



Physics 12

Resource Exam A

Exam Booklet

PART A: MULTIPLE CHOICE

Value: 70% of the exam

Suggested Time:

INSTRUCTIONS: For each question, select the **best** answer.

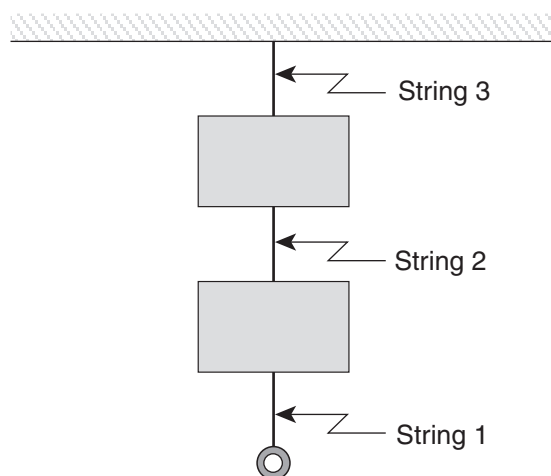
1. Which of the following is a scalar quantity?
 - A. impulse
 - B. magnetic field
 - C. electric charge
 - D. gravitational field

2. An airplane flying with a velocity of 280 km/h due east with respect to the air encounters a 55 km/h wind blowing towards the south. What is the resultant velocity of the plane?

	MAGNITUDE	DIRECTION
A.	225 km/h	45°S of E
B.	275 km/h	11°S of E
C.	285 km/h	11°S of E
D.	335 km/h	45°S of E

3. A projectile launched over level ground hits the ground with a velocity of 65 m/s at an angle of 25° below the horizontal. How far away from the impact point was the projectile launched?
- A. 170 m
 - B. 330 m
 - C. 360 m
 - D. 780 m

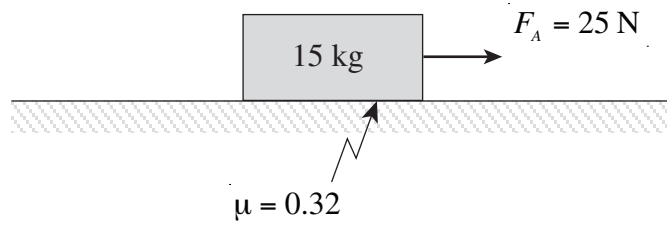
4. Two large masses are hung from the ceiling using identical strings as shown.



A large downward force is applied to the ring in a very short time interval. Which of the three strings will break first?

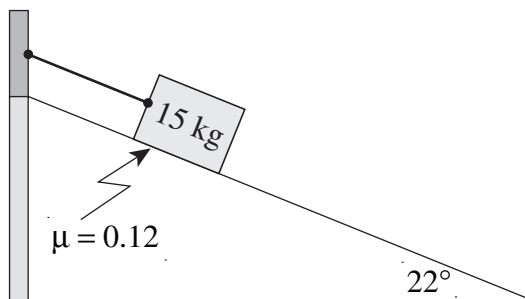
- A. String 1
- B. String 2
- C. String 3
- D. All three strings break at the same time.

5. A 15 kg block is at rest on a level surface. The coefficient of friction between the block and the surface is 0.32. A horizontal force of 25 N is applied to the block.



What is the force of friction acting on this block while the horizontal force is being applied?

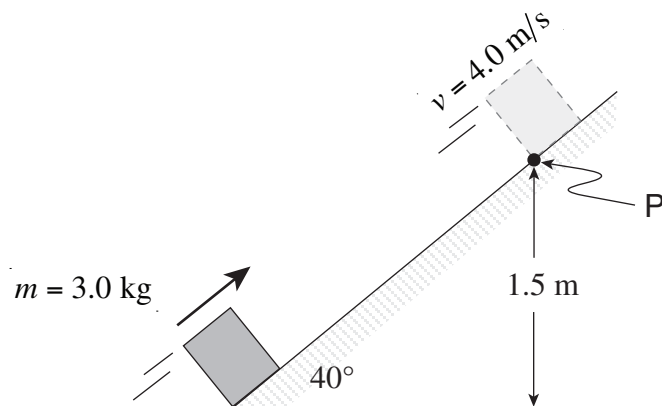
- A. 22 N
 - B. 25 N
 - C. 47 N
 - D. 72 N
6. A 15 kg block sitting on a 22° incline is held stationary by a string as shown. The coefficient of friction between the block and the surface of the incline is 0.12.



