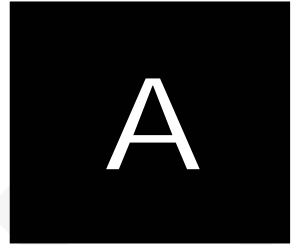


Name

RELEASED FORM

Physical Science

Form A



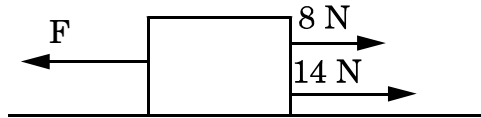
# North Carolina Test of Physical Science

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Public Schools of North Carolina  
[www.ncpublicschools.org](http://www.ncpublicschools.org)  
State Board of Education  
Department of Public Instruction  
Division of Accountability Services/North Carolina Testing Program  
Raleigh, North Carolina 27699-6314



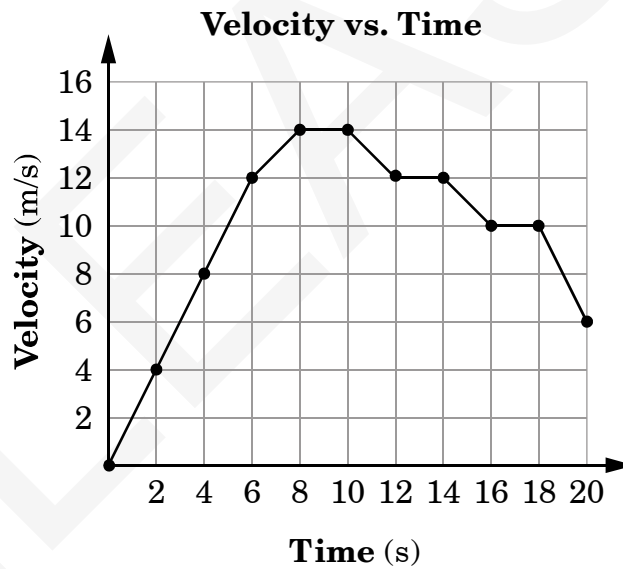
1. This diagram shows three horizontal forces acting on an object.



Neglecting friction, what is the magnitude of force,  $F$ , if the object remains at rest?

- A 6 N
- B 8 N
- C 14 N
- D 22 N

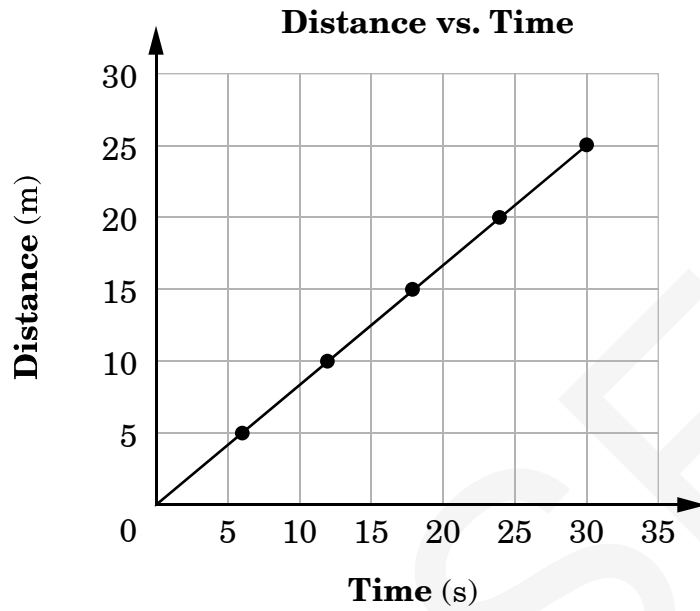
2. This graph represents the velocity of an object over time.



What is the average acceleration of the object during the first 4 seconds?

- A 1 m/s/s
- B 2 m/s/s
- C 4 m/s/s
- D 8 m/s/s

3. This graph represents the motion of a cart.



What is the average speed of the cart?

- A 0.83 m/s
- B 1.17 m/s
- C 5 m/s
- D 65 m/s

4. A person places a metal spoon that is at room temperature into a bowl of hot soup. How will the thermal energies of the spoon and the soup be affected?

