



Physics 12

Resource Exam B

Exam Booklet

PART A: MULTIPLE CHOICE

Value: 70% of the exam

Suggested Time:

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

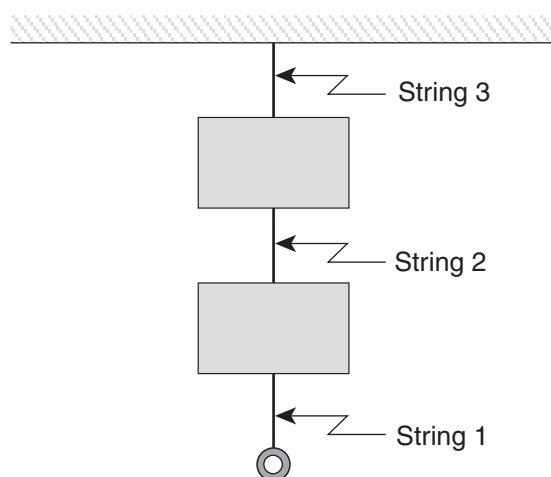
1. Which of the following is a scalar quantity?
 - A. impulse
 - B. magnetic field
 - C. electric charge
 - D. gravitational field

2. An airplane flying at a velocity of 280 km/h due east with respect to the air encounters a 55 km/h wind blowing towards 35°S of E . What is the resultant velocity of the plane?

	MAGNITUDE	DIRECTION
A.	225 km/h	45°S of E
B.	285 km/h	6°S of E
C.	327 km/h	6°S of E
D.	335 km/h	45°S of E

3. A projectile shot over level ground hits the ground with a velocity of 65 m/s at an angle below the horizontal. What was the projectile's maximum height?
- A. 39 m
 - B. 150 m
 - C. 180 m
 - D. 220 m

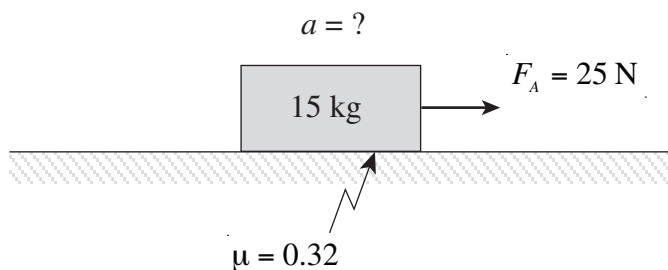
4. Two large masses are hung from the ceiling using identical strings as shown.



A very small force is applied in a downward direction to the ring. The force is slowly increased until one of the strings breaks. Which of the three strings will break first?

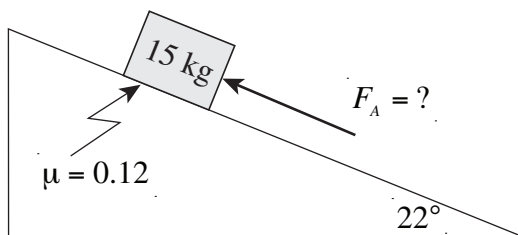
- A. String 1
- B. String 2
- C. String 3
- D. All three strings break at the same time.

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



What is the acceleration of the block while the horizontal force is being applied?

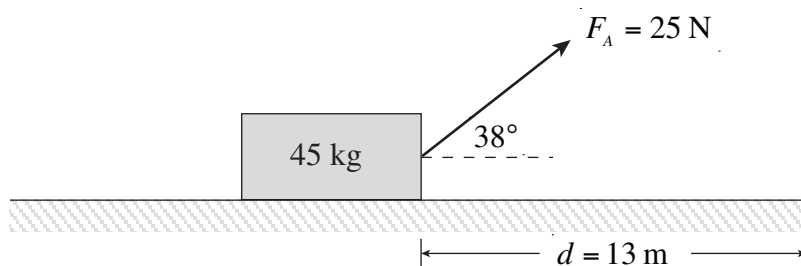
- A. 0 m/s^2
 - B. 1.5 m/s^2
 - C. 1.7 m/s^2
 - D. 4.8 m/s^2
6. A force applied parallel to a 22° incline prevents a 15 kg block from sliding down. The coefficient of friction between the block and the surface of the incline is 0.12.



