

TMSCA MIDDLE SCHOOL SCIENCE TEST #11 © FEBRUARY 9, 2019

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.

1A 1																	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	8A 18		
1 H 1.01																	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	8B 8 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, $g = 9.81 \text{ m/s}^2$

Avogadro's Number, $N = 6.02 \times 10^{23}$ 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 K = -273.15°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 (9.65×10^4 C)

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

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

Atomic mass unit, $m_u = 1.66 \times 10^{-27}$ 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 Torr = 760 mmHg

1 Electron Volt - 1.6×10^{-19} Joules

Charge of on electron''' -1.6×10^{-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

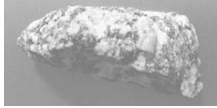
1 calorie= 4.184 Joules (J)

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

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1. What type of rock is formed by heat and pressure?
A. Sedimentary B. Igneous C. Metamorphic D. Minerals
2. On Earth, what is the rarest occurring pigment found in nature?
A. red B. blue C. purple D. green
3. Two important terms describing temperature changes in the equatorial Pacific are “El Nino” and “La Nina”. Which statement below describes these phases?
A. El Nino is the warm phase and La Nina is the cold phase.
B. El Nino is the cold phase and La Nina is the warm phase.
C. El Nino is the dry phase and La Nina is the wet phase.
D. El Nino is the wet phase and La Nina is the dry phase.
4. Which of the following would describe the word “posterior”?
A. back B. front C. middle D. side
5. Cameron’s science teacher took a pencil and rolled it across the desk. The friction of the pencil with the table eventually caused the pencil to stop rolling. The table pushing up on the pencil kept it from falling on the ground. The teacher discussed balanced and unbalanced forces. Which law of motion was the teacher demonstrating for Cameron’s class?
A. Newton’s first law of motion
B. Newton’s second law of motion
C. Newton’s third law of motion
D. Newton’s fourth law of motion
6. Earthworms are covered with small bristles which help with movement called what?
A. clitellum B. annuli C. castings D. setae
7. Which of these is considered the approximate velocity of light in a vacuum?
A. 3.0×10^8 m/sec
B. 6.63×10^{-34} J_s
C. 1.66×10^{-23} kg
D. Too fast to be written
8. The prefix “chrono” means what?
A. old B. time C. ancient D. down
9. Avogadro’s Number is equal to what?
A. 6.02×10^{23} particles
B. 1 mole
C. Both A and B
D. The number of particles in 12 grams of any element.

10. Looking under a microscope you see that the chromosomes have just become visible. What stage of mitosis would this be?
A. Prophase B. Metaphase C. Interphase D. Anaphase
11. Pumice is an interesting rock because it will do something that most rocks can't do. What does it do?
A. burns with a blue flame
B. react with vinegar
C. give off a red streak
D. float in water
12. The Noble gases on the Periodic Table are found in what group?
A. 7A B. 6A C. 1A D. 8A
13. Which of the following famous American scientists perfected a liquid rocket propellant to advance the progress of rockets that could leave the Earth's gravitational pull?
A. Isaac Newton
B. Hans Christian Oersted
C. Alexander Fleming
D. Robert Goddard
- 
14. Which of the following is a difference between plant and animal cells?
A. A large central vacuole is found in plant, but not animal cells.
B. Chlorophyll is found in plant, but not animal cells.
C. Plant cells have cell walls, but not animal cells.
D. All of these are differences.
- 
15. Students in Mr. Sherwood's class were studying about the rock cycle. They took some old crayons for make a model. First, they took they crayons and rubbed them on a cheese grater to make shavings of the wax. They took the shavings and collected them in the bottom of a cup. They compacted the shavings down until they were squeezed together into one piece again. Next, they took the cup and heated it so that the wax melted into a liquid. When the liquid cooled off, it became hard like a crayon once again. What should they do to represent metamorphic rock in this model?
A. Shave the pieces again on the cheese grater to make more little pieces.
B. Take the cooled piece of melted crayon and re-melt it.
C. Take the cooled piece of melted crayon and apply more layers above it. Apply pressure to it and some more heat.
D. Collect more tiny pieces of shaved wax and compact them together into one piece.
16. The number of these in an atom is very important in identifying the element. What is this part?
A. electron B. neutron C. proton D. nucleus

