Tennessee Comprehensive Assessment Program

TCAP

TNReady—Chemistry Item Release

TN Department of Education

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Metadata Interpretation Guide – Science

Item Information

Item Code:	TNS10220	Passage Title:	
Standard Code:	0307.1.1	Passage Code:	
Standard Text:	Identify specific parts of a plant and describe their function.		
Reporting Category:	Cells, Flow of Matter & Energy, Heredity		
Correct Answer:	B	DOK Level:	2

Item Code: Unique letter/number code used to identify the item.	**Passage Title:** (if listed): Title of the passage(s) associated with this item.
Standard Code: Primary educational standard assessed.	**Passage Code:** (if listed): Unique letter/number code used to identify the passage(s) that go with this item.
Standard Text: Text of the educational standard assessed.	
Reporting Category: Text of the Reporting Category the standard assesses.	
Correct Answer: Correct answer. This may be blank for constructed response items where students write or type their responses.	**DOK Level** (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

Item Information

Item Code:	TEC110154	Passage Title:	
Standard Code:	3221.1.2	Passage Code:	
Standard Text:	Interpret the periodic table to describe an element's atomic makeup.		
Reporting Category:	Atomic Structure		
Correct Answer:	C	DOK Level:	1

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

A electrons

B orbitals

C neutrons

D protons

Item Information

Item Code:	TEC110134	Passage Title:	
Standard Code:	3221.1.2	Passage Code:	
Standard Text:	Interpret the periodic table to describe an element's atomic makeup.		
Reporting Category:	Atomic Structure		
Correct Answer:	A	DOK Level:	2

Based on their placement in the periodic table, which set of elements is among the <u>most</u> reactive?

A lithium and fluorine

B carbon and aluminum

C argon and neon

D gold and platinum

Item Information

Item Code:	TEC110165	Passage Title:	
Standard Code:	3221.1.5	Passage Code:	
Standard Text:	Represent an electron's location in the quantum mechanical model of an atom in terms of the shape of electron clouds (s and p orbitals in particular), relative energies of orbitals, and the number of electrons possible in the s, p, d and f orbitals.		
Reporting Category:	Atomic Structure		
Correct Answer:	B	DOK Level:	2

Which element contains its highest energy electrons in a *d* orbital while in a ground state?

A Rn

B Hg

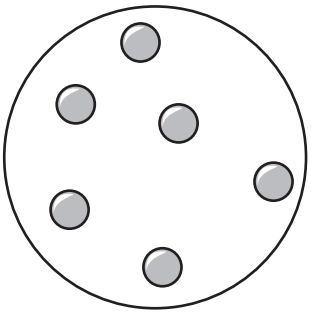
C Fr

D He

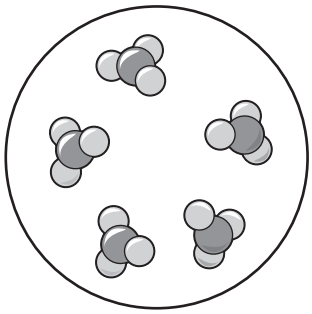
Item Information

Item Code:	TEC120046	Passage Title:	
Standard Code:	3221.2.1	Passage Code:	
Standard Text:	Distinguish among elements, compounds, and mixtures.		
Reporting Category:	Matter and Energy		
Correct Answer:	D	DOK Level:	2

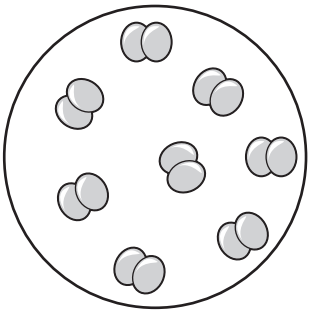
Which of these represents a mixture?