What is the minimum magnitude of this applied force?

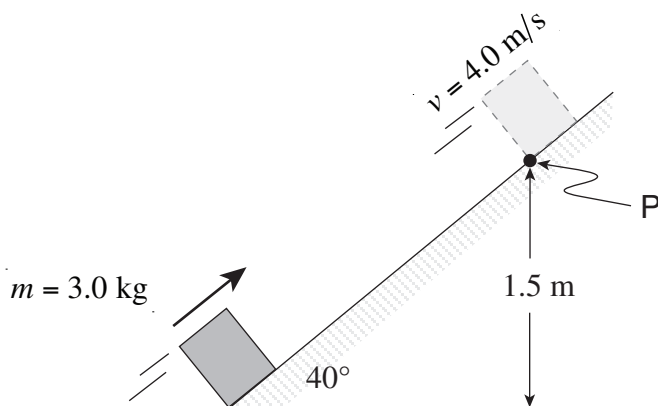
- A. 16 N
- B. 39 N
- C. 55 N
- D. 71 N

7. A force of 25 N applied at an angle of 38° above the horizontal is used to pull a 45 kg distance of 13 m along a horizontal wooden floor.



What is the work done on the block by force F_A ?

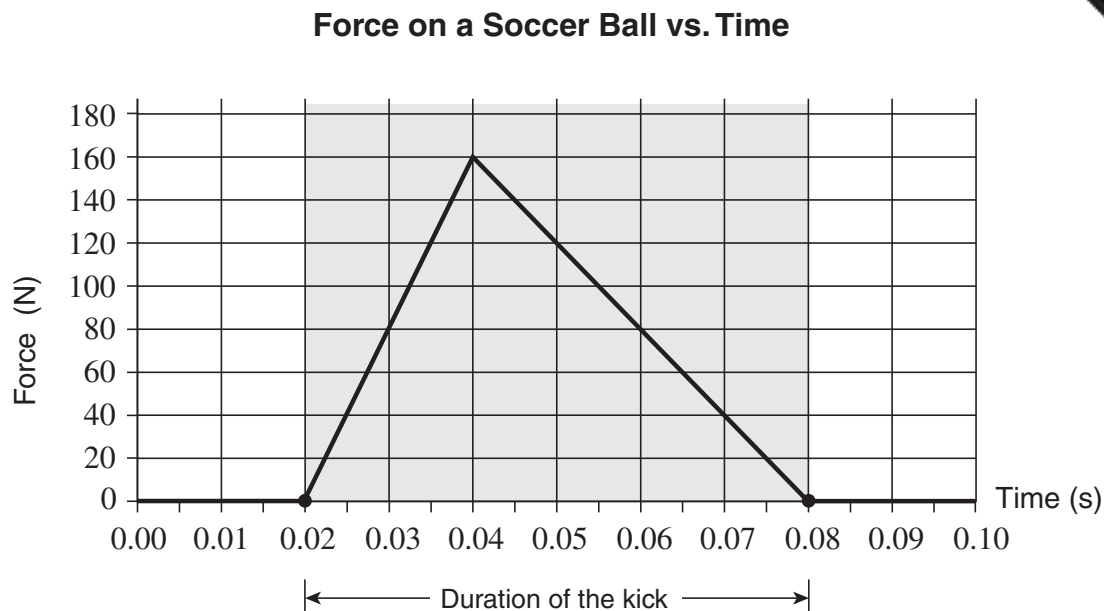
- A. 200 J
 - B. 260 J
 - C. 330 J
 - D. 4 800 J
8. A 3.0 kg block is launched up an incline from the position shown. As the block passes point P its speed is measured as 4.0 m/s.