- A The spoon will increase in thermal energy, and the soup will decrease in thermal energy.
- B Both the spoon and the soup will increase in thermal energy.
- C The spoon will decrease in thermal energy, and the soup will increase in thermal energy.
- D Both the spoon and the soup will decrease in thermal energy.

5. Which is the lowest point of a transverse wave?
- A amplitude
  - B crest
  - C period
  - D trough
6. An object has a mass of 12.8 kg and a velocity of 8.4 m/s. What is the kinetic energy of the object?
- A 53.8 J
  - B 107.5 J
  - C 451.6 J
  - D 903.2 J
7. How much potential energy does a 55-kg person gain when she walks to the top of a hill 20 m tall?
- A 75 J
  - B 539 J
  - C 1,100 J
  - D 10,780 J

8. A student builds an electromagnet using a variable power source and 40 turns of wire. The electromagnet is used to pick up metal paper clips. The student changes the voltage and counts the number of paper clips that are picked up. Which table could be the data the student collected?

A

Voltage (V)	Number of Paper Clips
3	24
6	12
9	8
12	6

B

Voltage (V)	Number of Paper Clips
3	27
6	24
9	21
12	18

C

Voltage (V)	Number of Paper Clips
3	10
6	20
9	20
12	10

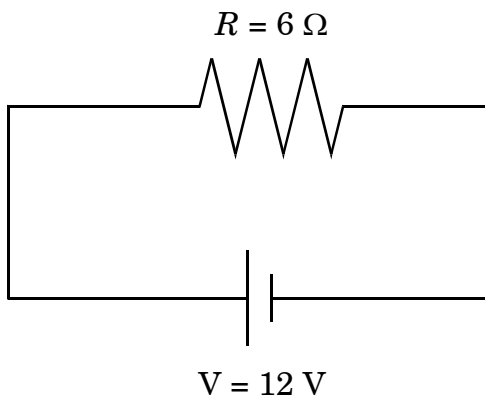
D

Voltage (V)	Number of Paper Clips
3	9
6	18
9	27
12	36

9. Which statement *best* explains why there could be a force of attraction between two electrically charged objects?

- A because they have like charges
- B because they have unlike charges
- C because they have the same number of protons
- D because they have the same number of electrons

10. This diagram represents a closed circuit.



How much current flows through this circuit?

- A 0.5 A
- B 2 A
- C 18 A
- D 72 A

11. An atom has 29 protons, 29 electrons, and 35 neutrons. What is the mass number of the atom?

- A 29
- B 35
- C 64
- D 93

12. Which one of these scientists described a model of the atom that included energy levels?

- A Dalton
- B Bohr
- C Newton
- D Thomson

13. This chart represents the melting points and boiling points of some substances.

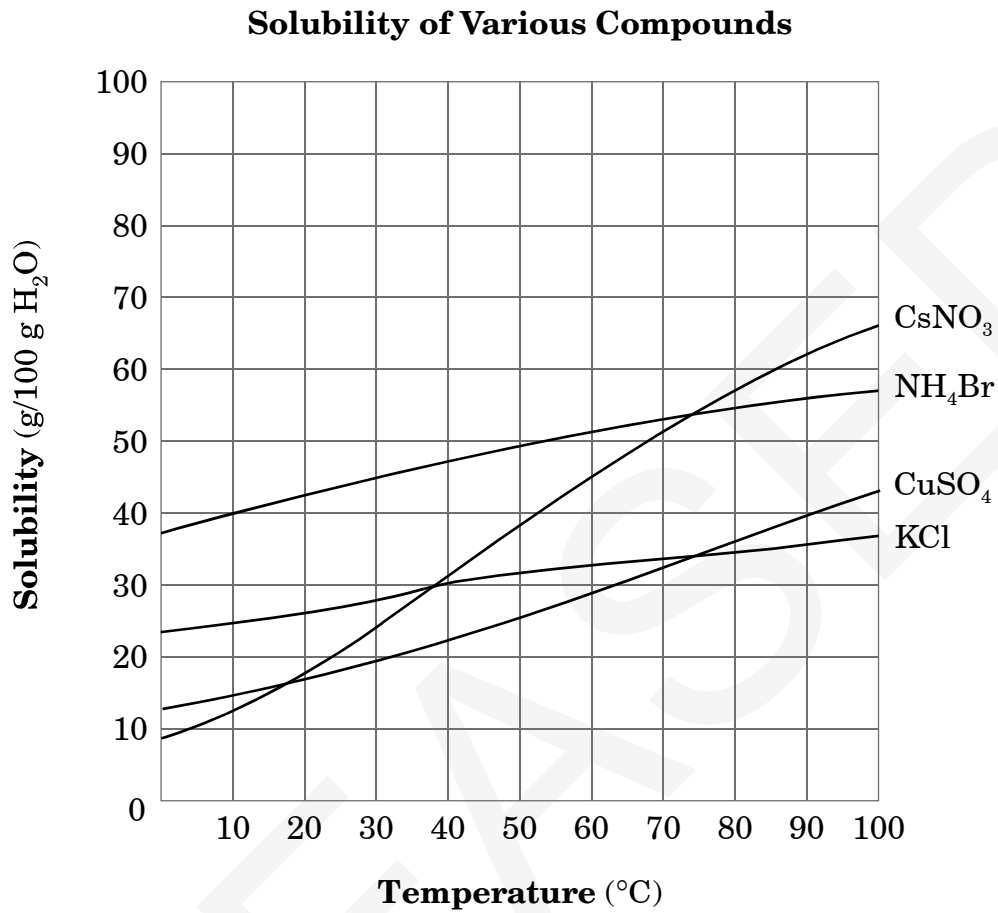
**Melting and Boiling Points  
for Substances**

