Example Items

Integrated Physics and Chemistry

Integrated Physics and Chemistry 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 #: 3291

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

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

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

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

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

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

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

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

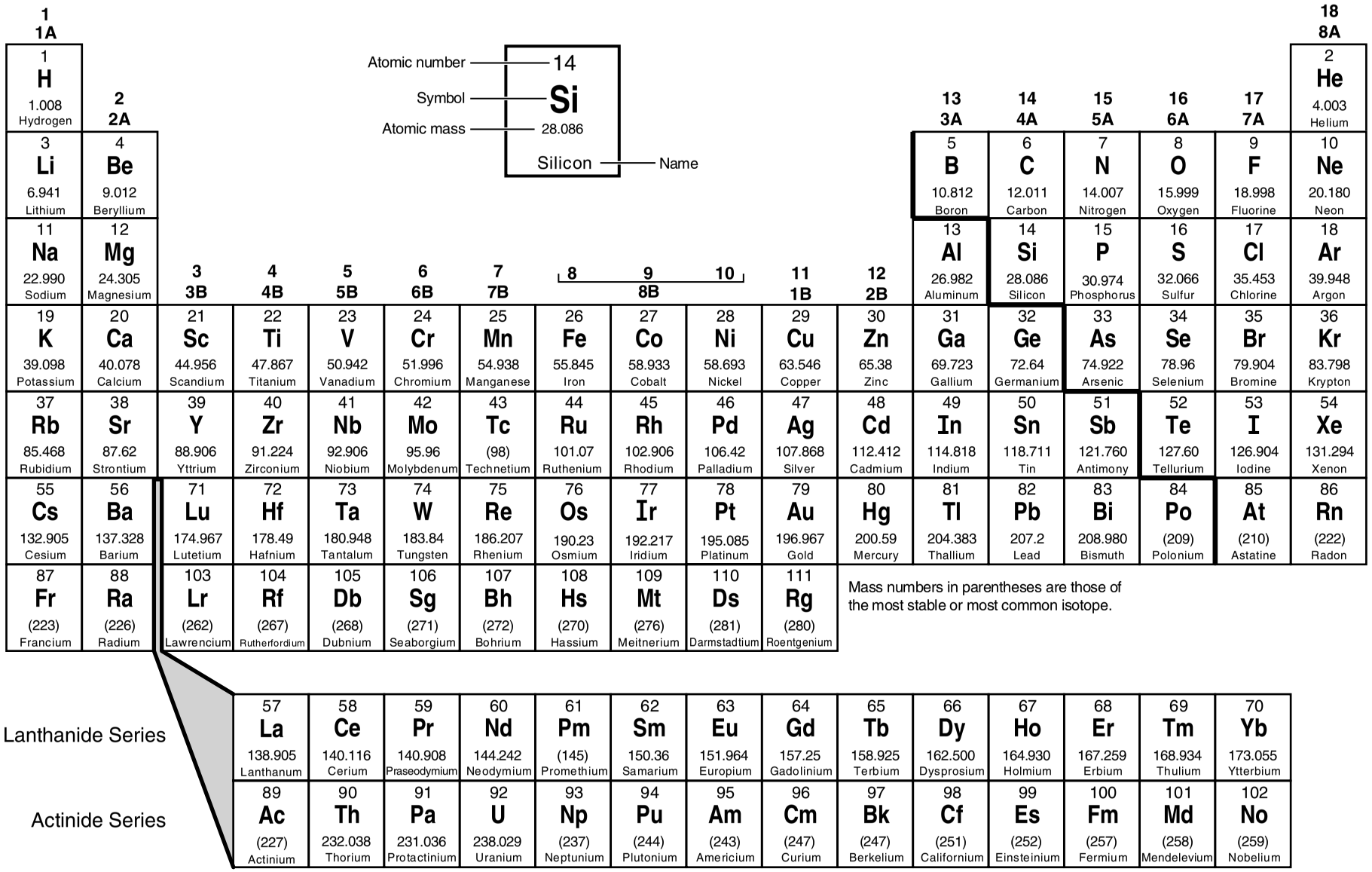
$$\text{joule (J)} = \text{N} \cdot \text{m}$$

