

Example Items

Physics 8

Physics 8 Example Items are a **representative set** of items for the ACP. Teachers may use this set of items along with the test blueprint as guides to prepare students for the ACP. On the last page, the correct answer, content SE and SE justification are listed for each item.

*The specific part of an SE that an Example Item measures is **NOT** necessarily the only part of the SE that is assessed on the ACP.* None of these Example Items will appear on the ACP.

Teachers may provide feedback regarding Example Items.

(1) Download the [Example Feedback Form](#) and email it. The form is located on the homepage of the Assessment website (assessment.dallasisd.org).

OR

(2) To submit directly: Login to the [Assessment website](#). Under “News” in the left-hand column, click on “Sem 2 Example Items Download.” Above the subjects, click on “Example Feedback Form.”

Second Semester
2017–2018
Code #: 3181

STAAR PHYSICS REFERENCE MATERIALS



FORCE AND MOTION

$$\text{Average velocity} = \frac{\text{displacement}}{\text{change in time}} \qquad v_{\text{avg}} = \frac{\Delta d}{\Delta t}$$

$$\text{Acceleration} = \frac{\text{final velocity} - \text{initial velocity}}{\text{change in time}} \qquad a = \frac{v_f - v_i}{\Delta t}$$

$$\text{Acceleration} = \frac{(\text{final velocity})^2 - (\text{initial velocity})^2}{2(\text{displacement})} \qquad a = \frac{v_f^2 - v_i^2}{2\Delta d}$$

$$\text{Displacement} = \left(\begin{array}{l} \text{initial} \\ \text{velocity} \end{array} \right) \left(\begin{array}{l} \text{change} \\ \text{in time} \end{array} \right) + \frac{1}{2} (\text{acceleration}) \left(\begin{array}{l} \text{change} \\ \text{in time} \end{array} \right)^2 \qquad \Delta d = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$\text{Centripetal acceleration} = \frac{(\text{tangential velocity})^2}{\text{radius}} \qquad a_c = \frac{v^2}{r}$$

$$\text{Net force} = (\text{mass})(\text{acceleration}) \qquad F_{\text{net}} = ma$$

$$\text{Work} = (\text{force})(\text{distance}) \qquad W = Fd$$

$$\text{Torque} = (\text{force})(\text{lever arm}) \qquad \tau = Fr$$

$$\text{Power} = \frac{\text{work}}{\text{time}} \qquad P = \frac{W}{t}$$

$$\text{Pythagorean theorem} \qquad a^2 + b^2 = c^2$$

GRAVITATIONAL, ELECTRICAL, AND MAGNETIC FORCES

$$\text{Force of gravitational attraction between 2 objects} = \left(\begin{array}{l} \text{universal} \\ \text{gravitation} \\ \text{constant} \end{array} \right) \left(\frac{\left(\begin{array}{l} \text{mass of} \\ \text{1st object} \end{array} \right) \left(\begin{array}{l} \text{mass of} \\ \text{2nd object} \end{array} \right)}{\left(\begin{array}{l} \text{distance between} \\ \text{centers of objects} \end{array} \right)^2} \right) \qquad F_g = G \left(\frac{m_1 m_2}{d^2} \right)$$

$$\text{Force between 2 charged particles} = \left(\begin{array}{l} \text{Coulomb's} \\ \text{constant} \end{array} \right) \left(\frac{\left(\begin{array}{l} \text{charge of} \\ \text{1st particle} \end{array} \right) \left(\begin{array}{l} \text{charge of} \\ \text{2nd particle} \end{array} \right)}{\left(\begin{array}{l} \text{distance between particles} \end{array} \right)^2} \right) \qquad F_{\text{electric}} = k_c \left(\frac{q_1 q_2}{d^2} \right)$$

$$\text{Electrical power} = (\text{voltage})(\text{current}) \qquad P = VI$$

$$\text{Current} = \frac{\text{voltage}}{\text{resistance}} \qquad I = \frac{V}{R}$$

$$\text{Equivalent resistance for resistors in series} \qquad R = R_1 + R_2 + R_3 + \dots$$

$$\text{Equivalent resistance for resistors in parallel} \qquad \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

