



2014 PSAE Science

November 2013

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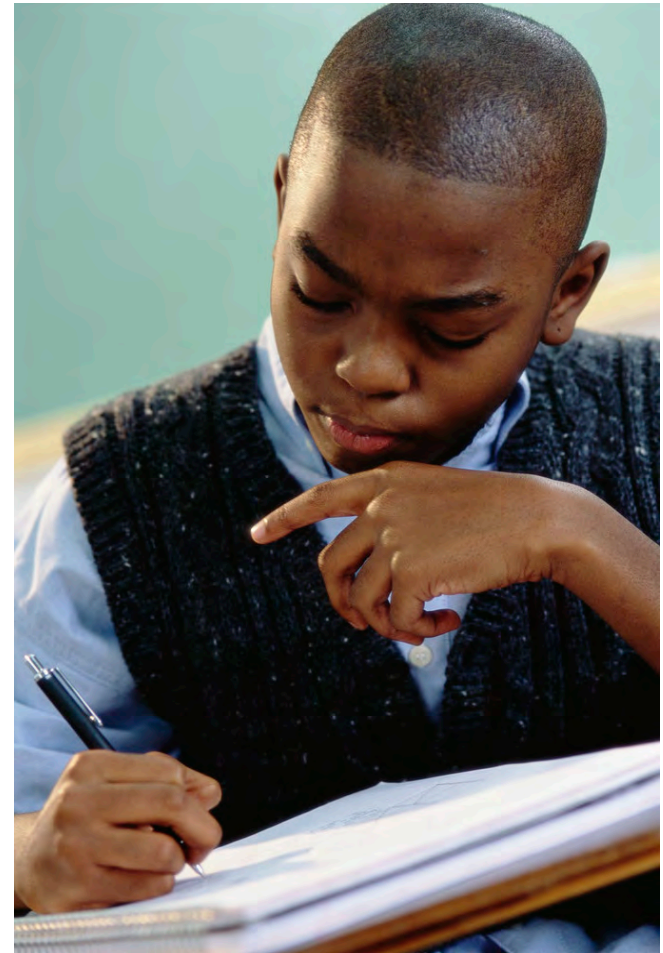
1-866-317-6034

www.isbe.net/assessment



PSAE Science

- Aligned to the Illinois Assessment Framework
- All multiple-choice items
- Day 1- ACT Science
- Day 2- ISBE-Developed
- 40 Items on Day 1 and 45 Items on Day 2
- 85 total items (5 field test)





Science – State Goal 11

Grade 11

STANDARD 11A – SCIENTIFIC INQUIRY

11.11.01 Understand and follow procedures relating to scientific investigations, including understanding the design and procedures used to test a hypothesis, organizing and analyzing data accurately and precisely, producing and interpreting data tables and graphs, performing appropriate calculations, applying basic statistical methods to the data, identifying appropriate conclusions, making predictions, and evaluating competing models.

11.11.02 Distinguish among the following: observing, drawing a conclusion based on observation, forming a hypothesis, conducting an experiment, organizing data, comparing data.

11.11.03 Identify possible sources of error in an experiment.

11.11.04 Distinguish and define the following components of typical experiments: constants, variables, experimental group, control group (or control setup).

STANDARD 11B – TECHNOLOGICAL DESIGN

11.11.05 Identify a technological design problem inherent in a given product.

11.11.06 Out of different lists of criteria, select the list of criteria outlining a successful design solution to a given problem.

11.11.07 Given test results on different models, choose the model which best solves the design problem.

11.11.08 Given a description of a test to be performed on a model, select from a list of options what are the possible sources of error in conducting the test.



