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Simple Machines

1. A simple machine can multiply:
   A. forces only
   B. forces and energy
   C. energy only.
   D. forces and speed.
2. All of the following are considered to be simple machines EXCEPT:
   A. Scissors
   B. a jackknife
   C. a bicycle.
   D. a wheelbarrow.
3. A lever rotates around a fixed point called a:
   A. ball bearing
   B. pulley.
   C. gear.
   D. fulcrum.
4. Mechanical advantage can be defined as the ratio of:
   A. work input to work output
   B. work output to work input
   C. output force to input force
   D. input force to output force.
5. The simple machine that operates as a ramp that curves around a shaft is a:
   A. rope and pulley system
   B. Lever
   C. screw.
   D. gear.
6. The force directed along the ropes of a rope and pulley system is called:
   A. Thread
   B. mechanical advantage
   C. lead
   D. tension

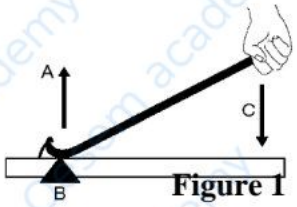
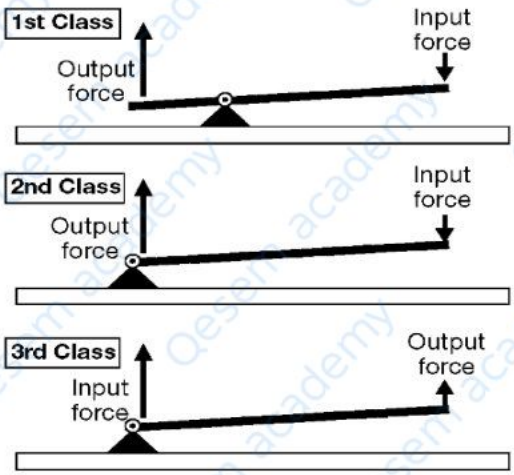


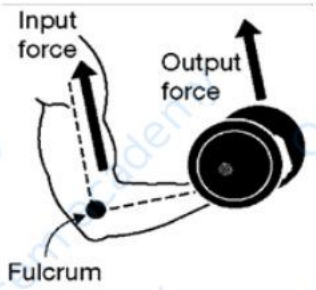
Figure 1

7. In the picture of the crowbar, which letter shows the fulcrum?
   A. A
   B. C
   C. B
   D. None of the above
8. In the picture of the crowbar, which letter shows the input force?
   A. A
   B. C
   C. B
   D. None of the above
9. The gear ratio is equal to:
   A. output teeth divided by input teeth
   B. output turns divided by input turns
   C. input speed divided by output speed.
   D. input direction divided by output direction.
10. Gears may be combined in a system to:
    A. transfer motion.
    B. change rotating speeds
    C. multiply forces.
    D. All of the above

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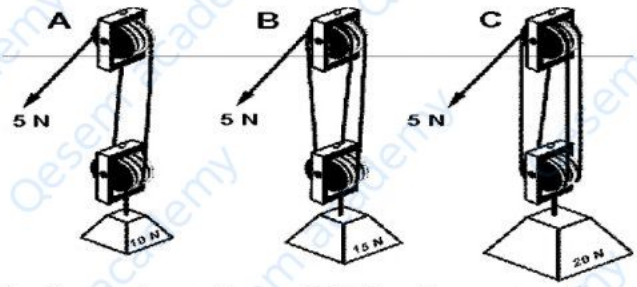


11. According to **the above figure**, if the output force of a lever is located between the fulcrum and input force, the lever is a:
    A. first class lever.
    B. second class lever.
    C. third class lever.
    D. Not enough information is given.
12. In which class of levers shown in **the above figure** is mechanical advantage always greater than 1?
    A. First class
    B. Second class
    C. Third class
    D. You cannot have a mechanical advantage greater than 1.
13. The human arm is an example of which class of lever?
    A. First class
    B. Second class
    C. Third class
    D. None of the above

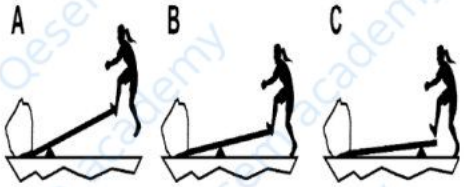


14. Which of the following rope and pulley systems has the largest mechanical advantage?
    A. System A has the largest mechanical advantage.
    B. System B has the largest mechanical advantage.
    C. System C has the largest mechanical advantage.
    D. All three systems have the same mechanical advantage.

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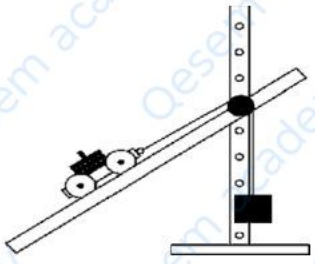


15. A simple machine has an input force of 10N and an output force of 100N. What is the mechanical advantage of the simple machine?
    A. 0.1 C. 1
    B. 10 D. 90
16. A rope and pulley system has an input force of 2.5N and an output force of 10N. What is the mechanical advantage of the system?
    A. 0.25 C. 7.5
    B. 4 D. 25
17. A rope and pulley system is used to lift a box that weighs 90 newtons. How much force do you need to pull on the rope if the machine has a mechanical advantage of 5?
    A. 5 N C. 9 N
    B. 18 N D. 45 N
18. Which of the following levers has the largest mechanical advantage?



    A. Lever A
    B. Lever B
    C. Lever C
    D. All three levers have the same mechanical advantage.
19. A lever has an input arm 50 centimeters long and an output arm 40 centimeters long. What is the mechanical advantage of the lever?
    A. 0.8 C. 1
    B. 1.25 D. 2.0
20. All of the following simple machines are represented in the diagram below EXCEPT:

    A. lever.
    B. ramp.
    C. wheel and axle.
    D. rope and pulley.



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21. If the mechanical advantage of a simple machine is 5, then:
    A. the input force is 5 times greater than the output force.
    B. the output force is 5 times greater than the input force.
    C. The output work is 5 times greater than the input work.
    D. The efficiency is 500%.
22. If the output force is bigger than the input force, the mechanical advantage is always:
    A. between 0 and 1
    B. larger than 1.
    C. less than 1
    D. 0.
23. What is a simple machine that changes the direction of a force?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Wedge
24. Which simple machine increases the force applied to an object?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Screw
25. What is a simple machine consisting of a rigid bar that pivots around a fixed point?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Wedge
26. Which simple machine is used to lift heavy loads by wrapping a rope around a wheel?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Wedge
27. Which simple machine reduces the force needed to move an object by increasing the distance over which the force is applied?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Screw
28. What is a simple machine that is a circular inclined plane?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Wedge
29. Which simple machine transforms a circular motion into a linear motion?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Screw
30. What is a simple machine that is a sloping surface used to raise or lower an object?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Wedge
31. Which simple machine is a pointed tool used to separate or hold objects apart?
    A. Lever
    B. Wedge
    C. Pulley
    D. Screw
32. Which simple machine is a helical inclined plane?
    A. Lever
    B. Screw
    C. Pulley
    D. Wedge

