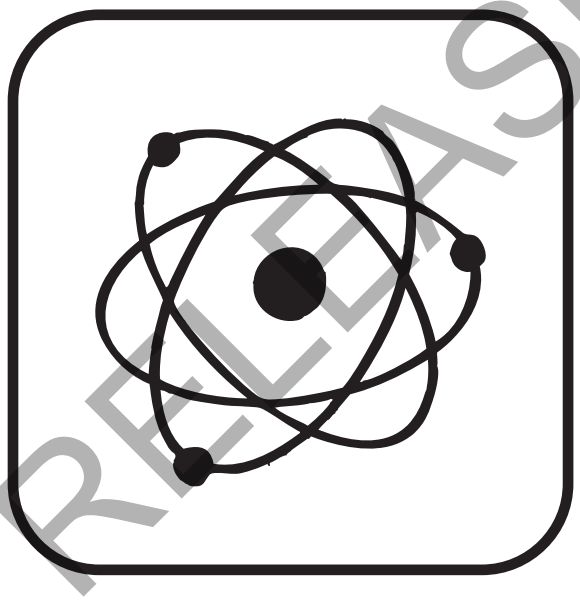
Released Items

Student Name:_____

Physics



2018–2019

NC Final Exam

Public Schools of North Carolina
Department of Public Instruction | State Board of Education
Division of Accountability Services/North Carolina Testing Program

1 A small object attached to the end of a string is swung in a horizontal circle at a constant linear speed. The linear speed of the object is doubled, and the length of the string remains the same. What effect does the change have on the centripetal acceleration of the object?

A It is reduced by half.

B It remains the same.

C It doubles.

D It quadruples.

2 Two rocks, one weighing 100 N and the other weighing 200 N, are dropped from a 50-m cliff at the same time. When both rocks are 10 m from the ground and air friction is ignored, which is the same?

A acceleration

B kinetic energy

C momentum

D potential energy

3 A ball is launched at an angle of 54° to the horizontal. What determines the amount of time the ball remains in flight? (Ignore air resistance.)

A initial velocity

B mass of the projectile

C centripetal acceleration

D composition of the projectile

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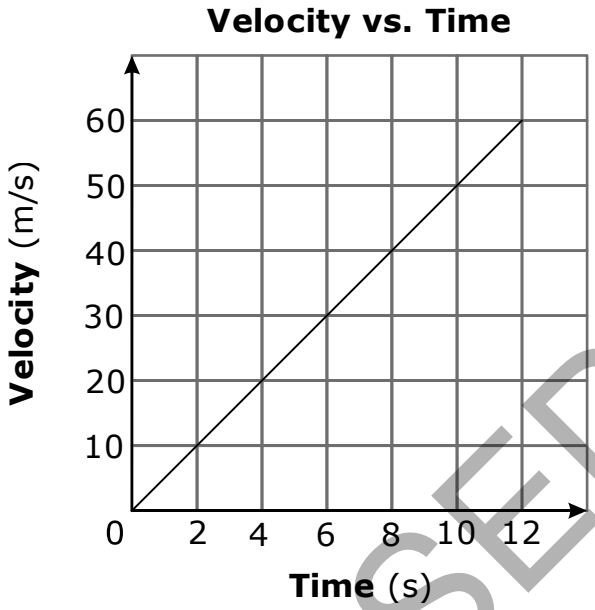
4 The graph below models the velocity of an object as it moves for 12 s.



Which statement correctly describes the motion of the object?

A The object traveled 360 m during the 12 s and had a constant acceleration of 0 m/s/s.

B The object traveled 360 m during the 12 s and had a constant acceleration of 5 m/s/s.

C The object traveled 720 m during the 12 s and had a constant acceleration of 0 m/s/s.

D The object traveled 720 m during the 12 s and had a constant acceleration of 5 m/s/s.

5 A 25-kg bucket is being lifted by a rope. The rope will break if it experiences more than 350 N of tension. What is the ***maximum*** upward acceleration the bucket can experience without breaking the rope?