As the block rises to point P, 28 J of heat energy is produced. What was its kinetic energy at the launch point?

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

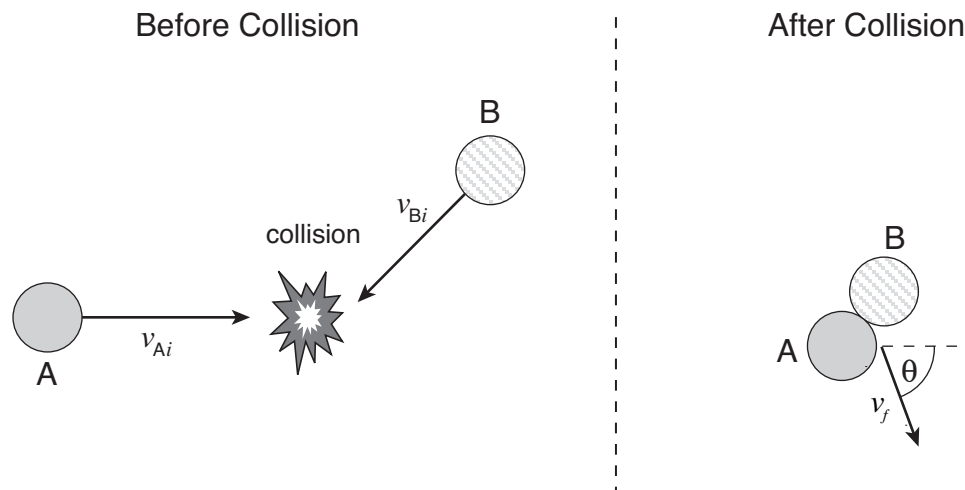
9. A soccer ball of mass 0.43 kg is initially at rest, and is then kicked forwards. The force on the ball during the kick is shown in the graph below.



What is the velocity of the soccer ball after the kick?

- A. 11.2 m/s
 - B. 14.9 m/s
 - C. 22.3 m/s
 - D. 29.8 m/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

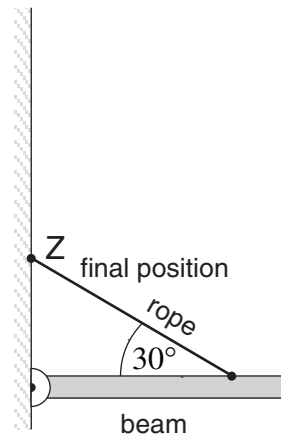
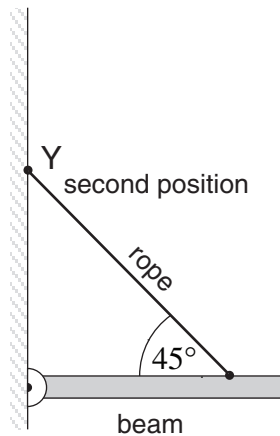
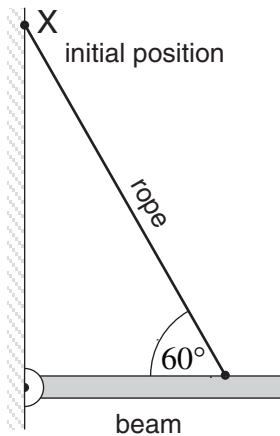
11. During an experiment two pucks of identical mass and speed collide and stick together



