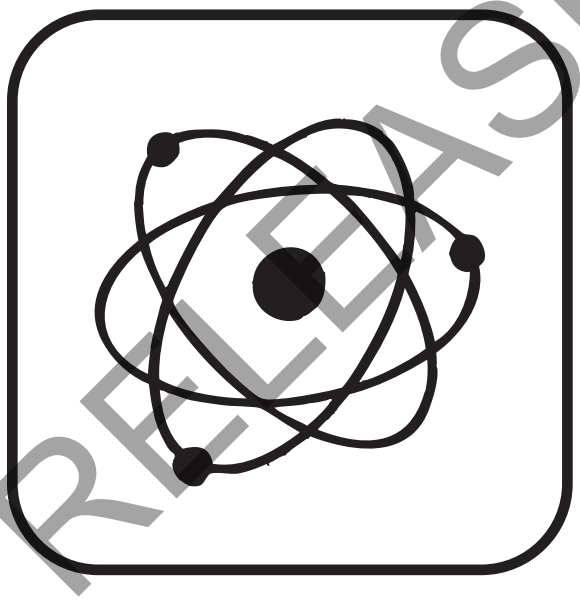
Released Items

Student Name:_____

Physics



2016–2017

NC Final Exam

Public Schools of North Carolina
State Board of Education
Department of Public Instruction
Raleigh, North Carolina 27699-6314

1 A 3,150-kg truck accelerates from 4.2 m/s to 7.8 m/s in 14 s. Which describes the average force needed for the truck to accelerate under these conditions?

A 810 N

B 950 N

C 1,800 N

D 2,700 N

2 A 45-kg boy throws a 0.50-kg ball at 15 m/s. Then, a 60-kg boy throws the same ball at 15 m/s. Which boy generates more momentum?

A Neither boy generates any momentum.

B The 45-kg boy generates more momentum.

C The 60-kg boy generates more momentum.

D Both boys generate the same amount of momentum.

3 A machine pushes a 400.0-N box forward with a horizontal force of 50.0 N for 10.0 s. By how much does the momentum of the box change due to the machine? (Ignore friction.)

A 4.50×10^3 N • s

B 4.00×10^3 N • s

C 3.50×10^3 N • s

D 5.00×10^2 N • s

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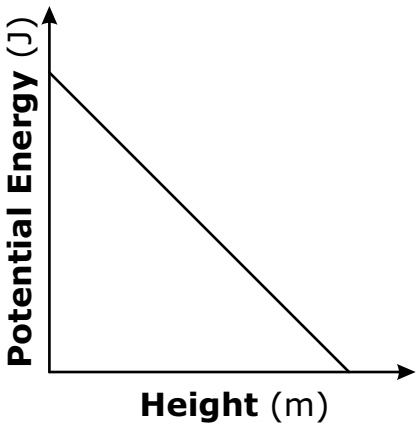
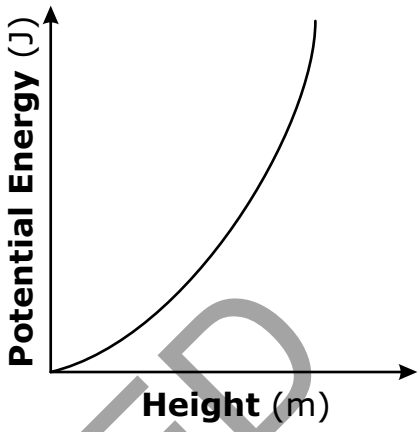
4 Which graph represents the relationship between the gravitational potential energy and the height of an object relative to the ground?