What is the minimum tension in the string?

- A. 16 N
- B. 39 N
- C. 55 N
- D. 71 N

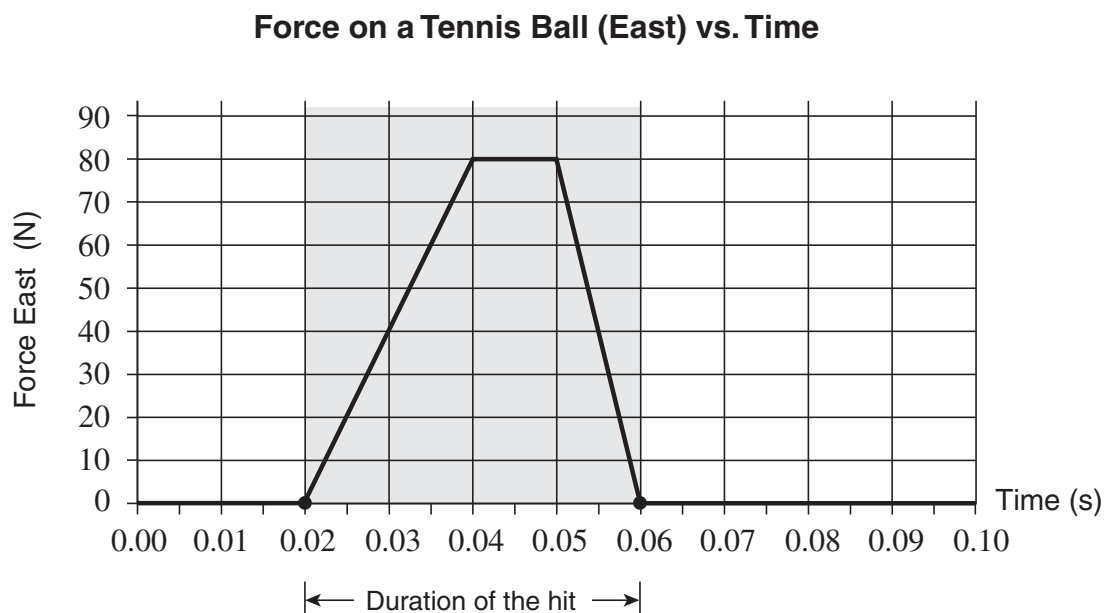
7. A 0.75 kg ball is thrown straight up into the air with an initial speed of 18 m/s. The ball reaches its maximum height and begins to fall back down. What is the speed of the ball when it is halfway back to the ground?
- A. 4.5 m/s
B. 9.0 m/s
C. 13 m/s
D. 14 m/s
8. A 3.0 kg block is launched up an incline from the position shown. As the block passes point P its speed is measured as 4.0 m/s. As the block rises to point P, 28 J of heat energy is produced.



What was the block's kinetic energy at the launch point?

- A. 28 J
B. 40 J
C. 44 J
D. 96 J

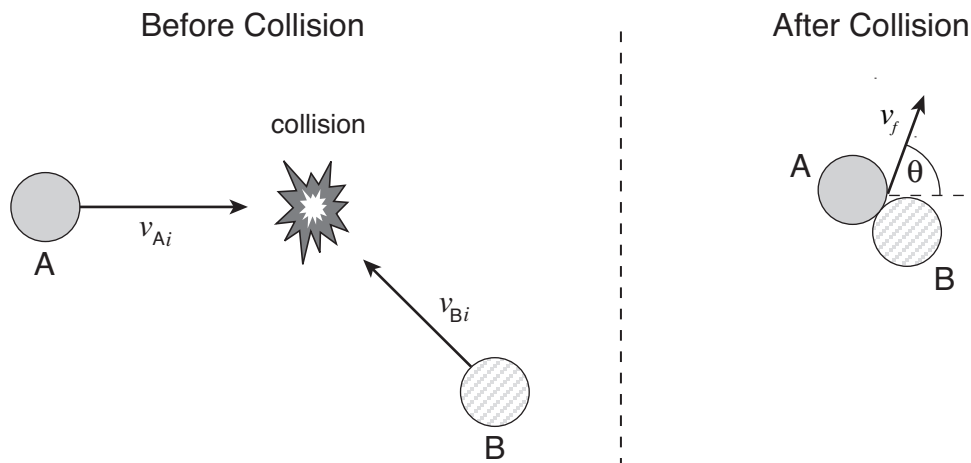
9. A 0.057 kg tennis ball moving **west** at 24 m/s is hit in the opposite direction east with a racket. The force acting on the ball during the hit is shown in the graph below.