A 0.25 m/s/s

B 0.40 m/s/s

C 2.5 m/s/s

D 4.2 m/s/s

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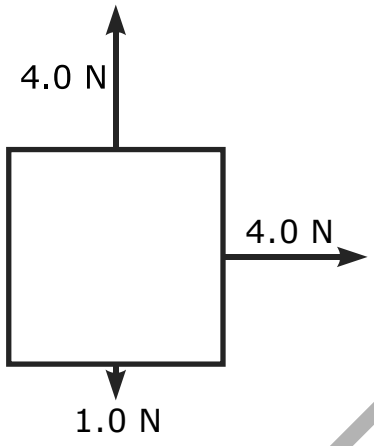
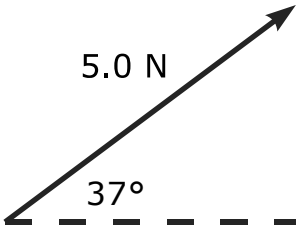
6 The forces acting on an object are shown with vectors in the free body diagram below.



Which vector accurately represents the net force on the object?

A

B



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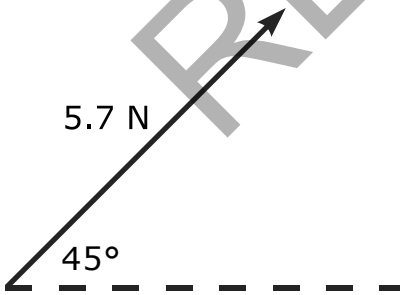

D

7 A 52-kg bike is moving along a smooth road at a constant velocity of 8.4 m/s. What is the net force acting on the bike?

A 0 N

B 190 N

C 320 N

D 510 N

8 A 3.3-kg block rests on a table. A 2.1-kg box rests on top of the block. What is the magnitude of the normal force exerted by the table on the block?

A 12 N

B 26 N

C 32 N

D 53 N

9 Two automobiles travel on a circular track at the same speed at different times. The first car is twice as massive as the second. Which describes the centripetal forces acting upon the two cars?

A The centripetal force on the first car is half the centripetal force on the second car.

B The centripetal forces on both cars are the same.

C The centripetal force on the first car is double the centripetal force on the second car.

D The centripetal force on the first car is quadruple the centripetal force on the second car.

10 Two carts of the same mass travel at the same speed toward each other. After they collide, each cart rebounds and moves in the opposite direction at the same speed as before the collision. What can be assumed about the collision?

A Momentum and energy are both conserved during the collision.

B Momentum and energy both change during the collision.

C Momentum is conserved, but energy changes during the collision.

D Momentum changes, but energy is conserved during the collision.

11 A player throws a ball at an average velocity of –40.0 m/s. Another player hits the ball back toward the thrower at a velocity of 30.0 m/s. If the ball has a mass of 0.144 kg, what is the magnitude of the impulse delivered to the ball to make it move in the opposite direction?

A 1.44 N•s

B 4.32 N•s

C 5.76 N•s

D 10.1 N•s

12 A 0.110-kg ball (ball X) moving at 1.20 m/s to the right, collides head-on with an identical ball (ball Y) moving to the left at a velocity of 0.600 m/s. Ball Y rebounds and reverses direction at a velocity of 0.800 m/s. What is the velocity of ball X following the collision?

A 0.200 m/s to the left

B 0.0924 m/s to the right

C 0.0880 m/s to the right

D 0.00440 m/s to the left

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13 Can a small, light ball have the same momentum as a large, heavy ball?

A no, because there is a difference in the inertia of the two balls

B no, because there is a difference in the masses of the two balls

C yes, because the small ball may be able to gain as much inertia as the large ball

D yes, because the velocity of the small ball may be much greater than that of the large ball

14 A force of 50 N is required to hold an ideal spring stationary after the spring has been stretched 0.1 m from its equilibrium position. How much potential energy is stored in the stretched spring?

A 50 J

B 25 J

C 5.0 J

D 2.5 J

15 A spring is on a frictionless horizontal surface. One end of the spring is attached to a rigid wall. A 0.65-kg ball initially moving at 4.3 m/s collides with the open end of the spring. How much potential energy is stored in the spring when the velocity of the ball is 0 m/s?

