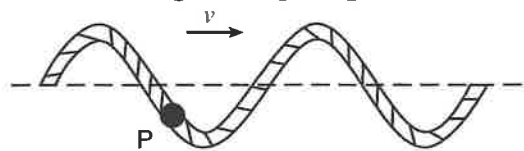


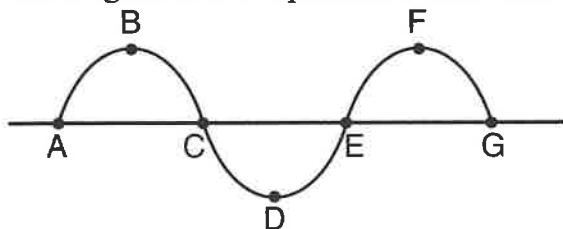
STEP PHYSICS - Final Review AND Answers May 2022

1. The diagram below shows a transverse wave moving toward the right along a rope.



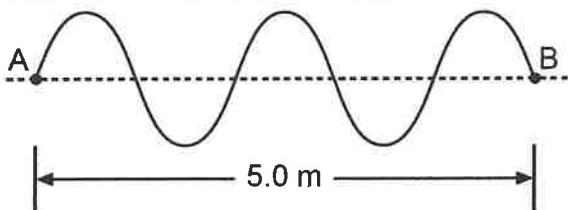
At the instant shown, point P on the rope is moving toward the

- A) bottom of the page B) top of the page
C) left D) right
2. The diagram below represents a transverse wave.



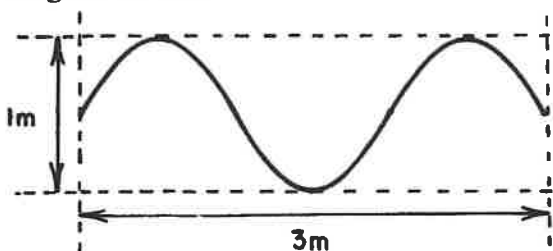
The wavelength of the wave is equal to the distance between points

- A) A and G B) B and F
C) C and E D) D and F
3. In the diagram below, the distance between points A and B on a wave is 5.0 meters.



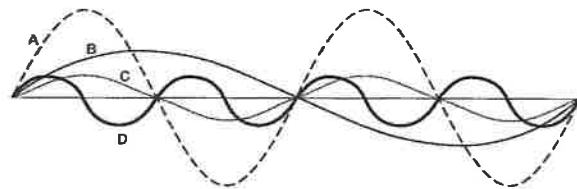
The wavelength of this wave is

- A) 1.0 m B) 2.0 m C) 5.0 m D) 4.0 m
4. What is the wavelength of the wave shown in to diagram below?



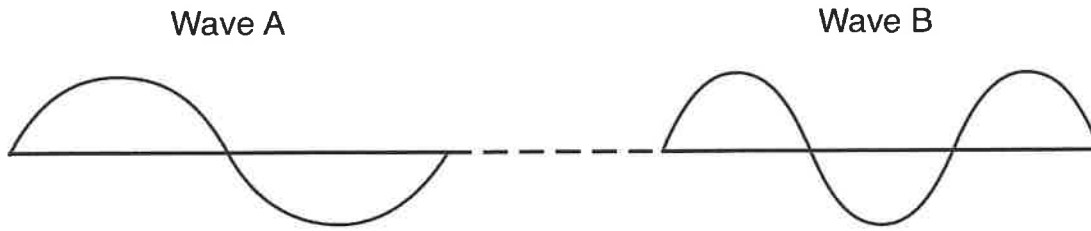
- A) 1 m B) 2 m C) 3 m D) 0.5 m

Base your answers to questions 5 and 6 on the diagram below, which represents waves A , B , C , and D traveling in the same medium.