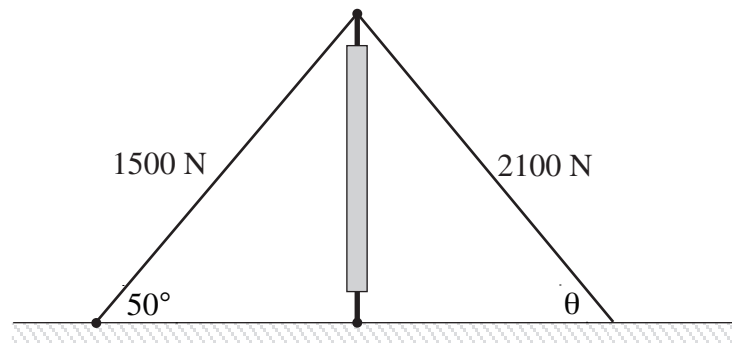
The experiment is then repeated but the mass of puck A is doubled. What is the effect on the direction (θ) of the pucks and on the magnitude of their total momentum after the collision? Ignore any effects due to friction.

	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 horizontal metal beam is held in position by a rope as shown. What happens to the tension in the rope when its connection point on the wall is moved from location X to locations Y and Z? Assume the length of the rope is adjusted to keep the beam in a horizontal position in each case.



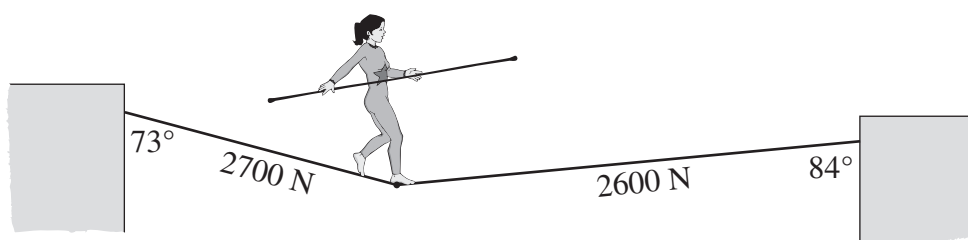
- A. Tension increases.
 B. Tension decreases.
 C. Tension remains the same.
 D. Tension increases then decreases.
13. A vertical post is held in place by two cables as shown.



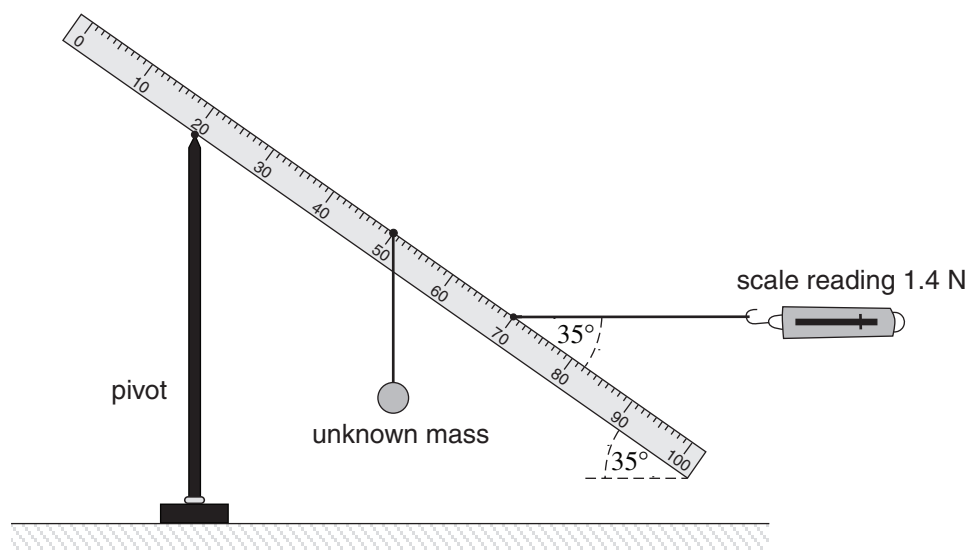
What is the angle θ ?

- A. 33°
 B. 50°
 C. 63°
 D. 70°

14. A gymnast balanced on a tightrope creates a dip in the rope, which produces the tension shown. What is the weight of the gymnast?