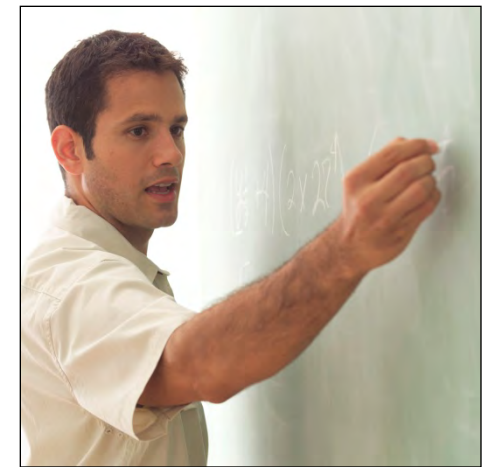
PSAE Science

- 11A Science Inquiry on Day 1
- 11B Technological Design, 12A Life Science, 12B Environmental Science, 12C Chemistry, 12D Force and Motion, 12E Earth Science, 12F Astronomy, 13A Safety, Ethics, 13B History of Science, Technology in Science on Day 2



Test Item Development

- Illinois teachers write and review test items
- Items written in February 2012, reviewed in August 2012, pilot-tested in April 2013
- Item data analyzed
- Some selected for 2014 PSAE





ACT

- Responsible for test development starting with 2008 tests
- Illinois teachers write and review items
- ACT is responsible for printing, distributing materials, scoring, and reporting





PSAE Standard Time Test Dates:

- Day 1 and Day 2 Initial Test Dates: April 23-24, 2014*
- Day 1 and Day 2 Makeup Test Dates: May 7-8, 2014*



****Note that testing will occur on Wednesday and Thursday in April and May.***



- Testing procedures are the same on Day 1 and Day 2.
- Newly-appointed Test Supervisors, Backup Test Supervisors, and Test Accommodations Coordinators are expected to view a PSAE Training webcast recorded by ISBE and ACT. PSAE staff who were trained previously are strongly encouraged, but not required, to view the webcast.



Testing Policies and Preparation





Day 1 ACT Science

- 40 questions - 35 minutes
- 7 passages
- Try to spend only 2 minutes reading each passage and 30 seconds to answer each question.
- Read the passages carefully
- Calculators may not be used



Day 1 ACT Science

- Content includes biology, chemistry, physics, Earth/space
- Emphasis on scientific reasoning skills- Standard 11A
- 3 different formats: data representation, research summaries, conflicting viewpoints



Day 1 ACT Science

- **Data Representation**
 - 38% of the test
 - Reading graphs, scatter plots, tables
- **Research Summaries**
 - 45% of the test
 - Descriptions of experiments
 - Questions on experimental design and interpretation of results



Day 1 ACT Science

- **Conflicting Viewpoints**
 - 17% of the test
 - Expressions of hypotheses, models, or views that are inconsistent with one another
 - Questions focus on understanding, analysis, comparison, and the evaluation of the alternative viewpoints



Day 1 ACT Science

- **ACT Science Cognitive Levels**
 - **Understanding**-comprehending information presented
 - **Analysis**-relating components presented
 - **Generalization**-thinking beyond presented materials