5. Which wave has the longest period?
- A) A B) B C) C D) D
6. Which two waves have the same wavelength?
- A) A and B B) A and C
C) B and D D) C and D

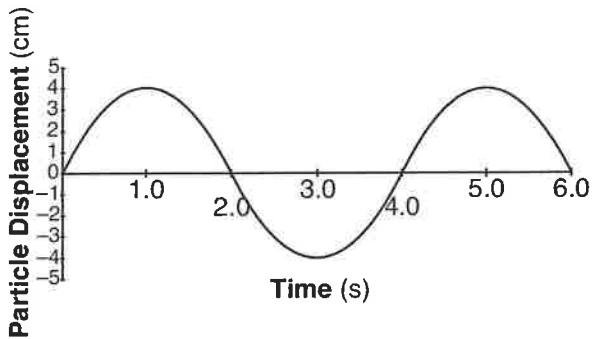
7. The diagram below represents two waves, *A* and *B*, traveling through the same uniform medium.



Which characteristic is the same for both waves?

- A) amplitude B) frequency C) period D) wavelength
-

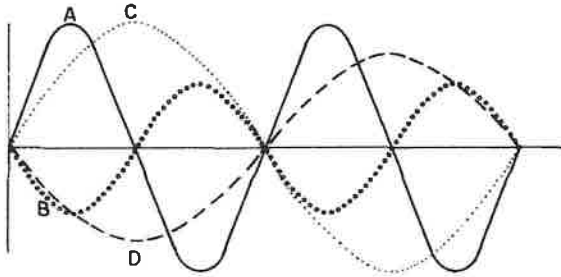
8. The graph below represents the displacement of a particle in a medium over a period of time.



The amplitude of the wave is

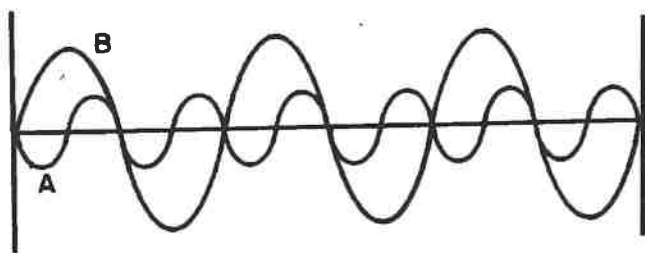
- A) 4.0 s B) 6.0 s C) 8 cm D) 4 cm

9. Which two wave representations in the diagram below have the same amplitude?



- A) *A* and *C* B) *A* and *B*
C) *B* and *C* D) *B* and *D*
-

10. Base your answer to the following question on the information and diagram below. The diagram represents two sound waves that are produced in air by two tuning forks. The frequency of wave *A* is 400 cycles per second.



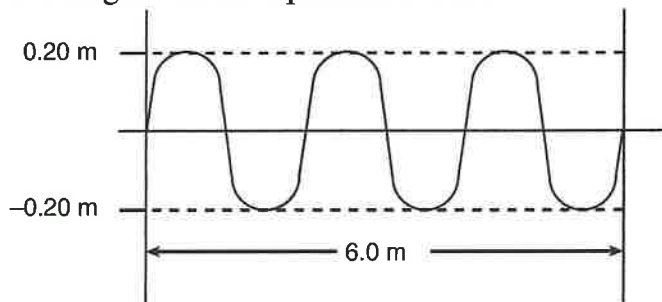
Compared to the amplitude of wave *B*, the amplitude of wave *A* is

- A) less B) greater C) the same
-
11. The time required to produce one cycle of a wave is known as the wave's
- A) amplitude B) frequency
C) period D) wavelength
12. What is the period of a sound wave having a frequency of 340. hertz?
- A) 3.40×10^2 s B) 1.02×10^0 s
C) 9.73×10^{-1} s D) 2.94×10^{-3} s
13. A physics student takes her pulse and determines that her heart beats periodically 60 times in 60 seconds. The period of her heartbeat is
- A) 1 Hz B) 60 Hz
C) 1 s D) 60 s
14. The product of a wave's frequency and its period is
- A) one B) its velocity
C) its wavelength D) Planck's constant
15. What is the period of a 60.-hertz electromagnetic wave traveling at 3.0×10^8 meters per second?
- A) 1.7×10^{-2} s B) 2.0×10^{-7} s
C) 6.0×10^1 s D) 5.0×10^6 s
16. If the frequency of a periodic wave is doubled, the period of the wave will be
- A) halved B) doubled
C) quartered D) quadrupled
17. **Note that the question below has only three choices.**
If the amplitude of a wave is increased, the frequency of the wave will
- A) decrease B) increase
C) remain the same
18. A physics student notices that 4.0 waves arrive at the beach every 20. seconds. The frequency of these waves is
- A) 0.20 Hz B) 5.0 Hz
C) 16 Hz D) 80. Hz
19. The hertz is a unit that describes the number of
- A) seconds it takes to complete one cycle of a wave
B) cycles of a wave completed in one second
C) points that are in phase along one meter of a wave
D) points that are out of phase along one meter of a wave
20. The time for one wave to pass by a point is called the
- A) frequency of the wave
B) wavelength of the wave
C) amplitude of the wave
D) period of the wave