A 3.6 J

B 3.9 J

C 6.0 J

D 6.4 J

16 How much power does it take to lift a 12-N object 0.87 m in 1.3 s?

A 0.80 W

B 8.0 W

C 10. W

D 18 W

17 A constant 3.0-N horizontal force is applied to a 0.10-kg object as it moves a distance of 0.20 m along a horizontal, frictionless surface. How much work does the force perform on the object?

A 6.0×10^{-2} J

B 3.0×10^{-2} J

C 6.0×10^{-1} J

D 3.0×10^{-1} J

18 A 2.00-kg brick falls from the top of a building 6.00 m above the ground. What is the kinetic energy of the brick just before it reaches the ground?

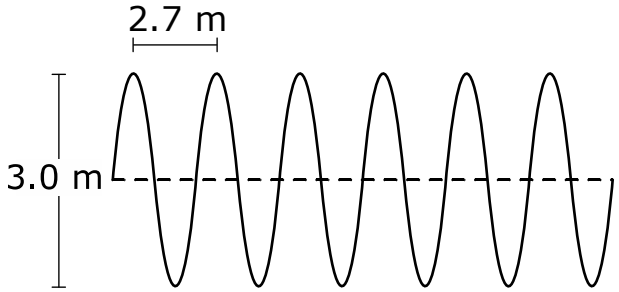
A 118 J

B 58.8 J

C 12.0 J

D 3.00 J

19 This diagram represents a wave with a frequency of 1.1 Hz.



What is the speed of the wave?

A 0.41 m/s

B 1.7 m/s

C 2.4 m/s

D 3.0 m/s

20 A student walked up a flight of stairs. Later, the same student ran up the same flight of stairs in less time. What can be concluded about the relative amounts of work performed and power produced by the student in these instances?

A The work performed was the same in both instances. The power was greater when the student ran up the stairs.

B The work performed was greater when the student ran up the stairs. The power was the same in both instances.

C The work and power were the same in both instances because it was the same student on the same stairs.

D The work performed and the power produced were both less when the student was running up the stairs than when walking up the stairs.

21 What is the frequency of a light wave if its wavelength is 4.70×10^{-7} meters?

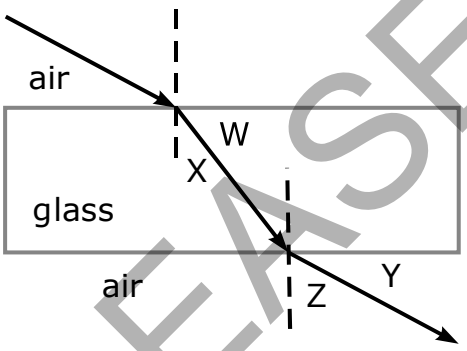
A 6.38×10^{14} Hz

B 6.32×10^{7} Hz

C 1.57×10^{-8} Hz

D 1.57×10^{-15} Hz

22 The diagram below shows a ray of light passing from air through a piece of glass and then back into air again.



The ray of light has an angle of incidence of 60° to normal when it originally passes from air to the glass. Which angle is also equal to 60°?

A W

B X

C Y

D Z

23 A blue light wave and a sound wave travel through air and then enter a glass block at an angle of incidence of 45°. Which statement ***best*** describes the motion of the waves as they travel through the glass block?

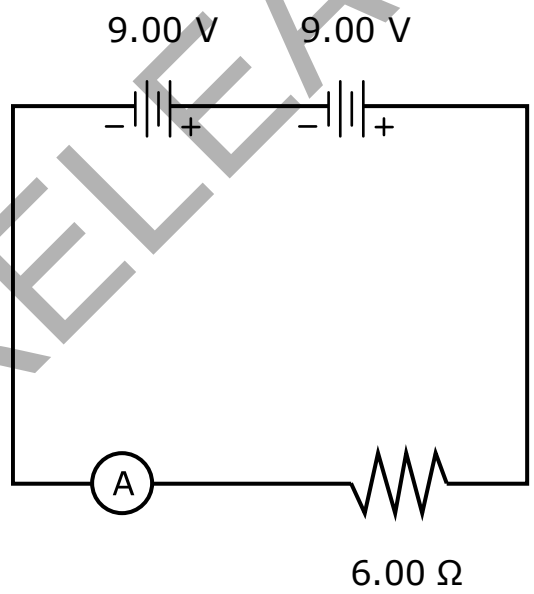
A Each wave will move at the same speed that it had when it was traveling through air.