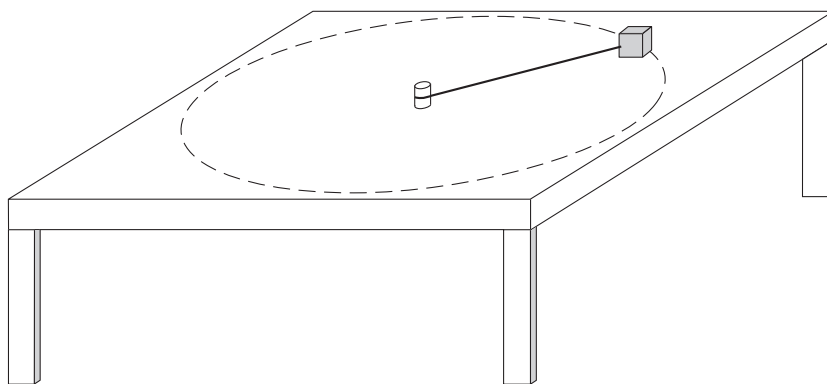
- A. 1060 N
 B. 2650 N
 C. 5200 N
 D. 5300 N
15. A 40 g metre stick with a pivot attached at the 20 cm mark is held at a 35° angle by a spring scale attached at the 70 cm mark as shown.



What mass must be suspended from the middle of the metre stick in order to produce a reading of 1.4 N on the scale?

- A. 127 grams
 B. 144 grams
 C. 167 grams
 D. 198 grams

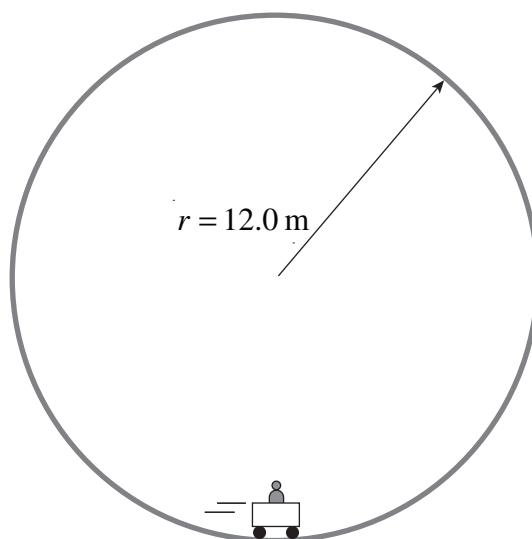
16. A disc is rotating with a frequency of 7.1 Hz. A 5.0×10^{-4} kg piece of the disc is experiencing a centripetal force of 1.6 N. How far from the centre of the disc is the piece located?
- A. 1.6 m
B. 65 m
C. 4.6×10^2 m
D. 4.0×10^3 m
17. A wooden block attached to a thin string is sliding across a smooth level table in a circular path as shown.



Which of the following is providing the centripetal force on the block?

- A. tension force
B. normal force
C. equilibrium force
D. gravitational force

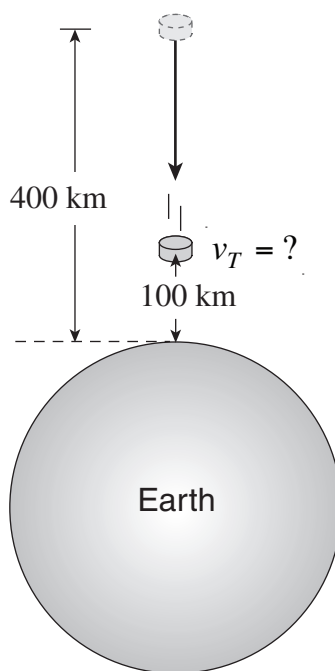
18. A roller coaster car carrying a 75.0 kg man has a speed of 24.3 m/s at the bottom of a circular loop.