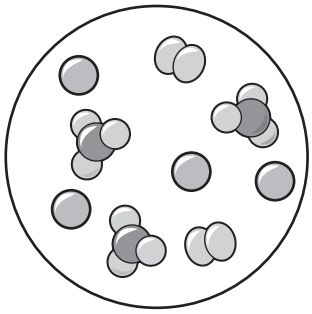
A



C



B



D

Item Information

Item Code:	TEC110436	Passage Title:	
Standard Code:	3221.2.2	Passage Code:	
Standard Text:	Identify properties of a solution: solute and solvent in a solid, liquid or gaseous solution: procedure to make or determine the concentration of a solution in units of ppm, ppb, molarity, percent composition, factors that affect the rate of solution.		
Reporting Category:	Matter and Energy		
Correct Answer:	C	DOK Level:	2

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

Item Information

Item Code:	TEC110167	Passage Title:	
Standard Code:	3221.2.3	Passage Code:	
Standard Text:	Classify a solution as saturated, unsaturated, or supersaturated based on its composition and temperature and a solubility graph.		
Reporting Category:	Matter and Energy		
Correct Answer:	B	DOK Level:	2

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

Item Information

Item Code:	TEC110079	Passage Title:	
Standard Code:	3221.2.4	Passage Code:	
Standard Text:	Identify properties of matter (e.g., physical: density, boiling point, melting point, or chemical: ability to rust or tarnish, be sour) or changes in matter (e.g., physical: phase change, shape, color, or chemical: formation of a gas or precipitate).		
Reporting Category:	Matter and Energy		
Correct Answer:	B	DOK Level:	2

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

Item Information

Item Code:	TEC110439	Passage Title:	
Standard Code:	3221.2.5	Passage Code:	
Standard Text:	Compare and contrast heat and temperature changes (endothermic /exothermic) in chemical (e.g., combustion) or physical (e.g., phase transformations) processes		
Reporting Category:	Matter and Energy		
Correct Answer:	C	DOK Level:	2

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

Item Code:	TEC110437	Passage Title:	
Standard Code:	3221.2.5	Passage Code:	
Standard Text:	Compare and contrast heat and temperature changes (endothermic /exothermic) in chemical (e.g., combustion) or physical (e.g., phase transformations) processes		
Reporting Category:	Matter and Energy		
Correct Answer:	B	DOK Level:	2

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

Item Code:	TEC110268	Passage Title:	
Standard Code:	3221.3.1	Passage Code:	
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.		
Reporting Category:	Interactions of Matter		
Correct Answer:	B	DOK Level:	3-4

What is the percent composition of carbon in the glucose molecule ($C_6H_{12}O_6$) if the molar mass is 180 g/mol?

A 6.7%

B 40.%

C 53%

D 90.%

Item Information

Item Code:	TEC110207	Passage Title:	
Standard Code:	3221.3.1	Passage Code:	
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.		
Reporting Category:	Interactions of Matter		
Correct Answer:	B	DOK Level:	2

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

A Ni_2S_3

B NiS

C $NiSO_4$

D $Ni_2(SO_4)_3$

Item Information

Item Code:	TEC120095	Passage Title:	
Standard Code:	3221.3.2	Passage Code:	
Standard Text:	Determine the reactants, products, and types of different chemical reactions: composition, decomposition, double replacement, single replacement, combustion.		
Reporting Category:	Interactions of Matter		
Correct Answer:	C	DOK Level:	2

The chemical equation shows the reaction between hydrogen fluoride (HF) and sodium hydroxide (NaOH).

$$\mathbf{HF + NaOH \rightarrow H_2O + NaF}$$

Which type of chemical reaction does this equation represent?

A decomposition

B composition

C double replacement

D single replacement

Item Information

Item Code:	TEC120056	Passage Title:	
Standard Code:	3221.3.4	Passage Code:	
Standard Text:	Balance a chemical equation to determine molar ratios.		
Reporting Category:	Interactions of Matter		
Correct Answer:	A	DOK Level:	2

The unbalanced chemical equation represents the breaking down of aluminum oxide (Al_2O_3).

$$\_\_\_Al_2O_3 \rightarrow \_\_\_Al + \_\_\_O_2$$

What is the molar ratio of aluminum oxide to oxygen (O_2) when the equation is balanced using the lowest possible number?

A 2 : 3

B 4 : 3

C 2 : 4

D 5 : 3

Item Information

Item Code:	TEC120175	Passage Title:	
Standard Code:	3221.3.5	Passage Code:	
Standard Text:	Convert among the following quantities of a substance: mass, number of moles, number of particles, molar volume at STP.		
Reporting Category:	Interactions of Matter		
Correct Answer:	C	DOK Level:	2

What is the approximate volume of 280 g of chlorine gas (Cl_2) at STP?