B Each wave will have the same frequency that it had when it was traveling through air.

C The blue light wave will decrease in speed, but the sound wave will increase in speed.

D The blue light wave will increase in frequency, but the sound wave will decrease in frequency.

24 The diagram below shows two 9.00-V batteries connected in series across a 6.00-Ω resistor.



What is the current reading at the ammeter?

A 0.667 A

B 3.00 A

C 54.0 A

D 108 A

25 An electrical appliance can work with a 12 V battery. It can also work by being plugged into a wall socket. What type of voltage conversion is needed between the wall socket and the appliance circuitry when the appliance is plugged into the wall socket?

A 12 V AC is changing to 120 V DC.

B 12 V DC is changing to 120 V AC.

C 120 V AC is changing to 12 V DC.

D 120 V DC is changing to 12 V AC.

26 A 3-Ω resistor is connected to a 6-V source. What is the power rating of the circuit when the 6-V power source is changed to a 12-V source?

A 2 W

B 4 W

C 36 W

D 48 W

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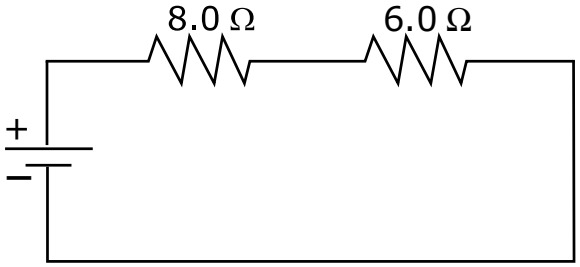
27 The diagram below represents a DC circuit.



The current flowing through the 8.0-Ω resistor is 1.0 A. What is the current flowing through the 6.0-Ω resistor?

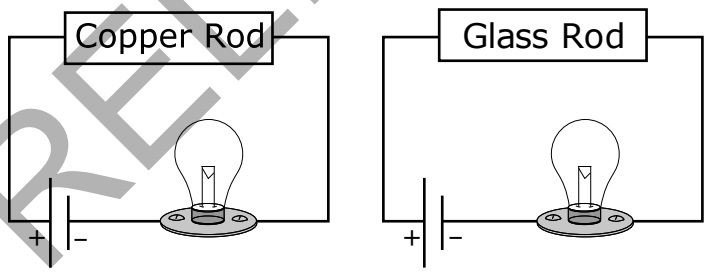
A 0.75 A

B 1.0 A

C 1.2 A

D 1.3 A

28 The circuits shown below are made using a battery, a lamp, and a rod. One circuit has a copper rod, and the other circuit has a rod made of glass.



Which rod is better at making the lamp glow?

A copper, because the electrons are tightly bound in copper

B copper, because the electrons are free to move through copper

C glass, because the electrons are free to move through glass

D glass, because the electrons are tightly bound in glass

29 A 60.0-W lightbulb in a 120-V lamp is left on for 3,600 seconds. What amount of energy does the lightbulb consume?

A 2.16×10^5 J

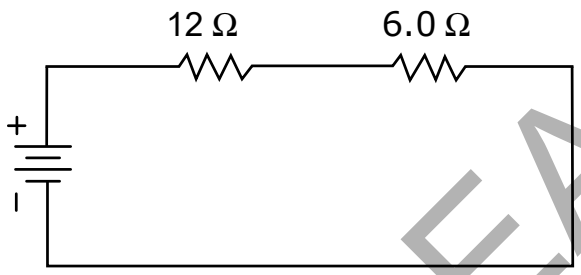
B 7.20×10^3 J

C 6.00×10^1 J

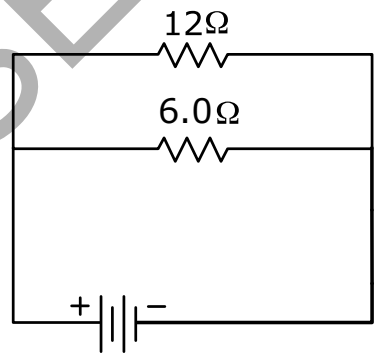
D 5.00×10^{-1} J

30 Below are two diagrams of different circuits.

Circuit I



Circuit II



How does the overall resistance in Circuit I compare to the overall resistance in Circuit II?