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 centre of the planet Stratos is 14 N/kg .
At what distance from the centre of Stratos is the gravitational field strength equal to 6.0 N/kg ?
- A. $0.43r$
 - B. $1.5r$
 - C. $2.3r$
 - D. $5.4r$

20. A 1600 kg object is initially at rest 400 km above the earth's surface. The object falls down and generates 8.3×10^8 J of heat energy while descending to an altitude of 100 km.

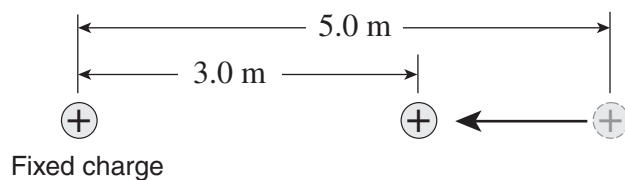


What is the velocity (v_T) of the object at this altitude?

- A. 2 100 m/s
 - B. 2 200 m/s
 - C. 2 600 m/s
 - D. 11 000 m/s
21. A satellite is in a circular orbit around a moon. Which of the following changes would require an increase in the satellite's speed in order for it to remain in the same circular orbit?
- A. an increase in the satellite's mass
 - B. a decrease in the satellite's mass
 - C. an increase in the moon's mass
 - D. a decrease in the moon's mass

22. Two small charged plastic balls are located 2.3 m apart and are each experiencing a 7.0×10^{-2} N electrostatic force. One of the balls carries a charge of $45 \mu\text{C}$. What is the charge on the other ball?
- A. $-40 \mu\text{C}$
 - B. $40 \mu\text{C}$
 - C. $-91 \mu\text{C}$
 - D. $91 \mu\text{C}$

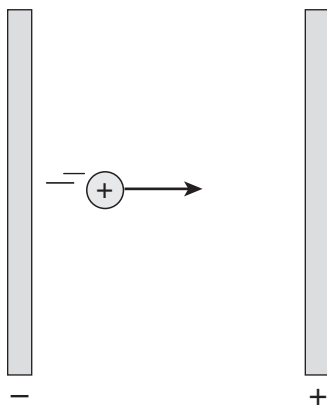
23. Two equally charged particles are initially placed 5.0 m apart. It requires 2.0×10^{-2} J of work to push one charge to a new position 3.0 m away from the other fixed charge.



What is the magnitude of each charge?

- A. $2.1 \mu\text{C}$
- B. $2.6 \mu\text{C}$
- C. $3.3 \mu\text{C}$
- D. $4.1 \mu\text{C}$

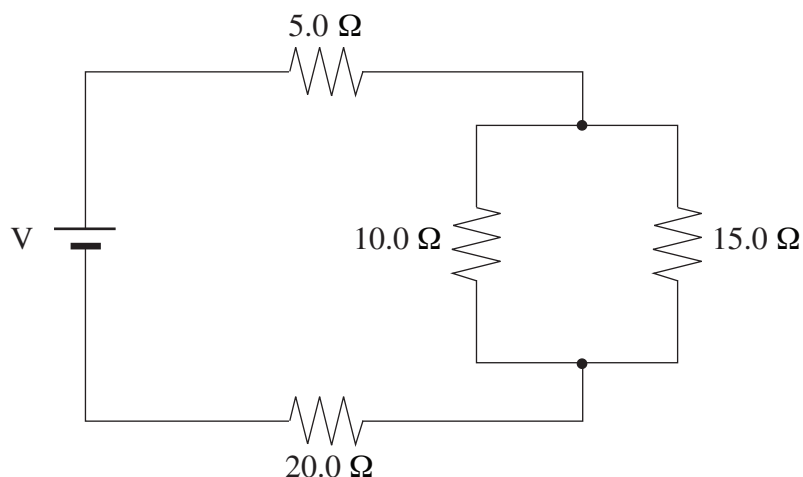
24. A positive charge is given an initial speed in order to cross the space between charged plates as shown.