<b>Substance</b>	<b>Melting Point (°C)</b>	<b>Boiling Point (°C)</b>
Ethanol	-119	79
Hexane	-95	69
Methane	-182	-164
Methanol	-94	65

Which substance is a gas at 45°C?

- A Ethanol  
B Hexane  
C Methane  
D Methanol
- 
14. How many protons and neutrons are there in an atom of  $^{11}_5\text{B}$ ?
- A 5 protons and 6 neutrons  
B 5 protons and 11 neutrons  
C 11 protons and 5 neutrons  
D 11 protons and 6 neutrons

15. This graph shows the solubility curves for various ionic compounds.



Which compound is **most** affected by a change in temperature from 30°C to 50°C?

- A CsNO<sub>3</sub>
- B NH<sub>4</sub>Br
- C CuSO<sub>4</sub>
- D KCl

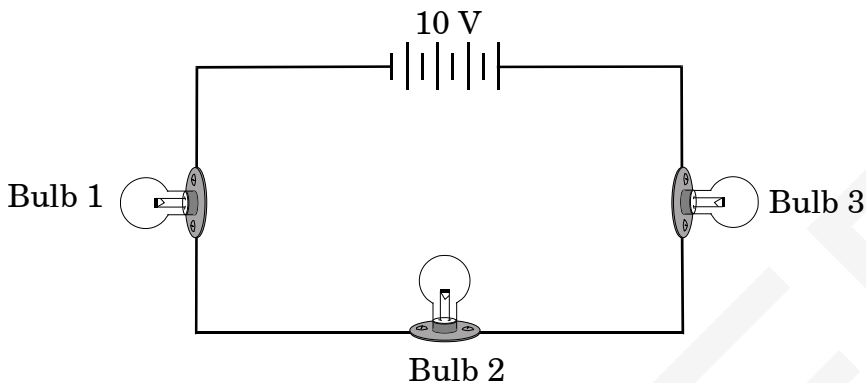


16. Which pair of elements has the most physical and chemical properties in common?
- A Ge and Se
  - B K and Kr
  - C Al and Ga
  - D Ba and Bi
17. Which chemical equation represents a double replacement reaction?
- A  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
  - B  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$
  - C  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
  - D  $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
18. Which **best** explains why water dissolves most salts?
- A Water is polar, and salts form ions in solution.
  - B Water is nonpolar, and salts form ions in solution.
  - C Water has the same density as salts.
  - D Water has a different density than salts.
19. How is this reaction classified?
- $$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{heat}$$
- A endothermic
  - B exothermic
  - C decomposition
  - D double replacement
20. Which chemical formula represents magnesium phosphate?
- A  $\text{MgPO}_4$
  - B  $\text{Mg}_2\text{PO}_4$
  - C  $\text{Mg}_3(\text{PO}_4)_2$
  - D  $\text{Mg}_2(\text{PO}_4)_3$

