- 1. When a plastic rod is rubbed with fur, the plastic rod becomes negatively charged. Which statement explains the charge transfer between the plastic rod and the fur?
 - A Protons are transferred from the plastic rod to the fur.
 - B Protons are transferred from the fur to the plastic rod.
 - C Electrons are transferred from the plastic rod to the fur.
 - D Electrons are transferred from the fur to the plastic rod.

- 2. How do electrically charged objects affect neutral objects when they come in contact?
 - A Electrons move from negatively charged objects to neutral objects.
 - B Electrons move from neutral objects to negatively charged objects.
 - C Protons move from positively charged objects to neutral objects.
 - D Protons move from neutral objects to positively charged objects.

3. The drawing shows two uncharged lightweight plastic balls suspended by thin, insulating threads. Ball 1 is given a positive charge. Ball 2 is given an equivalent negative charge.



Which diagram *best* shows how the balls will react after becoming charged?



4. This diagram shows a negatively charged balloon. When the charged balloon is brought near some pieces of paper, the papers are attracted to the balloon.



Which describes the charging of the pieces of paper?

- A positive, due to induction
- B positive, due to conduction
- C negative, due to induction
- D negative, due to conduction
- 5. A series circuit has a 6-V battery and 3 ohms of resistance. How much current will flow through the circuit?
 - A 0.5 A
 - B 2 A
 - C 3 A
 - D 18 A

- 6. What voltage is required to run a 45-watt light bulb if the current is 0.5 amphere?
 - A 45 volts
 - B 90 volts
 - C 120 volts
 - D 225 volts

- 7. How much current is used by a 120-V refrigerator that uses 650 W of power?
 - A 0.18 A
 - B 5.4 A
 - C 120 A
 - D 78,000 A

8. Three light bulbs are connected to a 120-V potential difference. Ammeters are placed at four different locations labeled #1, #2, #3, and #4.



At which location will the current be greatest?

- A #1
- B #2
- C #3
- D #4
- 9. Which *best* describes a circuit in series?
 - A Different parts are on separate branches.
 - B Current values are different at various points in the circuit.
 - C Electrons may take several paths.
 - D Electrons have only one path at all times.

- 10. Which statement is true about parallel circuits?
 - A They contain separate branches through which current can flow.
 - B They are usually called open circuits.
 - C They provide one path through which current can flow.
 - D They cease to function when one part of the circuit is disconnected.

11. Which is the correct diagram for a parallel circuit with three light bulbs powered by a 24-V battery?



- 12. A motor has a current of 2 A flowing through it when it is powered with a 12-V battery. What is the power used by the motor?
 - A 0.16 W
 - B 6 W
 - C 14 W
 - D 24 W

13. The diagrams represent two complete circuits. A 9-V battery is connected to two light bulbs as shown.





Which statement *best* describes what can be observed?

- A The light from Circuit A will be brighter because each light bulb adds its current to the other light bulb.
- B The light from Circuit B will be brighter because each light bulb has a direct path to both poles of the battery.
- C The light from Circuit A will be dimmer because each light bulb has a direct path to both poles of the battery.
- D The light from Circuit B will be dimmer because each light bulb must share its current with the other light bulb.

- 14. A light bulb with a resistance of 100 ohms is plugged into a 120-volt outlet. What is the current flowing through the bulb?
 - A 0.83 ampere
 - B 1.2 amperes
 - C 20 amperes
 - D 220 amperes
- 15. A sheet of paper is positioned to completely cover a bar magnet. Iron filings are then gently sprinkled on the paper. What does the pattern created by the iron filings indicate?
 - A the stronger of the two poles
 - B the distance between the two poles
 - C the midpoint of the area between the two poles
 - D the magnetic field created by the two poles

16. A magnet is moved back and forth through a loop of wire as shown below.



What will happen as the magnet is moved back and forth as shown?

- A The wire will attract the magnet.
- B The magnet will attract the wire.
- C The galvanometer needle will stay at 0 on the scale.
- D The galvanometer needle will move back and forth.

- 17. Which statement **best** describes a bar magnet that has been broken into two pieces?
 - A Both pieces have lost their magnetic poles.
 - B One piece has a north pole only, and the other piece has a south pole only.
 - C Each piece has both a north and a south pole.
 - D Both pieces have a north pole only.

18. A student coiled wire around a nail, attached both ends to a 1.5-V battery, and attempted to lift paper clips with the nail.

Results

Number of Turns of Wire	Paper Clips Picked Up
10	2
20	4
30	10
40	20

What is a valid conclusion for this investigation?

- A Increasing voltage increases electromagnetic strength.
- B Increasing the number of turns of wire decreases electromagnetic strength.
- C Increasing the number of turns of wire increases electromagnetic strength.
- D Increasing the number of turns of wire has no effect on electromagnetic strength.

19. A student performed an experiment to determine the number of paper clips that are attracted to an electromagnet as the amount of current changes.

Data Table		
Current	rent Number of Paper Clips	
5 A	20	
10 A	40	
15 A	60	
20 A	80	

Which graph best describes the relationship between magnetism and electrical current?