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33. What type of simple machine is a lever?
    A. Rotational
    B. Both A and B
    C. Linear
    D. Neither A nor B
34. What is the purpose of a lever?
    A. To increase force
    B. To change direction of force
    C. To change speed of force
    D. All of the above
35. What is the mechanical advantage of a lever?
    A. The ratio of the force applied to the distance from the fulcrum
    B. The ratio of the distance from the fulcrum to the output force
    C. The ratio of the input force to the output force
    D. The ratio of the output force to the input force
36. What is the formula for calculating the mechanical advantage of a lever?
    A. Output force / Input force
    B. Input force / Output force
    C. Distance from fulcrum to output force / Distance from fulcrum to input force
    D. Distance from input force to fulcrum / Distance from output force to fulcrum
37. What is the velocity ratio of a lever?
    A. The ratio of the input force to the output force
    B. The ratio of the distance from the fulcrum to the input force to the distance
    C. from the fulcrum to the output force
    D. The ratio of the output force to the input force
    E. The ratio of the distance from the input force to the fulcrum to the distance from the output force to the fulcrum
38. How is the efficiency of a machine calculated?
    A. Output force / Input force x 100
    B. Output distance / Input distance x 100
    C. Input force / Output force x 100
    D. Input distance / Output distance x 100
39. What is the ideal efficiency of a machine?
    A. 0%
    B. 100%
    C. 50%
    D. None of the above
40. What is the formula for calculating the efficiency of a machine?
    A. (Output force X Distance of output force) / (Input force X Distance of input force)
    B. (Input force x Distance of input force) / (Output force x Distance of output force)
    C. Output force / Input force
    D. Input force / Output force
41. What is the efficiency of a machine that has a mechanical advantage of 2 and an ideal input force of 10 N?
    A. 50%
    B. 100%
    C. 200%
    D.500%

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42. What is the mechanical advantage of a machine that has an input force of 10 N and an output force of 20 N?
    A. 2
    B. 10
    C. 0.5
    D. 0.05
43. What is the velocity ratio of a machine that has a distance from the fulcrum to the input force of 2 m and a distance from the fulcrum to the output force of 1 m?
    A. 0.5
    B. 1
    C. 2
    D. 0.25
44. What is the efficiency of a machine that has a mechanical advantage of 3 and a velocity ratio of 2?
    A. 100%
    B. 33.3%
    C. 50%
    D. 66.7%
45. Which simple machine increases the speed of force?
    A. Inclined Plane
    B. Pulley
    C. Lever
    D. Wheel and Axle
46. Which simple machine increases the force of force?
    A. Inclined Plane
    B. Pulley
    C. Lever
    D. Wedge
47. Which simple machine changes the direction of force?
    A. Lever
    B. Inclined Plane
    C. Pulley
    D. Wedge
48. What is the purpose of a wedge?
    A. To increase force
    B. To change direction of force
    C. To change speed of force
    D. To separate or hold objects apart
49. What is the formula for calculating the velocity ratio of a pulley system?
    A. (Distance from the input force to the pulley) / (Distance from the pulley to the output force)
    B. (Distance from the pulley to the output force) / (Distance from the input force to the pulley)
    C. Input force / Output force
    D. Output force / Input force
50. What is the efficiency of a machine that has a mechanical advantage of 4 and a velocity ratio of 2, with friction accounting for 10% of the input force?
    A. 80%
    B. 70%
    C. 90%
    D. 75%

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Wave and Sound

1. What type of wave is sound?
   A. Electromagnetic
   B. Digital
   C. Mechanical
   D. None of the above
2. What is the speed of sound in air at room temperature (20°C or 68°F)?
   A. 100 m/s
   B. 1000 m/s
   C. 331 m/s
   D. 3000 m/s
3. What is the primary medium of sound transmission?
   A. Water
   B. Gas
   C. Solid
   D. All of the above
4. Which wave property is related to the loudness of a sound?
   A. Amplitude
   B. Frequency
   C. Wavelength
   D. Phase
5. Which property of sound is measured in decibels (dB)?
   A. Volume
   B. Intensity
   C. Frequency
   D. Loudness
6. What is the difference between transverse and longitudinal waves?
   A. Transverse waves have oscillating particles in the same direction as wave travel, while longitudinal waves have oscillating particles in the direction perpendicular to wave travel
   B. transverse waves have oscillating particles in the direction perpendicular to wave travel, while longitudinal waves have oscillating particles in the same direction as wave travel
7. What type of wave motion is involved in the propagation of sound waves in solids?
   A. Both transverse and longitudinal wave motion
   B. Longitudinal wave motion
   C. transverse wave motion
   D. None of the above
8. Which ONE of the following types of waves is NOT an example of a mechanical wave?
   A. Sound waves
   B. Water waves
   C. Light waves
   D. Seismic waves
9. Select the correct definition from the list below for a transverse wave.
   A. The oscillations of a transverse wave are perpendicular to the direction in which the waves transfer energy.
   B. The oscillations of a transverse wave are parallel to the direction in which the waves transfer energy.
   C. The oscillations of a transverse wave are at 45° to the direction in which the waves transfer energy.
   D. The oscillations of a transverse wave are in the same direction in which the waves transfer energy.

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10. Which of the following statements about longitudinal waves is FALSE?
    A. Sound waves are an example of a longitudinal wave.
    B. A slinky spring can be used to demonstrate how longitudinal waves travel.
    C. Longitudinal waves have areas of compression and rarefaction.
    D. All electromagnetic waves are longitudinal waves.
11. What is the relationship between amplitude and energy?
    A. The bigger the amplitude of the waves, the more energy the waves carry.
    B. The smaller the amplitude of the waves, the more energy the waves carry.
    C. Amplitude and energy are not related, they have no effect on each other.
    D. Doubling the amplitude of the waves, reduces the amount of energy the wave carries by half.
12. If the time period of a wave is 4 secs, what is the frequency of the wave?
    A. 4 Hz
    B. 0.25 Hz
    C. 25 Hz
    D. 40 Hz
13. Identify the correct equation to calculate wave speed.
    A. $v = f\ \lambda$
    B. $v = \lambda\ F$
    C. $v = f.\ \lambda$
    D. $v = f.\ \lambda$
14. Sound waves in air travel at an approximate speed of …
    A. 34 m/s
    B. 3400 m/s
    C. 340 m/s
    D. 3×10^8 m/s
15. Which piece of apparatus would be most suitable for investigating waves?
    A. A beaker of water.
    B. A Ripple tank.
    C. A mirror.
    D. A flat piece of wood.
16. Refraction occurs at a boundary between two mediums because…
    A. the speed and wavelength of the waves change.
    B. the speed of the wave changes.
    C. the speed and amplitude of the waves change.
    D. the wavelength and the amplitude of the waves change.
17. Sound waves cannot travel through…
    A. matter.
    B. a vacuum.
    C. solids.
    D. a gas.
18. A reflected sound wave is known as …
    A. a repeat.
    B. a return.
    C. an echo.
    D. a reverberation.
19. The frequency range of human hearing is…
    A. 200 – 20,000 Hz
    B. 200 – 200, 000 Hz
    C. 20 – 2,000,000 Hz
    D. 20 – 20,000 Hz
20. Dolphins can use sonar to detect objects in the sea. How far away is the object from the dolphin if the sonar takes 1 sec to be returned? Sound travels at 1484 m/s in sea water.
    A. 742 m
    B. 2968 m
    C. 1484 m
    D. 371 m