STAAR PHYSICS REFERENCE MATERIALS

ENERGY AND MOMENTUM

$$\text{Kinetic energy} = \frac{1}{2}(\text{mass})(\text{velocity})^2 \qquad KE = \frac{1}{2}mv^2$$

$$\text{Gravitational potential energy} = (\text{mass})\left(\frac{\text{acceleration}}{\text{due to gravity}}\right)(\text{height}) \qquad PE_g = mgh$$

$$\text{Elastic potential energy} = \frac{1}{2}\left(\frac{\text{spring}}{\text{constant}}\right)\left(\frac{\text{distance stretched}}{\text{or compressed}}\right)^2 \qquad PE_{\text{elastic}} = \frac{1}{2}kx^2$$

$$\text{Energy} = (\text{power})(\text{time}) \qquad E = Pt$$

$$\text{Work} = \text{change in kinetic energy} \qquad W = \Delta KE$$

$$\text{Mechanical energy} = \text{kinetic energy} + \text{potential energy} \qquad ME = KE + PE$$

$$\text{Law of conservation of energy} \qquad KE_i + PE_i = KE_f + PE_f$$

$$\text{Momentum} = (\text{mass})(\text{velocity}) \qquad p = mv$$

$$\text{Impulse} = (\text{force})(\text{change in time}) = (\text{mass})(\text{change in velocity}) \qquad J = F\Delta t = m\Delta v$$

$$\text{Law of conservation of momentum} \qquad m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$$

$$\text{Heat gained or lost} = (\text{mass})\left(\frac{\text{specific}}{\text{heat}}\right)\left(\frac{\text{change in}}{\text{temperature}}\right) \qquad Q = mc_p\Delta T$$

WAVES AND LIGHT

$$\text{Velocity} = (\text{frequency})(\text{wavelength}) \qquad v = f\lambda$$

$$\frac{1}{\text{Focal length}} = \frac{1}{\text{distance to image}} + \frac{1}{\text{distance to object}} \qquad \frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

$$\text{Energy} = (\text{mass})(\text{speed of light})^2 \qquad E = mc^2$$

STAAR PHYSICS REFERENCE MATERIALS

CONSTANTS AND CONVERSIONS

$$c = \text{speed of light} = 3.00 \times 10^8 \frac{\text{m}}{\text{s}}$$

$$g = \text{acceleration due to gravity} = 9.8 \frac{\text{m}}{\text{s}^2}$$

$$G = \text{universal gravitation constant} = 6.67 \times 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$$

$$k_C = \text{Coulomb's constant} = 8.99 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2}$$

$$m_E = \text{mass of Earth} = 5.97 \times 10^{24} \text{ kg}$$

$$r_E = \text{radius of Earth} = 6.37 \times 10^6 \text{ m}$$

$$\text{newton (N)} = \frac{\text{kg} \cdot \text{m}}{\text{s}^2}$$

$$\text{joule (J)} = \text{N} \cdot \text{m}$$

$$\text{watt (W)} = \frac{\text{J}}{\text{s}} = \frac{\text{N} \cdot \text{m}}{\text{s}}$$