21. A periodic wave having a frequency of 5.0 hertz and a speed of 10. meters per second has a wavelength of

- A) 0.50 m B) 2.0 m
C) 5.0 m D) 50. m

22. The diagram below represents a wave.



What is the speed of the wave if its frequency is 8.0 hertz?

- A) 48 m/s B) 16 m/s
C) 3.2 m/s D) 1.6 m/s

23. Which equation correctly relates the speed v , wavelength λ , and period T of a periodic wave?

- A) $v = \frac{T}{\lambda}$ B) $v = T\lambda$
C) $v = \frac{\lambda}{T}$ D) $v = \lambda \frac{2}{T}$

24. As a car approaches a pedestrian crossing the road, the driver blows the horn. Compared to the sound wave emitted by the horn, the sound wave detected by the pedestrian has a

- A) higher frequency and a lower pitch
B) higher frequency and a higher pitch
C) lower frequency and a higher pitch
D) lower frequency and a lower pitch

25. Astronauts traveling toward Earth in a fast-moving spacecraft receive a radio signal from an antenna on Earth. Compared to the frequency and wavelength of the radio signal emitted from the antenna, the radio signal received by the astronauts has a

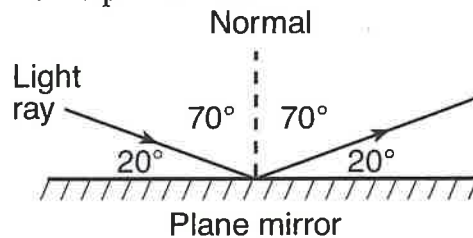
- A) lower frequency and a shorter wavelength
B) lower frequency and a longer wavelength
C) higher frequency and a shorter wavelength
D) higher frequency and a longer wavelength

26. Note the question below has only three choices.

As viewed from Earth, the light from a star has lower frequencies than the light emitted by the star because the star is

- A) moving toward Earth
B) moving away from Earth
C) stationary

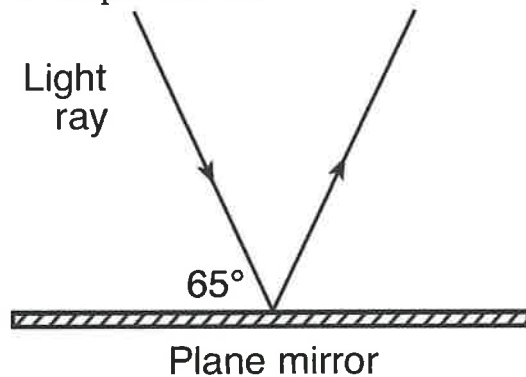
27. The diagram below represents a light ray reflecting from a plane mirror.



The angle of reflection for this light ray is

- A) 20° B) 70° C) 140° D) 160°

28. The diagram below represents a light ray reflecting from a plane mirror.



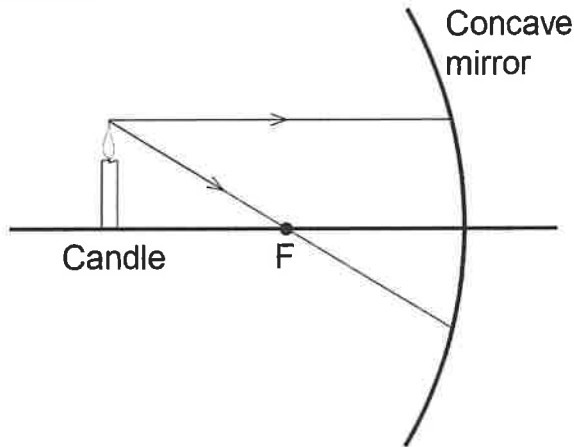
The angle of reflection for the light ray is

