

Place Contestant ID Label HERE  
BEFORE Contest Begins.



# Science

## DISTRICT Contest

### Grades 6-8



**2017**

Grader #1 Score: \_\_\_\_\_

Grader #2 Score: \_\_\_\_\_

Grader #3 Score: \_\_\_\_\_

**FINAL SCORE:** \_\_\_\_\_

(Please do not open test until the signal is given to begin.)

# Periodic Table of the Elements

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	8B 9	8B 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 65.41	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 138.91	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 (272)	112 Cn (285)												

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	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)

## Some Standard Properties of Water

property	symbol	value
density	$\rho$	1.00 g cm <sup>-3</sup> 1000 kg m <sup>-3</sup>
specific heats		
ice	$C_{ice}$	2.09 J g <sup>-1</sup> K <sup>-1</sup>
water	$C_{water}$	4.184 J g <sup>-1</sup> K <sup>-1</sup>
steam	$C_{steam}$	2.03 J g <sup>-1</sup> K <sup>-1</sup>
heat of fusion	$\Delta H_{fus}$ or $L_f$	334 J g <sup>-1</sup>
heat of vaporization	$\Delta H_{vap}$ or $L_v$	2260 J g <sup>-1</sup>
index of refraction	$n$	1.33

Pressure
1 atm = 760 torr
= 101325 Pa
= 14.7 psi
1 bar = 10 <sup>5</sup> Pa
= 100 kPa

Energy
1 cal = 4.184 J
1 L atm = 101.325 J
1 Cal = 1 kcal
1 hp = 746 W

## Various Physical Constants

property	symbol	value
universal gas constant	$R$	$8.314 \text{ J mol}^{-1} \text{ K}^{-1}$
		$62.36 \text{ L torr mol}^{-1} \text{ K}^{-1}$
		$0.08206 \text{ L atm mol}^{-1} \text{ K}^{-1}$
		$1.987 \text{ cal mol}^{-1} \text{ K}^{-1}$
Planck's constant	$h$	$6.626 \times 10^{-34} \text{ J s}$
		$4.136 \times 10^{-15} \text{ eV s}$
Planck's reduced constant	$h/2\pi$	$1.054 \times 10^{-34} \text{ J s}$
		$6.582 \times 10^{-16} \text{ eV s}$
Boltzmann constant	$k_B$	$1.38 \times 10^{-23} \text{ J K}^{-1}$
Stefan-Boltzmann	$\sigma$	$5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$
speed of light	$c$	$3.00 \times 10^8 \text{ m s}^{-1}$
speed of sound (at 20°C)	$v_{\text{air}}$	$343 \text{ m s}^{-1}$
acceleration of gravity	$g$	$9.80 \text{ m s}^{-2}$
gravitational constant	$G$	$6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
Avogadro's number	$N_A$	$6.022 \times 10^{23} \text{ mol}^{-1}$
elementary charge	$e$	$1.602 \times 10^{-19} \text{ C}$
Faraday	$F$	$96485 \text{ C mol}^{-1}$
Coulomb's law constant	$k$	$8.988 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$

## Various Physical Constants

property	symbol	value
electron rest mass	$m_e$	$9.11 \times 10^{-31} \text{ kg}$
		$0.000549 \text{ u}$
		$0.511 \text{ MeV c}^{-2}$
proton mass	$m_p$	$1.6726 \times 10^{-27} \text{ kg}$
		$1.00728 \text{ u}$
neutron mass	$m_n$	$1.6749 \times 10^{-27} \text{ kg}$
		$1.008665 \text{ u}$
		$939.6 \text{ MeV c}^{-2}$
atomic mass unit	$u$	$1.6605 \times 10^{-27} \text{ kg}$
		$931.5 \text{ MeV c}^{-2}$
earth mass		$5.972 \times 10^{24} \text{ kg}$
earth radius		$6.371 \times 10^6 \text{ m}$
moon mass		$7.348 \times 10^{22} \text{ kg}$
sun mass		$1.989 \times 10^{30} \text{ kg}$
distance earth-moon		$3.844 \times 10^9 \text{ m}$
distance earth-sun		$1.496 \times 10^{11} \text{ m}$
permittivity of free space	$\epsilon_0$	$8.85 \times 10^{-12} \text{ F m}^{-1}$
permeability of free space	$\mu_0$	$4\pi \times 10^{-7} \text{ T m A}^{-1}$