21. Ultrasound waves are used for medical scans because they are partly reflected at a boundary between…
    A. air and body tissue.
    B. body tissue and bone only
    C. body tissues of the same type
    D. two different types of body tissue.
22. Which ONE of the following statements about seismic waves is correct?
    A. Primary seismic waves and secondary seismic waves are longitudinal waves.
    B. Primary seismic waves and secondary seismic waves are transverse waves.
    C. Primary seismic waves are longitudinal waves and secondary seismic waves are transverse waves.
    D. Primary seismic waves are transverse waves and secondary seismic waves are longitudinal waves.
23. The frequency of a sound wave is 440 oscillations every second. Calculate the time period of the tuning fork.
    A. 2.5×10^{-3} s
    B. 4.4×10^{-3} s
    C. 440 s
    D. 2.5 s
24. The source of nearly all wave motion is a
    A. movement of matter.
    B. harmonic object.
    C. vibration.
    D. region of variable high and low pressure.
25. Which of the following is NOT a transverse wave?
    A. Sound
    B. radio wave
    C. light
    D. all of these
26. The distance between successive identical parts of a wave is called its
    A. frequency.
    B. wavelength.
    C. period.
    D. amplitude.
27. The period of an ocean wave is 10 seconds. What is the wave's frequency?
    A. 10 Hz
    B. 0.5 Hz
    C. 1.0 Hz
    D. 0.1 Hz
28. A certain ocean wave has a wavelength of 10 meters and a frequency of 0.05 hertz. What is the wave's speed?
    A. 200 m/s
    B. 0.5 m/s
    C. 10 m/s
    D. 0.05 m/s
29. What is true regarding the speed of sound in vacuum?
    A. Speed of sound in vacuum is a constant quantity
    B. Speed of sound in vacuum is variable
    C. Speed of sound is equal to speed of light in vacuum
    D. Sound cannot travel in vacuum

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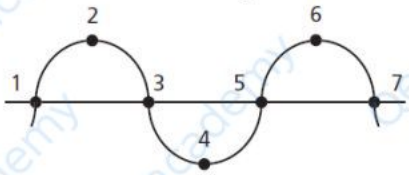
30. When sound travels through air, the air particles _____.
    A. vibrate along the direction of wave propagation
    B. vibrate but not in any fixed direction
    C. vibrate perpendicular to the direction of wave propagation
    D. do not vibrate
31. The speed of sound in medium depends upon
    A. Properties of the medium
    B. Amplitude
    C. Frequency
    D. Wavelength
32. Wavelength of sound is
    A. Distance traveled by the sound wave during one vibration of a particle
    B. Distance between two adjacent compressions
    C. Distance between two adjacent rarefactions
    D. All the above
33. The distance traveled by sound wave of frequency 3.4 kHz traveling with a b speed of 340 m/s in one time period is _____ m
    A. 100 C. 10
    B. 1 D. 0.1
34. Which of the following quantities is transferred during wave propagation?
    A. Energy C. Speed
    B. Mass D. Matter
35. Assuming the speed of sound in air as 340 m/s, a person receives an echo from a hill after 1 second. What would be the distance of the hill from the person?
    A. 1700 m C. 170 m
    B. 340 m D. 3400 m
36. When size of the obstacle in the path of sound is small compared to its Wavelength which of the following effects will be observed?
    A. Interference of sound
    B. Diffraction of sound
    C. Reflection of sound
    D. Polarization of sound
37. When size of the obstacle in the path of sound is large compared to its wavelength which of the following effects will be observed?
    A. Interference of sound
    B. Diffraction of sound
    C. Reflection of sound
    D. Polarization of sound
38. The minimum distance between the source and the reflector, so that an echo is heard is approximately equal to
    A. 10 m C. 17 m
    B. 34 m D. 13 m

39. The intensity of sound waves is directly proportional to a
    A. Square of amplitude
    B. Square root of amplitude
    C. Inverse of amplitude
    D. Inverse square root of amplitude

40. Earthquakes are recorded by detectors on the surface of the Earth called…
    A. accelerometers.
    B. seismometers.
    C. Quake-alarms.
    D. motion detector.

40. Seismic P waves are useful for investigating the inner structure of the Earth because they…
    A. travel slower than S waves.
    B. are reflected by solid rock.
    C. are refracted by different densities of rock.
    D. cannot travel through liquids.

41. Some points are marked on a wave, as shown in the diagram below. The wavelength is the distance between which points?



    A. 2 and 6
    B. 1 and 3
    C. 4 and 5
    D.1 and 7

42. A girl throws a small stone into a lake. Waves spread out from where the stone hits the water and travel to the bank of the lake. She notices that ten waves reach the side of the pond in a time of 5.0s. What is the frequency of the waves?
    A. 0.50 Hz
    B. 2.0 Hz
    C. 15 Hz
    D. 50 Hz

43. Water waves can be used to show reflection, refraction, and diffraction. For each of these, which row shows whether or not the speed of the water waves changes?

	Reflection	Refraction	Diffraction
A.	Yes	Yes	Yes
B.	Yes	No	Yes
C.	No	Yes	No
D.	No	No	No

44. It is the maximum displacement moved by a point on a vibrating body from the rest or mean position.
    A. Amplitude
    B. Trough
    C. Crest
    D. Compression

45. What is called as the sound power per unit area?
    A. Sound intensity
    B. Sound amplitude
    C. Sound pressure
    D. Sound velocity

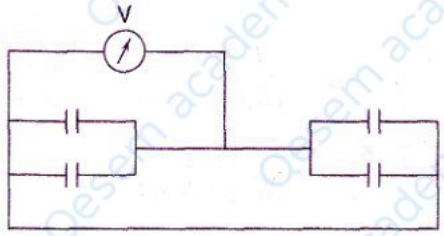
46. What happens when two waves meet at the same place at the same time?
    A. The two waves pass through each other without reflecting or refracting.
    B. The waves interfere to produce either a larger or smaller amplitude at the point where they meet.
    C. Nothing happens.
    D. Both A and B occur.
47. How many times a minute does a boat bob up and down on ocean waves that have a wavelength of 40.0 m and a propagation speed of 5.00 m/s?
    A. 6 times
    B. 4.5 times
    C. 7.5 time
    D. 9 times
48. Air temperature in the Sahara Desert can reach 56.0 °C (about 134 °F). What is the speed of sound in air at that temperature?
    A. 363 m/s
    B. 390 m/s
    C. 400 m/s
    D. 354 m/s
49. If a submarine's sonar can measure echo times with a precision of 0.0100 s, what is the smallest difference in distances it can detect (V=1540 m/s)?
    A. 10 m
    B. 7.7 m
    C. 8.9 m
    D. 5.2 m
50. The distance between a loudspeaker and the left ear of a listener is 2.70 m. What is the time required for sound to travel this distance if the air temperature is 20 °C?
    A. 7.87×10^{-3} s
    B. 3.56×10^{-3} s
    C. 8.78×10^{-3} s
    D. 4.67×10^{-3} s