- A) 25° B) 35° C) 50.° D) 65°

29. An incident light ray travels parallel to the principal axis of a concave spherical mirror. After reflecting from the mirror, the light ray will travel

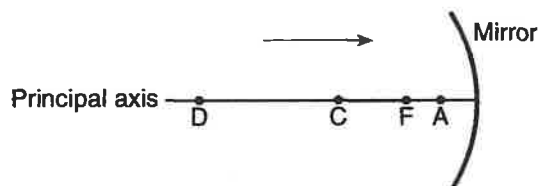
- A) through the mirror's principal focus
B) through the mirror's center of curvature
C) parallel to the mirror's principal axis
D) normal to the mirror's principal axis

30. A candle is located beyond the principal focus, F , of a concave spherical mirror. Two light rays originating from the same point on the candle are incident on the mirror, as shown in the diagram below.



After reflecting from the mirror, the light rays will

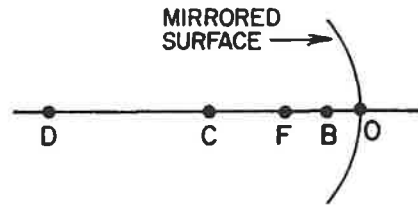
- A) diverge to form a virtual image
 - B) diverge to form a real image
 - C) converge to form a virtual image
 - D) converge to form a real image
31. The diagram below show a ray of light traveling parallel to the principal axis of a concave spherical mirror. Point F is the principal focus and point C is the center of curvature.



After striking the mirror, the ray of light will be reflected through point

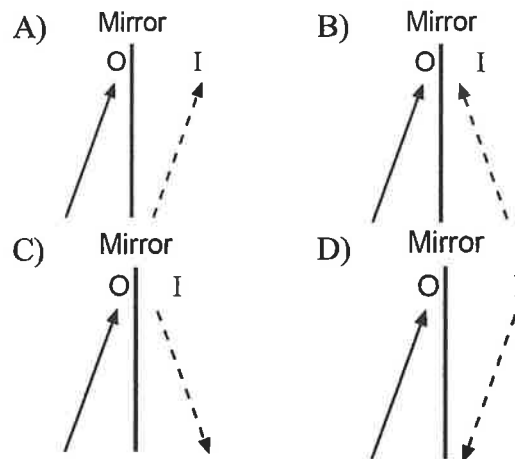
- A) A
- B) F
- C) C
- D) D

32. Base your answer to the following question on the diagram below which shows the principal axis of a concave spherical mirror. The focal point is F , and C is the center of curvature of the mirror. The focal length of the mirror is 0.10 meter.

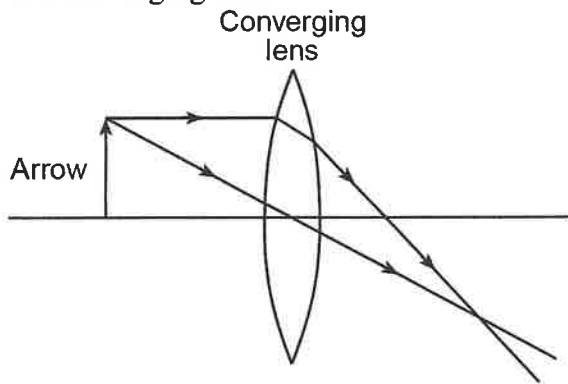


The radius of curvature of the mirror is

- A) 0.30 m
 - B) 0.20 m
 - C) 0.10 m
 - D) 0.050 m
33. Which diagram best represents image I , which is formed by placing object O in front of a plane mirror?

