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<th><strong>Passage Title:</strong> (if listed): Title of the passage(s) associated with this item.</th>
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<tbody>
<tr>
<td><strong>Standard Code:</strong> Primary educational standard assessed.</td>
<td><strong>Passage Code:</strong> (if listed): Unique letter/number code used to identify the passage(s) that go with this item.</td>
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<td><strong>Correct Answer:</strong> Correct answer. This may be blank for constructed response items where students write or type their responses.</td>
<td><strong>DOK Level</strong> (if listed): Depth of Knowledge (cognitive complexity) is measured on a four-point scale. 1 = Recall; 2 = Skill/Concepts; 3 = Strategic Thinking; 3-4 = Strategic/Extended Thinking</td>
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Chemistry

Item Information

Item Code: TEC110154
Standard Code: 3221.1.2
Standard Text: Interpret the periodic table to describe an element’s atomic makeup.
Reporting Category: Atomic Structure
Correct Answer: C

Carbon (C) exists in many isotopic forms. In each isotope, which subatomic particles differ in number?

A  electrons
B  orbitals
C  neutrons
D  protons
Based on their placement in the periodic table, which set of elements is among the most reactive?

A  lithium and fluorine
B  carbon and aluminum
C  argon and neon
D  gold and platinum
Which element contains its highest energy electrons in a \( d \) orbital while in a ground state?

A  Rn  
B  Hg  
C  Fr  
D  He
Which of these represents a mixture?

A

B

C

D
What is the molarity of a solution when 80.0 g of sodium chloride (NaCl) are dissolved in 500.0 mL of water?

A  1.37 M  
B  1.45 M  
C  2.74 M  
D  6.25 M
A student is preparing solutions for a laboratory experiment by dissolving solid solutes in liquid solvents. Which action will increase the rate of solubility?

A. lowering the temperature of the solvent
B. stirring the solute in the solution
C. increasing the pressure on the solution
D. increasing the particle size of the solute
Which example best represents a chemical change?

A  ice cubes melting at a warm temperature
B  milk spoiling when left out of the refrigerator
C  water evaporating from a rooftop
D  firewood being chopped for a fire
Chemistry

The heat of fusion of water is 80 calories/gram. How much energy is required to change 50 grams of ice into liquid water?

A 60 cal
B 200 cal
C 4000 cal
D 5000 cal
### Item Information

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<th>Passage Title:</th>
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<td>Standard Code:</td>
<td>3221.2.5</td>
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<tr>
<td>Standard Text:</td>
<td>Compare and contrast heat and temperature changes (endothermic/exothermic) in chemical (e.g., combustion) or physical (e.g., phase transformations) processes</td>
<td></td>
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<tr>
<td>Reporting Category:</td>
<td>Matter and Energy</td>
<td></td>
</tr>
<tr>
<td>Correct Answer:</td>
<td>B</td>
<td>DOK Level: 2</td>
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</table>

The total energy required to melt 30.0 grams of a solid is 741 joules. What is the latent heat of fusion for this substance?

- **A** 12.4 J/g
- **B** 24.7 J/g
- **C** 126 J/g
- **D** 741 J/g
### Item Information

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<td>Standard Text: Analyze ionic and covalent compounds in terms of their formation (electron transfer vs. sharing), names, chemical formulas (e.g., molecular:H2O, CO2, NH3: empirical: NaCl, CaBr2, Al(NO3)3), percent composition, and molar masses.</td>
<td></td>
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<td>Reporting Category: Interactions of Matter</td>
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<td>Correct Answer: B</td>
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<td>DOK Level: 3-4</td>
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</table>

What is the percent composition of carbon in the glucose molecule (C₆H₁₂O₆) if the molar mass is 180 g/mol?