- 20. Which describes the magnetic fields of permanent magnets?
 - A domains aligned in different directions
 - B domains aligned in a similar direction
 - C electric current produced by the protons in each atom
 - D electric current produced by a battery or other outside source

End of Goal 4 Sample Items

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1	Objective: 4.01a Investigate and analyze the nature of static electricity and the conservation of electrical charge: a. Positive and negative charges.			
	Thinking Skill: Apply	ying Correct Answer:	D	
2	Objective: 4.01 Investigate and analyze the charge: a. Positive and negative cha b. Opposite charges attract c. Analyze the electrical cha Thinking Skill: Know	e nature of static electricity and the conservation of arges. and like charges repel. arging of objects due to the transfer of charge. vledge Correct Answer:	of electrical A	
3	Objective: 4.01 Investigate and analyze the charge: a. Positive and negative cha b. Opposite charges attract c. Analyze the electrical cha Thinking Skill: Analy	e nature of static electricity and the conservation of arges. and like charges repel. arging of objects due to the transfer of charge. yzing Correct Answer:	of electrical A	
4	Objective: 4.01c Investigate and analyze the charge: c. Analyze the electrical cha Thinking Skill: Analy	e nature of static electricity and the conservation of arging of objects due to the transfer of charge. Yzing Correct Answer:	of electrical A	
5	Objective: 4.02 Investigate and analyze dire a. Ohm's law. b. Series circuits and/or part Thinking Skill: Apply	rect current electrical circuits: rallel circuits ying Correct Answer:	В	
6	Objective: 4.02 Investigate and analyze dire a. Ohm's law. b. Series circuits and/or par	rect current electrical circuits:	D	
	Thinking Skill: Apply	ying Correct Answer:	В	

7	Objective: 4.02 Investigate and analyze direct current electrical circuits: a. Ohm's law.			
	D. Series circuits and/or parallel circuitsThinking Skill:ApplyingCorrect Answer:	В		
8	Objective:4.02Investigate and analyze direct current electrical circuits:a. Ohm's law.b. Series circuits and/or parallel circuitsThinking Skill:AnalyzingCorrect Answer:	A		
9	Objective:4.02Investigate and analyze direct current electrical circuits:a. Ohm's law.b. Series circuits and/or parallel circuitsThinking Skill:KnowledgeCorrect Answer:	D		
10	Objective:4.02Investigate and analyze direct current electrical circuits:a. Ohm's law.b. Series circuits and/or parallel circuitsThinking Skill:KnowledgeCorrect Answer:	А		
11	Objective: 4.02Investigate and analyze direct current electrical circuits:a. Ohm's law.b. Series circuits and/or parallel circuits Thinking Skill: Analyzing Correct Answer:	В		
12	Objective:4.02bInvestigate and analyze direct current electrical circuits:b. Series circuits and/or parallel circuits.Thinking Skill:ApplyingCorrect Answer:	D		
13	Objective: 4.02Investigate and analyze direct current electrical circuits:a. Ohm's law.b. Series circuits and/or parallel circuits Thinking Skill: Analyzing Correct Answer:	В		

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14	Objective: 4.02			
	Investigate and analyze direct current electrical circuits:			
	a. Onm s law. b. Series circuits and/or parallel circuits			
	Thinking Skill:	Applying	Correct Answer:	В
	0			
15	Objective: 4.03 Investigate and analy of magnets.	ze magnetism and the practical ap	plications of the charac	teristics
	a. Permanent magnet	S		
	b. Electromagnetism			
	c. Movement of electr	ical charges		
	Thinking Skill:	Analyzing	Correct Answer:	D
10	01			
16	Objective: 4.03 Investigate and analyze magnetism and the practical applications of the characteristics			
	a Permanent magnet	s		
	b. Electromagnetism			
	c. Movement of electr	ical charges		
	Thinking Skill:	Analyzing	Correct Answer:	D
17	Objective: 4.03			
	Investigate and analy of magnets.	ze magnetism and the practical ap	plications of the charac	teristics
	a. Permanent magnet	S		
	b. Electromagnetism	ical charges		
	Thinking Skill.	Analyzing	Correct Answer	С
		1		C
18	Objective: 4.03			
	Investigate and analyze magnetism and the practical applications of the characteristics			
	of magnets.			
	a. Permanent magnets			
	b. Electromagnetism			
	c. Movement of electr	ical charges		a
	Thinking Skill:	Analyzing	Correct Answer:	C

19	Objective: 4.03			
	Investigate and analyze magnetism and the practical applications of the characteristics			
	of magnets.			
	a. Permanent magne	ets		
	b. Electromagnetism			
	c. Movement of electrical charges			
	Thinking Skill:	Applying	Correct Answer:	В
20	Objective: 4.03	a		
	Investigate and analyze magnetism and the practical applications of the characteristics			
	of magnets.			
	a. Permanent magnets			
	Thinking Skill:	Knowledge	Correct Answer:	В