## 2017 PSIA District Science Contest

- (1) A grassland in the tropics is a  
A) taiga. D) savanna.  
B) rain forest. E) tundra.  
C) steppe.
- (2) In which human structure are eggs produced?  
A) ovary D) vas deferens  
B) vagina E) oviduct  
C) uterus
- (3) Which of the following is a nucleon?  
A) electron D) positron  
B) neutron E) isotope  
C) ion
- (4) 145 square centimeters equals \_\_\_\_\_ square meters.  
A) 0.145 D) 14500  
B) 1.45 E) 0.0145  
C)  $1.45 \times 10^{-4}$
- (5) The first American to orbit our earth was  
A) John Glenn. D) Alan Shepherd.  
B) Deke Slayton. E) Sally Ride.  
C) Neil Armstrong
- (6) Jesus picks up a 2-kg block and raises the block 6 meters above the ground in 8 seconds. He then drops the block. What is the kinetic energy of the block upon impact with the ground?  
A) 120 Joules D) 12 Joules  
B) 96 Joules E) 64 Joules  
C) 28 Joules
- (7) Na is the chemical symbol for  
A) naproxen. D) nitrogen.  
B) sodium. E) niobium.  
C) selenium.
- (8) The atomic number of an element represents the number of \_\_\_\_\_ for the element.  
A) nucleons D) ions  
B) electrons E) quarks  
C) protons
- (9) One of the most heat-trapping gases in our planet's atmosphere is methane. What is the chemical formula for methane?  
A)  $MH_4$  D)  $CO_2$   
B)  $H_2O$  E)  $CH_4$   
C) CO
- (10) Which of the following is not the result of a centripetal force?  
A) a car rounding a curve  
B) the moon circling our earth  
C) a spinning car tire making the car move forward  
D) an electron moving in a circle in a magnetic field  
E) a child feeling heavier on a swing at the bottom of circular path
- (11) What is the measure of the time-rate of speed?  
A) momentum D) acceleration  
B) kinetic energy E) force  
C) displacement
- (12) The planet, other than earth, that is the easiest to see at night is  
A) Mars. D) Saturn.  
B) Jupiter. E) Mercury.  
C) Venus.
- (13) Many viruses are quickly destroyed by the human body's  
A) red blood cells. D) white blood cells.  
B) enzymes. E) plasma.  
C) golgi bodies.
- (14) Animals with backbones are called  
A) vertebrates. D) cnidarians.  
B) humans. E) invertebrates.  
C) exoskeletons.
- (15) Which of the following does not normally contain carbon?  
A) humans D) graphite  
B) diamond E) salt  
C) graphene



- (30) A comfortable temperature in a classroom is about  
A) 300 K.                      D) 3 K.  
B) 3° C.                        E) 30° F.  
C) 30 K.
- (31) If an earth-orbiting satellite is 0.1 astronomical units (AU's) from earth, how far is it from our sun?  
A) 0.9 AU                      D) 1.01 AU  
B) 0.09 AU                    E) 1.1 AU  
C) 0.99 AU
- (32) Which of the following has the least amount of momentum?  
A) a snail moving at 0.5 cm/sec  
B) a sixth-grader running at 3 m/sec  
C) a school bus stopped while picking up students  
D) an atom of oxygen moving in a jar  
E) a massless photon moving at the speed of light
- (33) One of the many results of global warming on our planet is  
A) lake levels rising.  
B) sea levels rising.  
C) arctic ice sheets growing in size.  
D) polar bears are hibernating longer times.  
E) sea lions are getting dangerous tans.
- (34) Which of the following is considered the dominant generation in flowering plants?  
A) sporophyte                D) hypocotyl  
B) derringer                 E) gametophyte  
C) anthophyte
- (35) Which of the following foods contains the most milligrams of cholesterol?  
A) 1 cup of whole milk  
B) 1 whole egg  
C) 1 cup of dry roasted almonds  
D) 1 slice of dry toast  
E) 1 cup of olive oil
- (36) If the half-life of a given isotope is 7 days, what fraction of the original isotope will be left after 14 days?  
A) one-half                    D) one-third  
B) one-seventh               E) one-fourteenth  
C) one-fourth
- (37) Which of the following planets in our solar system does not have a moon orbiting it?  
A) Jupiter                      D) Mars  
B) Venus                        E) Saturn  
C) Uranus
- (38) What is the name of the unit for electrical resistance?  
A) watt                         D) joule  
B) volt                         E) ohm  
C) ampere
- (39) How are the frequency and the period of a wave related?  
A) The period is the reciprocal of the frequency.  
B) The period is the square root of the frequency.  
C) The period is one-half the frequency.  
D) The period is equal to the frequency.  
E) The period is directly proportional to the frequency.
- (40) Which of the following would contain the most energy?  
A) a photon of red light  
B) a photon of purple light  
C) a photon of yellow light  
D) a photon of green light  
E) a photon of orange light
- (41) The reason the sun appears on the horizon when in fact it is below the horizon is because of the phenomena called  
A) reflection.                D) diffraction.  
B) polarization.             E) diffusion.  
C) refraction.