17. Which of the root words, suffixes, or prefixes below means “new”?
- A. neo B. nova C. iso D. Both A and B
18. Granite is a rock with fairly large crystals. Where did it most likely form?
- A. on the surface of the Earth
B. under water
C. in a volcanic eruption
D. under the surface of the Earth
- 
19. What is the best definition of pH?
- A. A measure of the salts within a solution
B. A measure of the conductivity of water based on hydrogen ions
C. Number from 0-14 describing the acid in the water
D. The relative measure of hydrogen ion concentration within a solution
20. When observing the trophic levels and the energy relationships, about how much energy is passed from one level to the next? (as from producers to primary consumers, primary to secondary, and so on.)
- A. 90% B. 50% C. 25% D. 10%
21. When a baby duckling hatched, the first living organism it saw was a human. The baby started following this human around everywhere. The duck’s mother was nowhere to be found. This baby may have a difficult time surviving in the wild because of why?
- A. it will not find the natural food it needs
B. instinct will not be learned from mother
C. imprinting on a human can prevent learning survival skills
D. innate behaviors will not develop
22. Coral and zooxanthellae have a symbiotic relationship. The coral provides protection for the algae and the algae provides nutrients for the coral. What type of relationship do they have?
- A. mutualism
B. parasitism
C. commensalism
D. xanthophyllism
23. Out of the following waves on the electromagnetic spectrum, which has the shortest wavelength?
- A. ultraviolet light
B. infrared waves
C. gamma rays
D. radio waves

24. How many hours of daylight would there be at Earth's North Pole on December 21?
 A. 24 hours B. 23.5 hours C. 0 hours D. 12 hours

25. Which term describes a very strong dust or sand storm?
 A. hoodoo B. arroya C. loess D. haboob

26. Vinegar is composed of what elements?
 A. Nitrogen, Hydrogen, and Oxygen
 B. Carbon, Hydrogen, and Oxygen
 C. Argon, Nitrogen, and Carbon
 D. Hydrogen, Carbon, and Phosphorus

27. The planets stay in orbit around the sun in our solar system. The moons orbit around planets. These movements in our solar system are governed by what force?
 A. magnetic field B. gravity C. friction D. static

28. What percent of the offspring have homozygous genotypes?
 A. 25% B. 50% C. 75% D. 100%

	Maternal	
	B	b
Paternal	B	BB Bb
	b	Bb bb

29. Which of the following statements is false when discussing chemical reactions?
 A. The products are the substances that result after the reaction.
 B. The reactants are the substances that you end with.
 C. This symbol \rightarrow stands for "yields"
 D. Each symbol may have a coefficient if needed.

30. What Ecoregion of Texas would include the cities of El Paso and Fort Davis?
 A. Edward's Plateau
 B. Rolling Plains
 C. Pineywoods
 D. Trans Pecos

31. Which one of the following is not a correct unit of volume?
 A. kg B. mL C. cm^3 D. m^3

32. In a vascular plant, the tissue that carries food to other parts of the plant is called what?
 A. Phloem B. Xylem C. Cambium D. Stomata

33. When comparing a cell to a city, what cell part would perform the same role as storage buildings in a city?
- nucleus
 - cytoplasm
 - vacuoles
 - mitochondria
34. Kenneth was testing which type of battery lasts the longest in his flashlight. He used three different brands of batteries and times how long they would continually keep the flashlight shining. Here are his results.
- How long did Battery A last?
- 115 hours
 - 217.25 hours
 - 205.25 hours
 - 215.5 hours
- | Battery Brand | Start time | End time |
|---------------|---------------|-----------------|
| A | Day 1 -3:00pm | Day 10 – 4:15am |
| B | Day 1 -3:00pm | Day 14 – 5:30pm |
| C | Day 1 -3:00pm | Day 7 – 1:45pm |
35. Complete this analogy: Mammoth is to Cenozoic as Trilobite is to _____.
 A. Cenozoic B. Paleozoic C. Cambrian D. Precambrian
36. The process of chemical digestion starts where in a human?
- with the movement of the esophagus
 - with the absorption in the intestines
 - with the acid in the stomach
 - with the saliva in the mouth
37. Ramona was trying to move a TV cart from one side of the room to the other. Ramona applied 125 N of force on the TV cart to push south side of the room. Her friend pushed with 130 N of force. The TV cart did not move. How much work was done on the TV cart?
- 0 J
 - 5 J
 - 200 J
 - 255 J
38. Adrienne was walking down the street when suddenly, she was approached by a large dangerous looking dog. Her hypothalamus in her brain set off an alarm which caused signals to have her adrenal gland release a surge of hormones. What two hormones would this include?
- insulin and oxytocin
 - adrenaline and melatonin
 - cortisol and insulin
 - adrenaline and cortisol