What is the magnitude of the final momentum of the tennis ball?

- A. 0.63 kgm/s
 - B. 1.37 kgm/s
 - C. 1.80 kgm/s
 - D. 3.37 kgm/s
10. A 150 kg cart moving at 13 m/s east collided with a 420 kg wagon moving at 5.0 m/s east. The cart rebounded westward with a speed of 3.0 m/s. What was the speed of the wagon after the collision?
- A. 0.71 m/s
 - B. 1.4 m/s
 - C. 8.6 m/s
 - D. 11 m/s

11. During an experiment two pucks of identical mass and speed collide and stick together

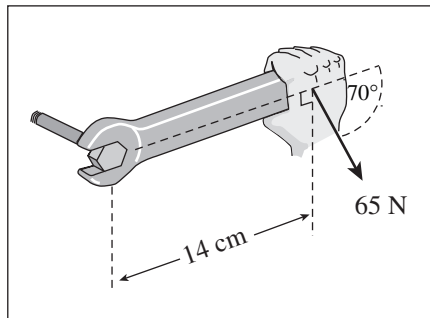


The experiment is then repeated, but the initial velocity of puck B is doubled. What is the effect on the direction (θ) of the pucks and on the magnitude of their total momentum after the collision? Ignore any effects due to friction.

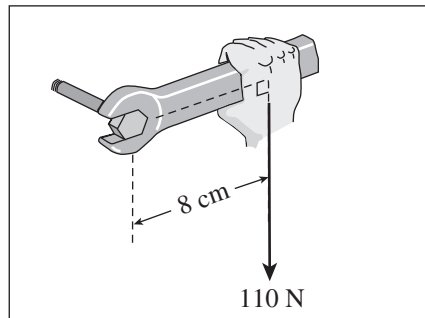
	DIRECTION AFTER THE COLLISION	MAGNITUDE OF THE TOTAL MOMENTUM AFTER THE COLLISION
A.	angle θ increases	increases
B.	angle θ decreases	increases
C.	angle θ increases	decreases
D.	angle θ decreases	decreases

12. A wrench is used to tighten a bolt as shown. Which situation would produce the largest torque on the bolt?

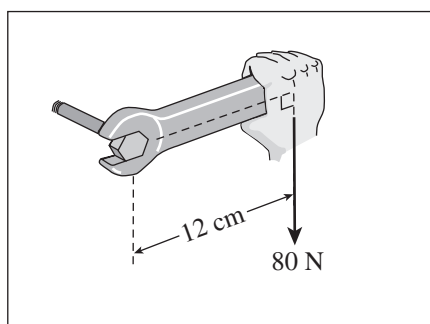
A.



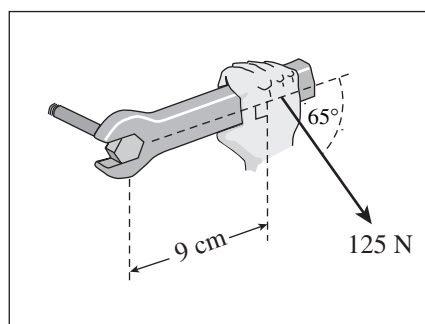
B.



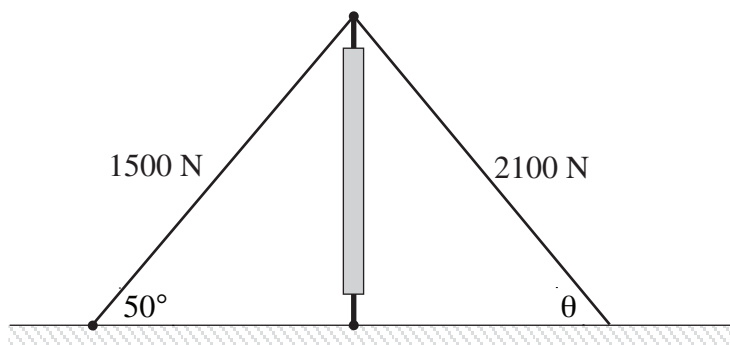
C.



