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 # 6 ©

D E C E M B E R 5 , 2 0 2 0

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

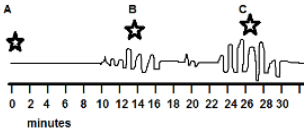
Acceleration of gravity at Earth's surface, g = 9.81 m/s^2
Avogadro's Number, N = 6.02 x 10^{23} molecules/mole
Planck's constant, h = 6.63 x 10^{-34} J•s
Planck's reduced constant, $\hbar = h/2\pi$ = 1.05 X 10^{-34} J•s
Standard temperature and pressure (STP) is 0°C and I atmosphere
Gram molecular volume 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

2020-2021 TMSCA Middle School Science Test #6

1. Once a pathogen has entered a human body, what defense mechanism helps the person fight the pathogen?

A. skin and mucous
B. cytotoxic T-cells
C. thrombocytes
D. personal protection equipment

2. An earthquake took place in Mexico and a seismograph set up in Alaska recorded this response. The star labeled A is when the earthquake actually took place.
What do the stars B and C represent?



A. B is the S-wave, C is the P-wave
B. B is the P- wave, C is the S-wave
C. B is shear wave, C is the pressure wave
D. Both A and C are correct

3. High energy particles from the solar wind get into the magnetosphere and become trapped within the Earth's magnetic field to produce what?

A. Van Allen belts of radiation B. Ionosphere C. Ephemeris D. Oort cloud

4. Which statement below is not true?

A. B-cells are antibodies that mark pathogens for destruction by white blood cells.
B. Mucous and skin are the body's first line of defense against pathogens.
C. Macrophages are red blood cells that engulf viruses to destroy them.
D. Oil and sweat make the skin surface acidic which reduces the growth of pathogens.

5. Which of these stars is found in the constellation called the Little Dipper?

A. Dubhe B. Polaris C. Betelgeuse D. Sirius

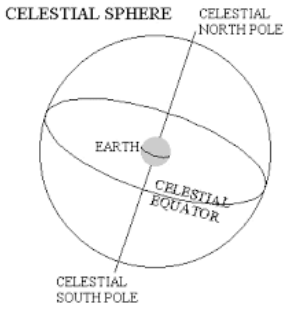
6. Which of the following statement below is not true?

A. The sun's most abundant element is Hydrogen.
B. The sun is about 93 million miles away from Earth.
C. The sun is one astronomical unit from Earth.
D. The sun is in the F category of stars on the HR diagram.

7. Which of the following describes amino acids?

A. carbon chain molecules that are building blocks of protein
B. have the same number of protons, but different number of neutrons
C. the carrier of genetic information in organisms
D. inorganic compounds that are insoluble in water

8. Look at the point on the celestial sphere where the sun is the farthest south. The time of the year when the sun passes this point is called what? (around December 21-22 in Northern Hemisphere)



A. winter solstice
B. summer solstice
C. vernal equinox
D. autumnal equinox

9. Jenny was in geology lab looking at two different sedimentary rocks. Rock A has angular pieces of different sizes and Rock B has rounded pieces of more uniform size. What is most likely true about these rocks?

A. Rock A formed from sediments that traveled a long distance possibly transported by a river, while Rock B was formed when it traveled a short distance possibly transported by a glacier.
B. Rock A formed from volcanic ash, while Rock B formed in a swamp.
C. Rock A and Rock B both formed in a stream with a high energy source that caused much motion and tumbling before deposition.
D. Rock A formed from sediments that traveled a short distance possibly transported by a glacier, while Rock B was formed in a rushing stream type area over a longer area before being deposited.

10. If an egg is held at a height of 8 meters before being dropped, what is its gravitational potential energy? (egg's mass = 60 g) gravitational PE = mass(kg) x 9.8 m/s^2 x height(m)

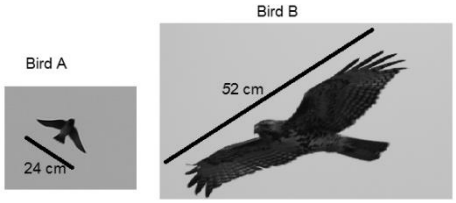
A. about 4,000 Joules
B. about 10 Joules
C. about 60 Joules
D. about 5 Joules

11. All of these make good conductors of electricity except for which one?

A. silver B. gold C. copper D. diamond

12. Which of these birds would not need to flap its wings more to stay in the air?

A. Bird A
B. Bird B
C. They would flap their winds the same.
D. the information is insufficient



13. One example of a covalent bond in which atoms share electrons would be what?

A. NaCl B. CH_4 C. BrLi D. NaF

14. In a wind turbine, the motion of the wind causes the blades on the turbine to move. What energy transformation is occurring with this action?