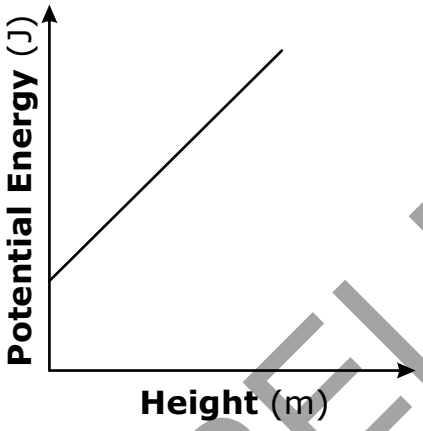
A



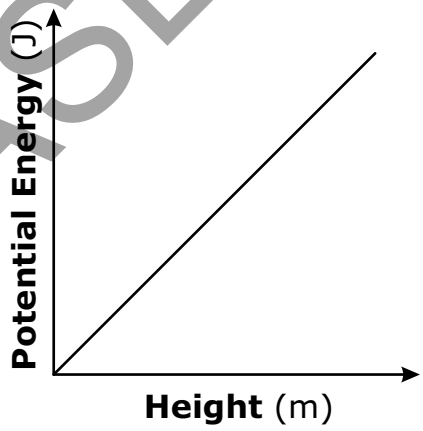
B



C



D



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5 A circuit consists of a single resistor, R_1, and a 9-V battery. A second identical resistor, R_2, is added to the circuit in parallel with R_1. How does the potential difference across R_1 change after R_2 is added?

A The potential difference decreases because a 9-V battery cannot handle resistors in parallel.

B The potential difference decreases because two resistors in parallel can split the 9 V equally.

C The potential difference remains the same because resistors in parallel do not cause a change in voltage.

D The potential difference remains the same because resistors in parallel create extra current that balances the extra resistance.

6 Two rocks with masses of 5 kg and 10 kg are dropped from a height of 20 m above the ground. Just before they reach the ground, which statement is true about the rocks? (Ignore all friction.)

A The value for the acceleration of the 5-kg rock is the same as the value for the 10-kg rock, but the velocity values are different.

B The values for the acceleration and velocity of the 5-kg rock are the same as the values for the 10-kg rock.

C The values for the acceleration and velocity of the 5-kg rock are less than the values for the 10-kg rock.

D The values for the acceleration and velocity of the 5-kg rock are greater than the values for the 10-kg rock.

Go to the next page.

7 The atoms of both copper and rubber contain protons and electrons; however, copper is more conductive than rubber. Why is copper able to conduct more electricity?

A Copper contains free electrons, and rubber contains bound electrons.

B Rubber contains free electrons, and copper contains bound electrons.

C Copper contains free protons, and rubber contains bound protons.

D Rubber contains free protons, and copper contains bound protons.

8 A positive glass rod is placed near a neutral metallic sphere. If they do not touch, what happens to the charges inside the sphere?

A Like charges attract, which causes the sphere to become polarized.

B Unlike charges attract, which causes the sphere to become polarized.

C Like charges attract, which causes the sphere to become charged.

D Unlike charges attract, which causes the sphere to become charged.

9 An electron loses 2.00×10^{-15} J of energy traveling to the screen of a laptop computer. Why is the energy loss small?

A because the charge is small

B because the charge is large

C because the resistance is small

D because the resistance is large

Go to the next page.

10 How does a large number of turns in an electromagnet create a strong magnetic field?

A Each turn increases the amount of time it takes for the current to travel through the wire.

B Each turn decreases the amount of time it takes for the current to travel through the wire.

C Each turn increases the amount of induction produced by the current in the wire.

D Each turn decreases the amount of induction produced by the current in the wire.

11 Two current-carrying solenoids are placed near each other. Which would increase the amount of mutual inductance the pair of coils experiences?

A aligning the coils perpendicular to each other

B aligning the coils parallel to each other

C using only aluminum wiring

D using only copper wiring

12 An object is in uniform, circular motion and is moving at a speed of 2.3 m/s. How does the speed of the object change if the centripetal force and the radius remain constant and the mass of the object quadruples?

A Its speed is cut in half, because centripetal force is based on the square root of velocity.

B Its speed is cut in half, because centripetal force is based on velocity squared.

C Its speed doubles, because centripetal force is based on the square root of velocity.

D Its speed doubles, because centripetal force is based on velocity squared.

Go to the next page.

13 A student throws a ball straight up into the air, and it travels to a height of 11 m. Ignoring air friction, what is the initial velocity of the ball?