21. A car is traveling at a constant speed of 12 m/s. When the driver accelerates, the car reaches a speed of 26 m/s in 6 s. What is the average acceleration of the car?
- A 2 m/s/s
  - B 2.3 m/s/s
  - C 4.3 m/s/s
  - D 84 m/s/s
22. A large rock has a mass of 750 kg. What is its weight?
- A 76.5 N
  - B 740.2 N
  - C 759.8 N
  - D 7,350 N
23. A 100-kg student kicks a 1.5-kg ball with a force of 450 N. What force does the ball apply on the student?
- A 4.5 N
  - B 300 N
  - C 450 N
  - D 675 N
24. A metal spoon is used to stir a pot of boiling water. The person holding the metal spoon feels the spoon get hot. Which **best** describes the transfer of heat in the spoon?
- A radiation
  - B electrical
  - C conduction
  - D convection
25. A student moves a box across the floor by exerting 23.3 N of force and doing 47.2 J of work on the box. How far does the student move the box?
- A 0.49 m
  - B 2.03 m
  - C 23.9 m
  - D 1,099.8 m

26. A sound wave has a frequency of 247 Hz and a wavelength of 1.4 m. What is the speed of the sound wave in air?
- A 176.4 m/s
  - B 245.6 m/s
  - C 248.4 m/s
  - D 345.8 m/s
27. What happens to the kinetic energy and gravitational potential energy of a ball during free fall?
- A Gravitational potential energy and kinetic energy both increase.
  - B Gravitational potential energy and kinetic energy both decrease.
  - C Gravitational potential energy decreases, and kinetic energy increases.
  - D Gravitational potential energy increases, and kinetic energy decreases.
28. If the north poles of two bar magnets are brought together, which is true?
- A The two north poles will repel each other.
  - B The two north poles will attract each other.
  - C No force will be experienced between the two magnets.
  - D One north pole will become a south pole due to the interaction.
29. A series circuit has a current of 3 A. The circuit contains a 12- $\Omega$  resistor. What is the voltage of the circuit?
- A 0.25 V
  - B 4 V
  - C 15 V
  - D 36 V

30. This diagram represents a closed circuit with three light bulbs and a 10-volt battery.



If Bulb 3 burns out in the circuit, what will *most likely* happen?

- A Bulb 1 and Bulb 2 will continue to glow.
- B Bulb 1 and Bulb 2 will not glow as brightly.
- C Bulb 1 will glow, but Bulb 2 will not glow.
- D Bulb 1 and Bulb 2 will not glow.

31. This chart lists the densities of various gemstones.

**Densities of Gemstones**

Gemstone	Density (g/cm <sup>3</sup> )
Opal	2.20
Diamond	3.01
Garnet	3.15
Topaz	3.50

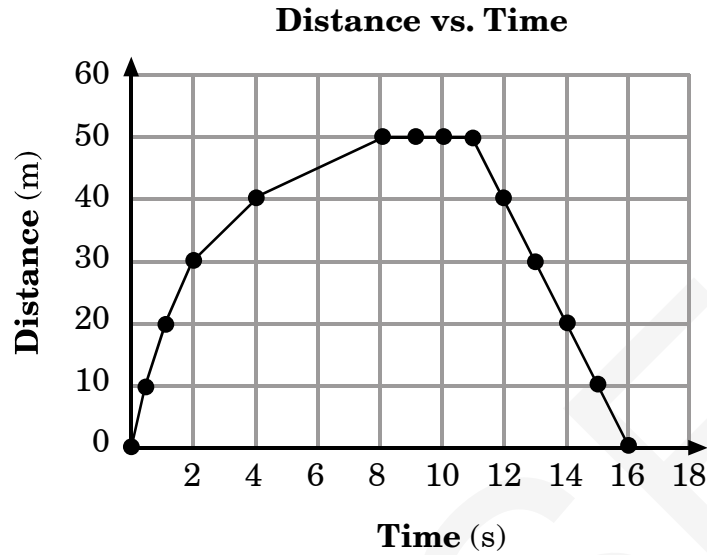
A gemstone has a mass of 6.24 g and a volume of 1.98 cm<sup>3</sup>. What is the identity of the gemstone?