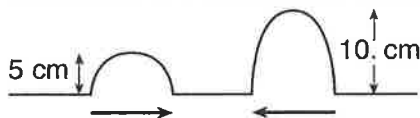


34. The diagram below shows an arrow placed in front of a converging lens.



The lens forms an image of the arrow that is

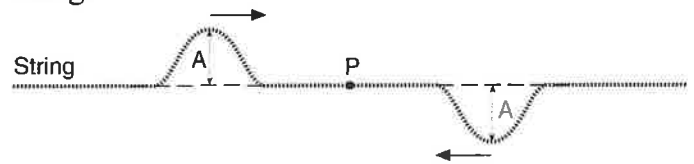
- A) real and inverted
 B) real and erect
 C) virtual and inverted
 D) virtual and erect
35. The focal length of a concave spherical mirror 0.060 meter. What is the radius of curvature of the mirror?
- A) 0.060 m B) 0.12 m
 C) 8.3 m D) 17 m
36. The diagram below shows two pulses approaching each other in a uniform medium.



Which diagram best represents the superposition of the two pulses?

- A) 7.5 cm
 B) 15 cm
 C) 5 cm
 D) 5 cm

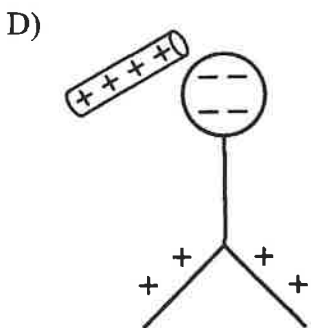
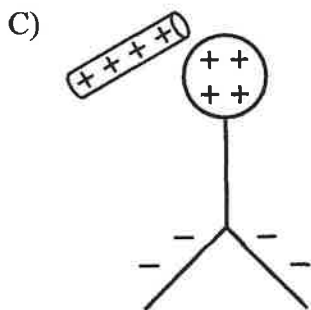
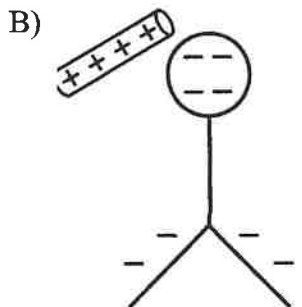
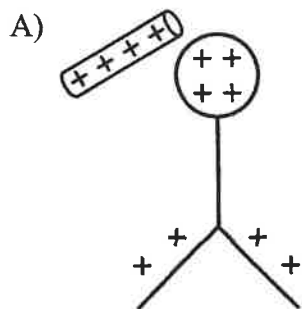
37. The diagram below shows two pulses of equal amplitude, A , approaching point P along a uniform string.



When the two pulses meet at P , the vertical displacement of the string at P will be

- A) A B) $2A$ C) 0 D) $\frac{A}{2}$
38. Which type of images can be projected onto a screen?
- A) real images, only
 B) virtual images, only
 C) both real images and virtual images
 D) neither real images nor virtual images
39. When a neutral metal sphere is charged by contact with a positively charged glass rod, the sphere
- A) loses electrons B) gains electrons
 C) loses protons D) gains protons

40. A positively charged rod is held near the knob of a neutral electroscope. Which diagram best represents the distribution of charge on the electroscope?



41. Two objects, *A* and *B* are rubbed together. If object *A* acquires an excess of 100 electrons object *B* must have

- A) gained 100 electrons
- B) gained 100 protons
- C) lost 100 electrons
- D) lost 100 protons

42. A glass rod is given a positive charge by rubbing it with silk. The rod has become positive by

- A) gaining electrons
- B) gaining protons
- C) losing electrons
- D) losing protons

43. When hair is combed with a hard rubber comb, the hair becomes positively charged because the comb

- A) transfers protons to the hair
- B) transfers electrons to the hair
- C) removes protons from the hair
- D) removes electrons from the hair

44. One of two identical metal spheres has a charge of $+q$, and the other sphere has a charge of $-q$. The spheres are brought together and then separated. Compared to the total charge on the two spheres before contact, the total charge on the two spheres after contact is