A. chemical energy to potential energy
B. heat energy to light energy
C. potential energy to electrical energy
D. kinetic energy to mechanical energy

15. When looking at the side of a canyon, a geologist can tell which layers are shale, limestone, or sandstone by observing what?

A. Shale and sandstone layers will be light in color, while limestone will appear darker
B. Sandstone and shale will be defined and rigid, while limestone will appear crumbly
C. Sandstone and limestone will make more defined cliffs, while shale layers will look crumbly
D. Limestone and sandstone will be darker in color, while shale layers will be lighter

16. The smallest unit of matter that cannot be broken down by chemical means is called a what?

A. cell B. atom C. DNA D. nucleus

17. What type of molecules do not dissolve very well in water?

A. polar B. nonpolar C. diatomic D. carbon dioxide

18. When two different egg cells are fertilized by different sperm cells at the same time, what results?

A. identical twins B. fraternal twins C. cloning D. none of the above

19. Carbohydrates are any of a large group of compounds that are found in foods and living tissues. Which of the following is not a carbohydrate?

A. starch B. sugar C. fish D. cellulose

20. George heard of a fun activity that he wanted to try. He took a slice of an orange and dipped it in baking soda. Then he put it in his mouth and chewed. When he did, the orange slice started bubbling and fizzing in his mouth. Why did this happen?

A. the citric acid in the orange was activated when the baking soda touched it
B. the saliva in his mouth reacted with the citric acid and caused the fizzing
C. when the citric acid in orange is combined with baking soda, a physical change occurs and carbon dioxide is formed
D. the orange is acidic and the baking soda is basic – when the two combined with chewing a chemical reaction took place and carbon dioxide gas was formed

21. The path or flow that the charge follows on an electric circuit is called what?

A. electric current B. ampere C. conductor D. resistance

22. Which trait listed below is not considered an inherited trait?

A. tendency for hemophilia B. color blindness C. PTC tasting D. finger calluses

23. A way to tell the difference between shale and mudstone is to break it. Which of the following would be true?

A. shale breaks into thin layers and mudstone breaks into chunks or blocks
B. shale breaks into chunks or blocks and mudstone breaks into thin layers
C. shale will break into thin layers and mudstone will not break at all
D. shale will not break at all and mudstone will break into chunks and blocks

24. What makes direct exploration to the Earth's interior mainly impossible?

A. high temperatures
B. tremendous pressure
C. Both A and B
D. direct exploration to the Earth's interior has taken place

25. If an organism possesses two alleles for tallness or two alleles for shortness, the organism will be what?

A. heterozygous for that trait
B. both tall and short
C. hybrid
D. homozygous for that trait

26. What substance is responsible for the green color in plants?

A. coating on the outside of cell walls
B. glucose
C. ribosomes
D. chlorophyll

27. Which of the following is part of a bacterial cell?

A. nucleus B. cell wall C. golgi apparatus D. mitochondria

28. All of the following statements are true except for which one?

A. Edward Jenner is among the first to discover vaccines.
B. Edward Jenner's vaccine for smallpox was developed in 1796.
C. Smallpox is caused by the variola virus.
D. Smallpox vaccines are regularly given to school children during the present day.

29. Some animals are able to regrow a part of their body that have been lost due to an injury. This is known as what?

A. reincarnation B. maturation C. regeneration D. extension

30. Which list below includes only abiotic factors?

A. air currents, temperature, moisture, light, soil
B. wind, rocks, rain, and plants
C. oxygen, soil, atmosphere, bacteria
D. viruses, protists, algae, mold

31. Using this chart of metal densities, find the mass in kg of a cube of Nickel with a volume of 6 m^3.

Metal	Principal Ore	Density
Aluminum	Bauxite	2.7 g/cm^3
Lead	Galena	11.34 g/cm^3
Nickel	Pentlandite	8.9 g/cm^3
Zinc	Sphalerite	7.14 g/cm^3

A. 53.4 kg
B. 1.48 kg
C. 53,400 kg
D. 67.4 kg

32. Out of the names listed below, which is not a cell?
A. neuron B. erythocytes C. coronavirus D. bacteria

33. Which organelle(s) in an animal cell process(es) energy?
A. vacuoles B. chloroplasts C. mitochondria D. Both B and C

34. Some organisms reproduce asexually. Which statement below is true about asexual reproduction?
A. Asexual reproduction provides for more genetic variation in the species.
B. Paramecium produce spores as a type of asexual reproduction.
C. Parthenogenesis happens when the male of the species is cloned.
D. The Hydra reproduces by budding which is a type of asexual reproduction.