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

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

STAAR PHYSICS REFERENCE MATERIALS

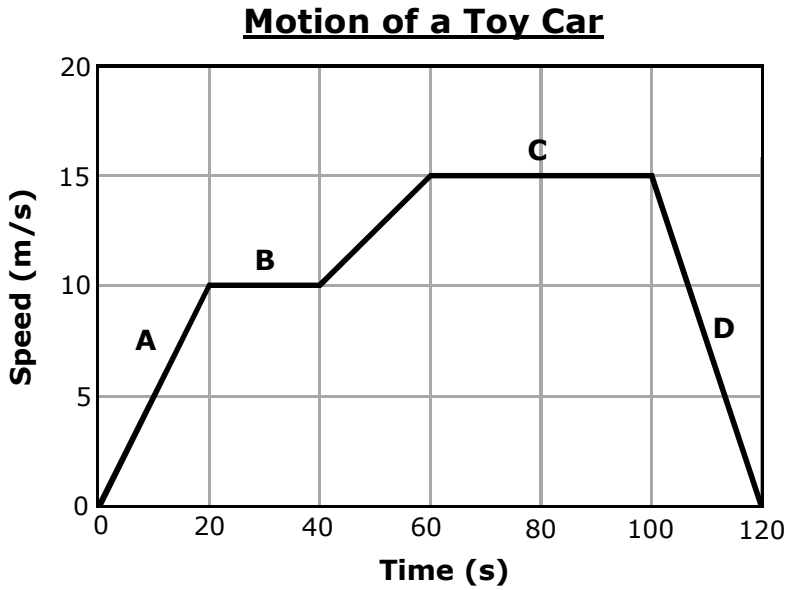
PERIODIC TABLE OF THE ELEMENTS



Updated Spring 2011

EXAMPLE ITEMS IPC, Sem 2

Use the graph to answer the next question.



1 During which segment of the car's motion is its speed greatest?

A A

B B

C C

D D

2 Which statement is an example of the Law of Conservation of Energy?

A Appliances are turned off when they are not being used.

B Gasoline is stored in the trunk of a car.

C The speed of a falling object increases with time.

D The charge on an electron never changes.

3 Cold-blooded animals, like lizards, raise their body temperature by basking on rocks in the Sun. The types of heat transfer used to warm cold-blooded animals are —

A radiation from the rocks and conduction from the Sun

B conduction from the rocks and radiation from the Sun

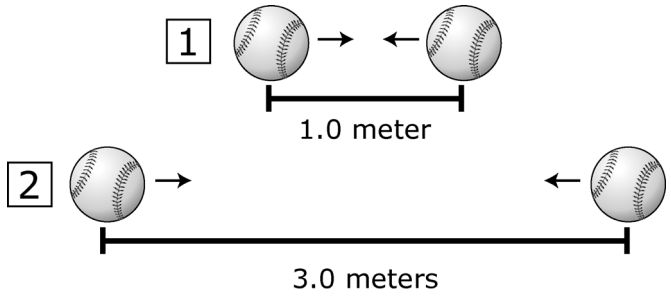
C convection from the rocks and radiation from the Sun

D conduction from both the Sun and the rocks

Dallas ISD - Example Items

EXAMPLE ITEMS IPC, Sem 2

Use the illustration to answer the next question.



4 Which statement best describes the gravitational forces of the two situations in the illustration?

A The gravitational force in situation 1 is three times greater than in situation 2.

B The gravitational forces are equal in both situations.

C The gravitational force in situation 1 is nine times greater than in situation 2.

D The gravitational force is zero in both situations.

