Example Items

Physics
Pre-AP

Physics Pre-AP 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 #: 3211

STAAR PHYSICS REFERENCE MATERIALS

FORCE AND MOTION

Average velocity $= \dfrac{\text{displacement}}{\text{change in time}}$	$v_{avg} = \dfrac{\Delta d}{\Delta t}$
Acceleration $= \dfrac{\text{final velocity} - \text{initial velocity}}{\text{change in time}}$	$a = \dfrac{v_f - v_i}{\Delta t}$
Acceleration $= \dfrac{(\text{final velocity})^2 - (\text{initial velocity})^2}{2(\text{displacement})}$	$a = \dfrac{v_f^2 - v_i^2}{2\Delta d}$
Displacement $= \begin{pmatrix}\text{initial}\\ \text{velocity}\end{pmatrix}\begin{pmatrix}\text{change}\\ \text{in time}\end{pmatrix} + \frac{1}{2}\,(\text{acceleration})\begin{pmatrix}\text{change}\\ \text{in time}\end{pmatrix}^2$	$\Delta d = v_i \Delta t + \frac{1}{2} a \Delta t^2$
Centripetal acceleration $= \dfrac{(\text{tangential velocity})^2}{\text{radius}}$	$a_c = \dfrac{v_t^2}{r}$
Net force = (mass)(acceleration)	$F_{net} = ma$
Work = (force)(distance)	$W = Fd$
Torque = (force)(lever arm)	$\tau = Fr$
Power $= \dfrac{\text{work}}{\text{time}}$	$P = \dfrac{W}{t}$
Pythagorean theorem	$a^2 + b^2 = c^2$

GRAVITATIONAL, ELECTRICAL, AND MAGNETIC FORCES

Force of gravitational attraction between 2 objects $= \begin{pmatrix}\text{universal}\\ \text{gravitation}\\ \text{constant}\end{pmatrix}\left(\dfrac{\begin{pmatrix}\text{mass of}\\ \text{1st object}\end{pmatrix}\begin{pmatrix}\text{mass of}\\ \text{2nd object}\end{pmatrix}}{\begin{pmatrix}\text{distance between}\\ \text{centers of objects}\end{pmatrix}^2}\right)$	$F_g = G\left(\dfrac{m_1 m_2}{d^2}\right)$
Force between 2 charged particles $= \begin{pmatrix}\text{Coulomb's}\\ \text{constant}\end{pmatrix}\left(\dfrac{\begin{pmatrix}\text{charge of}\\ \text{1st particle}\end{pmatrix}\begin{pmatrix}\text{charge of}\\ \text{2nd particle}\end{pmatrix}}{(\text{distance between particles})^2}\right)$	$F_{electric} = k_C\left(\dfrac{q_1 q_2}{d^2}\right)$
Electrical power = (voltage)(current)	$P = VI$
Current $= \dfrac{\text{voltage}}{\text{resistance}}$	$I = \dfrac{V}{R}$
Equivalent resistance for resistors in series	$R = R_1 + R_2 + R_3 + \ldots$
Equivalent resistance for resistors in parallel	$\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3} + \ldots$

STAAR PHYSICS REFERENCE MATERIALS

ENERGY AND MOMENTUM

Kinetic energy $= \frac{1}{2}(\text{mass})(\text{velocity})^2$	$KE = \frac{1}{2}mv^2$
Gravitational potential energy $= (\text{mass})\left(\begin{matrix}\text{acceleration}\\ \text{due to gravity}\end{matrix}\right)(\text{height})$	$PE_g = mgh$
Elastic potential energy $= \frac{1}{2}\left(\begin{matrix}\text{spring}\\ \text{constant}\end{matrix}\right)\left(\begin{matrix}\text{distance stretched}\\ \text{or compressed}\end{matrix}\right)^2$	$PE_{\text{elastic}} = \frac{1}{2}kx^2$
Energy = (power)(time)	$E = Pt$
Work = change in kinetic energy	$W = \Delta KE$
Mechanical energy = kinetic energy + potential energy	$ME = KE + PE$
Law of conservation of energy	$KE_i + PE_i = KE_f + PE_f$
Momentum = (mass)(velocity)	$p = mv$
Impulse = (force)(change in time) = (mass)(change in velocity)	$J = F\Delta t = m\Delta v$
Law of conservation of momentum	$m_1v_{1_i} + m_2v_{2_i} = m_1v_{1_f} + m_2v_{2_f}$
Heat gained or lost $= (\text{mass})\left(\begin{matrix}\text{specific}\\ \text{heat}\end{matrix}\right)\left(\begin{matrix}\text{change in}\\ \text{temperature}\end{matrix}\right)$	$Q = mc_p\Delta T$