- A Opal
- B Diamond
- C Garnet
- D Topaz

32. Which accounts for *most* of the mass of an atom?
- A electrons
  - B protons
  - C neutrons and protons
  - D electrons and neutrons
33. Which describes an atom with an atomic number of 9?
- A 10 protons, 9 neutrons
  - B 9 protons, 10 neutrons
  - C 4 protons, 5 neutrons
  - D 3 protons, 3 neutrons
34. Which conclusion can be drawn from Rutherford's gold foil experiment?
- A The atom has a small positive center.
  - B The atom has a small negative center.
  - C The atom has a large positive center.
  - D The atom has a large negative center.
35. Which is the correctly balanced equation?
- A  $\text{Cl}_2 + 2\text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$
  - B  $\text{Cl}_2 + 2\text{NaI} \rightarrow \text{NaCl} + 2\text{I}_2$
  - C  $\text{Cl}_2 + \text{NaI} \rightarrow \text{NaCl} + \text{I}_2$
  - D  $2\text{Cl}_2 + \text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$
36. Which situation provides the *best* evidence that a chemical reaction is taking place?
- A A metal strip bends when heated.
  - B A solution freezes in the freezer.
  - C Two solutions mixed in a beaker produce a solid.
  - D A chemical completely dissolves in water and the temperature of the solution remains constant.

37. What is one problem with using nuclear fission as an energy source?
- A finding radioactive elements that have longer half-lives
  - B finding ways of storing radioactive wastes
  - C finding compounds to cool heated water
  - D finding nonradioactive elements for nuclear reactors
38. Which element is an alkaline earth metal?
- A Li
  - B O
  - C Ne
  - D Ca
39. An aqueous solution is tested with an electrical conductivity probe. The conductivity probe does not detect an electric current. Which solution was *most likely* tested?
- A  $\text{SO}_2$  solution
  - B  $\text{NaNO}_3$  solution
  - C  $\text{MnCl}_2$  solution
  - D  $\text{Ba}(\text{OH})_2$  solution
40. Which type of bond is responsible for atoms of pure gold to remain bonded?
- A covalent
  - B hydrogen
  - C ionic
  - D metallic

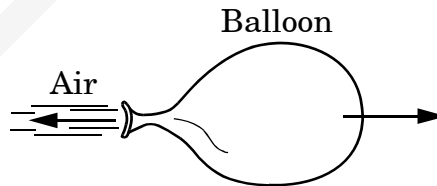
41. This graph shows the motion of a car.



What distance has the car traveled in 10 s?

- A 0 m
- B 8 m
- C 50 m
- D 100 m

42. This diagram represents a balloon that is moving in one direction while escaping air is moving in the opposite direction.



What causes the balloon to move?

- A action-reaction forces
- B electrical forces
- C friction
- D gravitational potential energy

43. A student applies a force to a box with a mass of 30 kg. If the student applies the same force to a box with a mass of 15 kg, which **best** describes the effect on the acceleration of the 15-kg box?
- A It is half the acceleration of the 30-kg box.
  - B It is double the acceleration of the 30-kg box.
  - C It is the same as the acceleration of the 30-kg box.
  - D It is triple the acceleration of the 30-kg box.
44. Which is true of infrared waves?
- A They have shorter wavelengths than X-rays.
  - B They give off more energy than gamma rays.
  - C They have longer wavelengths than ultraviolet waves.
  - D They have higher frequencies than visible light waves.
45. If 15 N of force are applied to a cart to move it a distance of 5 m, how much work is done on the cart?
- A 0.33 J
  - B 3 J
  - C 15 J
  - D 75 J
46. A ball with a mass of 5 kg is dropped from a resting position 10 m above the ground. What is the potential energy of the ball just before it is dropped?
- A 0 J
  - B 49 J
  - C 98 J
  - D 490 J