- A) less
- B) greater
- C) the same

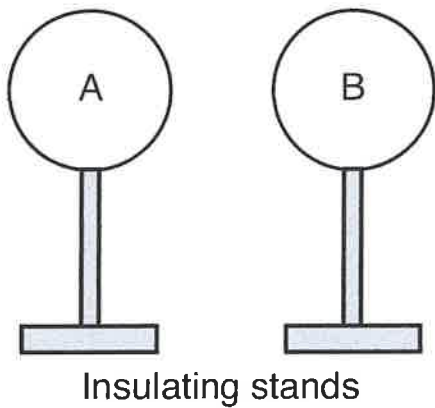
45. After two neutral solids, *A* and *B*, were rubbed together, solid *A* acquired a net negative charge. Solid *B*, therefore, experienced a net

- A) loss of protons
- B) increase of protons
- C) loss of electrons
- D) increase of electrons

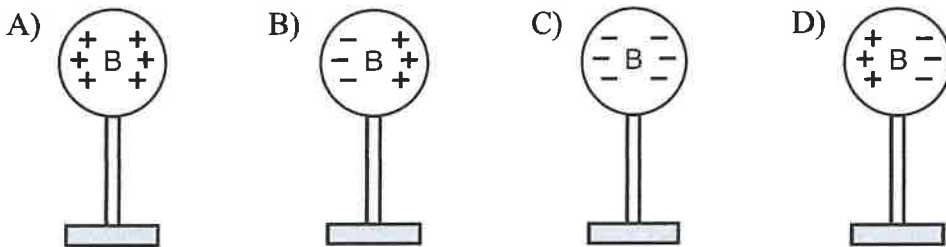
46. A particle could have a charge of

- A) $0.8 \times 10^{-19} \text{ C}$
- B) $1.2 \times 10^{-19} \text{ C}$
- C) $3.2 \times 10^{-19} \text{ C}$
- D) $4.1 \times 10^{-19} \text{ C}$

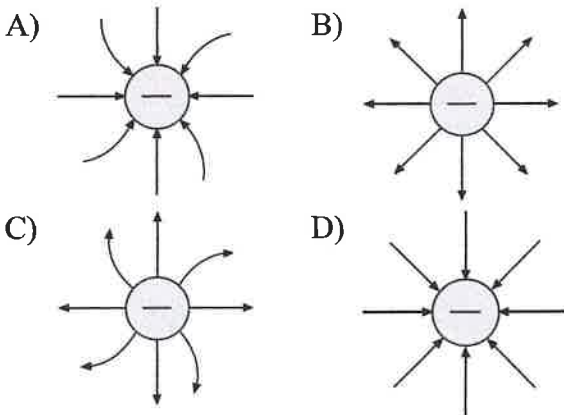
47. Two identically-sized metal spheres, *A* and *B*, are on insulating stands, as shown in the diagram below. Sphere *A* possesses an excess of 6.3×10^{10} electrons and sphere *B* is neutral.



Which diagram best represents the charge distribution on sphere *B*?



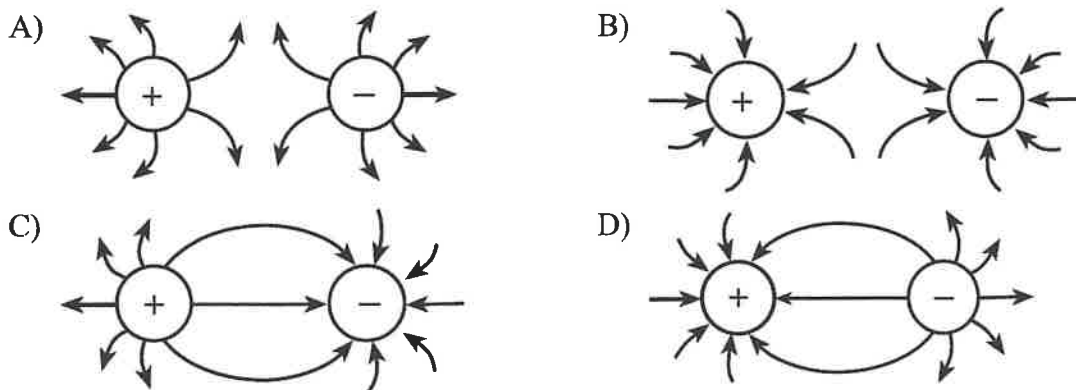
48. Which diagram best represents the electric field around a negatively charged conducting sphere?