WAVES AND LIGHT

Velocity = (frequency)(wavelength)	$v = f\lambda$
$\frac{1}{\text{Focal length}} = \frac{1}{\text{distance to image}} + \frac{1}{\text{distance to object}}$	$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$
Energy = (mass)(speed of light)^2	$E = mc^2$

STAAR PHYSICS REFERENCE MATERIALS

CONSTANTS AND CONVERSIONS

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

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

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

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

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

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

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

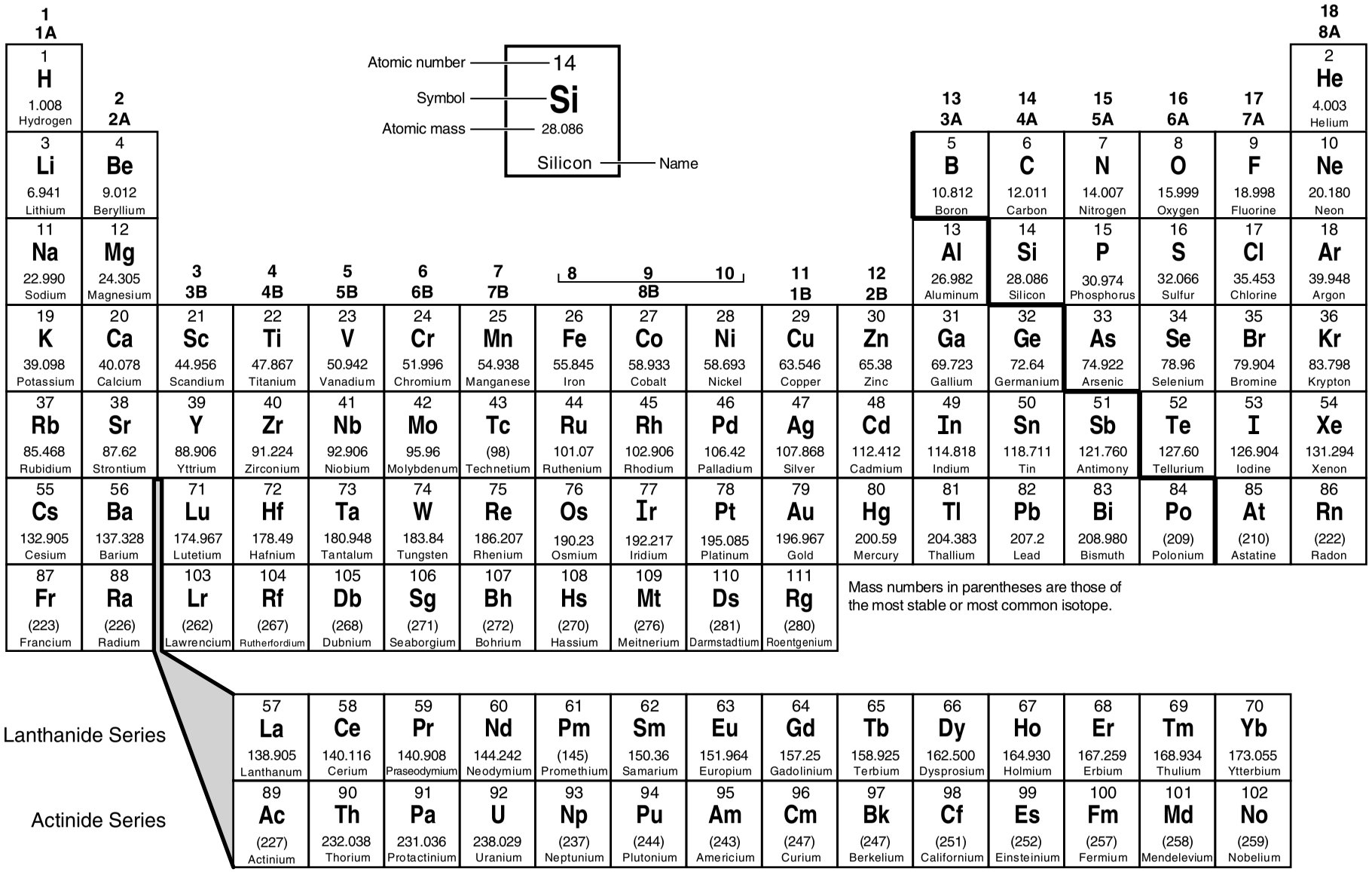
$$\text{joule (J)} = \text{N} \cdot \text{m}$$