47. How could 3 magnets be arranged end-to-end so that there will be no attraction between them?

A 

N	S
---	---

S	N
---	---

N	S
---	---

B 

S	N
---	---

N	S
---	---

N	S
---	---

C 

N	S
---	---

N	S
---	---

S	N
---	---

D 

S	N
---	---

S	N
---	---

S	N
---	---

48. A flashlight bulb connected to a 6-V battery draws a 0.5-A current. What is the power used by the flashlight bulb?

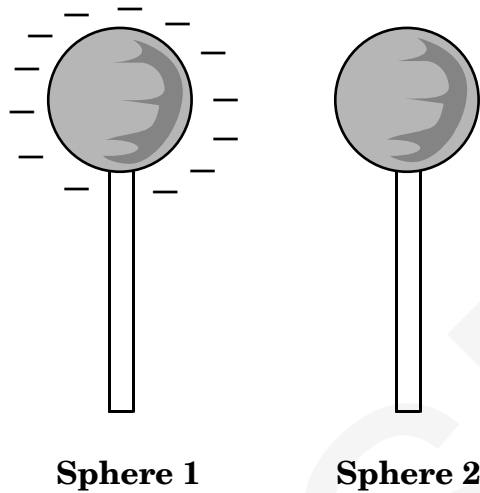
A 1.25 W

B 3 W

C 6.5 W

D 12 W

49. This diagram shows two copper spheres. Sphere 1 is negatively charged, and Sphere 2 is neutral.



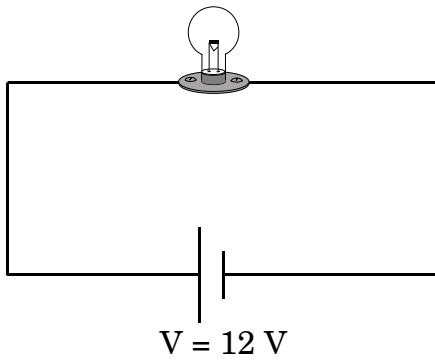
What will be the result when the two spheres touch?

- A Sphere 1 will become positively charged.
- B Sphere 2 will become positively charged.
- C Both spheres will become negatively charged equal to the initial charge of Sphere 1.
- D Both spheres will become negatively charged less than the initial charge of Sphere 1.