Electrostatic

1. Electric charge is measured in:
    A. Amperes
    B. Volts
    C. Coulombs
    D. Watts
2. Coulomb's law describes the relationship between electric force and:
    A. Electric field
    B. Electric charge
    C. Electric potential
    D. Electric current
3. Electric field lines represent:
    A. The path of electric charge
    B. The direction of electric force
    C. The magnitude of electric potential
    D. The strength of electric current
4. Electric potential energy depends on:
    A. The magnitude of electric charge
    B. The distance between charges
    C. The direction of electric field
    D. All of the above
5. The difference between two points in an electric field is also known as:
    A. Electric force
    B. Electric resistance
    C. Electric power
    D. Voltage

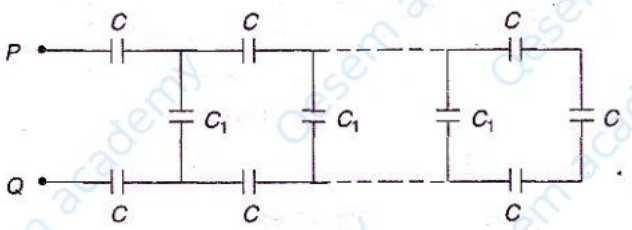
6. Equipotential surfaces are defined as surfaces where:
    A. The electric field is constant
    B. The electric potential is constant
    C. The electric charge is constant
    D. The electric current is constant
7. Capacitors store electric charge in the form of:
    A. Electric potential energy
    B. Electric current
    C. Electric fields
    D. Electric potential difference
8. A parallel plate capacitor consists of two parallel plates separated by a distance d. The capacitance of a parallel plate capacitor depends on:
    A. The area of the plates
    B. The distance between the plates
    C. The dielectric constant of the material between the plates
    D. All of the above
9. When capacitors are connected in parallel, the total capacitance is given by:
    A. The sum of the individual capacitances
    B. The product of the individual capacitances
    C. The reciprocal of the sum of the individual capacitances
    D. The reciprocal of the product of the individual capacitances
10. The energy stored in a capacitor is directly proportional to:
    A. The capacitance
    B. The voltage across the capacitor
    C. The charge stored in the capacitor
    D. All of the above
11. In a circuit, the potential difference across a capacitor is equal to:
    A. The voltage supplied by the battery
    B. The sum of the voltages across all components
    C. The voltage drops across the resistor
    D. None of the above
12. A dielectric material inserted between the plates of a capacitor:
    A. Increases the capacitance
    B. Decreases the capacitance
    C. Does not affect the capacitance
    D. Causes the capacitor to discharge
13. If a capacitor is fully charged and then disconnected from the circuit, the charge on the capacitor:
    A. Decreases
    B. Increases
    C. Remains the same
    D. Becomes zero

14. Which of the following is true for a charged capacitor in a circuit?
    A. The potential difference across the capacitor is zero
    B. The electric field inside the capacitor is zero
    C. The electric potential on the positive plate is higher than the negative plate
    D. The electric potential on the negative plate is higher than the positive plate
15. Four capacitors, each of capacitance 50 μF are connected as shown in Fig. If the voltmeter reads 100 V, the charge on each capacitor is



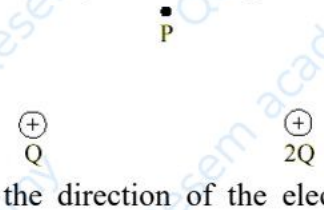
    A. 2×10^{-3} C
    B. 0.2 C
    C. 5×10^{-3} C
    D. 0.5 C
16. In the network shown in Fig., $C_1 = 6$ μF and $C = 9$ μF. The equivalent capacitance between points P and Q is

    A. 3 μF
    B. 6 μF
    C. 9 μF
    D. 12 μF



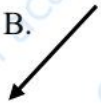
17. Three capacitors connected in series have an effective capacitance of 2 μF. If one of the capacitors is removed, the effective capacitance becomes 3 μF. The capacitance of the capacitor that is removed is
    A. 1μF
    B. $\frac{2}{3}$μF
    C. $\frac{3}{2}$μF
    D. 6 μF
18. Two-point charges Q_1 & Q2, separated by distance r exert a force F on each other. When another charge q is added to Q_1, the force increases by a factor of 1.5. The magnitude of q in terms of Q_1 is
    A. Q_1
    B. $0.5Q_1$
    C. $1.5Q_1$
    D. $2Q_1$
19. An electron ($m = 9x10^{-31}$kg) is released from rest in a region where there is a uniform electric field of $9x10^4$ N/C. How long does it take the electron to move a distance of 3.2m?
    A. $4x10^{-16}$s
    B. $4x10^{-8}$s
    C. $2x10^{-8}$s
    D. $2x10^{-6}$s

20. A 0.2 gm ball hangs from a thread in a vertical electric field of 3kN/c directed upward. What is the charge on the ball if the tension in the thread is zero.
    A. 6.66nC
    B. 0.67μC
    C. 0.67×10^{-8}C
    D. 67μC
21. A capacitor when connected in an electric circuit block
    A. AC only
    B. neither AC nor DC
    C. DC only
    D. both AC and DC
22. Two charges q_1 and $q_2 = 4q_1$, are 1m apart. If the electric potential at a point midway between the two charges is 4.5×10^5 V, what is the electric field at this point?
    A. 9×10^5 N/C
    B. 5.4×10^5N/C
    C. 4.5×10^5N/C
    D. 2.7×10^5N/C
23. The effective capacitance of two capacitors, when connected in parallel in 32μF and when connected in series is 6μF. what are the values of the two capacitors in μF?
    A. 16, 16
    B. 5, 27
    C. 20, 12
    D. 8, 24
24. If a charge of Q= 5μC is moved from a point with 25V potential to a point with 125V potential, what is the increase in potential energy.
    A. 5×10^{-4}J
    B. 1.25×10^{-4}J
    C. 2×10^{-5}J
    D. 6.25×10^{-4} J
25. An important difference between electrical and gravitational force is that gravitational force always
    A. stronger
    B. positive
    C. attractive
    D. constant in magnitude
26. An object cannot have a charge of
    A. 3.2×10^{-19}C
    B. 4.8×10^{-19} C
    C. 8×10^{-19} C
    D. 4.5×10^{-19} C
27. The diagram below shows two positive charges of magnitude Q and 2Q.



Which vector best represents the direction of the electric field at point P, which is equidistant from both charges?