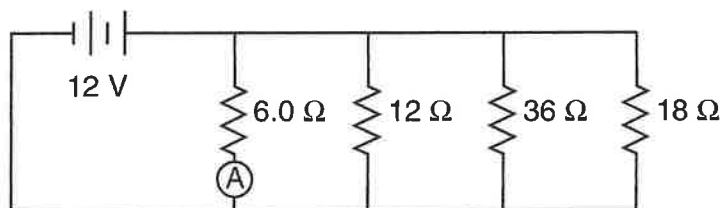
50. In a simple electric circuit, a 24-ohm resistor is connected across a 6.0-volt battery. What is the current in the circuit?

- A) 1.0 A B) 0.25 A
C) 140 A D) 4.0 A

49. Which diagram represents the electric field between two oppositely charged conducting spheres?

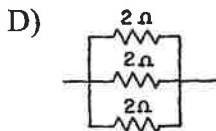
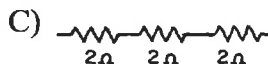
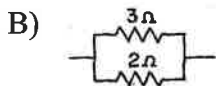
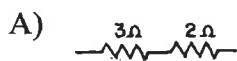


51. Base your answer to the following question on the diagram below, which represents an electric circuit consisting of four resistors and a 12-volt battery.

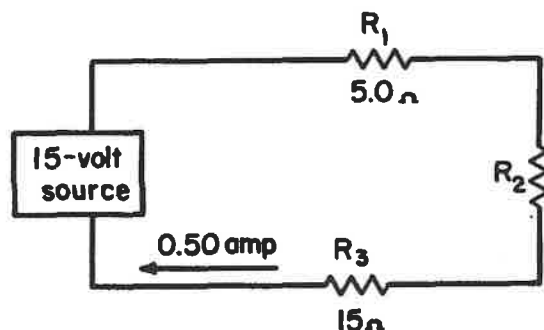


What is the current measured by ammeter A ?

- A) 0.50 A B) 2.0 A C) 72 A D) 4.0 A
52. A 6.0 ohm resistor that obeys Ohm's Law is connected to a source of variable potential difference. When the applied voltage is decreased from 12 V to 6.0 V, the current passing through the resistor
- A) remains the same B) is doubled
C) is halved D) is quadrupled
53. The potential difference across a resistor measures 40. volts and the current through it measures 4.0 amperes. The resistance of the resistor is
- A) 10 ohms B) 36 ohms
C) 44 ohms D) 160 ohms
54. Which voltage would cause a current of 0.5 ampere in a circuit that has a resistance of 24 ohms?
- A) 6.0 V B) 12 V C) 24 V D) 48 V
55. Which circuit segment has an equivalent resistance of 6 ohms?

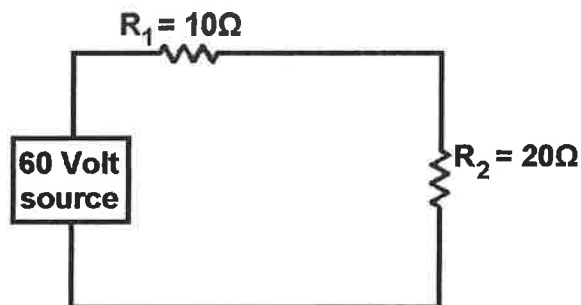


Base your answers to questions 56 and 57 on the diagram below which shows 3 resistors connected to a 15-volt source.



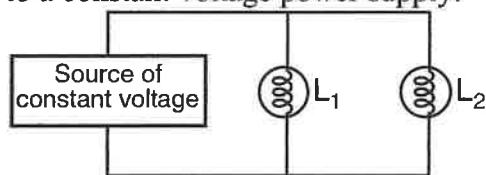
56. If resistor R_3 is removed and replaced by a resistor of lower value, the resistance of the circuit will
- A) decrease B) increase
C) remain the same
57. The total resistance of the circuit is
- A) 10 Ω B) 20 Ω C) 30 Ω D) 40 Ω

58. Base your answer to the following question on the diagram below.



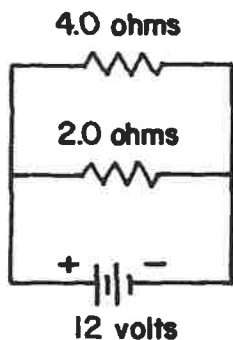
What is the total resistance of the circuit?