50. Which circuit has the **most** current flowing through it?

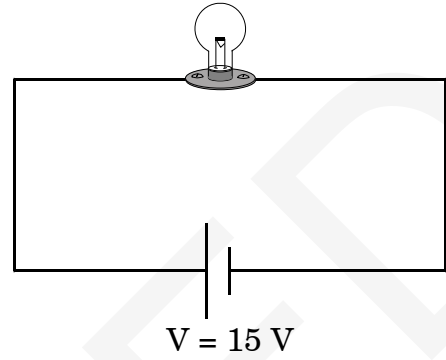
A

15 W



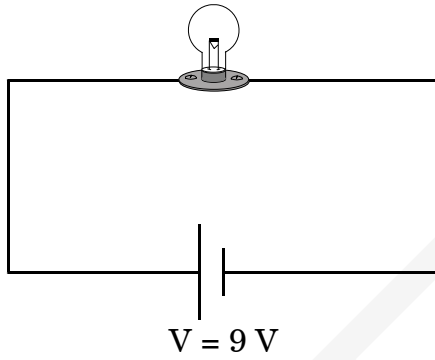
B

9 W



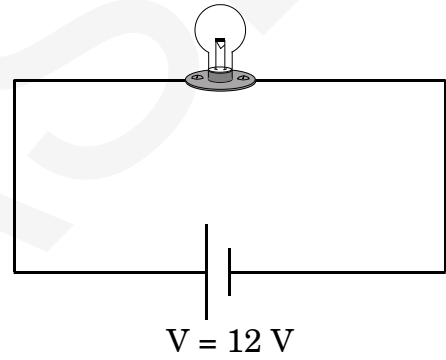
C

16 W



D

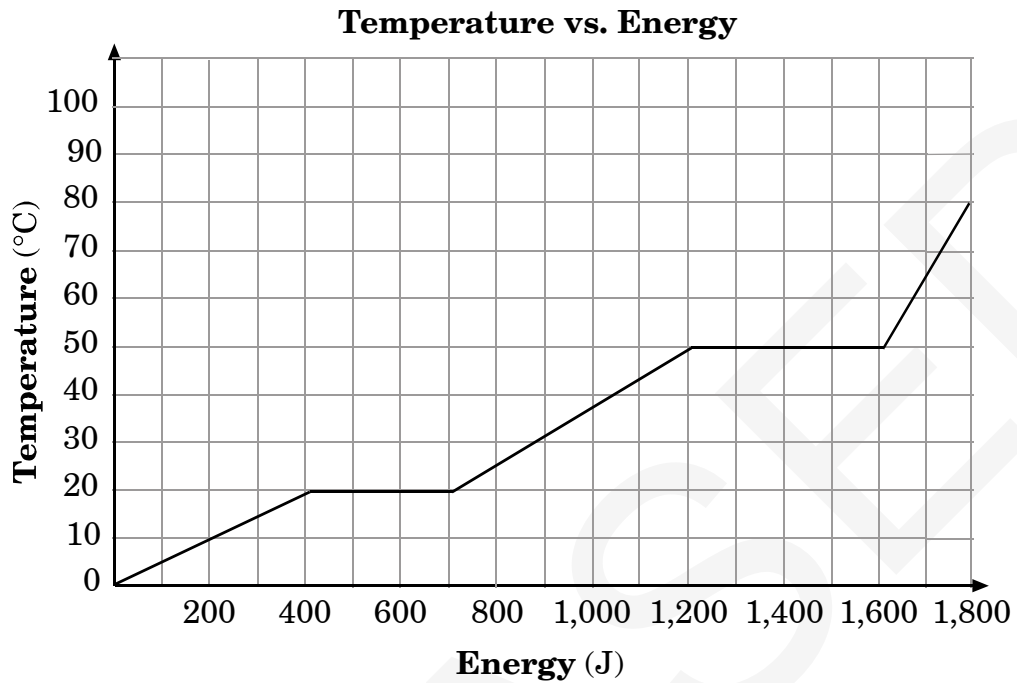
18 W



51. Which **best** represents how electrons are arranged in the energy levels of a carbon atom?

- A first energy level = 1 electron  
second energy level = 5 electrons
- B first energy level = 2 electrons  
second energy level = 4 electrons
- C first energy level = 3 electrons  
second energy level = 3 electrons
- D first energy level = 4 electrons  
second energy level = 2 electrons

52. This graph shows temperature vs. energy data for a substance.



What is the melting point of this substance?

- A 0°C
- B 20°C
- C 50°C
- D 90°C

53. How many neutrons are in an atom of Pu-246?

- A 94
- B 150
- C 152
- D 246

54. Which element has the same number of valence electrons as krypton (Kr)?

- A neon (Ne)
- B fluorine (F)
- C chlorine (Cl)
- D selenium (Se)

55. A teacher wants to demonstrate a chemical reaction to her students. Which activity would **best** demonstrate a chemical reaction?
- A placing a metal in an acid to create a gas
  - B measuring the densities of liquid water and ice
  - C melting a solid piece of aluminum
  - D filling a balloon with helium gas
- 

56. This chart shows the effects of several solutions on litmus paper.

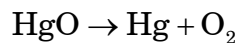
**Solutions and Their Effects on Litmus Paper**

<b>Solution</b>	<b>Effect on Blue Litmus</b>	<b>Effect on Red Litmus</b>
1	None	Turns Blue
2	None	Turns Blue
3	None	None
4	Turns Red	None
5	None	Turns Blue
6	None	None
7	Turns Red	None

Which solutions are **most likely** acids?

- A Solutions 1 and 3
- B Solutions 2 and 5
- C Solutions 3 and 6
- D Solutions 4 and 7

57. This is an unbalanced equation representing a chemical reaction.



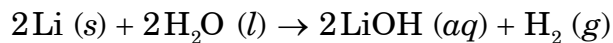
Which equation is the correctly balanced chemical equation for this reaction?

- A  $\text{HgO} \rightarrow \text{Hg} + 2\text{O}_2$
- B  $2\text{HgO} \rightarrow \text{Hg} + \text{O}_2$
- C  $2\text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$
- D  $2\text{HgO} \rightarrow \text{Hg} + 2\text{O}_2$

58. Which statement *best* describes the atoms of elements that form compounds by covalent bonding?

- A They share electrons between them.
- B They have a large difference in atomic mass.
- C They are in the same period in the periodic table.
- D They have a large difference in valence electron number.