A.


B.


C.


D.


28. A 6.0 x 10^{-6} C charge is located 4.0 m from a –3.0 x10^{-6} C charge.



$Q_1 = 6.0 \times 10^{-6}$ C $\qquad$ $Q_2 = -3.0 \times 10^{-6}$ C

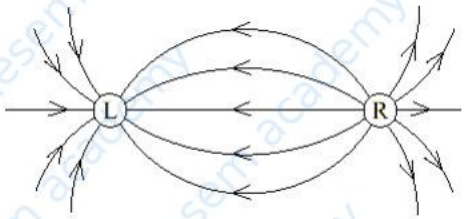
What is the electric potential at P, halfway between the charges?

A. -4.1 x 10^{-2} V
B. 1.4 x 10^{4} V
C. 6.8 x 10^{3} V
D. 4.1 x 10^{4} V

29. The diagram below shows the electric field near two-point charges L and R.

What is the polarity of each charge?

	Charge L	Charge R
A.	positive	positive
B.	positive	negative
C.	negative	positive
D.	negative	negative



30. The electric field 2.0 m from a point charge has a magnitude of 8. x 10^{4} N/C. What is the strength of the electric field at a distance of 4.0 m?

A. 2 x 10^{4} N/C
B. 1.6 x 10^{5} N/C
C. 4 x 10^{4} N/C
D. 3.2 x 10^{5} N/C

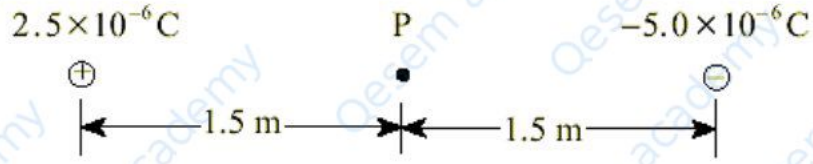
31. When a charge is accelerated through a potential difference of 500 V, its kinetic energy increases from 2.0 x 10^{-5} J to 6. 0 x 10^{-5}J. What is the magnitude of the charge?

A. 4.0 x 10^{-8} C
B. 2 x 10^{-7} C
C. 8.0 x 10^{-8} C
D. 6 x 10^{-7} C

32. A negative charge in an electric field experiences a force accelerating it due south. What is the direction of the electric field?

A. East
B. North
C. West
D. South

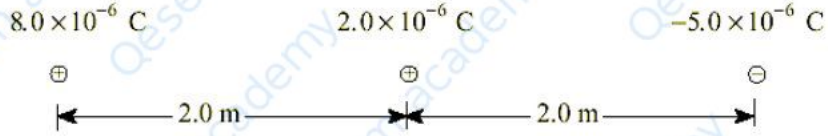
33. Two-point charges, 2.5 x 10^{-6}C and -5.0 x 10^{-6}C, are placed 3.0 m apart as shown below.



What is the magnitude of the electric field at point P, midway between the two charges?

A. 0 N/C
B. 2.0 x 10^{4} N/C
C. 1.0 x 10^{4} N /C
D. 3.0 x 10^{4} N/C

34. A 2 x 10^{-6} C charge is located halfway between an 8 x 10^{-6} C charge and a -5.0 x 10^{-6} C charge as shown below.



Find the net force on the 2.0 x 10^{-6} C charge.

A. 1.4 x 10^{-2} N towards the left
B. 5.9 x 10^{-2} N towards the left
C. 1.4 x 10^{-2} N towards the right
D. 5.9 x 10^{-2} N towards the right

35. What is the electric potential energy of an electron located 5. 3 x 10^{-11} m from the proton in a hydrogen atom?

A. -8. 2 x 10^{-8} J
B. -2.2 x 10^{-18} J
C. -4.3 x 10^{-18} J
D. -1.6 x 10^{-19}J

36. Two parallel plates 4.0 x 10^{-2} m apart have a potential difference of 1000 V. An electron is released from the negative plate at the same instant that a proton is released from the positive plate. Which of the following best compares their speed and kinetic energy as they strike the opposite plate?

	Speed of Electron and proton	**Kinetic Energy of Electron and Proton**
A.	same	same
B.	same	different
C.	different	same
D.	different	different

37. The diagram below shows a positive point charge Q.



Which of the following describes the magnitude and direction of the electric field at points r and s?

	Magnitude of field at r and s	**Direction of field at r and s**
A.	Same	away from Q
B.	same	towards Q
C.	different	away from Q
D.	different	towards Q

38. Two long, parallel plates are separated by 0.028 m and have a potential difference between them of 80 V, as shown below.



Point P is located midway between the plates. What is the potential difference between point P and one of the plates?

A. 0 V
B. 80 V
C. 40 V
D. 160 V

39. Two positive charges, equal in magnitude, are separated as shown below.

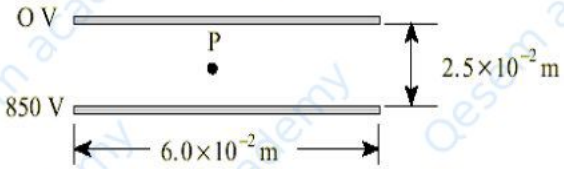


In which location would the electric field strength be zero?

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

40. An electron is positioned in an electric field. The force on the electron due to the electric field is equal to the force of gravity on the electron. What is the magnitude of this electric field?
    A. 8.93×10^{-30} N/C
    B. 5.69×10^{-12} N/C
    C. 5.58×10^{-11} N/C
    D. 1.44×10^{-9} N/C

41. Two parallel plates 6.0×10^{-2} m long are separated by 2.5×10^{-2} m and have a potential difference of 850 V. Point P is located midway between the two plates as shown below.

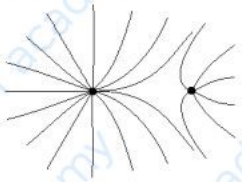


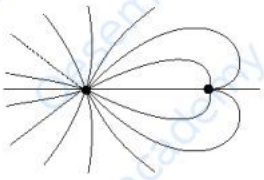
What is the magnitude of the electric field at point P?

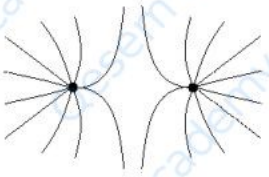
A. 4×10^{4} V/ m
B. 3.4×10^{4} V/ m
C. 7×10^{4} V/ m
D. 6.8×10^{4} V/ m

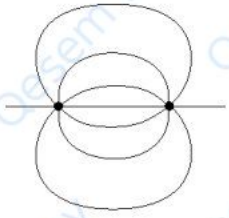
42. A particle with a charge of 2.4×10^{-5} C is accelerated from rest through a potential difference of 6.2×10^{4} V. If the final speed of this particle is 9.3×10^{3} m/s, what is the mass of the particle?
    A. 7.7×10^{-10} kg
    B. 3.4×10^{-8} kg
    C. 5.2×10^{-9} kg
    D. 1.5×10^{-1} kg

43. Which of the following diagrams shows the electric field in the region of two equal but opposite point charges?

A. 