A 7.9 L

B 22 L

C 88 L

D 180 L

Item Information

Item Code:	TEC120556	Passage Title:	
Standard Code:	3221.3.7	Passage Code:	
Standard Text:	Classify substances as acids or bases based on their formulas and how they react with litmus and phenolphthalein.		
Reporting Category:	Interactions of Matter		
Correct Answer:	A	DOK Level:	2

The table shows the reaction of four solutions with litmus paper.

Litmus Paper Reactions with Four Solutions

Solution	Litmus Paper
1	Blue litmus paper stays blue
2	Blue litmus paper turns red
3	Red litmus paper turns blue
4	Red litmus paper stays red

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

Item Information

Item Code:	TEC110185	Passage Title:	
Standard Code:	3221.3.7	Passage Code:	
Standard Text:	Classify substances as acids or bases based on their formulas and how they react with litmus and phenolphthalein.		
Reporting Category:	Interactions of Matter		
Correct Answer:	D	DOK Level:	2

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

Item Information

Item Code:	TEC120253	Passage Title:	
Standard Code:	3221.3.8	Passage Code:	
Standard Text:	Describe radioactivity through a balanced nuclear equation and through an analysis of the half-life concept.		
Reporting Category:	Interactions of Matter		
Correct Answer:	A	DOK Level:	2

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

Item Information

Item Code:	TEC120026	Passage Title:	
Standard Code:	3221.Inq.2	Passage Code:	
Standard Text:	Analyze the components of a properly designed scientific investigation.		
Reporting Category:	Embedded Inquiry, Technology & Engineering, Mathematics		
Correct Answer:	B	DOK Level:	2

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

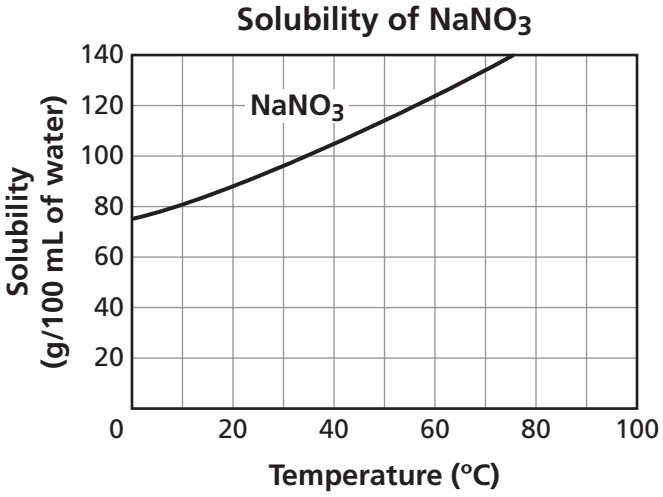
C dissolving 1.13 g of NaOH in 0.750 L of water

D dissolving 1.13 g of NaOH in enough water to make up to 750 mL of solution

Item Information

Item Code:	TEC120385	Passage Title:	
Standard Code:	3221.Inq.7	Passage Code:	
Standard Text:	Compare conclusions that offer different but acceptable explanations for the same set of experimental data.		
Reporting Category:	Embedded Inquiry, Technology & Engineering, Mathematics		
Correct Answer:	A	DOK Level:	2

The graph shows the solubility for sodium nitrate ($NaNO_3$).



A student observed that 85 grams of $NaNO_3$ 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 $NaNO_3$ to react with the water.

C At 20°C the kinetic energy of the water molecules caused the $NaNO_3$ to decompose.

D Water is the only solvent that can dissolve $NaNO_3$ at this temperature.

Item Information

Item Code:	TEC120125	Passage Title:	
Standard Code:	3221.TE.2	Passage Code:	
Standard Text:	Evaluate a protocol to determine the degree to which an engineering design process was successfully applied.		
Reporting Category:	Embedded Inquiry, Technology & Engineering, Mathematics		
Correct Answer:	A	DOK Level:	3-4

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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