59. What type of chemical reaction is represented by this equation?



- A decomposition
  - B double replacement
  - C single replacement
  - D synthesis
- 

60. Which *best* describes alpha particles?

- A They are attracted to negative electric fields.
- B They are composed of beta particles.
- C They are able to penetrate concrete blocks.
- D They are products of chemical reactions.



**End of Physical Science Test**

**North Carolina Test of Physical Science  
Form A RELEASED Fall 2009  
Answer Key**

Item Number	Correct Answer	Goal
1	D	2 — Forces and Motion
2	B	2 — Forces and Motion
3	A	2 — Forces and Motion
4	A	3 — Energy/ Energy Conservation
5	D	3 — Energy/ Energy Conservation
6	C	3 — Energy/ Energy Conservation
7	D	3 — Energy/ Energy Conservation
8	D	4 — Electricity and Magnetism
9	B	4 — Electricity and Magnetism
10	B	4 — Electricity and Magnetism
11	C	5 — Structure and Properties of Matter
12	B	5 — Structure and Properties of Matter
13	C	5 — Structure and Properties of Matter
14	A	5 — Structure and Properties of Matter
15	A	6 — Regularities in Chemistry
16	C	6 — Regularities in Chemistry
17	D	6 — Regularities in Chemistry
18	A	6 — Regularities in Chemistry
19	B	6 — Regularities in Chemistry
20	C	6 — Regularities in Chemistry
21	B	2 — Forces and Motion
22	D	2 — Forces and Motion
23	C	2 — Forces and Motion
24	C	3 — Energy/ Energy Conservation
25	B	3 — Energy/ Energy Conservation
26	D	3 — Energy/ Energy Conservation
27	C	3 — Energy/ Energy Conservation
28	A	4 — Electricity and Magnetism
29	D	4 — Electricity and Magnetism
30	D	4 — Electricity and Magnetism
31	C	5 — Structure and Properties of Matter
32	C	5 — Structure and Properties of Matter
33	B	5 — Structure and Properties of Matter
34	A	5 — Structure and Properties of Matter
35	A	6 — Regularities in Chemistry
36	C	6 — Regularities in Chemistry
37	B	6 — Regularities in Chemistry
38	D	6 — Regularities in Chemistry
39	A	6 — Regularities in Chemistry
40	D	6 — Regularities in Chemistry
41	C	2 — Forces and Motion
42	A	2 — Forces and Motion



**North Carolina Test of Physical Science  
Form A RELEASED Fall 2009  
Answer Key**

43	B	2 — Forces and Motion
44	C	3 — Energy/ Energy Conservation
45	D	3 — Energy/ Energy Conservation
46	D	3 — Energy/ Energy Conservation
47	A	4 — Electricity and Magnetism
48	B	4 — Electricity and Magnetism
49	D	4 — Electricity and Magnetism
50	C	4 — Electricity and Magnetism
51	B	5 — Structure and Properties of Matter
52	B	5 — Structure and Properties of Matter
53	C	5 — Structure and Properties of Matter
54	A	6 — Regularities in Chemistry
55	A	6 — Regularities in Chemistry
56	D	6 — Regularities in Chemistry
57	C	6 — Regularities in Chemistry
58	A	6 — Regularities in Chemistry
59	C	6 — Regularities in Chemistry
60	A	6 — Regularities in Chemistry

**North Carolina Test of Physical Science  
Form A RELEASED Fall 2009  
Raw to Scale Score Conversion**

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<b>Raw Score</b>	<b>Scale Score</b>
0	121
1	122
2	122
3	123
4	124
5	124
6	125
7	126
8	126
9	127
10	128
11	129
12	130
13	130
14	131
15	132
16	133
17	135
18	136
19	137
20	138
21	139
22	140
23	141
24	142
25	143
26	144
27	145
28	145
29	146
30	147
31	148
32	149
33	150
34	150
35	151
36	152
37	153
38	153
39	154
40	155
41	156

**North Carolina Test of Physical Science  
Form A RELEASED Fall 2009  
Raw to Scale Score Conversion**

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42	156
43	157
44	158
45	159
46	160
47	160
48	161
49	162
50	163
51	164
52	165
53	166
54	168
55	169
56	171
57	172
58	174
59	176
60	179