D.



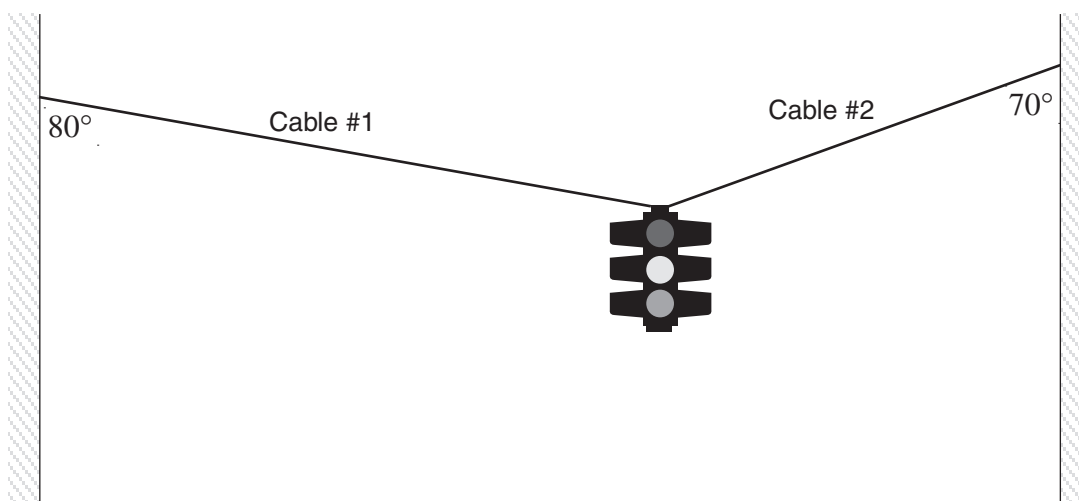
13. A vertical post is held in place by two cables as shown.



What is the angle θ ?