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

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

STAAR PHYSICS REFERENCE MATERIALS

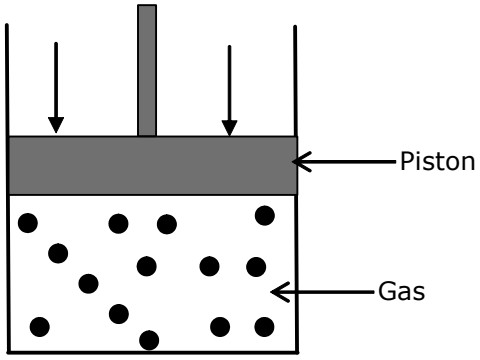
PERIODIC TABLE OF THE ELEMENTS



Updated Spring 2011

EXAMPLE ITEMS Physics Pre-AP, Sem 2

1 Consider the thermodynamic system shown.



If one Joule of work is done on the gas by pushing the piston down, what happens to the pressure and the kinetic energy of the gas in the cylinder if no energy leaves the system?

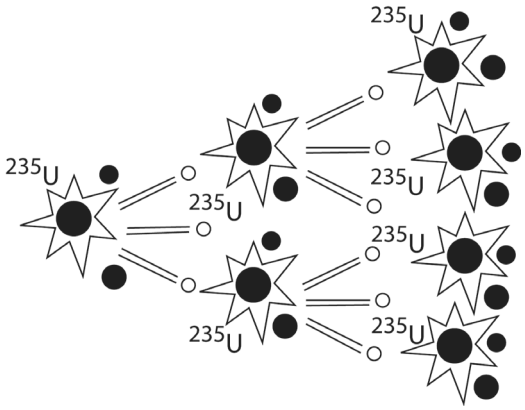
A Both kinetic energy and pressure increase.

B Kinetic energy increases and pressure decreases.

C Kinetic energy decreases and pressure increases.

D Kinetic energy remains the same and pressure increases.

2 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

EXAMPLE ITEMS Physics Pre-AP, Sem 2

3 Coffee, with a temperature of 100°C, is poured into a mug whose temperature is 35 °C. This increases the temperature of the mug. Which law of thermodynamics is illustrated by this everyday example?

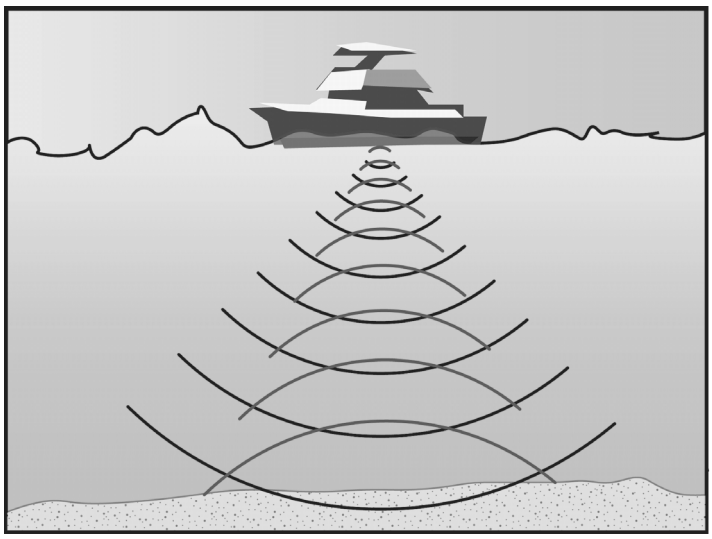
A First Law of Thermodynamics

B Second Law of Thermodynamics

C Third Law of Thermodynamics

D Fourth Law of Thermodynamics

4 A ship sends out an ultrasound pulse to the bottom of the ocean. The pulse reflects off the bottom, and returns to the ship.



