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SCIENCE
Practice Packet

Spring 2022 | High School

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UIL SCIENCE PRACTICE PACKET
Spring 2022

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With a Masters in microbiology from U.T. Texas Health Science Center, Ken Davis brings over 25 years teaching experience to his writing. As an educator, his experience spans from elementary to college levels, including Advanced Placement and dual credit courses for high school. He has developed curriculum for all ages and has coached numerous UIL Science teams to District and Regional championships and has also taught students who have reached the State level.

We are a small company that listens! If you have any questions or if there is an area that you would like fully explored, let us hear from you. We hope you enjoy this product and stay in contact with us throughout your academic journey.
~ President Hexco Inc., Linda Tarrant

IF YOU LIKE THIS PRODUCT, WE ALSO RECOMMEND

Biology Tests   ●   **Chemistry Tests**   ●   **Science Practice Packets**

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UIL SCIENCE PRACTICE PACKET – Spring 2022

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1. **Periodic Table and Formulas**
2. **Score Sheet**
3. **Answer Sheet**
4. **Six Sets of Science Tests (S22-A – S22-F)**

   <u>Each Test Includes</u>:
   - Biology - 20 Questions
   - Chemistry - 20 Questions
   - Physics - 20 Questions
   - Answer Key
   - Solutions

   For official UIL Constitution and Contest Rules for Science, please review the Section 952 document at: http://www.uiltexas.org/academics/science

GENERAL INSTRUCTIONS
Science

- Do not open until told to do so.

- Ninety minutes should be ample time to complete this test, but contestants may take up to two hours. If you are in the process of writing an answer when time is called, you may finish writing your answer.

- Papers may not be turned in until at least 30 minutes has elapsed. If you finish in less than 30 minutes, remain in your seat and keep your paper until told to do otherwise. Use this time to check your answers.

- All answers must be written on the answer sheet provided.

- You may make notations anywhere on the test, but not on the answer sheet which is for answers only.

- You may use scratch paper provided by the contest director.

- All questions have ONE and only ONE correct (best) answer. There is a penalty for incorrect answers.

- If a question is skipped, no points are given or deducted.

- You should be provided with a sheet of the Periodic Table of the Elements and other scientific relationships; you may refer to this during the test.

- Silent hand-held calculators which do not need wall plugs are allowed. You may bring one spare calculator. Memory must be cleared in all calculators before testing. Other small hand-held devices are not allowed.

SCORING: All correctly answered questions receive 6 points; no points will be given or subtracted if unanswered; 2 points will be deducted for an incorrect answer.