5 Two protons are located near each other. Which statement about the forces acting on them is true?

A Since the electrical force between them is repulsive, and the gravitational force is less attractive, the protons repel each other.

B Since the electrical force between them is attractive, and the gravitational force is more repulsive, the protons repel each other.

C Since the electrical force between them is repulsive, and the gravitational force is more attractive, the protons attract each other.

D Since the electrical force between them is repulsive, and the gravitational force is equally attractive, the protons do not attract or repel each other.

6 An airplane flying northeast from Dallas to New York travels 1730 km in 4.3 hours. What is the airplane's speed?

A 4.3 km/hr

B 402.3 km/hr

C 1730 km/hr

D 7439 km/hr

Dallas ISD - Example Items

EXAMPLE ITEMS IPC, Sem 2

7 Based on the concept of conservation of momentum, when an automobile and a truck collide, the total momentum —

A decreases

B increases

C stays the same

D depends on whether the collision is elastic or inelastic

8 Which object possesses chemical potential energy?

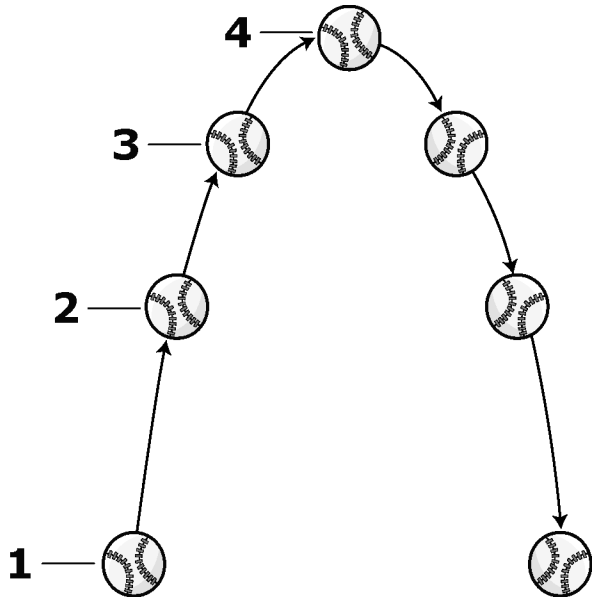
A Slinky

B Car battery

C Roller coaster

D Basketball

9 A ball is thrown into the air and follows the trajectory shown.



Which statement about the kinetic energy of the ball is true?

A The kinetic energy at points 1, 2, 3 and 4 are all equal.

B The kinetic energy at points 1 and 4 are equal, but the kinetic energy at locations 2 and 3 are not equal.

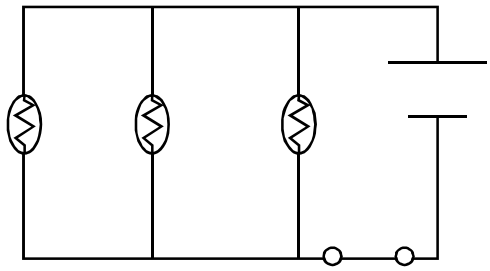
C The kinetic energy is greatest at point 4.

D The kinetic energy is greatest at point 1.

Dallas ISD - Example Items

EXAMPLE ITEMS IPC, Sem 2

Use the circuit to answer the next question.



10 There will be no transfer of electrical energy in this parallel circuit when —

A one bulb burns out in the circuit

B the switch in the circuit is opened

C two bulbs are removed from the circuit

D the switch is replaced with a fourth bulb

11 The bending of waves as they pass through an opening is the definition of —

A reflection

B refraction

C diffusion

D diffraction

12 Which sequence of energy conversions is used to produce electrical power?

A Chemical Energy from fossil fuels → Heat Energy → Mechanical Energy → Electrical Energy