A 15 m/s

B 10 m/s

C 7.3 m/s

D 1.3 m/s

14 The amount of work performed when an airplane took off from sea level and climbed to an altitude of 830 m in 65 s was 7.6×10^7 J. How much power from the airplane's engine was required to produce this amount of work?

A 1.2×10^6 W

B 1.1×10^7 W

C 7.6×10^7 W

D 7.4×10^8 W

15 Which statement explains an increase in efficiency from using alternating current instead of direct current in power-distribution systems?

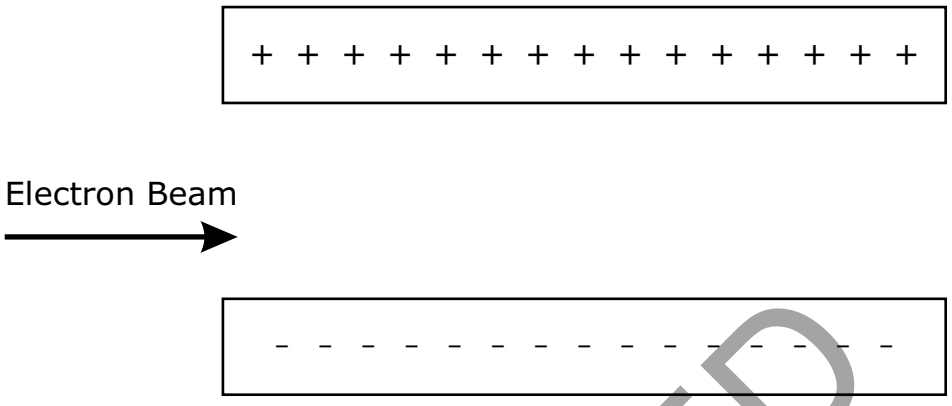
A Alternating current has electrons that move with the current flow, and direct current has electrons that do not move with the current flow.

B Alternating currents are used in low-voltage applications, whereas direct currents are used in high-voltage applications.

C Alternating currents lose less power when transmitted through wires over long distances than direct currents do.

D Alternating currents will not reverse the voltage and direction of the current flow, and direct currents will allow reverse voltage and current flow.

16 An electron beam enters a region between two oppositely charged electric plates, as shown in these diagrams.



In which direction will the electron beam bend?

A It will bend toward the negative plate.

B It will bend toward the positive plate.

C It will bend in the opposite direction of the way it is moving.

D It will not bend and will continue to move in the same direction.

17 A box is given an initial push and then slides across a frictionless floor. Which variable is assumed to be zero after the initial push?

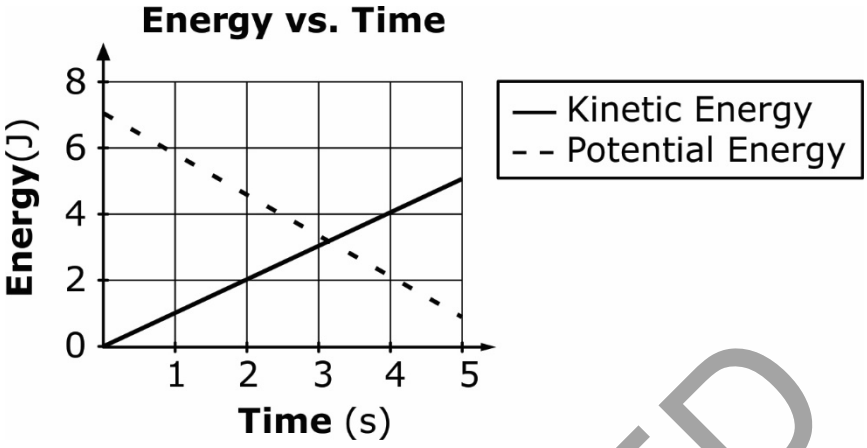
A kinetic energy

B horizontal velocity

C momentum

D acceleration

18 This graph represents the energy change of a system over a period of 5 seconds.



What change in total mechanical energy is experienced by the system during the 5 seconds?