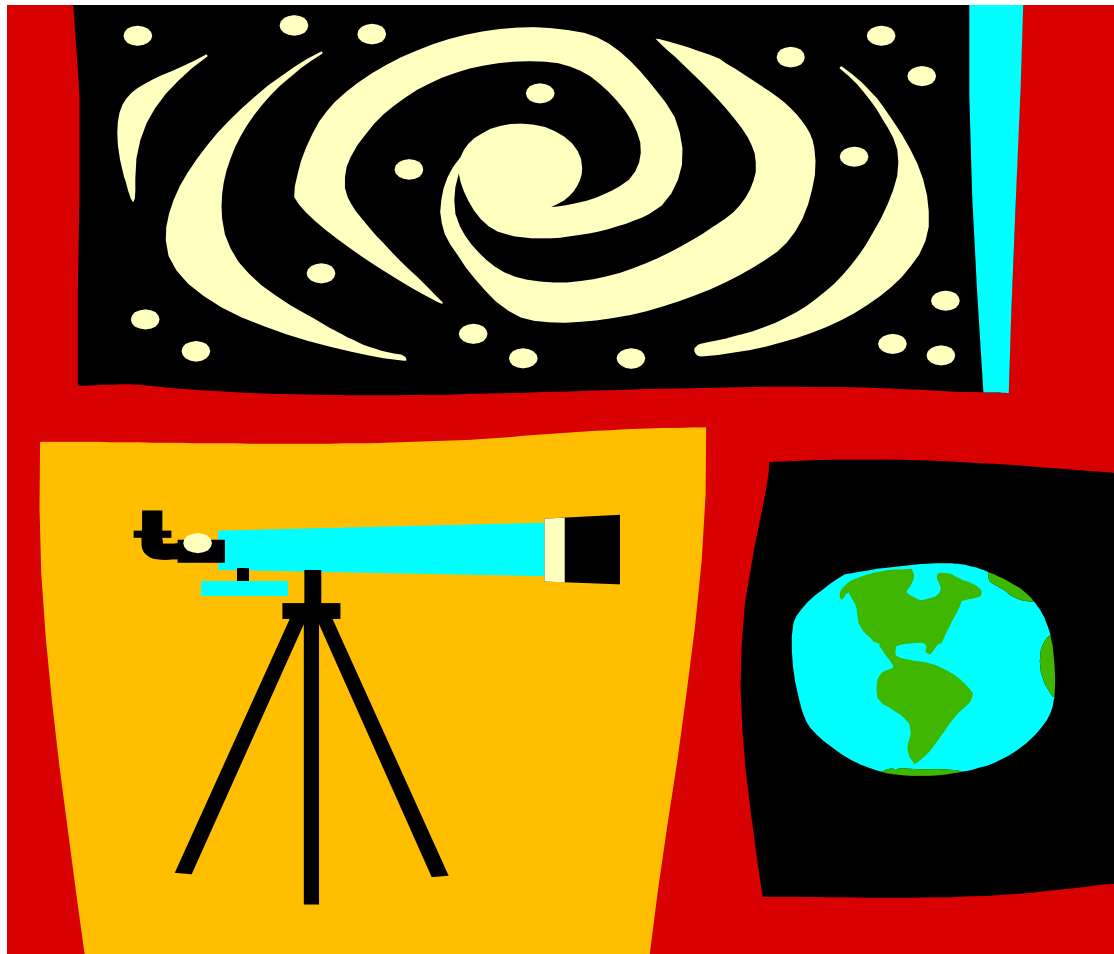


Day 2 ISBE-Developed Science

- 45 multiple-choice items (5 are pilot items)
- 40 minutes
- Items align to Illinois Science Assessment Framework
- Items written and reviewed by Illinois teachers and pilot-tested in Illinois



Sample Items



**Passage V**

Density is defined as the mass of a substance divided by its volume:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Table 1 lists the phases and the densities, in grams per cubic centimeter (g/cm^3), of various pure substances at 25°C and 1 atmosphere (atm) of pressure.

Substance	Phase	Density (g/cm^3)
Arsenic	solid	5.73
Glucose	solid	1.56
Iron	solid	7.86
Lead	solid	11.34
Zinc	solid	7.14
Ethanol	liquid	0.79
Ethyl ether	liquid	0.71
Glycerol	liquid	1.26
Mercury	liquid	13.59
Freon-12	gas	0.00495
Krypton	gas	0.00343
Methane	gas	0.00065



Figure 1 shows how the density of liquid water changes with temperature.