What characteristic of the pulse is used to determine the depth of the ocean?

A Speed

B Frequency

C Wavelength

D Amplitude

5 Convection occurs in —

A gases only

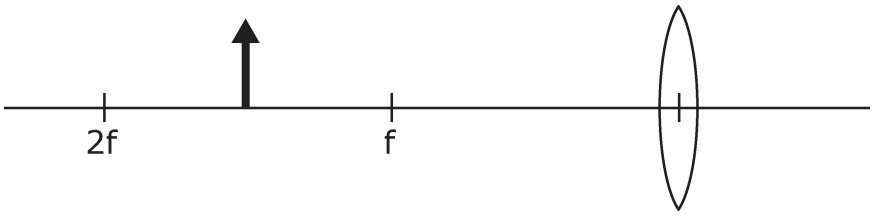
B liquids only

C solids only

D gases and liquids only

Dallas ISD - Example Items

6 An object is placed 15 cm away from a convex lens of focal length 10 cm.



How far is the image from the lens, and is the image real or virtual?

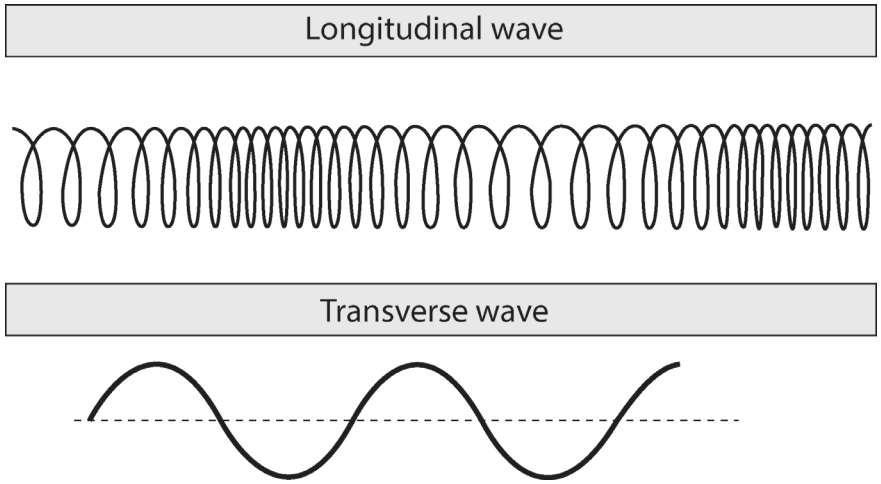
A 6 cm, real

B 6 cm, virtual

C 30 cm, real

D 30 cm, virtual

7 The illustration shows a longitudinal wave and a transverse wave.



What is the major difference between the two types of waves?

A The particle displacement due to vibrations is different in all longitudinal and all transverse waves.

B The wavelengths of all longitudinal waves are greater than the wavelengths of all transverse waves.

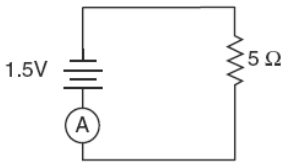
C The frequencies of all transverse waves are greater than the frequencies of all longitudinal waves.

D All transverse waves travel at the same speed, but all longitudinal waves travel at different speeds.