$$\text{hertz (Hz)} = \frac{\text{cycle}}{\text{s}}$$

STAAR PHYSICS REFERENCE MATERIALS

PERIODIC TABLE OF THE ELEMENTS

1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9	10	11 1B	12 2B	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A																						
1 H 1.008 Hydrogen	2 He 4.003 Helium	3 Li 6.941 Lithium	4 Be 9.012 Beryllium	5 B 10.812 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998 Fluorine	10 Ne 20.180 Neon	11 Na 22.990 Sodium	12 Mg 24.305 Magnesium	13 Al 26.982 Aluminum	14 Si 28.086 Silicon	15 P 30.974 Phosphorus	16 S 32.066 Sulfur	17 Cl 35.453 Chlorine	18 Ar 39.948 Argon																						
19 K 39.098 Potassium	20 Ca 40.078 Calcium	21 Sc 44.956 Scandium	22 Ti 47.867 Titanium	23 V 50.942 Vanadium	24 Cr 51.996 Chromium	25 Mn 54.938 Manganese	26 Fe 55.845 Iron	27 Co 58.933 Cobalt	28 Ni 58.693 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.64 Germanium	33 As 74.922 Arsenic	34 Se 78.96 Selenium	35 Br 79.904 Bromine	36 Kr 83.798 Krypton																						
37 Rb 85.468 Rubidium	38 Sr 87.62 Strontium	39 Y 88.906 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.906 Niobium	42 Mo 95.96 Molybdenum	43 Tc (98) Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.906 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.868 Silver	48 Cd 112.412 Cadmium	49 In 114.818 Indium	50 Sn 118.711 Tin	51 Sb 121.760 Antimony	52 Te 127.60 Tellurium	53 I 126.904 Iodine	54 Xe 131.294 Xenon																						
55 Cs 132.905 Cesium	56 Ba 137.328 Barium	57 Lu 174.967 Lutetium	58 Hf 178.49 Hafnium	59 Ta 180.948 Tantalum	60 W 183.84 Tungsten	61 Re 186.207 Rhenium	62 Os 190.23 Osmium	63 Ir 192.217 Iridium	64 Pt 195.085 Platinum	65 Au 196.967 Gold	66 Hg 200.59 Mercury	67 Tl 204.383 Thallium	68 Pb 207.2 Lead	69 Bi 208.980 Bismuth	70 Po (209) Polonium	71 At (210) Astatine	72 Rn (222) Radon																						
87 Fr (223) Francium	88 Ra (226) Radium	89 La 138.905 Lanthanum	90 Ce 140.116 Cerium	91 Pr 140.908 Praseodymium	92 Nd 144.242 Neodymium	93 Pm (145) Promethium	94 Sm 150.36 Samarium	95 Eu 151.964 Europium	96 Gd 157.25 Gadolinium	97 Tb 158.925 Terbium	98 Dy 162.500 Dysprosium	99 Ho 164.930 Holmium	100 Er 167.259 Erbium	101 Tm 168.934 Thulium	102 Yb 173.055 Ytterbium	103 Lu 174.967 Lutetium	104 Ac (227) Actinium	105 Th 232.038 Thorium	106 Pa 231.036 Protactinium	107 U 238.029 Uranium	108 Np (237) Neptunium	109 Pu (244) Plutonium	110 Am (243) Americium	111 Cm (247) Curium	112 Bk (247) Berkelium	113 Cf (251) Californium	114 Es (252) Einsteinium	115 Fm (257) Fermium	116 Md (258) Mendelevium	117 No (259) Nobelium	118 Lr (262) Lawrencium	119 Rf (267) Rutherfordium	120 Db (268) Dubnium	121 Sg (271) Seaborgium	122 Bh (272) Bohrium	123 Hs (270) Hassium	124 Mt (276) Meitnerium	125 Ds (281) Darmstadtium	126 Rg (280) Roentgenium

Mass numbers in parentheses are those of the most stable or most common isotope.

