



# TMSCA MIDDLE SCHOOL SCIENCE BANA INVITATIONAL © 2017

## 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  $0^\circ\text{C}$  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 =  $4.18 \text{ J/g}\cdot^\circ\text{C}$

**2017-2018 Middle School BANA/TMSCA Invitational Science Test**

1. The hypothalamus, pancreas, testes and thyroid are studied in which field of science?  
A. morphology      B. gastronomy      C. endocrinology      D. ichthyology
2. How many kilograms are in 547339 centigrams of ambergris?  
A. 54.7339      B. 5473.39      C. 5.47339      D. 547,339,000
3. Which planet in our solar system besides Earth has only one moon?  
A. Mercury      B. Venus      C. Mars      D. no other planet
4. In mammals, which body system contains the humerus, femur and clavicle?  
A. digestive      B. muscular      C. skeletal      D. circulatory
5. Ceres, Vesta and Pallas are names of \_\_\_\_\_.  
A. stars      B. famous inventors      C. stalagmites      D. asteroids
6. Argon, krypton and xenon are examples of \_\_\_\_\_.  
A. alkali metals      B. noble gases      C. transition metals      D. extinct planets
7. An example of a medication used to treat pain is \_\_\_\_\_.  
A. talc      B. morphine      C. ambergris      D. calcium
8. The right ventricle and left atrium are located in the \_\_\_\_\_.  
A. heart      B. liver      C. brain      D. pancreas
9. Which of these instruments measures ionizing radiation?  
A. barometer      B. galvanometer      C. compass      D. Geiger counter
10. Who was involved in the Manhattan project?  
A. Oppenheimer      B. Salk      C. DeBaKey      D. Cooley
11. In which USA manned mission program did Neil Armstrong walk on the moon?  
A. Apollo      B. Mercury      C. Gemini      D. Saturn
12. How many ounces are in 37 pounds of feathers?  
A. 370      B. 592      C. 555      D. 518
13. Which of these nucleic acids usually occurs only in RNA but not DNA?  
A. guanine      B. uracil      C. cytosine      D. thymine
14. Which animal is classified as a primate?  
A. platypus      B. mallard      C. marmot      D. mandrill
15. Which of these planets is smaller than Mars?  
A. Venus      B. Earth      C. Mercury      D. Neptune

16. Which of these anatomical structures is located nearest the throat?

- A. epiglottis      B. ulna      C. duodenum      D. cecum

17. What type of organelles are the protein builders for the cell?

- A. vacuole      B. mitochondrion      C. vesicle      D. ribosome

18. Of these planets, which has the longest day?

- A. Jupiter      B. Mars      C. Earth      D. Saturn

19. The chemical formula for caffeine is  $C_8H_{10}N_4O_2$ . What element does C represent?

- A. carbon      B. calcium      C. cobalt      D. chlorine

20. Which of these scientists was most influential in the United States space program?

- A. Leibnitz      B. Einstein      C. Pasteur      D. Von Braun

21. The duodenum is part of the \_\_\_\_\_.

- A. small intestine      B. brain      C. heart      D. pancreas

22. An echidna is an example of a/an \_\_\_\_\_, a mammal that lays eggs.

- A. marsupial      B. monotreme      C. monocyte      D. mesophyte

23. Which planet has many moons, including Triton, Proteus and Larissa?

- A. Uranus      B. Jupiter      C. Saturn      D. Neptune

24. Who was a computer scientist who helped program the Harvard Mark I?

- A. Charles Babbage      B. Lady Lovelace      C. Grace Hopper      D. Jonas Salk

25. A term that describes thought processes in the brain is \_\_\_\_\_.

- A. cognition      B. telepathy      C. respiration      D. exhalation

26. Which type of human tooth is located closest to the back of the mouth?

- A. incisor      B. molar      C. cuspid      D. bicuspid

27. Which of these life forms does not normally inhabit a taiga biome?

- A. bear      B. pine      C. monotreme      D. wolverine

28. Fourteen moons have been discovered orbiting which planet in our solar system?
- A. Neptune            B. Jupiter            C. Saturn            D. Uranus
29. The study of typhoons and cold fronts is included in the field of \_\_\_\_\_.
- A. astronomy            B. endocrinology            C. biology            D. meteorology
30. What is the classification of the Earth's moon just before or just after the new moon?
- A. full            B. waning            C. gibbous            D. crescent
31. Who was the astronomer who predicted the orbit of a comet that passes near Earth about every 76 years?
- A. Edmund Halley    B. Louis Pasteur            C. Edwin Budding    D. Gregor Mendel
32. The study of the structure and function of plant and animal cells is called \_\_\_\_\_.
- A. topology            B. oology            C. cytology            D. cetology
33. What type of rocks are formed by the cooling of lava or magma on the earth's surface?
- A. igneous            B. metamorphic            C. sedimentary            D. torpidic
34. Which of these animals has the longest migration period?
- A. gray whale            B. desert locust            C. caribou            D. Monarch butterfly
35. In computer programming, RAM designates what kind of memory?
- A. Readily Available    B. Ready Alert            C. Random Access    D. Read Action
36. A group of bears is called a sleuth. A group of quail can be called a \_\_\_\_\_.
- A. bevy            B. aggregate            C. colony            D. pod
37. In computer hardware, which of these components was used in the first generation of computers?
- A. vacuum tubes            B. transistors            C. VLSI circuits            D. integrated circuits
38. In the United States, how many mountains exceed 18,000 feet above sea level?
- A. zero            B. one            C. three            D. five

39. Moose are indigenous to \_\_\_\_\_.

- A. Costa Rica      B. Rwanda      C. Finland      D. Brazil

40. Forms of this metal are used as fuel for nuclear power plants and as ballasts for ships. Which metal has these uses?

- A. uranium      B. caesium      C. lead      D. silver

41. The human organ that contains nephrons is the \_\_\_\_\_.

- A. liver      B. thyroid      C. kidney      D. pancreas

42. Which of these is a female reproductive organ?

- A. patella      B. cochlea      C. ovary      D. testes

43. A cardiologist might operate on which of these body parts?

- A. radius      B. pelvis      C. ventricle      D. brain

44. Which astronaut was the first to be a traveler in space?

- A. Alan Shepard      B. Yuri Gagarin      C. John Glenn      D. Neil Armstrong

45. Which human organ cleanses the blood of waste products?

- A. heart      B. brain      C. kidney      D. pancreas

46. Which of these is an acronym for one of the early computers?

- A. EDJAC      B. UNISAC      C. ARNAC      D. ENIAC

47. The highest point in California is \_\_\_\_\_.

- A. Mt. Elbert      B. Mt. Mitchell      C. Mt. Whitney      D. Mt. Greylock

48. Which of these scientists contributed to the development of modern computers?

- A. Jonas Salk      B. Michael Debakey      C. Alan Shepard      D. John von Neumann

49. Glucose, sucrose and fructose are examples of \_\_\_\_\_.

- A. coagulants      B. sugars      C. hydrocarbons      D. enzymes

50. Which of these animals is not a rodent?

- A. bear      B. porcupine      C. rat      D. squirrel

2017-2018 Middle School BANA/TMSCA Science Test Answer Key

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