39.

Time of Reading	Power (watts)
6:00am	HA – 30 VA - 2
12:00pm	HA – 52 VA – 8
6:00pm	HA – 140 VA – 43
	HA (horizontal axis) VA (vertical axis)

In this chart, which type of wind turbine has more electricity generation, a horizontal axis wind turbine (MUST be facing into the wind) or a vertical axis wind turbine (does not have to face into the wind)?

- A. horizontal axis
 - B. vertical axis
 - C. difficult to tell with this chart
 - D. they are the same
40. An instrument that is used to measure atmospheric pressure is called a what?
- A. seismic scale B. seismograph C. epicenter D. barometer
41. Which of the following elements are not diatomic molecules?
- A. Nitrogen and Hydrogen
 - B. Oxygen and Bromine
 - C. Fluorine and Chlorine
 - D. Helium and Argon
42. What does the prefix “pter” mean?
- A. having wings or fins
 - B. another species
 - C. standing or staying
 - D. middle
43. The NOAA organization is important in keeping people informed about hurricane dangers. What does NOAA stand for?
- A. Nationwide Organization of Atmosphere Administration
 - B. National Oceanic and Atmospheric Administration
 - C. New Organization of American Atmosphere
 - D. National Ocean Advancement Association
44. Which statement about tigers is true?
- A. Tigers dislike water and will avoid it.
 - B. Tigers are fast runners and can reach speeds of 65 mph.
 - C. No two tigers have the same pattern of stripes
 - D. Tigers live in North America.



45. How is polarized light different from unpolarized light?
- A. Unpolarized light waves vibrates in one horizontal plane and polarized does not.
 - B. Polarized light waves means that the light has been lined up with a magnetic field.
 - C. Polarized light waves vibrates in one plane and unpolarized light waves vibrates in more than one plane.
 - D. Unpolarized light has been filtered to exclude all visible light waves except for one.
46. When a white flower such as a snapdragon, is crossed with a red flower of the same species, the offspring may end up being pink in color. This is an example of what?
- A. Codominance
 - B. Incomplete dominance
 - C. Polygenic
 - D. Recessive
47. A free-falling object only under gravity's pull has a downward acceleration of what on Earth?
- A. 9.8 N/kg
 - B. 9.8 m/s^2
 - C. 6.8 m/s^2
 - D. both A and B are correct
48. If you were able to be transported back in time on the Geologic Time Scale, what would you most likely see during the Permian Period?
- A. large flowering plants, giant land-dwelling animals, separated continents
 - B. various types of dinosaurs, large areas of dry land, many volcanoes
 - C. only seas covering all the land, aquatic animals of various types, shelled animals
 - D. large areas of land and water, seed ferns, coniferous plants, first land dwelling reptiles
49. Which of the following traits may be influenced by parts of the environment, such as temperature, soil pH, or nutrition?
- A. Flower color, fur color, height, weight
 - B. Disease transmission, leaf color, eye color, hair color
 - C. Ear shape, height, disease, number of toes, species
 - D. Nose shape, stem color, cell shape, mode of reproduction
50. Jason printed an object on the 3D printer. He knows the mass of the material used in the printer and the volume of the object. How would he find the object's density?
- A. Take the volume measurement and divide by the mass
 - B. Take the mass measurement and divide it by the volume
 - C. Take the mass measurement and multiply by the volume
 - D. Take the volume measurement and multiply by the mass

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