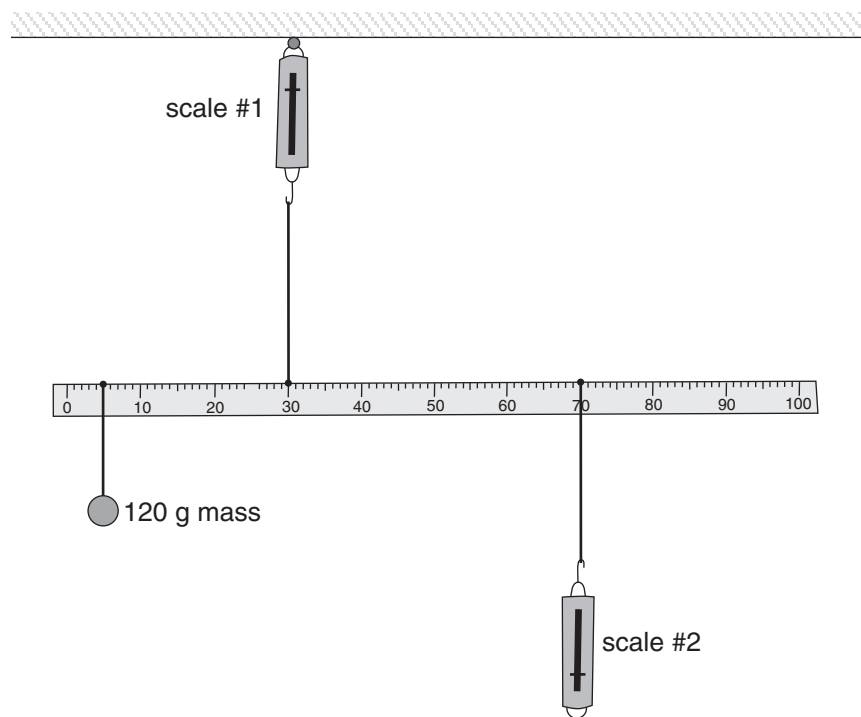
- A. 33°
- B. 50°
- C. 63°
- D. 70°

14. A 12 kg traffic light is suspended by two cables as shown. What is the force exerted by each cable?



	FORCE IN CABLE #1	FORCE IN CABLE #2
A.	59 N	59 N
B.	221 N	232 N
C.	63 N	55 N
D.	118 N	118 N

15. A 55 g metre stick is held horizontal by two spring scales, and has a 120 g mass attached at the 5 cm mark as shown.

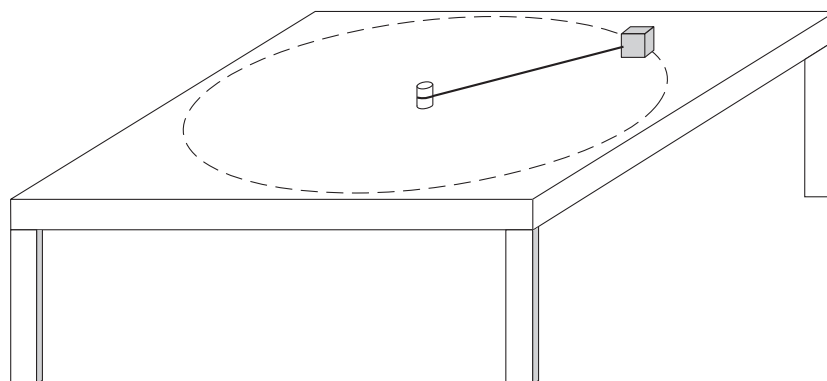


What is the reading on scale #1?

	READING ON SCALE #1
A.	1.3 N
B.	1.6 N
C.	1.9 N
D.	2.1 N

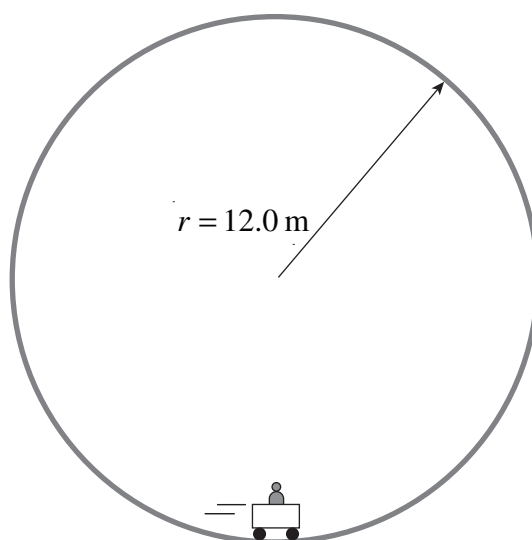
16. A disc is rotating with a frequency of 7.1 Hz. What is the size of the centripetal force being exerted on a 5.0×10^{-4} kg piece of the disc located 1.2 m from the centre?
- A. 4.0×10^{-4} N
 B. 4.3×10^{-3} N
 C. 3.0×10^{-2} N
 D. 1.2 N

17. A wooden block attached to a thin string is sliding across a smooth level table in a circular path as shown.



Which of the following best describes what the tension force in the string is doing to the block?

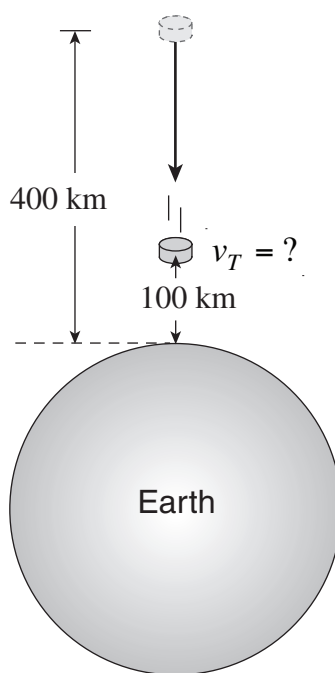
- A. slowing the block down
 - B. speeding the block up
 - C. changing the block's direction
 - D. pushing the block outwards
18. A roller coaster car carrying a 75.0 kg man has a speed of 24.3 m/s at the bottom of a circular loop.



What is the normal force acting on the man when the coaster is at the bottom of the loop?
(Ignore friction.)