Lanthanide Series

Actinide Series

EXAMPLE ITEMS Physics 8, Sem 2

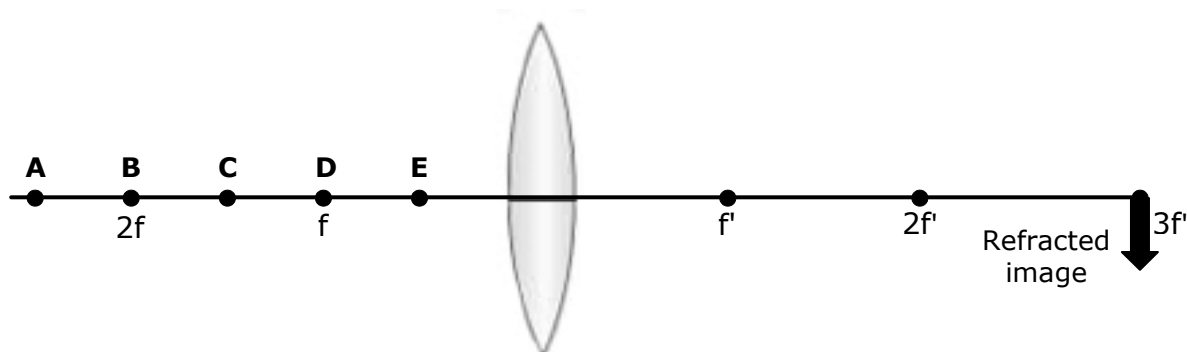
- 1** A scientist examined the characteristics of sound waves during one of his experiments. He examined the five different situations shown.

- #1 – Sound transmitted through water.
- #2 – Sound transmitted through hot air.
- #3 – Sound transmitted through train tracks.
- #4 – Sound transmitted through outer space.
- #5 – Sound transmitted through cold air.

Which list of situations is arranged in decreasing order (fastest to slowest) for the speed of sound?

- A** 4, 5, 2, 1, 3
- B** 3, 1, 5, 2, 4
- C** 4, 2, 5, 1, 3
- D** 3, 1, 2, 5, 4

- 2** The location of an image is shown.



Considering refraction through a thin convex lens, where is the original object located in order to achieve this image?

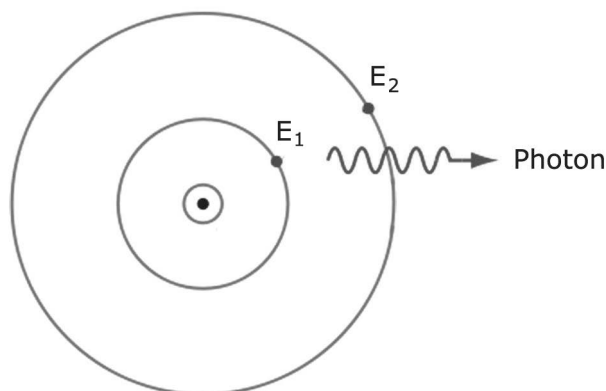
- A** Location **A**
- B** Location **B**
- C** Location **C**
- D** Location **D**

- 3** Convection occurs in —

- A** gases only
- B** liquids only
- C** solids only
- D** gases and liquids only

EXAMPLE ITEMS Physics 8, Sem 2

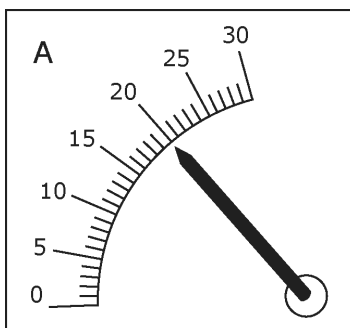
4 How atoms emit their characteristic light is explained by Bohr's model of the atom as shown.



According to the Bohr model, which process explains how atoms give off radiation that forms their characteristic spectra?

- A** Radiation is given off when electrons jump from a lower orbit to a higher orbit and photon energy equals $E_2 - E_1$.
- B** Radiation is given off when electrons jump from a lower orbit to a higher orbit and photon energy is less than $E_2 - E_1$.
- C** Radiation is given off when electrons jump from a higher orbit to a lower orbit and photon energy is greater than $E_2 - E_1$.
- D** Radiation is given off when electrons jump from a higher orbit to a lower orbit and photon energy equals $E_2 - E_1$.