- A) 6.6Ω B) 10Ω C) 20Ω D) 30Ω
59. In the diagram below, lamps L_1 and L_2 are connected to a constant voltage power supply.



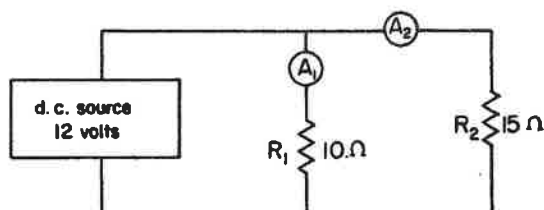
If lamp L_1 burns out, the brightness of L_2 will

- A) decrease B) increase
C) remain the same
60. In the circuit shown at the right, the potential difference across the 4.0-ohm resistor is



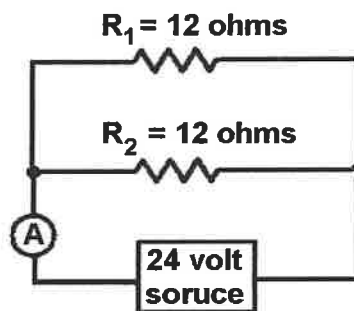
- A) 6.0 volts B) 2.0 volts
C) 3.0 volts D) 12 volts

61. Base your answer to the following question on the diagram below which represents an electrical circuit.



The potential difference across R_2 is

- A) 1.0 V B) 2.0 V C) 10. V D) 12 V
62. Base your answer to the following question on the diagram below.



The potential difference across R_2 is

- A) 24 V B) 18 V C) 6.0 V D) 4.0 V

Answer Key
Review for Final - May 2022

- | | | | |
|-----|-----------------|-----|-----------------|
| 1. | <u>B</u> | 36. | <u>B</u> |
| 2. | <u>B</u> | 37. | <u>C</u> |
| 3. | <u>B</u> | 38. | <u>A</u> |
| 4. | <u>B</u> | 39. | <u>A</u> |
| 5. | <u>B</u> | 40. | <u>D</u> |
| 6. | <u>B</u> | 41. | <u>C</u> |
| 7. | <u>A</u> | 42. | <u>C</u> |
| 8. | <u>D</u> | 43. | <u>D</u> |
| 9. | <u>A</u> | 44. | <u>C</u> |
| 10. | <u>A</u> | 45. | <u>C</u> |
| 11. | <u>C</u> | 46. | <u>C</u> |
| 12. | <u>D</u> | 47. | <u>D</u> |
| 13. | <u>C</u> | 48. | <u>D</u> |
| 14. | <u>A</u> | 49. | <u>C</u> |
| 15. | <u>A</u> | 50. | <u>B</u> |
| 16. | <u>A</u> | 51. | <u>B</u> |
| 17. | <u>C</u> | 52. | <u>C</u> |
| 18. | <u>A</u> | 53. | <u>A</u> |
| 19. | <u>B</u> | 54. | <u>B</u> |
| 20. | <u>D</u> | 55. | <u>C</u> |
| 21. | <u>B</u> | 56. | <u>A</u> |
| 22. | <u>B</u> | 57. | <u>C</u> |
| 23. | <u>C</u> | 58. | <u>D</u> |
| 24. | <u>B</u> | 59. | <u>C</u> |
| 25. | <u>C</u> | 60. | <u>D</u> |
| 26. | <u>B</u> | 61. | <u>D</u> |
| 27. | <u>B</u> | 62. | <u>A</u> |
| 28. | <u>A</u> | | |
| 29. | <u>A</u> | | |
| 30. | <u>D</u> | | |
| 31. | <u>B</u> | | |
| 32. | <u>B</u> | | |
| 33. | <u>B</u> | | |
| 34. | <u>A</u> | | |
| 35. | <u>B</u> | | |
-