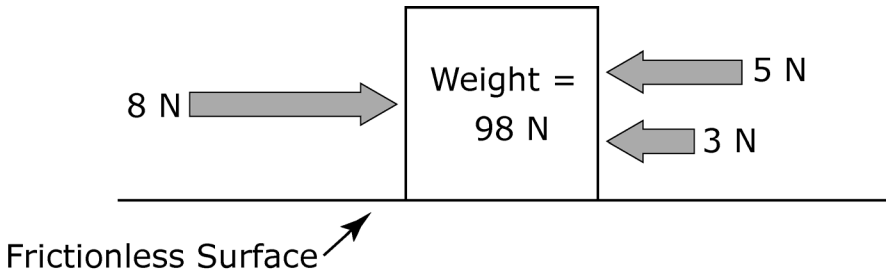
B Radiant Energy from the Sun → Mechanical Energy → Heat Energy → Electrical Energy

C Nuclear Energy from atomic nucleus → Chemical Potential Energy → Heat Energy → Electrical Energy

D Wind Energy from the motion of air → Heat Energy → Chemical Potential Energy → Electrical Energy

EXAMPLE ITEMS IPC, Sem 2

13 A box is resting on a frictionless surface. Three forces are then applied to the box as shown in the figure.



What (if anything) does the box do?

A It does not move because the net force on the box is zero.

B It does not move because the weight of the box is greater than any of the forces.

C It accelerates to the to right because the force on the left is greater than either of the forces on the right.

D It accelerates to the left because there are two forces pushing it to the left and only one force pushing it to the right

14 An electric current flows through a long straight piece of wire. This results in a(n) —

A magnetic field in the space outside the wire

B electric field in the space outside the wire

C magnetic field inside the wire but not outside the wire

D magnetic and an electric field inside the wire but not outside the wire

15 Identical boxes A and B, each weighing 100 N, are resting on a frictionless floor. Box A is pulled by a rope with a force of 50 N. Box B is pushed by a steel rod with a force of 50 N. How do the motions of the two boxes compare?

A B accelerates faster than A, because steel is stronger than rope.

B Neither box accelerates, because 50 N is not enough force to accelerate a 100 N box.

C They both accelerate at the same rate, because the forces on them are equal.

D A accelerates faster than B, because a pulling force is stronger than a pushing force.

EXAMPLE ITEMS IPC Key, Sem 2

Item#	Key	SE	Process Skills	SE Justification
1	C	IPC.4B	2D	Measure and graph distance and speed as a function of time using moving toys.
2	C	IPC.5D	--	Investigate the law of conservation of energy.
3	B	IPC.5E	2E	Demonstrate the movement of thermal energy through solids and gases by conduction and radiation such as in weather and living systems.
4	C	IPC.4F	2D	Describe the gravitational attraction between objects of masses at different distances.
5	A	IPC.4G	2E	Examine electrical force as a universal force between any two charged objects and compare the relative strength of the electrical force and gravitational force.
6	B	IPC.4A	2D	Calculate an object's motion in terms of speed.
7	C	IPC.4E	--	Apply the concept of conservation of momentum using action and reaction forces.
8	B	IPC.5B	--	Demonstrate common forms of potential energy, including chemical, such as batteries.
9	D	IPC.5A	2D	Recognize that objects and substances in motion have kinetic energy.
10	B	IPC.5F	2E	Evaluate the transfer of electrical energy in parallel circuits.
11	D	IPC.5G	--	Explore the behaviors of energy transferred by waves, including waves on water as they bend around corners.
12	A	IPC.5H	--	Analyze energy conversions such as those from radiant, nuclear, fossil fuels and the movement of the water or wind.
13	A	IPC.4C	2D	Investigate how an object's motion changes only when a net force is applied, including equipment such as classroom objects
14	A	IPC.5C	--	Demonstrate that moving electric charges produce magnetic forces.
15	C	IPC.4D	--	Assess the relationship between force, mass, and acceleration, noting the relationship is independent of the nature of the force.