



**TMSCA MIDDLE SCHOOL
SCIENCE
TEST #4 ©
NOVEMBER 12, 2016**

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 , $\ln x$, 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 $\pm 5\%$ 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 H 1.008	2A																	8A
	3 Li 6.941	4 Be 9.012											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 23.00	12 Mg 24.31	3B	4B	5B	6B	7B	8B			1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95	
	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	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 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3	
	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)	
	87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)		109 Une (267)										

Lanthanides	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
Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	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 (260)

OTHER USEFUL INFORMATION

Acceleration of gravity at Earth's surface, $g = 9.81 \text{ m/s}^2$

Avogadro's Number, $N = 6.02 \times 10^{23} \text{ molecules/mole}$

Planck's constant, $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$

Planck's reduced constant, $\hbar = h/2\pi = 1.05 \times 10^{-34} \text{ J}\cdot\text{s}$

Standard temperature and pressure (STP) is 0°C and 1 atmosphere

Gram molecular volume at STP = 22.4 liters

Velocity of light, $c = 3.0 \times 10^8 \text{ m/sec}$

Absolute zero = $0 \text{ K} = -273.15^\circ\text{C}$

Gas constant, $R = 1.986 \text{ cal/K}\cdot\text{mole} = 0.082 \text{ liter}\cdot\text{atm/K}\cdot\text{mole}$

One Faraday = 96,500 coulombs ($9.65 \times 10^4 \text{ C}$)

Dulong and Petit's constant = $6.0 \text{ amu}\cdot\text{cal/gram}\cdot\text{K}$

Electron rest mass, $m_e = 9.11 \times 10^{-31} \text{ kg}$

Atomic mass unit, $m_a = 1.66 \times 10^{-27} \text{ kg}$

Boltzmann constant, $k_B = 1.38 \times 10^{-23} \text{ J/K}$

Permittivity of free space $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$

Permeability of free space $\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}$

1 Atmosphere = $1.02 \times 10^5 \text{ N/m}^2 = 760 \text{ Torr} = 760 \text{ mmHg}$

1 Electron Volt = $1.6 \times 10^{-19} \text{ Joules}$

Charge of an electron = $-1.6 \times 10^{-19} \text{ coulombs (C)}$

1 horsepower (hp) = $746 \text{ W} = 550 \text{ ft}\cdot\text{lb/s}$

Neutron Mass = 1.008665 au

Proton Mass = 1.007277 au

1 au = 931.5 MeV

1 calorie = 4.184 Joules (J)

Specific heat of water = $4.18 \text{ J/g}\cdot^\circ\text{C}$

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1. An animal that hunts other animals for food is called a/an _____.
A. prey B. predator C. scavenger D. omnivore
2. It takes _____ force to change the direction or speed of an object.
A. no B. a balanced C. more than one D. an unbalanced
3. A land area in which surface runoff drains into a river or a system of rivers is called _____.
A. hard water B. pore space C. a reservoir D. a watershed
4. A large quartz crystal is added to a graduated cylinder containing 80 mL of water, raising the level to 90 mL of water. What is the volume of the quartz?
A. 10 cm³ B. 80 cm³ C. 90 mL D. 90 cm³
5. _____ is a group of cells in the body in which there is loss of control of cell division and function.
A. Cancer B. Malnutrition C. Immunity D. Bacterium
6. An animal's heart rate _____ when it hibernates.
A. stops B. speeds up C. slows down D. stays the same
7. Substances pass in and out of a cell through the _____.
A. cell membrane B. mitochondria C. nucleus D. nuclear membrane
8. Of the following, _____ determines the identity of an element.
A. atomic number B. mass number C. atomic mass D. overall charge
9. Mitosis in plant and animal cells differs in the _____ stage.
A. third B. second C. first D. last
10. Which of the following everyday materials is not a good insulator because of its physical properties?
A. wood B. cloth C. metal D. rubber
11. Meltwater is a stream of water formed by _____.
A. melting snow B. a valley glacier C. an iceberg D. surface runoff from ice
12. Unlike cold-blooded animals, warm-blooded animals have an advantage in that they can _____.
A. survive with little food C. warm the air around them
B. reproduce by internal fertilization D. live in a wide range of environments
13. Of the following, a _____ is not a simple machine.
A. faucet handle B. jar lid C. can opener D. seesaw
14. In a lateral fault, one block _____.
A. moves up relative to the other C. breaks through the other
B. slides over the other D. moves horizontally past the other