35. A spider-web like geologic structure of fractures in the crust found on the surface of Venus is called what?
A. chelicerata B. anticline C. nappes D. arachnoid

36. Which of these stars is found in the constellation called the Big Dipper?
A. Dubhe B. Polaris C. Betelgeuse D. Sirius

37. Atoms bond together to form molecules. When atoms have two or more electrons that share electrons, this is what type of bond?
A. ionic B. cohesive C. adhesive D. covalent

38. Water molecules have the tendency to stick or cling to each other. This quality is explained as what?
A. ionic B. cohesion C. adhesion D. nonpolar

39. What part of a microscope do you look through?
A. stage B. ocular C. base D. diaphragm

40. What is the SI unit to measure power?
A. ampere B. hertz C newton D. watt

41. Sound travels faster through what than through gases?
A. solid B. vacuum C. liquid D. Both A and C

42. You and your friend are playing tug of war. You pull on the rope with a force of 25 East. Your friend pulls on the rope with a force of 35 West. What direction will the rope move and who is winning the contest?

A. The rope will move east, you win
B. The rope will move west, your friend wins
C. The rope will not move, you tie
D. The rope will move west, your friend loses

43. In a vacuum, two objects of different masses free falling from gravity at the top of a building will reach the bottom at the same time. Why does that statement include "in a vacuum"?

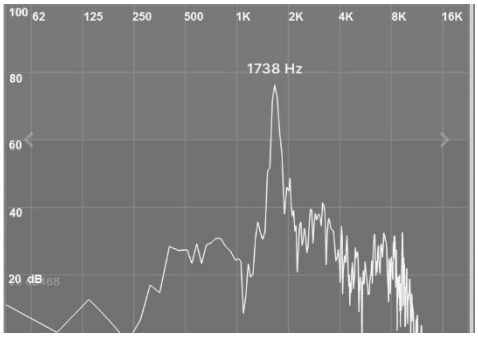
A. Even in a vacuum, this statement is false.
B. If the objects were not in a vacuum, they could be affected by air resistance changing the results.
C. All experiments should be conducted in a vacuum.
D. The objects masses will cause them to fall differently even in a vacuum.

44. One example of an ionic bond in which ions of opposite charges interact to form a bond would be what?

A. NaCl B. CH_4 C. CO D. HCl

45. Robert was exploring with the sound reader app on his phone. He whistled a constant note and did a screen shot of the output for when he whistled. His cat was also in the room busy cleaning and licking its coat of fur. This is the screenshot he took. The x-axis ismarked in Hertz and the y-axis displays decibels.
How many Hz did his whistle register on this graph?

A. 75 B. 20 C. 1738 D. 500



46. What does Hertz measure on this graph?

A. loudness B. frequency C. wavelength D. none of these

47. What is the approximate highest decibel reading for Robert's sound test?

A. 40 B. 80 C. 50 D. 2,000

48. If a highly trained athlete can produce 2 mechanical horsepower when performing a physical task, how many watts would this equal?

A. 1,492 W B. 3,000 W C. 746 W D. 373 W

49. Mrs. Glade's class wanted to plant bluebonnets in the spring. She found some packaged seeds, but wanted to make sure they would grow. Bluebonnets are lupines that need to go through certain conditions before they germinate. Mrs. Glade told the class that they would need to scarify the seeds. What does that mean?

A. grow them in a greenhouse environment first
B. place them in special soil
C. soak them in oil for two weeks and then bake them in an oven
D. weaken, alter, or open the coat of the seed to encourage germination

50. Look at the moon phase shown in this photo. What phase will happen in about 3 or 4 days?

A. full moon
B. waning crescent
C. new moon
D. waning gibbous

2020 - 2021 TMSCA Middle School Science Test #6 - Key

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