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

- A. constant
 - B. increasing
 - C. decreasing
 - D. increasing then decreasing
25. A $40\ \mu\text{C}$ and a $65\ \mu\text{C}$ charge are located 5.0 m apart. What is the electric potential at a point midway between them?
- A. $4.5 \times 10^4\ \text{V}$
 - B. $9.0 \times 10^4\ \text{V}$
 - C. $2.0 \times 10^5\ \text{V}$
 - D. $3.8 \times 10^5\ \text{V}$

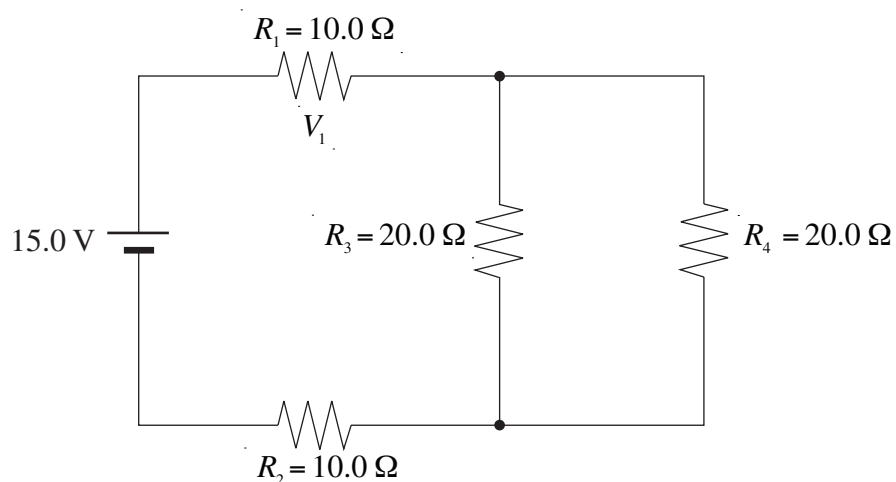
26. A power supply maintains a constant voltage, V , to the circuit shown in the diagram below.



If the location of the $5.0\ \Omega$ and $15.0\ \Omega$ resistors was swapped, what happens to the equivalent resistance of the circuit and the current through the $20.0\ \Omega$ resistor?

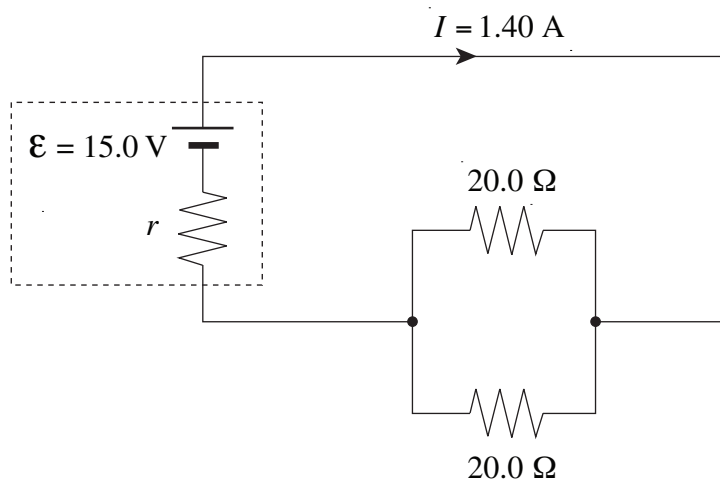
	EQUIVALENT RESISTANCE	CURRENT THROUGH $20.0\ \Omega$ RESISTOR
A.	increases	decreases
B.	decreases	increases
C.	increases	increases
D.	decreases	decreases