15. Flat areas that form on the sides of a mature river and that are sometimes covered by river water are called _____.
- A. deltas B. flood plains C. alluvial fans D. levees
16. A _____ is a longitudinal belt of the Earth in which all areas have the same local time.
- A. International date line B. meridian C. Mercator project D. time zone
17. Stomach acids help defend the body against infectious diseases by _____.
- A. providing an acquired immunity against disease C. producing white blood cells to fight infection
- B. producing antibodies to fight infection D. killing microorganisms that have been swallowed
18. The diffusion of water and dissolved materials into the bloodstream is called _____.
- A. absorption B. digestion C. constipation D. reproduction
19. Hydrogen gas can be produced when an acid reacts with _____.
- A. a base B. baking soda C. a salt D. a metal
20. The nucleus, coma, and tail are parts of a/an _____.
- A. cell B. comet C. planet D. meteorite
21. The altitude of an object in the sky is its angular distance _____.
- A. above the horizon C. from the zenith
- B. from the north celestial pole D. from the prime meridian
22. Probably the most important reason for the success of insects is their _____.
- A. complete body systems C. distinct body sections
- B. high rate of reproduction D. metamorphic changes
23. Carbon atoms can form the backbone of organic compounds because each carbon atom _____.
- A. has 4 valence electrons C. can form 4 bonds
- B. can bond with 4 atoms D. all of these
24. The thickest layer of Earth is the _____.
- A. crust B. mantle C. outer core D. inner core
25. Volcanic glass so full of bubbles that it can float on water is called _____.
- A. glassy B. magma C. pluton D. pumice
26. The type of tissue that provides for movement is called _____ tissue.
- A. connective B. muscular C. nervous D. epithelial
27. Tidal range is greatest during _____.
- A. spring tide B. neap tide C. a tidal bore D. the daytime

28. The hot, plastic-like layer beneath the lithosphere is called the _____.
A. outer core B. crust C. inner core D. athenosphere
29. The skin is part of the integumentary system. What is the main function of the integumentary system?
A. support B. regulation C. protection D. gas exchange
30. A/An _____ is an organism that lives in or on another organism and usually causes harm to its host.
A. saprophyte B. parasite C. protista D. genus
31. An increase in the concentration of hydronium ions in a solution _____ the pH.
A. raises B. lowers C. does not affect D. doubles
32. Of the following, the _____ does not play an important role in excreting wastes.
A. lungs B. kidneys C. skin D. stomach
33. In incomplete dominance, _____.
A. a single gene controls many traits C. genes for a trait are all recessive
B. the environment controls the genes D. each allele for a trait has its own degree of influence
34. _____ is the joining of a sperm cell and an egg cell.
A. Respiration B. Evacuation C. Fertilization D. Decomposition
35. Humans can cause different types of pollution. When fertilizers and pesticides make their way into water systems, which type of pollution has taken place?
A. air B. biological C. chemical D. thermal
36. 100 centimeters is equal to _____.
A. 1 liter B. 1 meter C. 1 gram D. 1 kilometer
37. The transfer of thermal energy by the movement of a liquid or a gas is _____.
A. convection B. insulation C. radiation D. conduction
38. The sac in which bile is stored is called the _____.
A. liver B. pancreas C. gall bladder D. Stensen's duct
39. A crack in rock is called a/an _____.
A. fault B. hanging wall C. foot wall D. fracture
40. The stars that you see in the sky depend on _____.
A. your latitude B. the time of year C. the time of night D. all of these
41. A force that tends to pull together the matter in stars is _____.
A. nuclear fission B. nuclear fusion C. expansion D. gravity

42. Blood vessels that carry blood from the heart to all parts of the body are called _____.
A. aortas B. veins C. arteries D. ventricles
43. A substance that speeds up a reaction without being permanently changed is called a/an _____.
A. reactant B. catalyst C. inhibitor D. concentrate
44. Strike-slip boundaries occur where two plates _____.
A. move downward C. slide over one another
B. move upward D. slide past one another
45. The key to natural selection is _____.
A. successful reproduction C. genetic mutations
B. inherited traits D. genetic variation
46. The _____ is an excretory organ that removes wastes from the blood.
A. liver B. kidney C. bladder D. anus
47. A paddlefish is born with an unusually wide paddle/mouth. When this paddlefish breeds, some of its offspring also have the unusually wide paddle. What is the most likely explanation for the wider mouth in the paddlefish and its offspring?
A. a mutation B. natural selection C. a change in habitat D. a change in diet
48. A _____ is any change in the environment that causes a response in an organism.
A. deterrent B. hindrance C. dissuasion D. stimulus
49. The nerve fibers that send messages from the fingertips to the spinal cord are _____.
A. motor neurons C. association neurons
B. sensory neurons D. axons
50. The Moon is different from the Earth because it _____.
A. has almost no atmosphere C. has no gravity
B. is not solid D. receives almost no solar light

**2016-2017 Middle School Science #4
Answer Key**

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