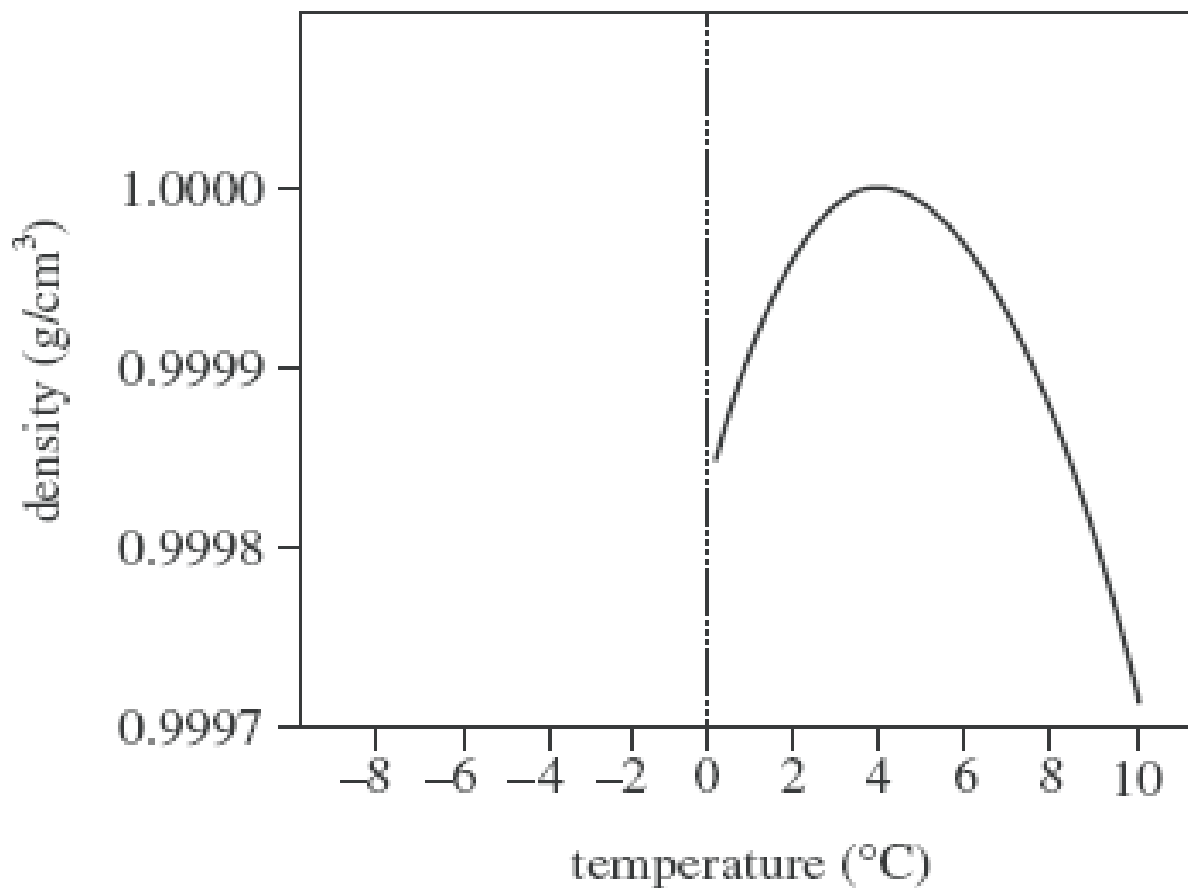
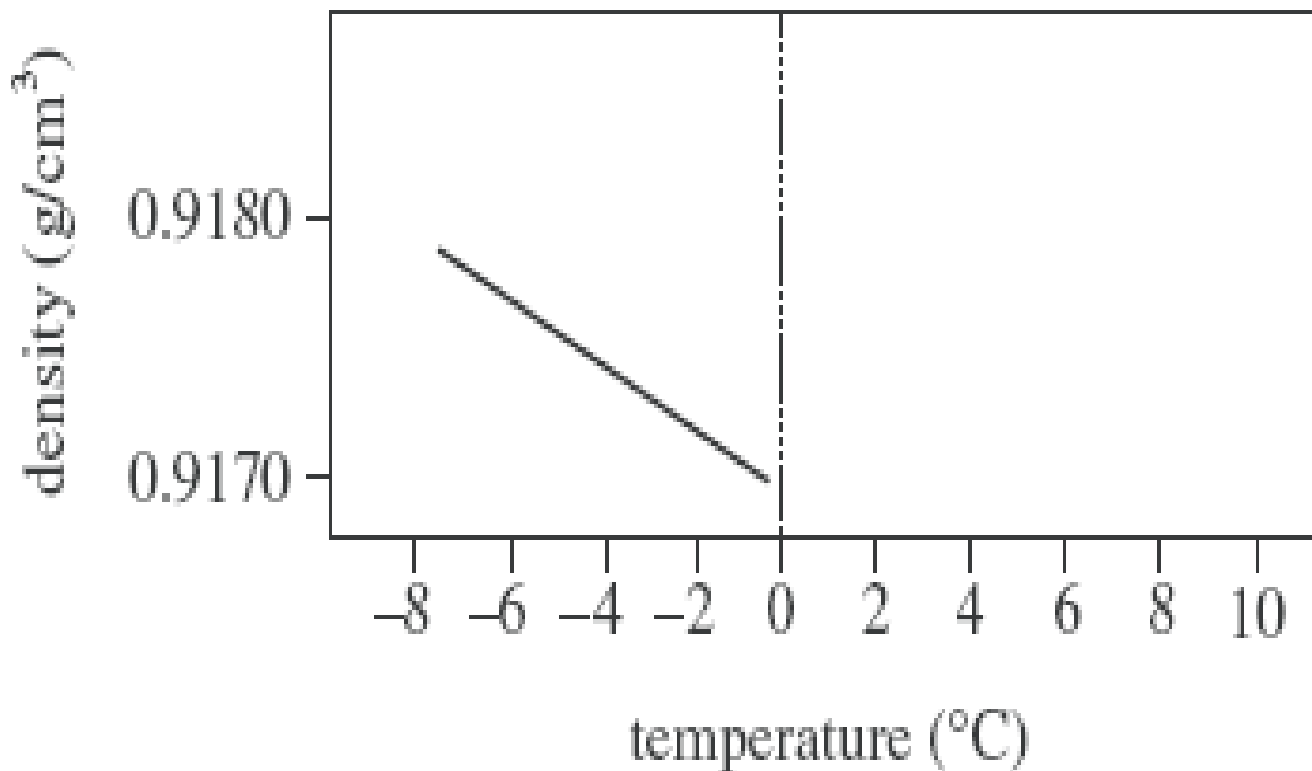