Periodic Table of the Elements

1 IA																	18 8A
1 **H** 1.008	**2** **2A**											**13** **3A**	**14** **4A**	**15** **5A**	**16** **6A**	**17** **7A**	**2** **He** 4.003
3 **Li** 6.941	**4** **Be** 9.012											**5** **B** 10.811	**6** **C** 12.011	**7** **N** 14.007	**8** **O** 15.999	**9** **F** 18.998	**10** **Ne** 20.180
11 **Na** 22.990	**12** **Mg** 24.305	**3** **3B**	**4** **4B**	**5** **5B**	**6** **6B**	**7** **7B**	**8**	**9** **8B**	**10**	**11** **1B**	**12** **2B**	**13** **Al** 26.982	**14** **Si** 28.086	**15** **P** 30.974	**16** **S** 32.066	**17** **Cl** 35.453	**18** **Ar** 39.948
19 **K** 39.098	**20** **Ca** 40.078	**21** **Sc** 44.956	**22** **Ti** 47.88	**23** **V** 50.942	**24** **Cr** 51.996	**25** **Mn** 54.938	**26** **Fe** 55.933	**27** **Co** 58.933	**28** **Ni** 58.693	**29** **Cu** 63.546	**30** **Zn** 65.39	**31** **Ga** 69.732	**32** **Ge** 72.61	**33** **As** 74.922	**34** **Se** 78.09	**35** **Br** 79.904	**36** **Kr** 84.80
37 **Rb** 84.468	**38** **Sr** 87.62	**39** **Y** 88.906	**40** **Zr** 91.224	**41** **Nb** 92.906	**42** **Mo** 95.94	**43** **Tc** 98.907	**44** **Ru** 101.07	**45** **Rh** 102.906	**46** **Pd** 106.42	**47** **Ag** 107.868	**48** **Cd** 112.411	**49** **In** 114.818	**50** **Sn** 118.71	**51** **Sb** 121.760	**52** **Te** 127.6	**53** **I** 126.904	**54** **Xe** 131.29
55 **Cs** 132.905	**56** **Ba** 137.327	**57** **La** 138.91	**72** **Hf** 178.49	**73** **Ta** 180.948	**74** **W** 183.85	**75** **Re** 186.207	**76** **Os** 190.23	**77** **Ir** 192.22	**78** **Pt** 195.08	**79** **Au** 196.967	**80** **Hg** 200.59	**81** **Tl** 204.383	**82** **Pb** 207.2	**83** **Bi** 208.980	**84** **Po** [208.982]	**85** **At** 209.987	**86** **Rn** 222.018
87 **Fr** 223.020	**88** **Ra** 226.025	**89** **Ac** [227]	**104** **Rf** [261]	**105** **Db** [262]	**106** **Sg** [266]	**107** **Bh** [264]	**108** **Hs** [269]	**109** **Mt** [268]	**110** **Ds** [269]	**111** **Rg** [272]	**112** **Cn** [277]						

58 **Ce** 140.115	**59** **Pr** 140.908	**60** **Nd** 144.24	**61** **Pm** 144.913	**62** **Sm** 150.36	**63** **Eu** 151.966	**64** **Gd** 157.25	**65** **Tb** 158.925	**66** **Dy** 162.50	**67** **Ho** 164.930	**68** **Er** 167.26	**69** **Tm** 168.934	**70** **Yb** 173.04	**71** **Lu** 174.967
90 **Th** 232.038	**91** **Pa** 231.036	**92** **U** 238.029	**93** **Np** 237.048	**94** **Pu** 244.064	**95** **Am** 243.061	**96** **Cm** 247.070	**97** **Bk** 247.070	**98** **Cf** 251.080	**99** **Es** [254]	**100** **Fm** 257.095	**101** **Md** 258.1	**102** **No** 259.101	**103** **Lr** [262]

Acceleration of gravity at Earth's surface: $\quad\quad g = 9.81 m/s^2$

Avogadro's Number: $\quad$ N = 6.02 x 10^{23} molecules/mole

Planck's constant: $\quad\quad h = 6.63$ x 10^{-34} J•s

Planck's reduced constant: $\quad\quad \hbar = {}^h/2\Pi = 1.05$ x 10^{-34} J•s

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

Gram molecular volume at STP = 22.4 liters

Velocity of light: $\quad\quad c = 3.0$ x 10^8 m/sec

Absolute zero = 0 K = -273.15°C

Gas constant: $\quad\quad$ R = 1.986 cal/K•mole = 0.082 liter•atm/K•mole

One Faraday = 96,500 coulombs (9.65 x 10^4C)

Dulong and Petit's constant = 6.0 amu•cal/gram•K

Electron rest mass: $m_e = 9.11$ x 10^{-31} kg

Atomic mass unit: $m_a = 1.66$ x 10^{-27} kg

Boltzmann constant: $\quad k_B = 1.38$ x 10^{-23} J/K

Permittivity of free space: $\quad \in_\circ = 8.85$ x 10^{-12} $C^2/N•m^2$

Permeability of free space: $\quad \mu_\circ = 4\Pi$ 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 an electron = -1.6 x 10^{-19} coulombs (C)

1 calorie = 4.186 Joules (J)