- A. 735 N
- B. 2960 N
- C. 3690 N
- D. 4430 N

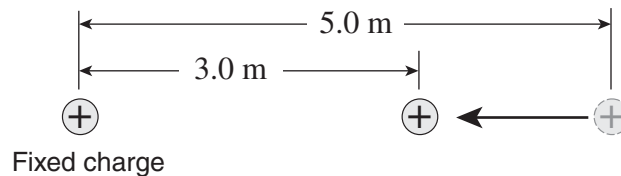
19. The gravitational field strength at a distance r from the center of the planet Stratos is 10 N/kg . What is the gravitational field strength at a distance $1.5r$ from the center of Stratos?
- A. 6.7 N/kg
 - B. 10 N/kg
 - C. 23 N/kg
 - D. 34 N/kg
20. A 1600 kg object is initially at rest 400 km above the earth's surface. The object falls straight down and generates $8.3 \times 10^8 \text{ J}$ of heat energy while descending to an altitude of 100 km .



What is the velocity (v_T) of the object at this altitude?

- A. $2\,100 \text{ m/s}$
- B. $2\,200 \text{ m/s}$
- C. $2\,600 \text{ m/s}$
- D. $11\,000 \text{ m/s}$

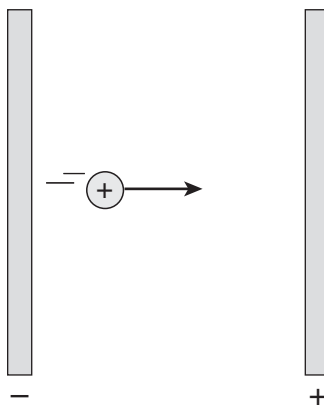
21. A satellite is in a circular orbit around a moon. Which of the following changes would increase the satellite's speed in order for it to remain in a circular orbit?
- an increase in the satellite's mass
 - a decrease in the satellite's mass
 - an increase in the satellite's orbital radius
 - a decrease in the satellite's orbital radius
22. Two small charged plastic balls are located 1.7 m apart and are each experiencing an 8.0 N repulsive electrostatic force. One of the balls carries a charge of $40 \mu\text{C}$. What is the charge on the other ball?
- $-38 \mu\text{C}$
 - $38 \mu\text{C}$
 - $-64 \mu\text{C}$
 - $64 \mu\text{C}$
23. Two equally charged particles are initially placed 5.0 m apart. It requires $2.0 \times 10^{-2} \text{ J}$ of work to push one charge to a new position 3.0 m away from the other fixed charge.



What is the magnitude of each charge?

- $2.1 \mu\text{C}$
- $2.6 \mu\text{C}$
- $3.3 \mu\text{C}$
- $4.1 \mu\text{C}$

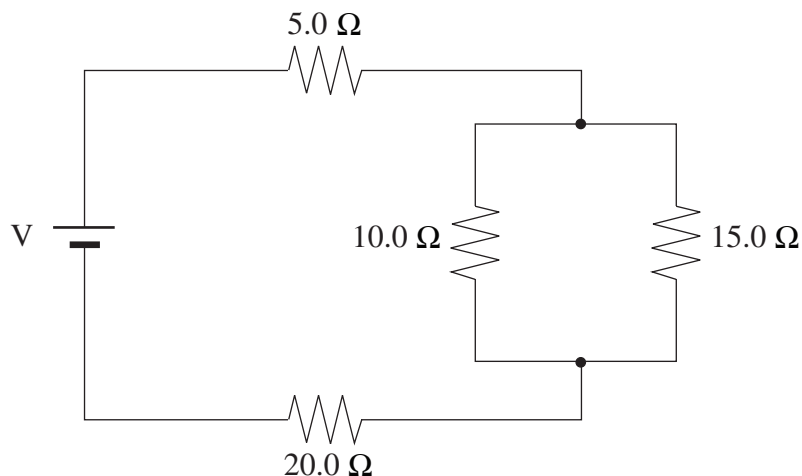
24. A positive charge is given an initial speed in order to cross the space between charged plates as shown.



What is happening to its kinetic energy as the charge moves towards the positive plate?