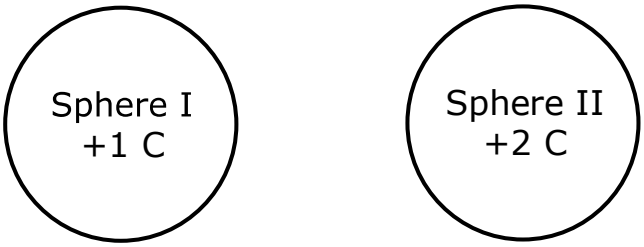
A Circuit I has an overall resistance of 0.25 Ω, while Circuit II has an overall resistance of 18 Ω.

B Circuit I has an overall resistance of 4.0 Ω, while Circuit II has a total resistance of 18 Ω.

C Circuit I has an overall resistance of 18 Ω, while Circuit II has an overall resistance of 0.25 Ω.

D Circuit I has an overall resistance of 18 Ω, while Circuit II has an overall resistance of 4.0 Ω.

31 Two identical conducting spheres are brought near each other as seen in the figure below. Sphere I has a charge of +1 C, and Sphere II has a charge of +2 C.



What is the direction of charge flow when they are touched together?

A Protons will move from Sphere I to Sphere II.

B Protons will move from Sphere II to Sphere I.

C Electrons will move from Sphere I to Sphere II.

D Electrons will move from Sphere II to Sphere I.

32 The electric field strength between two parallel plates 42 cm apart is 840 V/m. What is the potential difference between them?

A 110 V

B 350 V

C 2.0×10^3 V

D 3.5×10^4 V

33 Two point charges are located 2.1 m apart. One has a charge of 4.0×10^{-6} C and the other has a charge of 6.0×10^{-6} C. What is the electrostatic force between the charges?

A 0.22 N

B 0.10 N

C 0.049 N

D 0.032 N

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34 A negatively charged metal rod is brought into contact with a neutral metal sphere. Which is a description of the charge of each object after their contact?

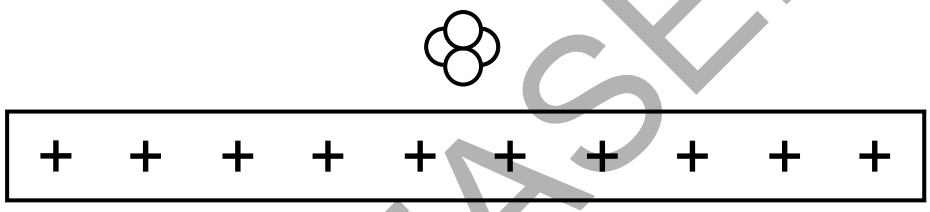
A The rod is positively charged and the sphere is negatively charged.

B The rod is negatively charged and the sphere is positively charged.

C The rod and the sphere are both positively charged.

D The rod and the sphere are both negatively charged.

35 An alpha particle is released above a positively charged plate as shown in the diagram below.



The alpha particle is composed of two protons and two neutrons. How will the alpha particle react to the plate?

A The particle has an overall neutral charge because the protons cancel the neutrons, so it will be attracted to the plate.

B The particle has an overall neutral charge because the protons cancel the neutrons, so it will be repelled from the plate.

C The particle has an overall positive charge because of the protons, so it will be repelled from the plate.

D The particle has an overall negative charge because of the neutrons, so it will be attracted to the plate.

36 A student touches a negatively charged rod to an uncharged electroscope. Which is the result?

A A negative charge flows from the rod to the electroscope, and an equal positive charge flows from the electroscope to the rod.