5 An ammeter shows the current produced by a battery in a simple series circuit.



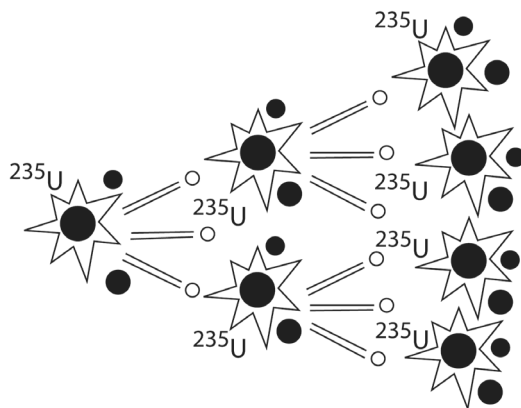
If the voltage across the circuit is 10 V, what is the circuit's resistance?

- A** 0.5 Ω
- B** 2.0 Ω
- C** 10.0 Ω
- D** 20.0 Ω

EXAMPLE ITEMS Physics 8, Sem 2

6

Nuclear fission of Uranium-235 involves a chain reaction as shown.



The chain reaction results from the fission process —

- A** producing electrons that can then strike and split neighboring nuclei creating a reaction that releases energy due to a change in mass of the original atom
- B** producing neutrons that can then strike and split neighboring nuclei creating a reaction that releases energy due to a change in mass of the original atom
- C** producing protons that can then strike and split neighboring nuclei creating a reaction that absorbs energy due to a change in mass of the original atom
- D** combining smaller-mass nuclei to form larger-mass nuclei creating a reaction that absorbs energy due to a change in mass of the original atom

7

Which statement about wave propagation is correct?

- A** Light waves move fastest through a diamond.
- B** Radio waves move faster through glass than through air.
- C** Sound waves move faster through air than through glass.
- D** Electromagnetic waves move fastest through a vacuum.

8

Doppler radar is used to determine the speed that a storm is approaching an observer. What measurable characteristic of waves is changed due to the Doppler effect to make this possible?

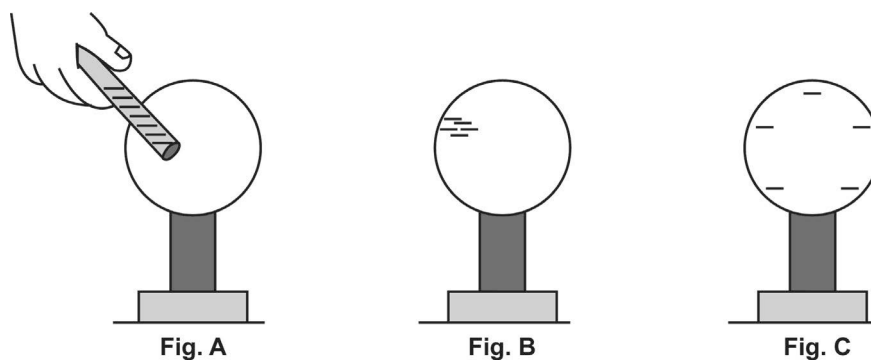
- A** Amplitude
- B** Interference
- C** Frequency
- D** Velocity

EXAMPLE ITEMS Physics 8, Sem 2

9 During hot summer days, automobile tires, filled with air, sometimes burst. Tires bursting due to elevated temperatures is most likely caused by —

- A** the tire walls becoming weaker during the summer
- B** an increase in the average kinetic energy of the air molecules inside the tire
- C** a decrease in the average kinetic energy of the air molecules inside the tire
- D** a higher atmospheric pressure

10 In the diagram shown, a charged object is touched to a metal sphere (Fig. A). The sphere acquires a negative charge (Fig. B), and the charge within the sphere quickly distributes itself uniformly throughout the sphere (Fig. C).