- A. increasing
 - B. decreasing
 - C. constant
 - D. increasing then decreasing
25. A $40\ \mu\text{C}$ and a $-70\ \mu\text{C}$ charge are located 5.0 m apart. What is the electric potential at a point midway between them?
- A. $5.4 \times 10^4\ \text{V}$
 - B. $-1.08 \times 10^5\ \text{V}$
 - C. $1.98 \times 10^5\ \text{V}$
 - D. $-3.96 \times 10^5\ \text{V}$

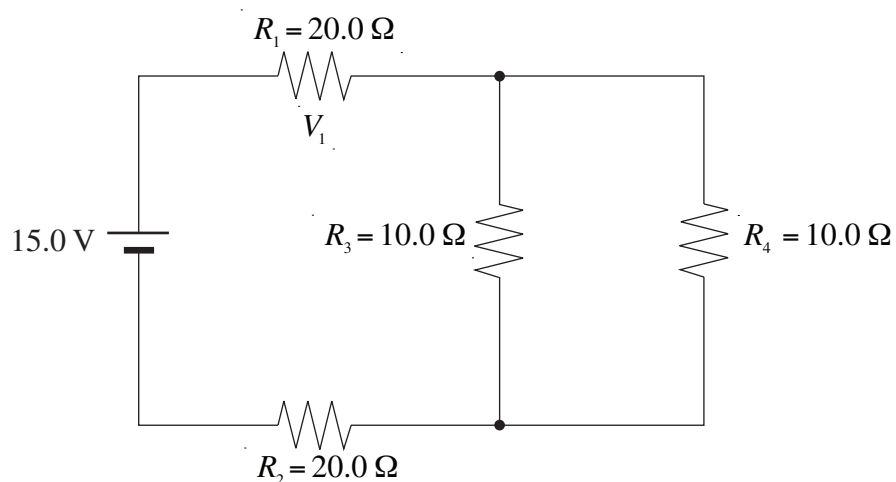
26. A power supply maintains a constant voltage, V , to the circuit shown in the diagram below.



If the location of the $5.0\ \Omega$ and $10.0\ \Omega$ resistors was swapped, what happens to the equivalent resistance of the circuit and the current through the $20.0\ \Omega$ resistor?

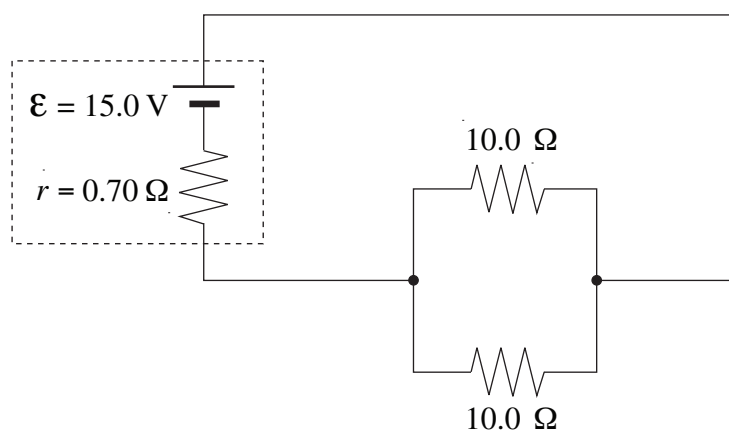
	EQUIVALENT RESISTANCE	CURRENT THROUGH $20.0\ \Omega$ RESISTOR
A.	increases	decreases
B.	decreases	increases
C.	increases	increases
D.	decreases	decreases

27. Four resistors and a 15.0 V power supply are arranged to form the circuit shown in diagram below.



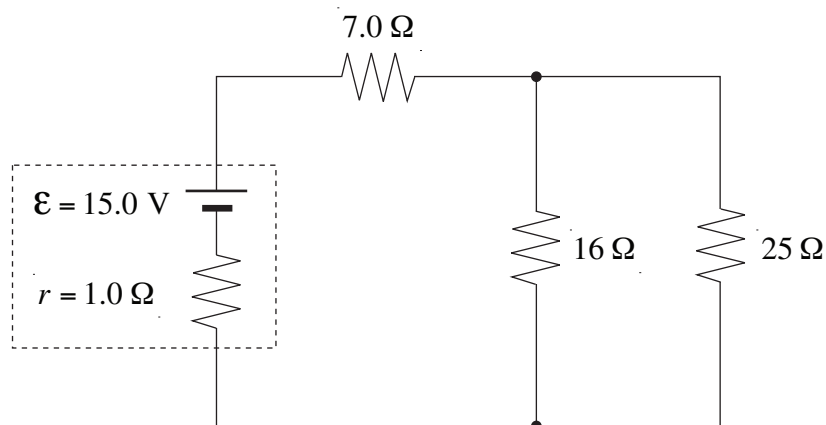
What is the potential difference, V_1 , across resistor R_1 ?