C. 

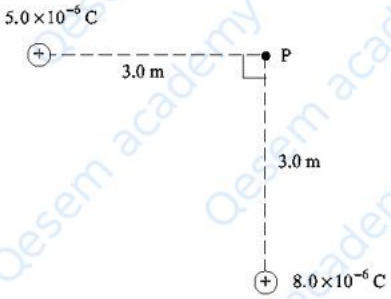
B. 

D. 

44. An electron experiences an electric force of 1.8×10^{-11} N at a distance of 5×10^{-9} m from the nucleus of an ion. The electron is moved farther away, to a distance of 2×10^{-8} m from the ion. What is the new electric force on the electron?

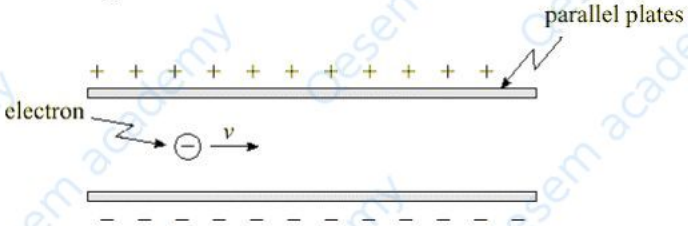
A. 1.1×10^{-12} N
B. 7.2×10^{-11} N
C. 4.5×10^{-12} N
D. 2.9×10^{-10} N

45. What is the magnitude of the electric field at point P due to the two fixed charges as shown?



A. 3.0×10^{3} N/C
B. 1.3×10^{4} N/C
C. 9.4×10^{3} N/C
D. 3.9×10^{4} N/C

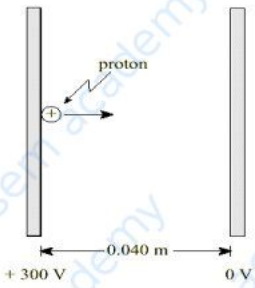
46. An electron is travelling in an electric field as shown.



Describe the electrostatic force acting on the electron while in the field.

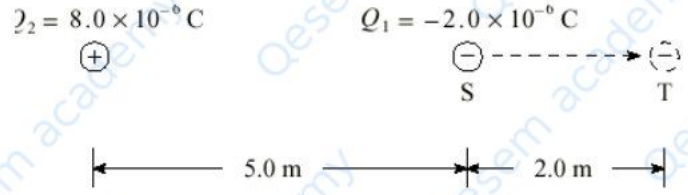
MAGNITUDE OF FORCE	DIRECTION OF FORCE
A. Changing	Upward
B. Changing	Downward
C. Constant	Upward
D. Constant	Downward

47. A proton initially at rest is accelerated between parallel plates through a potential difference.
What is the maximum speed attained by the proton?



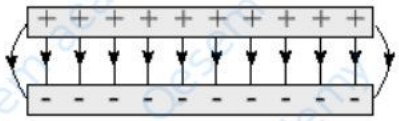
A. 7.5×10^{3} m/s
B. 1.7×10^{5} m/s
C. 2.4×10^{5} m/s
D. 1.2×10^{6} m/s

48. How much work is done moving the -2.0×10^{-6}C charge, Q_1, from S to T in the diagram shown below?

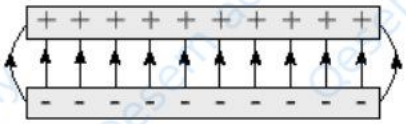


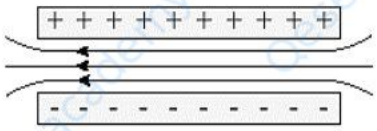
A. 5.6×10^{-3} J
B. 8.2×10^{-3} J
C. 1.2×10^{-2} J
D. 7.2×10^{-2} J

49. Which diagram shows the electric field between a pair of charged parallel plates?

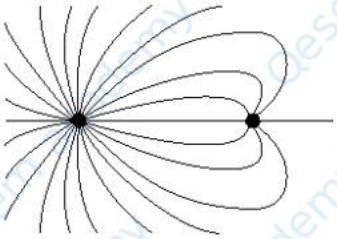
A. 

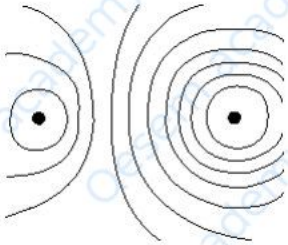
C. 

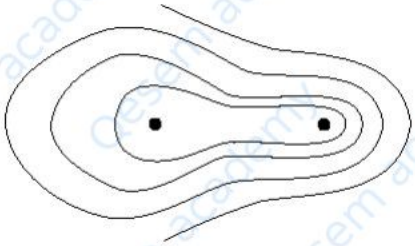
B. 

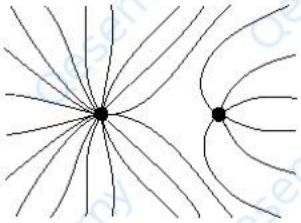
D. 

50. Which of the following shows the electric field between two opposite charges of unequal magnitude?

A. 

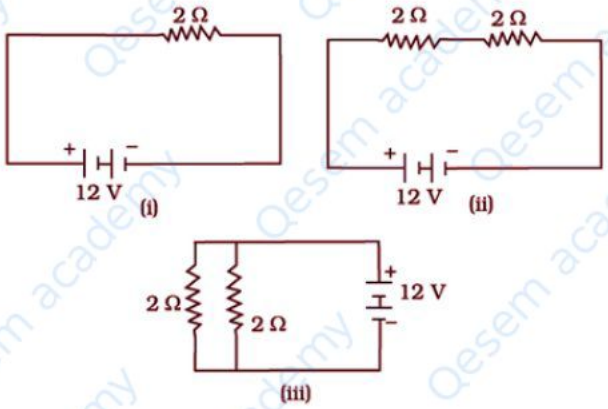
C. 

B. 

D. 

