

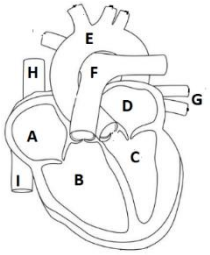
A. through a parasite that lives on its thorax
B. by eating milkweed plant when it is a caterpillar
C. through migration
D. through the nectar that it eats

17. Most organisms that live in aquatic environments are "cold-blooded", meaning that they assume the temperature of their environment. What do you call organisms that gain their heat from the environment?

A. amphibian B. homeothermic C. fervid D. ectothermic

18. What chamber of the heart is labeled B?

A. left atrium
B. left ventricle
C. right atrium
D. right ventricle



19. An instrument that is used to measure the magnitude of an earthquake is called a what?

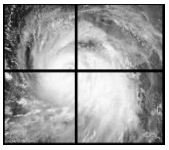
A. seismic scale
B. seismograph
C. epicenter
D. Barometer

20. When an ancient living thing gets trapped in tree resin and is preserved for many years, this can form a fossil. The ancient tree sap that traps the living thing is called what?

A. cast B. petrified C. amber D. mold

21. In the northern hemisphere, which section of a hurricane would most likely cause the most damage, wind, and storm surge?

A. right front quadrant (northeast)
B. left front quadrant (northwest)
C. right back quadrant (southeast)
D. left back quadrant (southwest)

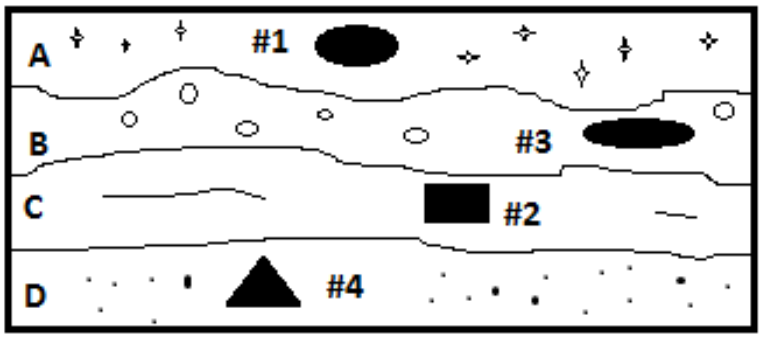


22. A chemical reaction in which a substance gains one or more electrons is called what? (This reaction is paired with another reaction in which the electron(s) are lost.)

A. oxidation B. reduction C. condensation D. precipitation

23. A hydraulic car lift can raise a several thousand-pound vehicle into the air with ease. What scientific law or principle does this lift utilize?

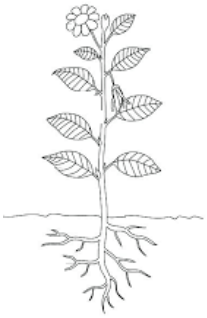
A. Hooke's B. Pascal's C. Newton's principle of force D. Bernoulli's



24. A paleontologist was collecting fossils on an exposed hillside. The hill had visible layers which she labeled A, B, C, and D. He found fossils, 1,2,3,4, at the locations on the diagram above. Which of the following statements below about the fossils found is true?

A. Fossil number 4 is the youngest.
B. Fossil number 2 is older than fossil 4.
C. Fossil number 3 is younger than fossil number 1.
D. Fossil number 2 is older than fossil 1 and 3.

25. Barbara had a drawing of a plant and needed to place it in her Science journal. What section should she put it in?



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

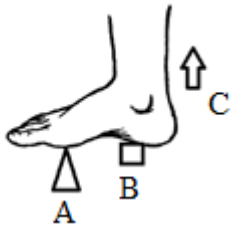
26. Using this Punnett square, what percentage of the offspring should be homozygous recessive?

		Maternal	
		B	b
Paternal	B	BB	Bb
	b	Bb	bb

A. 25%
B. 50%
C. 75%
D. 100%

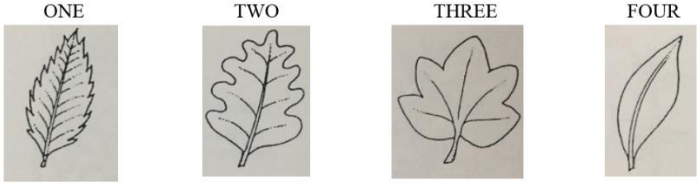
27. The human foot is an example of a class 2 lever. What parts of the lever are labeled by the letters A, B, and C?

A.	A-fulcrum	B- resistance	C.- effort
B.	A-effort	B- fulcrum	C. -resistance
C.	A-fulcrum	B.-effort	C. -resistance
D.	A-resistance	B.-fulcrum	C.-effort



28. Which leaf in this diagram is considered to be palmately lobed?

A. one
B. two
C. three
D. four



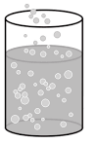
29. Which of the following statements is not true?

A. A satellite's closest point during its orbit about Earth is called the perigee.
B. A planet's closest point during its orbit of the sun is called the perihelion.
C. A satellite's furthest point during its orbit about the Earth is called the apogee.
D. A planet's furthest point during its orbit about the sun is called the perigee.

30. When a structure of a living thing is buried in sediment and then dissolved by underground water with only the shape and surface markings appearing, what type of fossil is created?