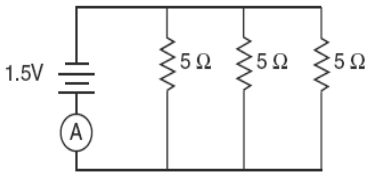
EXAMPLE ITEMS Physics Pre-AP, Sem 2

8 In which circuit does the ammeter (placed at point A) show the ***greatest*** current?

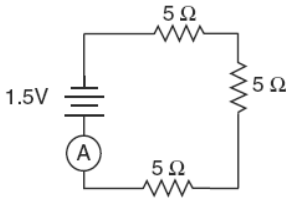
A



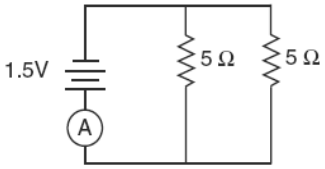
C



B

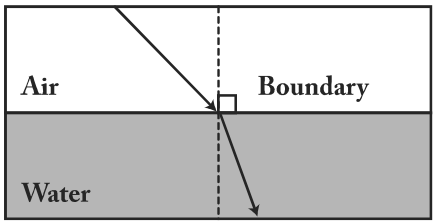


D

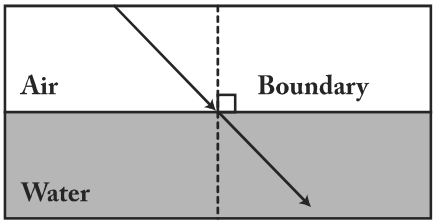


9 Which diagram **<u>best</u>** represents the behavior of light as it moves from a less dense medium, air, into a more dense medium, water?

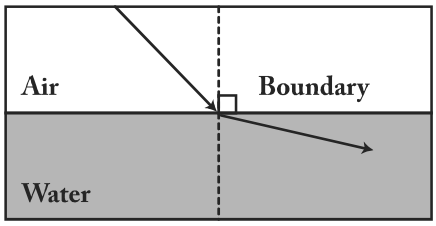
A



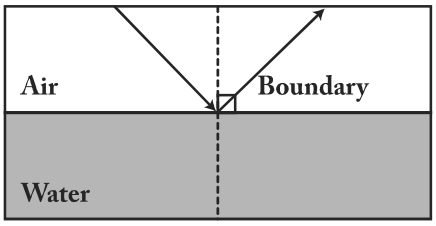
C



B



D



10 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

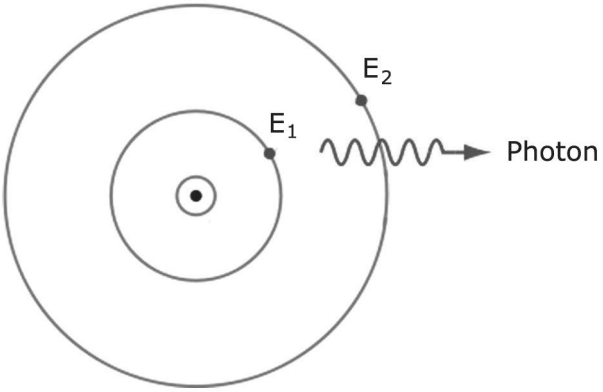
C number of electrons emitted will increase

D kinetic energy of the emitted electrons will increase

Dallas ISD - Example Items

EXAMPLE ITEMS Physics Pre-AP, Sem 2

11 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?

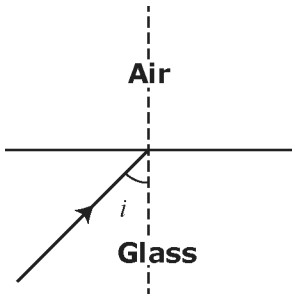
A Radiation is given off when electrons jump from a lower orbit to a higher orbit and photon energy equals $E_2 - E_1$.

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 $E_2 - E_1$.

⇨ **Use the diagram to answer the next question.**



12 Which statement describes the behavior of light when its angle of incidence, i, is greater than the critical angle for the two media?

A The light is completely transmitted.

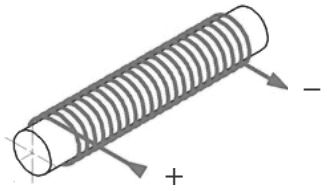
B The light is totally internally reflected.

C The light is partially reflected.

D The light is refracted.

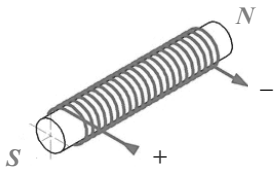
EXAMPLE ITEMS Physics Pre-AP, Sem 2

13 The diagram shows a ferrous rod with a coil of wire wrapped around it. The arrows indicate the direction of the current flowing through the wire.

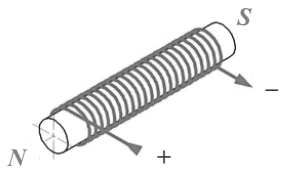


Which diagram correctly shows the polarity of the magnetic field generated by this current?