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



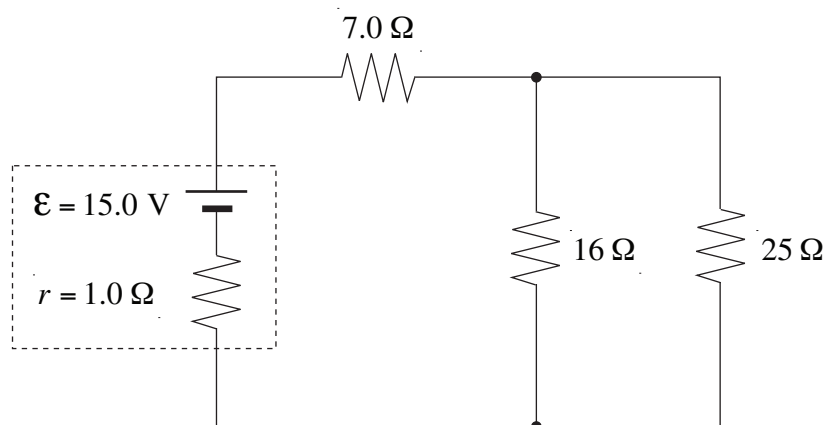
What is the potential difference, V_1 , across resistor R_1 ?

- A. 2.5 V
 - B. 3.8 V
 - C. 5.0 V
 - D. 15.0 V
28. What is the terminal voltage of the battery shown in the circuit diagram below?



- A. 1.0 V
- B. 10.7 V
- C. 14.0 V
- D. 15.0 V

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

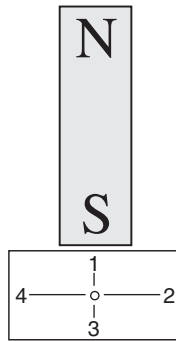


- A. 4.2 W
- B. 4.8 W
- C. 7.0 W
- D. 11 W

30. For which situation will the magnetic field at the dot be directed to the right? (Assume identical strength bar magnets.)



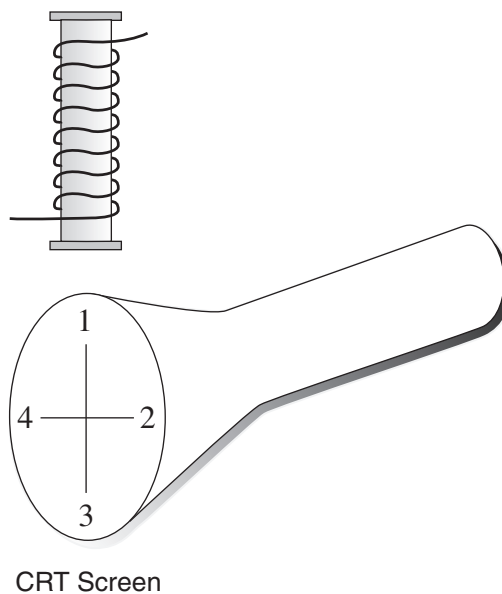
31. Imagine an electron beam emerging through a small hole in a card placed near a bar magnet as shown.



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

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

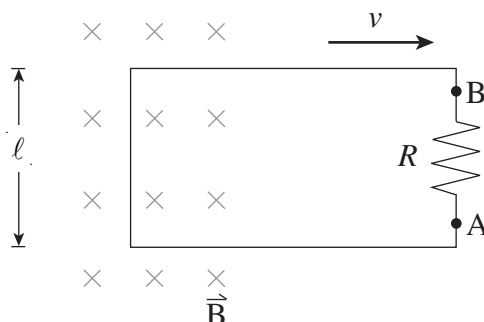
32. A solenoid is placed near a cathode ray tube screen as shown.



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

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

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 resistance of the motor's windings?

- A. $1.5 \, \Omega$
- B. $1.8 \, \Omega$
- C. $2.3 \, \Omega$
- D. $9.0 \, \Omega$

35. A transformer has 270 primary windings and 9 secondary windings. If the secondary voltage is 4.0 V, what is the transformer's primary voltage?
- A. 0.13 V
 - B. 4.0 V
 - C. 120 V
 - D. 610 V

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