A. track B. a cast C. a mold D. coprolite

31. I lived during the 18th century in England. I invented carbonated water which gives soft drinks the "fizz" everyone loves. By heating a compound of mercury, I discovered a new element which has an atomic number of 8. Who am I?



A. Watson
B. Mendeleev
C. Mendel
D. Priestley

32. Which of the following diseases affect the respiratory system?

A. asthma
B. emphysema
C. bronchitis
D. all of these

33. Skin, hair, nails, glands, and some nerves are all parts of what system that helps to protect the body?

A. respiratory B. integumentary C. lymphatic D. endocrine

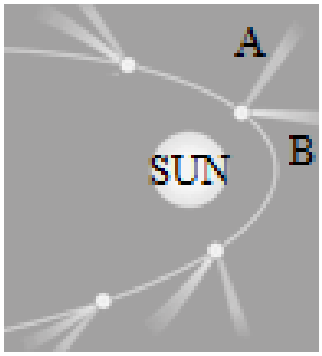
34. An imaginary sphere of very large radius surrounding the Earth that includes the planets, stars, sun, and moon which helps when plotting the apparent position of objects from Earth is called what?

A. celestial sphere
B. globe
C. hemisphere
D. Both A and B

35. When hydrogen peroxide comes in contact with sunlight, it starts to decompose. Which statement below shows this reaction?

A. $2\ H_2O_2 \rightarrow 2\ H_2O + O_2$
B. $2\ H_2O_2 \rightarrow 2\ H_2O + O$
C. $H_2O_2 \rightarrow 2\ H_2O + O$
D. $2\ H_2O_2 \rightarrow H_2O + O_2$

36. This diagram shows the orbit of a comet. Notice that the comet has two tails. The tail marked with the letter A is pointing directly away from the sun. The tail with the letter B is leaning more into the orbital path. Which is what type?



A. A is the ion tail and B is the dust tail.
B. A is the dust tail and B is the gas tail
C. A is the gas tail and B is the ion tail
D. comets never have two tails

37. The atomic mass is 88 and the number of neutrons is 50. What is the element?

A. Thulium B. Argon C. Strontium D. Radium

38. What is this instrument used to measure? (it is composed of two thermometers that swing around a handle in the air)

A. relative humidity
B. barometric pressure
C. wind sheer
D. sling psychrometer

39. What is specific gravity of a liquid or solid?

A. The ratio of an object's density compared to the density of an equal volume of water at 4^{o} C.
B. The ratio of an object's density compared to the object's volume.
C. The ratio of an object's mass compared to twice its volume in water at 4^{o} C.
D. The ratio of an object's volume compared to the mass of the same object.

40. What kind of waves are P-waves when discussing earthquakes?

A. compression waves
B. primary waves
C. pressure waves
D. all of these

41. This tool is used to measure what?

A. turbidity of water
B. amount of rainfall
C. temperature
D. water quality

42. I discovered that the pressure of a gas is related to its volume. I also found that electrical forces can travel through a vacuum, but sound cannot. Who am I?

A. McClintock B. Boyle C. Faraday D. Watson

43. Which feeding description matches this bird, Greater Roadrunner (*Geococcyx californianus*)?

A. herbivorous, especially seeds
B. mainly carnivorous, with occasional plant seasonal supplements
C. strictly carnivorous, specialized in coyotes only
D. omnivorous, equal amounts of plants and animals

44. Capillaries are important to exchange gases, nutrients, wastes, and hormones between veins and arteries. What connects the arteries to the capillaries?

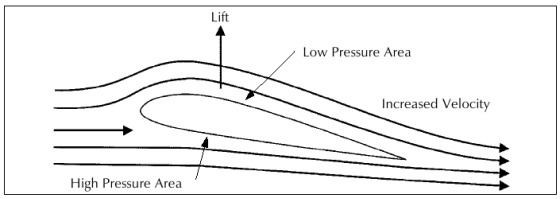
A. smooth tissue B. arterioles C. venules D. valves

45. What rock is also known as "volcanic glass" and has conchoidal fracture when broken?

A. granite B. shale C. gabbro D. obsidian

46. According to this principle, faster moving air above the wing on an airplane exerts less pressure than the slower moving air below the wing which increases the pressure below the wing causing an upward force called lift. What is the principle called?

A. Newton's
B. Wright's
C. Marconi's
D. Bernoulli's



47. The formula for calculating gravitational potential energy is what?

A. gravitational PE = mass (kg) x free fall acceleration (9.8 m/s^2) x weight (kg)
B. gravitational PE= mass(g) x freefall acceleration (9.8 m/s^2) x height (km)
C. gravitational PE= volume(m^3) x freefall acceleration (9.8 m/s^2) x height (m)
D. gravitational PE= mass(kg) x freefall acceleration (9.8 m/s^2) x height (m)

48. Out of the following waves on the electromagnetic spectrum, which has the lowest amount of energy?

A. ultraviolet light B. infrared waves C. gamma rays D. radio waves

49. A shark was swimming in the open ocean and was clocked with an average speed was 40 km/hr. The time was 3 minutes. What distance did the shark go at that speed?

A. 2km B. 120km C. 13.3 km D. None of these

50. Which two science areas of study would be most important to a paleontologist?

A. physics, biology B. biology, geology C. geology, chemistry D. chemistry, physics

2020 – 2021 TMSCA Middle School Science Test #2 - Key

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