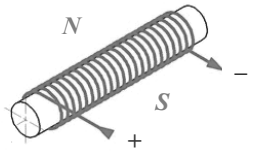
A



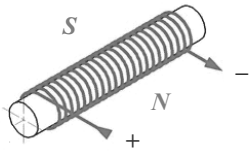
C



B



D



14 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).

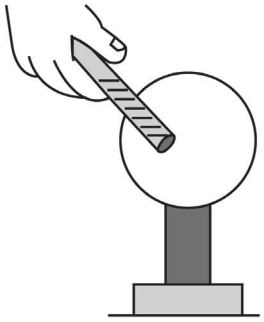


Fig. A

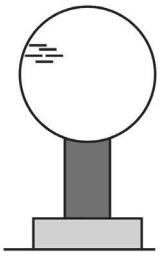


Fig. B

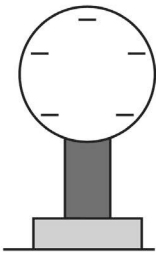


Fig. C

The sphere represents an example of a(n) —

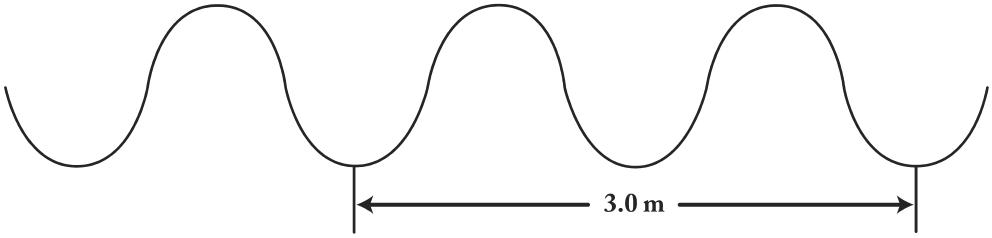
A insulator

B electromagnet

C solenoid

D conductor

15 The periodic wave shown in the diagram has a frequency of 40 Hz.



What is the speed of the wave, in meters per second?

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

⊕	⊙	⊙	⊙	⊙	⊙	⊙	⊙
⊖	0	0	0	0	0	0	0
	1	1	1	1	1	1	1
	2	2	2	2	2	2	2
	3	3	3	3	3	3	3
	4	4	4	4	4	4	4
	5	5	5	5	5	5	5
	6	6	6	6	6	6	6
	7	7	7	7	7	7	7
	8	8	8	8	8	8	8
	9	9	9	9	9	9	9

EXAMPLE ITEMS Physics Pre-AP Key, Sem 2

Item#	Key	SE	Process Skills	SE Justification
1	A	P.6E	--	Describe how the macroscopic properties of a thermodynamic system such as pressure are related to the molecular level of matter, including kinetic energy of atoms.
2	B	P.8C	2K	Describe the significance of mass-energy equivalence and apply it in explanations of phenomena such as fission.
3	B	P.6G	3A	Analyze and explain everyday examples that illustrate the laws of thermodynamics.
4	A	P.7F	--	Describe the role of wave characteristics and behaviors in industrial applications.
5	D	P.6F	--	Give examples of different processes of thermal energy transfer, including convection.
6	C	P.7E	2L	Describe and predict image formation as a consequence of refraction through a thin convex lens.
7	A	P.7C	--	Compare characteristics of transverse waves and characteristics of longitudinal waves.
8	C	P.5F	2K	Calculate in terms of current through electric circuit elements connected in both series and parallel combinations.
9	A	P.7A	2K	Describe wave propagation in various types of media.
10	D	P.8A	--	Describe the photoelectric effect.
11	D	P.8B	2K	Explain the emission spectra produced by various atoms.
12	B	P.7D	2J	Investigate behaviors of waves including refraction.
13	C	P.5G	2K	Investigate and describe the relationship between electric and magnetic fields in applications such as generators, motors, and transformers.
14	D	P.5E	--	Characterize materials as conductors based on their electrical properties.
15	60	P.7B	2H, 2L	Calculate using the relationship between wave speed, frequency, and wavelength.