- A. 5.0 V
 - B. 6.0 V
 - C. 6.7 V
 - D. 15.0 V
28. What is the terminal voltage of the battery shown in the circuit diagram below?



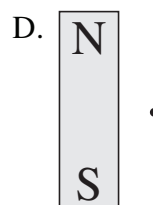
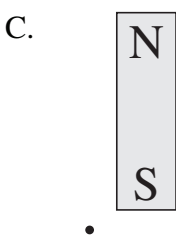
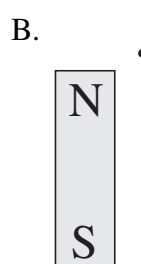
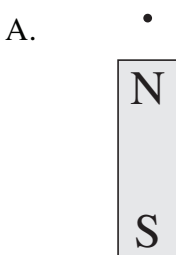
- A. 1.8 V
- B. 13.2 V
- C. 15.0 V
- D. 16.8 V

29. What is the power dissipated in the $16\ \Omega$ resistor?

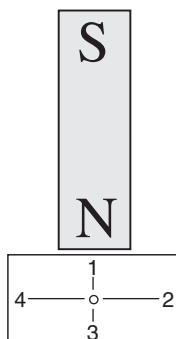


- A. 4.2 W
- B. 4.8 W
- C. 7.0 W
- D. 11 W

30. For which situation will the magnetic field at the dot be directed towards the bottom of the page?
(Assume identical strength bar magnets.)

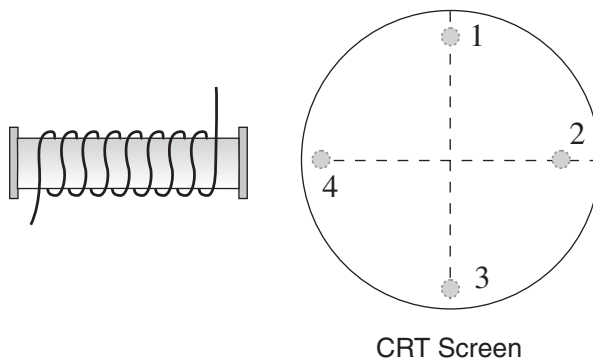


31. Imagine an electron beam emerging through a small hole in a card placed near a bar magnet as shown.



Towards which numbered position on the card will the electron beam be deflected?

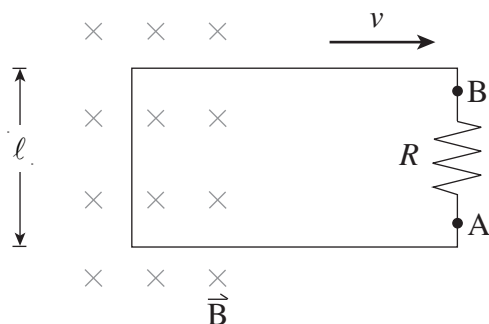
- A. 1
 - B. 2
 - C. 3
 - D. 4
32. A solenoid is placed near a cathode ray tube screen as shown.



When a current is passed through the solenoid, the electron beam can be deflected towards which of the numbered locations on the CRT screen?

- A. 2 only
- B. 4 only
- C. 2 or 4
- D. 1 or 3

33. The single rectangular loop of wire shown below is being pulled out of the 0.50 T magnetic field at a constant speed. An emf of 0.60 V is being generated in the loop and the length of side ' ℓ ' is 0.30 m.



What is the speed of the loop and what is the direction of the current through the resistor?

	SPEED OF LOOP (m/s)	DIRECTION OF CURRENT
A.	4.0	B to A
B.	0.090	A to B
C.	4.0	A to B
D.	0.090	B to A

34. An electric drill motor operates at 18.0 V. When prevented from turning the drill draws a current of 10.0 A, and while spinning freely draws a current of 2.0 A. What is the motor's back emf when it is prevented from turning?

- A. 0 V
- B. 13 V
- C. 15 V
- D. 18 V

35. A transformer has 270 primary windings and 9 secondary windings. If the primary 120 V what is the transformer's secondary voltage?
- A. 0.25 V
 - B. 4.0 V
 - C. 120 V
 - D. 3 600 V

**This is the end of the multiple-choice section.
Answer the remaining questions directly in the Response Booklet.**