Electricity

1. In the following circuits, heat produced in the resistor or combination of resistor connected to a 12 V battery will be



A. Same in all the cases
B. Maximum in case (ii)
C. Maximum in case (i)
D. Maximum in case (iii)

2. Electrical resistivity of a given metallic wire depends upon
   A. Its length
   B. Its shape
   C. Its thickness
   D. Nature of the material
3. A current of 1 A is drawn by a filament of an electric hub. Number of electrons passing through a cross-section of the filament in 16s would be roughly
   A. $\mathbf{10^{20}}$
   B. $\mathbf{10^{18}}$
   C. $\mathbf{10^{16}}$
   D. $\mathbf{10^{23}}$
4. What is the maximum resistance which can be made using five resistors each of $\frac{1}{5}\Omega$?
   A. $\frac{1}{5}\Omega$
   B. $10\ \Omega$
   C. $1\ \Omega$
   D. $15\ \Omega$
5. What is the minimum resistance which can be made using five resistors each of $\frac{1}{5}\Omega$?
   A. $\frac{1}{5}\Omega$
   B. $\frac{1}{25}\Omega$
   C. $\frac{1}{10}\Omega$
   D. 25Ω
6. The proper representation of series combination of cells obtaining maximum potential is

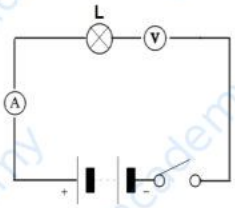
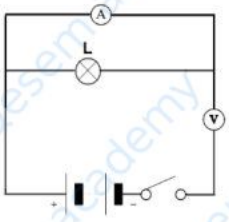
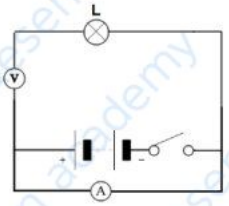
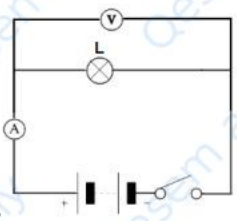


   A. (i)
   B. (iii)
   C. (ii)
   D. (iv)
7. A cylindrical conductor conducts of length $\boldsymbol{l}$ and uniform area of cross-section $\boldsymbol{A}$ has resistance $\boldsymbol{R}$. Another conductor of length $\boldsymbol{2l}$ and resistance $\boldsymbol{R}$ of the same material has area of cross-section.
   A. $\frac{A}{2}$
   B. 2A
   C. $\frac{3A}{2}$
   D. 3A
8. If the current $\boldsymbol{I}$ through a resistor is increased by $\mathbf{100}\%$ (assume that temperature remains unchanged), the increase in power dissipated will be
   A. 100%
   B. 300%
   C. 200%
   D. 400%
9. The resistivity does not change if
   A. The material is changed
   B. The temperature is changed
   C. The shape of the resistor is changed
   D. Both material and temperature are changed

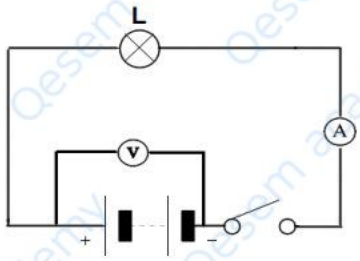
10. In an electrical circuit three incandescent bulbs A, B and C of rating 40 W, 60 W and 100 W respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness?
    A. Brightness of all the bulbs will be the same
    B. Brightness of bulb A will be the maximum
    C. Brightness of bulb B will be more than that of A
    D. Brightness of bulb C will be less than that of B
11. In an electrical circuit, two resistors of $\mathbf{2\ \Omega}$ and $\mathbf{4\ \Omega}$ respectively are connected in series to a 6V battery. The heat dissipated by the $\mathbf{4\ \Omega}$ resistor in $\mathbf{5\ s}$ will be
    A. 5J
    B. 20J
    C. 10J
    D. 30J
12. An electric kettle consumes 1 kW of electric power when operated at 220 V. A fuse wire of what rating must be used for it?
    A. 1A
    B. 4A
    C. 2A
    D. 5A
13. Two resistors of resistance 2 Ω and 4 Ω when connected to a battery will have
    A. same current flowing through them when connected in parallel
    B. same current flowing through them when connected in series
    C. same potential difference across them when connected in series
    D. different potential difference across them when connected in parallel
14. Unit of electric power may also be expressed as
    A. volt ampere
    B. watt second
    C. kilowatt hour
    D. joule second
15. What is the direction of the conventional current through the light bulb in the circuit presented by the diagram above?

    A. 
    B. 
    C. 
    D. 

16. A group of physics students performs an experiment with electric circuits. Which of the following circuits can be used to measure the electric current and voltage?

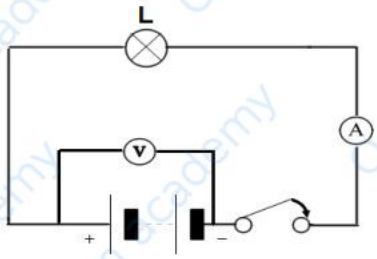
    A. 
    B. 
    C. 
    D. 

17. When the switch in the circuit presented by the diagram to the right is open, the voltmeter reading is referred to as:



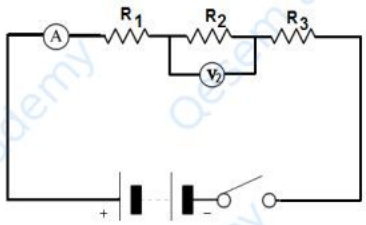
A. Terminal voltage
B. EMF
C. Current
D. Resistance

18. When the switch in the circuit presented by the diagram above is closed, the voltmeter reading is referred to as:



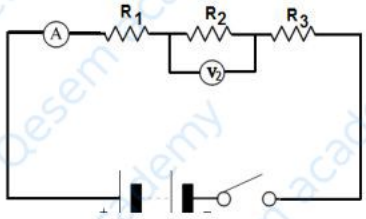
A. Terminal voltage
B. EMF
C. Current
D. Resistance

19. Three resistors: $R_1 = 5\ \Omega$, $R_2 = 3\ \Omega$, and $R_3 = 4\ \Omega$ are connected in series to each other. A voltmeter connected in parallel to resistor R_2 measures voltage of 6 V. What is the current through the ba



A. 2A
B. 3A
C. 4A
D. 5A

20. Three resistors: $R_1 = 5\ \Omega$, $R_2 = 3\ \Omega$, and $R_3 = 4\ \Omega$ are connected in series to each other. A voltmeter connected in parallel to resistor R_2 measures voltage of 6 V. What is the net voltage in the



A. 24V
B. 20V
C. 16V
D. 12V

21. Two resistors $R_1 = 6\ \Omega$ and $R_2 = 12\ \Omega$ are connected in parallel to each other and in series to $R_3 = 2\ \Omega$. An ammeter measures an electric current of 3 A flowing though resistor R_3. What is the current in 12 Ω resistor?

A. 6 A
B. 3 A
C. 1 A
D. 5 A

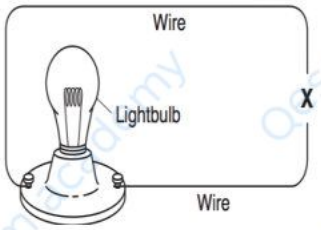
22. Which of the following statement is true both for a series and a parallel D.C. circuit?