1 horsepower (hp) = 746 W = 550 ft•lb/s

Neutron Mass = 1.008665 au

Proton Mass = 1.007277 au

1 au = 931.5 MeV

Contestant _____

Science Test Answer Sheet

BIOLOGY	CHEMISTRY	PHYSICS
1. _____	21. _____	41. _____
2. _____	22. _____	42. _____
3. _____	23. _____	43. _____
4. _____	24. _____	44. _____
5. _____	25. _____	45. _____
6. _____	26. _____	46. _____
7. _____	27. _____	47. _____
8. _____	28. _____	48. _____
9. _____	29. _____	49. _____
10. _____	30. _____	50. _____
11. _____	31. _____	51. _____
12. _____	32. _____	52. _____
13. _____	33. _____	53. _____
14. _____	34. _____	54. _____
15. _____	35. _____	55. _____
16. _____	36. _____	56. _____
17. _____	37. _____	57. _____
18. _____	38. _____	58. _____
19. _____	39. _____	59. _____
20. _____	40. _____	60. _____

50. Calculate the period of a pendulum that is 7.25 x 10^5 m above the surface of the Earth. The length of the pendulum is 1.25 m.
    A. 7.91 s
    B. 2.52 s
    C. 2.50 s
    D. 15.8 s
    E. 5.03 s

51. An aluminum calorimeter with a mass of 125 g holds 275 g of water. The water and the calorimeter are at 25.0 °C. A metal ingot with a mass of 175 g is at 125°C and is placed into the calorimeter. At equilibrium the water, metal, and calorimeter reach 28.8°C. Calculate the specific heat of the 175 g metal ingot. The specific heat of aluminum is .921 J/g x °C.
    A. .260 J/g x °C
    B. .323 J/g x °C
    C. .0260 J/g x °C
    D. .286 J/g x °C
    E. .234 J/g x °C

52. Calculate the resistance in 17.5 m of number 12-gauge copper wire at 20.0 °C. 12-gauge copper wire has a diameter of 2.053 mm and a resistivity of 1.724 x 10^{-6} Ω x cm.
    A. 2.28 x 10^{-3} Ω
    B. 4.68 x 10^{-1} Ω
    C. 7.16 x 10^{-5} Ω
    D. 9.11 x 10^{-2} Ω
    E. none of these

53. If two charges, one 45.0 μC and the other 76.0 μC, exert a repulsive force on each other that measures 75.5 N in air, how far apart would they be?
    A. 4.07 x 10^{-1} m
    B. 3.07 x 10^1 m
    C. 1.54 x 10^1 m
    D. 2.04 x 10^{-1} m
    E. none of these

54. The electrons in a beam of a cathode ray tube move horizontally at a velocity of 4.25 x 10^7 m/s. They pass through a vertical magnetic field that acts on them with a force of 1.75 x 10^{-13} N. Calculate the magnitude of the magnetic field in Teslas.
    A. 2.57 x 10^{-2} T
    B. 6.60 x 10^{-40} T
    C. 4.12 x 10^{-20} T
    D. 2.56 x 10^{-20} T
    E. 1.76 x 10^{-2} T

55. A 35.0 Ω, 45.0 Ω, and 55.0 Ω resistor are connected in parallel then connect to a 24.0 V battery. What is the equivalent resistance of this parallel combination?
    A. 6.90 x 10^{-2} Ω
    B. 1.48 x 10^{-1} Ω
    C. 4.50 x 10^1 Ω
    D. 2.22 x 10^{-2} Ω
    E. 1.45 x 10^1 Ω

56. An object that is 12.0 cm tall is 60.0 cm from a concave mirror. This mirror has a focal length of 14.0 cm. What is the height of the image produced by this mirror?
    A. inverted image 6.30 cm tall
    B. inverted image 3.65 cm tall
    C. real image 3.65 cm tall
    D. inverted image 18.3 cm tall
    E. real image 6.30 cm tall

57. Which of the following quantum numbers of an atom designates a specific orbital found within a subshell?
    A. Principal Quantum Number
    B. Angular Momentum Quantum Number
    C. Magnetic Quantum Number
    D. Spin Quantum Number
    E. all of the above do this