- (42) In 2015 an instrument referred to as LIGO was used to detect what phenomena that helped support Einstein's general theory of relativity?  
A) dark matter                      D) gravity waves  
B) dark energy                      E) black holes  
C) worm holes
- (43) What is the most common name for the junctions across which nerve cells carry chemical messages from cell to cell?  
A) synapse                              D) ganglia  
B) soma                                  E) cartilage  
C) tendon
- (44) In 2016, Texas led our nation in the production of electricity using  
A) coal energy.  
B) natural gas energy.  
C) photovoltaic energy.  
D) hydroelectric energy.  
E) wind turbine energy.
- (45) The hard coral of coral reefs is primarily made of  
A) granite.                              D) calcium carbonate.  
B) lignite.                              E) halite.  
C) basalt.
- (46) Which of the following is not one of the major cloud types?  
A) cirrostratus                      D) cirrocumulus  
B) cirronimbus                      E) They all are  
C) cirrus
- (47) Ignoring boundary adjustments, most individual time zones are how many degrees of longitude apart?  
A) 5°                                      D) 30°  
B) 10°                                    E) 60°  
C) 15°
- (48) What is the name of the particle that carries the electromagnetic force?  
A) proton                                D) electron  
B) fermion                              E) magneton  
C) photon
- (49) Which of the following sound frequencies would generally not be heard by humans?  
A) 40 Hertz                              D) 4.0 kilo-Hertz  
B) 100 Hertz                            E) 40 kilo-Hertz  
C) 1000 Hertz
- (50) If a superior planet is at opposition, it can be seen  
A) only at midnight.  
B) only at sunset.  
C) throughout the night.  
D) just before sunrise.  
E) not at all.

# PSIA Science 6-8 Contest

## Contestant Answer Sheet

CONTESTANT ID#: \_\_\_\_\_

GRADE LEVEL: \_\_\_\_\_

**INSTRUCTIONS:** Place the PRINTED CAPITAL letter of each answer choice (A, B, C, D, or E) in the blank corresponding to the test item number. **SCORING:** +5 for each correct answer; -2 for each incorrect answer; no deduction is taken for skipped or unanswered items. Visible erasures and mark-outs constitute a 2-point deduction ONLY if a correct answer is not written in the answer space.

1. _____	18. _____	35. _____	
2. _____	19. _____	36. _____	
3. _____	20. _____	37. _____	
4. _____	21. _____	38. _____	
5. _____	22. _____	39. _____	
6. _____	23. _____	40. _____	
7. _____	24. _____	41. _____	
8. _____	25. _____	42. _____	
9. _____	26. _____	43. _____	
10. _____	27. _____	44. _____	<u>SCORE</u> <u>Initials</u>
11. _____	28. _____	45. _____	Grader 1: _____
12. _____	29. _____	46. _____	Grader 2: _____
13. _____	30. _____	47. _____	
14. _____	31. _____	48. _____	Grader 3: _____
15. _____	32. _____	49. _____	
16. _____	33. _____	50. _____	
17. _____	34. _____	<b>OFFICIAL SCORE:</b> _____	

Contest Director ONLY: Match Contestant ID Labeled Test with Answer Sheet AFTER Scoring:



**PSIA Science Contest**  
**Grades 6-8 DISTRICT - 2017**  
**Answer Key**

**Scoring:** +5 for each correct answer; -2 for each incorrect answer; no points are deducted for skipped or unanswered items. Mark-outs and erasures not resulting in a correct answer receive a 2-point deduction.

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