Figure 2 shows how the density of solid water changes with temperature.





According to Figure 1, as the temperature of liquid water decreases from 10°C to 0°C , the density:

- A. increases only.
- B. decreases only.
- C. decreases, then increases.
- D. increases, then decreases.

A student claimed that “If the masses of 1 cm^3 of any solid and 1 cm^3 of any liquid are compared, the mass of the solid will be greater.” Do the data in Table 1 support his claim?

- F. No; lead has a higher density than any of the liquids listed.
- G. No; mercury has a higher density than any of the solids listed.
- H. Yes; lead has a higher density than any of the liquids listed.
- J. Yes; mercury has a higher density than any of the solids listed.

Which of the following hypotheses about the relationship between the temperature and the density of a solid is best supported by the data in Figure 2 ? As the temperature of a solid increases, the density of the solid:

- A. increases only.
- B. decreases only.
- C. increases, then decreases.
- D. decreases, then increases.



- Aligns to 11.11.01
- Understand and follow procedures relating to scientific investigations...interpreting data tables and graphs...applying statistical methods to the data...evaluating competing models.”



During cellular respiration, energy from glucose is converted and stored for use by the cell in what form?

- A** As heat energy in water molecules
- B** As kinetic energy in ADP molecules
- C** As potential energy in oxygen molecules
- D** As chemical energy in ATP molecules



- Aligns to 12.11.09
- “Understand that the chief energy-storing compound used by organisms is ATP (adenosine triphosphate).”



New species can form when organisms are geographically isolated from parent colonies. Examples of barriers that can cause geographic isolation are mountain ranges, rivers, and glaciers. Why would barriers such as these cause new species to evolve over time?