The sphere represents an example of a(n) —

- A** insulator
- B** electromagnet
- C** solenoid
- D** conductor

11 White light is refracted as it passes from the air into a glass prism, separating the colors that make up the original white light. This happens because —

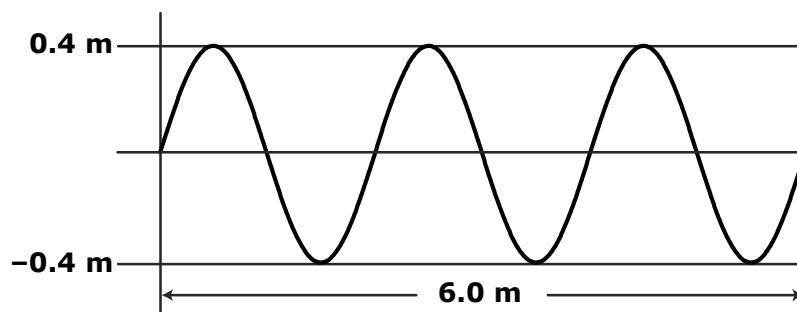
- A** all light travels at the same slower velocity in glass than in air
- B** all light travels at the same faster velocity in glass than in air
- C** different colors of light travel at different speeds in glass
- D** red light travels faster in glass than in air

EXAMPLE ITEMS Physics 8, Sem 2

12 Photoelectrons are emitted from a metal surface when light shines on it. If the wavelength of the light is decreased, the —

- A** number of electrons emitted will decrease
- B** kinetic energy of the emitted electrons will decrease
- C** number of electrons emitted will increase
- D** kinetic energy of the emitted electrons will increase

13 A graph of a wave is shown.



If the frequency, f , is 8.0 Hz, what is the wave's speed in m/s?

Record the answer and fill in the bubbles on the grid provided. Be sure to use the correct place value.

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	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8	<input type="radio"/> 8
	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9	<input type="radio"/> 9

EXAMPLE ITEMS Physics 8, Sem 2

14 What is the first law of thermodynamics?

- A** Entropy of an isolated system increases or remains the same.
- B** Total energy of an isolated system is conserved.
- C** Temperature of an object is a measure of the average kinetic energy of its molecules.
- D** Total momentum of an isolated system is conserved.

15 A wire loop is located in a magnetic field. When an electric current is made to flow through the loop, the loop rotates 90 degrees and then stops. This effect is the basis of what device?

- A** Generator
- B** Motor
- C** Transformer
- D** Resistor

EXAMPLE ITEMS Physics 8 Key, Sem 2

Item#	Key	SE	Process Skills	SE Justification
1	D	P.7C	3A	Compare characteristics and behaviors of longitudinal waves, including sound waves.
2	C	P.7E	2K	Describe and predict image formation as a consequence of refraction through a thin convex lens.
3	D	P.6F	--	Give examples of different processes of thermal energy transfer, including convection.
4	D	P.8B	2K	Explain the emission spectra produced by various atoms.
5	A	P.5F	2H, 2L	Calculate in terms of current through, potential difference across, and resistance of, electric circuit elements connected in series.
6	B	P.8C	2K	Describe the significance of mass-energy equivalence and apply it in explanations of phenomena such as fission.
7	D	P.7A	--	Describe wave propagation in various types of media.
8	C	P.7F	2K	Describe the role of wave behaviors in industrial applications.
9	B	P.6E	2K, 3A	Describe how the macroscopic properties of a thermodynamic system such as temperature are related to the molecular level of matter, including kinetic energy of atoms.
10	D	P.5E	--	Characterize materials as conductors based on their electrical properties.
11	C	P.7D	--	Investigate behaviors of waves including refraction.
12	D	P.8A	--	Describe the photoelectric effect.
13	16	P.7B	--	Calculate using the relationship between wave speed, frequency, and wavelength.
14	B	P.6G	--	Analyze the laws of thermodynamics, including the law of conservation of energy.
15	B	P.5G	--	Describe the relationship between electric and magnetic fields in applications such as motors.