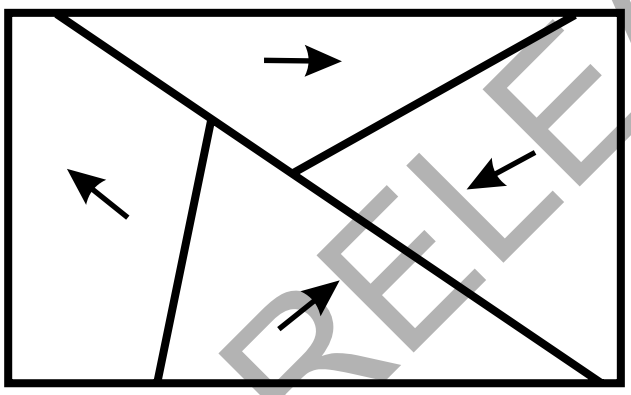
B A negative charge flows from the rod to the electroscope, and the leaves diverge.

C A positive charge flows from the electroscope to the rod until the rod is neutral.

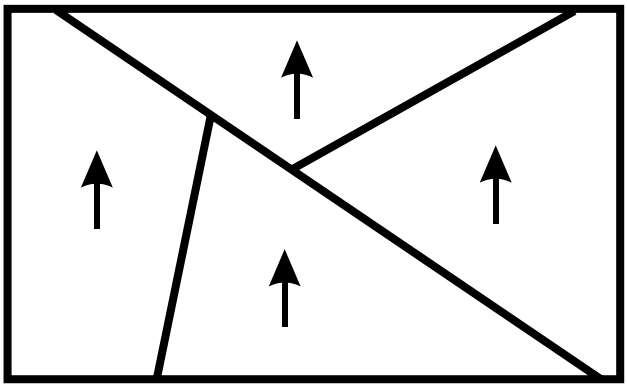
D A positive charge is attracted to the head of the electroscope, but the leaves remain closed.

37 Which diagram illustrates the magnetic domains of a permanent magnet?

A



B



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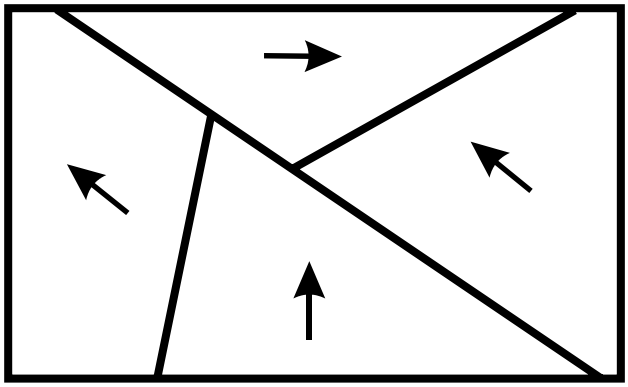

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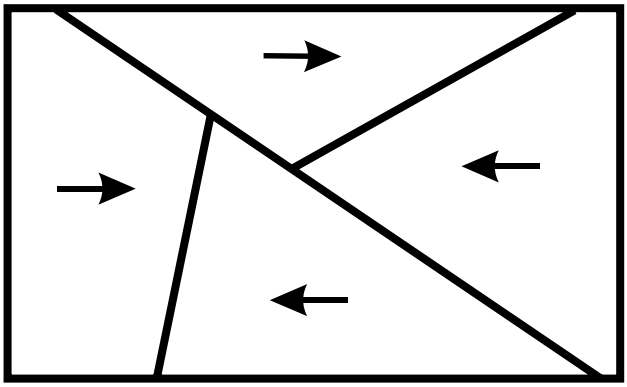

38 Which type of magnetic field is created by a straight, current-carrying wire?

A a magnetic field of straight lines perpendicular to the wire

B a magnetic field of straight lines parallel to the wire

C a magnetic field that follows crossed lines originating from the wire

D a magnetic field that follows a circular path around the wire

39 What happens when an ideal step-up transformer increases the voltage of alternating current?

A Alternating current can produce a large amount of energy; therefore, voltages increase, while current remains the same.

B As the voltage is increased by the transformer, it decreases current proportionately to maintain the same power.

C Alternating current induces voltage across the output wires of the transformer, thereby increasing electrical power.

D The increased voltage in the output is a peak value, and over time the voltage drops to match the input value.

40 An electromagnet is constructed by wrapping a current-carrying wire around an iron core. Which conditions will produce the ***strongest*** magnetic field?

A 40 turns of a wire carrying 4 A current

B 20 turns of a wire carrying 4 A current

C 40 turns of a wire carrying 2 A current

D 20 turns of a wire carrying 2 A current

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