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<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tr>
<td>A</td>
<td>6.7%</td>
</tr>
<tr>
<td>B</td>
<td>40.0%</td>
</tr>
<tr>
<td>C</td>
<td>53%</td>
</tr>
<tr>
<td>D</td>
<td>90.0%</td>
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<td>Item Code: TEC110207</td>
<td>Passage Title:</td>
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<tr>
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<td>Passage Code:</td>
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<tr>
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<tr>
<td>Reporting Category: Interactions of Matter</td>
<td>DOK Level: 2</td>
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<tr>
<td>Correct Answer: B</td>
<td></td>
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</table>

**What is the chemical formula for nickel(II) sulfide?**

A. \( \text{Ni}_2\text{S}_3 \)

B. \( \text{NiS} \)

C. \( \text{NiSO}_4 \)

D. \( \text{Ni}_2(\text{SO}_4)_3 \)
The chemical equation shows the reaction between hydrogen fluoride (HF) and sodium hydroxide (NaOH).

\[ \text{HF} + \text{NaOH} \rightarrow \text{H}_2\text{O} + \text{NaF} \]

Which type of chemical reaction does this equation represent?

A decomposition

B composition

C double replacement

D single replacement
The unbalanced chemical equation represents the breaking down of aluminum oxide \((\text{Al}_2\text{O}_3)\).

\[
\text{___Al}_2\text{O}_3 \rightarrow \text{___Al} + \text{___O}_2
\]

What is the molar ratio of aluminum oxide to oxygen \((\text{O}_2)\) when the equation is balanced using the lowest possible number?

A 2 : 3  
B 4 : 3  
C 2 : 4  
D 5 : 3
What is the approximate volume of 280 g of chlorine gas (Cl₂) at STP?

A 7.9 L
B 22 L
C 88 L
D 180 L
The table shows the reaction of four solutions with litmus paper.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Litmus Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blue litmus paper stays blue</td>
</tr>
<tr>
<td>2</td>
<td>Blue litmus paper turns red</td>
</tr>
<tr>
<td>3</td>
<td>Red litmus paper turns blue</td>
</tr>
<tr>
<td>4</td>
<td>Red litmus paper stays red</td>
</tr>
</tbody>
</table>

Which set of identifications most likely identifies KCl and KOH correctly based on information from the data table?

A  4 as KCl and 3 as KOH
B  1 as KCl and 2 as KOH
C  3 as KCl and 4 as KOH
D  3 as KCl and 2 as KOH
A student performs an acid-base titration experiment to determine the amount of ascorbic acid in different brands of juice. Which solution should the student use as the base solution in this acid-base titration experiment?

A  HCl  
B  CaCl$_2$  
C  LiBr  
D  NaOH
The half-life of the radioisotope potassium-42 is 12.36 hours. How much of a 450 g sample of potassium-42 will be left after 72 hours?

A  7.9 g  
B  28 g  
C  56 g  
D  75 g
As part of an investigation, students were asked to prepare a sodium chloride solution of a certain molarity. The students were given a choice of procedures. Which procedure will result in 750 mL of 1.5 M NaOH solution?

A. dissolving 40 g of NaOH in 1 L of water
B. dissolving 45 g of NaOH in enough water to make up to 750 mL of solution
C. dissolving 1.13 g of NaOH in 0.750 L of water
D. dissolving 1.13 g of NaOH in enough water to make up to 750 mL of solution
The graph shows the solubility for sodium nitrate (NaNO₃).

A student observed that 85 grams of NaNO₃ completely dissolved in 100 milliliters of water at 20°C. The student concluded the solution contained enough solvent molecules to make all the solute dissociate. Which statement is an alternate explanation for the student’s observation?

A  At 20°C the solvent had enough kinetic energy to dissociate the solute completely.

B  Stirring the solution provided energy for the NaNO₃ to react with the water.

C  At 20°C the kinetic energy of the water molecules caused the NaNO₃ to decompose.

D  Water is the only solvent that can dissolve NaNO₃ at this temperature.
An engineer designing a small rocket researched the characteristics of five different potential rocket fuels. Which additional step in the engineering protocol must be carried out to successfully design a fuel-efficient rocket engine?

A. measure the efficiency and effectiveness of the fuels in extreme temperatures
B. produce a rocket engine that is able to use the most expensive fuel
C. fabricate a tank that will hold the least expensive fuel regardless of efficiency
D. determine which type of fuel is most popular with the people involved in flying the rockets
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