A 6.0 J

B 5.0 J

C 1.0 J

D 0 J

19 A current of 0.5 A flows through a 4-Ω resistance for 10 s. How does the amount of energy change when the current flows for 20 s?

A The energy decreases from 40 J to 20 J.

B The energy decreases from 20 J to 10 J.

C The energy increases from 10 J to 20 J.

D The energy increases from 20 J to 40 J.

Physics
RELEASED Items[1]
2016–2017
Answer Key

Question Number	QuestionType[2]	Correct Answer	Percent Correct[3]	Objective
1	MC	A	78%	Phy.1.2.1
2	MC	D	66%	Phy.1.3.2
3	MC	D	50%	Phy.1.3.2
4	MC	D	66%	Phy.2.1.1
5	MC	C	55%	Phy.2.3.1
6	MC	B	56%	Phy.1.1.1
7	MC	A	79%	Phy.3.1.1
8	MC	B	51%	Phy.3.1.4
9	MC	A	30%	Phy.3.1.5
10	MC	C	65%	Phy.3.2.2
11	MC	B	48%	Phy.3.2.3
12	MC	B	56%	Phy.1.2.5
13	MC	A	50%	Phy.1.1.2
14	MC	A	70%	Phy.2.1.3
15	MC	C	58%	Phy.2.3.3
16	MC	B	66%	Phy.3.1.1

Question Number	QuestionType[2]	Correct Answer	Percent Correct[3]	Objective
17	MC	D	64%	Phy.1.1.2
18	MC	C	37%	Phy.2.1.2
19	MC	C	53%	Phy.2.3.4

[1]These released items were administered to students during a previous test administration. This sample set of released items may not reflect the breadth of the standards assessed and/or the range of item difficulty found on the NC Final Exam. Additional information about the NC Final Exam is available in the *Assessment Specification* for each exam located at http://www.ncpublicschools.org/accountability/common-exams/specifications/.

[2]This NC Final Exam contains only multiple-choice (MC) items.

[3]Percent correct is the percentage of students who answered the item correctly during a previous administration.

Clarifying Objectives Descriptions

Only clarifying objective descriptions addressed by the released items in this document are listed below. A complete list of North Carolina *Essential Standards* for Science may be reviewed at http://www.ncpublicschools.org/curriculum/science/scos/support-tools/#standards.

Phy.1.1.1 (Forces and Motion)
Analyze motion graphically and numerically using vectors, graphs, and calculations.

Phy.1.1.2 (Forces and Motion)
Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration.

Phy.1.2.1 (Forces and Motion)
Analyze forces and systems of forces graphically and numerically using vectors, graphs, and calculations.

Phy.1.2.5 (Forces and Motion)
Analyze basic forces related to rotation in a circular path (centripetal force).

Phy.1.3.2 (Forces and Motion)
Analyze the motion of objects based on the relationship between momentum and impulse.

Phy.2.1.1 (Energy: Conservation and Transfer)
Interpret data on work and energy presented graphically and numerically.

Phy.2.1.2 (Energy: Conservation and Transfer)
Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects.

Phy.2.1.3 (Energy: Conservation and Transfer)
Explain the relationship among work, power, and energy.

Phy.2.3.1(Energy: Conservation and Transfer)
Explain Ohm's law in relation to electric circuits.

Phy.2.3.3 (Energy: Conservation and Transfer)
Compare the general characteristics of AC and DC systems without calculations.

Phy.2.3.4 (Energy: Conservation and Transfer)
Analyze electric systems in terms of their energy and power.

Phy.3.1.1 (Interactions of Energy and Matter)
Explain qualitatively the fundamental properties of the interactions of charged objects.

Phy.3.1.4 (Interactions of Energy and Matter)
Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction.

Phy.3.1.5 (Interactions of Energy and Matter)
Explain how differences in electrostatic potentials relate to the potential energy of charged objects.

Phy.3.2.2 (Interactions of Energy and Matter)
Explain how electric currents produce various magnetic fields.

Phy.3.2.3 (Interactions of Energy and Matter)
Explain how transformers and power distributions are applications of electromagnetism.