- A** Isolated populations can only breed among themselves, keeping genetic changes within the population.
- B** Isolated populations produce fewer offspring.
- C** Isolated populations will breed with other species to form new species.
- D** Isolated populations produce mutations more frequently.



- Aligns to 12.11.28
- “Understand that reproductive or geographic isolation can lead to speciation.”



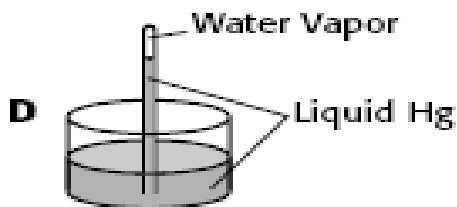
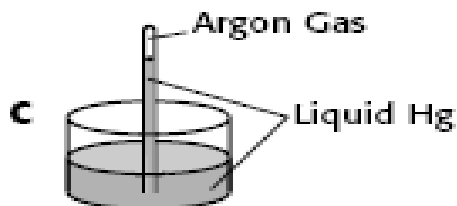
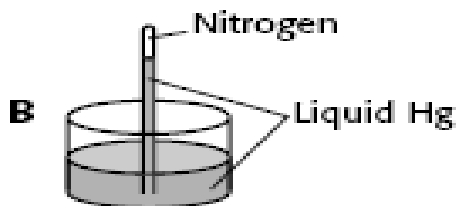
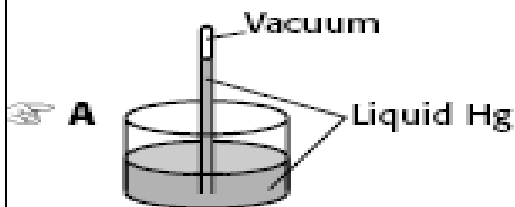
Why does the Southern Hemisphere have less variation in normal annual temperature than the Northern Hemisphere?

- A** The Southern Hemisphere has colder ocean water.
- B** The Southern Hemisphere receives less solar radiation.
- C** The Southern Hemisphere has more cloud cover.
- D** The Southern Hemisphere has more water area.

Aligns to 12.11.95



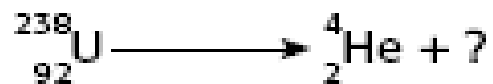
Which design for building a sealed-tube barometer will work best?



Aligns to 11.11.06



In the nuclear reaction below,
what product would be formed?



Aligns to 12.11.56



Which most likely occurs if two genes are found close to each other on a chromosome?

- A. The genes will be related to each other.
- B. The genes will have low recombination rates.
- C. The genes will have high recombination rates.
- D. The genes will code for the same trait.

Aligns to 12.11.12

Aligns to 12.11.35

Why do almost all food chains depend upon a stable supply of plants?

- A. Plants contain fewer nutrients than do other life forms.
- B. Plants can grow in every biome in the world.
- C. Plants are eaten by most other life forms.
- D. Plants can create nutrients from inorganic materials.



Aligns to 12.11.62

Solution A has a pH of 5.0, while solution B has a pH of 7.0.

The $[H^+]$ of solution A is how many times as great as the $[H^+]$ of solution B?

- A.** 2 times as great
- B.** 100 times as great
- C.** $\frac{1}{2}$ as great
- D.** $\frac{1}{100}$ as great

Aligns to 12.11.81

Which of the four fundamental forces is the force that binds one atom to another?

- A.** Gravitational force
- B.** Electrical force
- C.** Weak nuclear force
- D.** Strong nuclear force



Aligns to 12.11.103

Astronomers have discovered that stars may vary in mass from less than a tenth to more than two hundred times the mass of our sun.

As the mass of stars increases, how, if at all, is the lifetime of stars affected?

- A. The lifetime of stars generally increases.**
- B. The lifetime of stars generally decreases.**
- C. The lifetime of stars does not vary.**
- D. The lifetime of stars varies, but with no general trend.**



- More ACT and ISBE-Developed Science practice items can be found online:
- www.actstudent.org/testprep/index.html
- www.isbe.net/assessment/psae.htm



Questions?

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