A. Elements have individual currents
B. Currents are additive
C. Voltages are additive
D. Power is additive

23. Resistance of a material always decreases if
    A. Temperature of material is decreased
    B. Temperature of material is increased
    C. Number of free electrons available becomes more
    D. None of the above is correct
24. Two copper conductors have equal length. The cross-sectional area of one conductor is four times that of the other. If the conductor having smaller cross-sectional area has a resistance of 40 ohms the resistance of another conductor will be
    A. 160 Ω
    B. 20 Ω
    C. 80 Ω
    D. 10 Ω
25. An instrument which detects electric current is known as
    A. Voltmeter
    B. Wattmeter
    C. Rheostat
    D. Galvanometer
26. In a series circuit with unequal resistances
    A. The highest resistance has the most of the current through it
    B. The lowest resistance has the highest voltage drop
    C. The lowest resistance has the highest current
    D. The highest resistance has the highest voltage drop
27. When electric current passes through a metallic conductor, its temperature rises. This is due to
    A. Collisions between conduction electrons and atoms
    B. The release of conduction electrons from parent atoms
    C. Mutual collisions between metal atoms
    D. Mutual collisions between conducting electrons.
28. Two lamps 100 W and 40 W are connected in series across 230 V (alternating). Which of the following statement is correct?
    A. 100 W lamp will glow brighter
    B. 40 W lamp will glow brighter
    C. Both lamps will glow equally bright
    D. 40 W lamp will fuse
29. Which of the following statement is true?
    A. A galvanometer with low resistance in parallel is a voltmeter
    B. A galvanometer with high resistance in parallel is a voltmeter
    C. A galvanometer with low resistance in series is an ammeter
    D. A galvanometer with high resistance in series is an ammeter
30. Electrical voltage is a measure of
    A. total amount of current.
    B. how much current is moving through a circuit.
    C. the ratio of work done moving electric charges.
    D. how many electrons are moving through a wire.
31. What are the basic components of a simple electric circuit?
    A. energy source, device where work is done, and switch
    B. energy source, connecting wires, and switch

C. connecting wires, device, and switch
D. energy source, device where work is done, wires, and switch

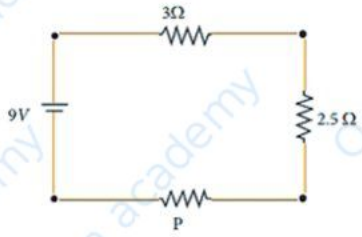
32. An incomplete electric circuit is shown below. The lightbulb is not lit. Which object placed at X would complete the circuit and light the bulb?
A. magnet
B. battery
C. metal nail
D. second lightbulb



33. A wire connected to a power supply of 230 V has power dissipation P_1. Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is P_2. The ratio P_2 / P_1 is
A. 1
B. 3
C. 2
D. 4

34. In India electricity is supplied for domestic use at 220 V. It is supplied at 110 V in USA. If the resistance of a 60W bulb for use in India is R, the resistance of a 60W bulb for use in USA will be
A. R
B. R/4
C. 2R
D. R/2

35. There is a current of 1.0 A in the circuit shown below. What is the resistance of P?
A. 1.5 Ω
B. 2.5 Ω
C. 3.5 Ω
D. 4.5 Ω

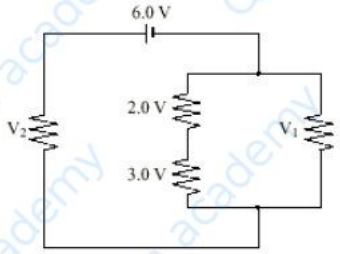


36. The temperature coefficient of resistance of a wire is 0.00125 per °C. At 300 K, its resistance is 1 Ω. The resistance of the wire will be 2 Ω at
A. 1154 K
B. 1400 K
C. 1100 K
D. 1127 K

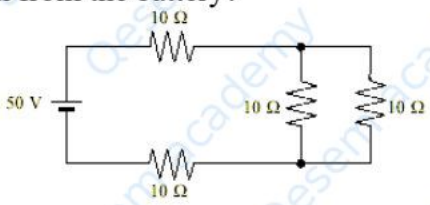
37. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω is
A. 0.2 Ω
B. 0.8 Ω
C. 0.5 Ω
D. 1.0 Ω

38. Which of the following precaution need not be taken while using electric appliances?
A. Never touch lighted electric bulb connected to mains.
B. Never experiment with the electric supply from mains.
C. Never use any wire to replace fuse wire.
D. Never turn switch in 'ON' position.

39. A potato cell can generate an EMF of 1.0 V, but has an internal resistance of 5 kΩ. Use this information for the following questions. When the terminals of a circuit powered by a potato cell have a potential difference of 0.8 V, the current flowing is:
    A. 160 μA
    B. 160 mA
    C. 40μA
    D. 40mA
40. What are the potential differences, V_1 and V_2, in the circuit shown below respectively?
    A. 1V and 5V
    B. 1V and 6V
    C. 5V, and 1V
    D. 5V, and 5V

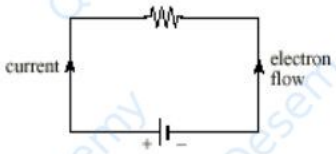


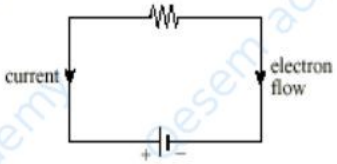
41. In the following circuit, what current is drawn from the battery?
    A. 1.3 A
    B. 1.7 A
    C. 2 A
    D. 5 A

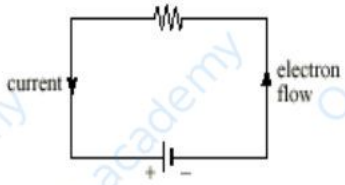


42. Which of the following correctly shows the direction of conventional current and electron flow?

A.

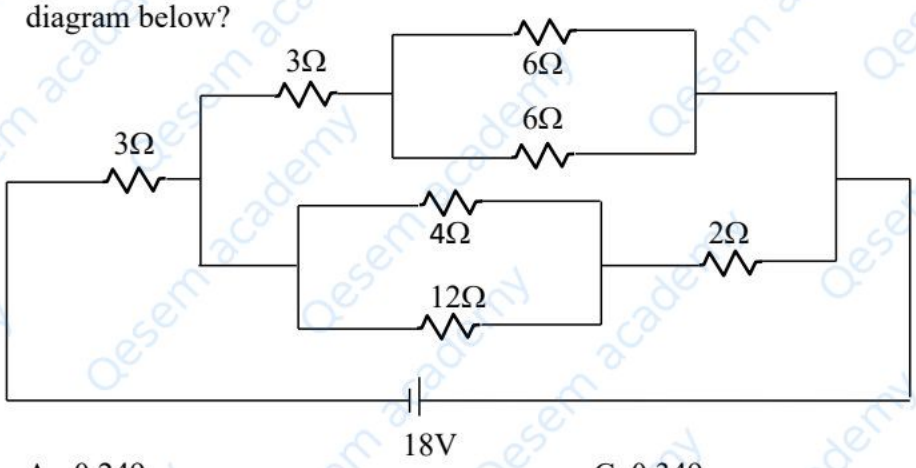

B.


C.


D.


43. What is the internal resistance of a battery?
    A. The resistance within the conductive material of the battery
    B. The resistance outside the battery in a circuit
    C. The resistance due to the presence of other components in the circuit
    D. The resistance caused by the flow of electric charge in a circuit
44. A battery of emf 12V and internal resistance 0.2Ω is placed across a variable resistor until it dissipates a maximum amount of power. At which the current through it is this happening?
    A. 12A
    B. 30A
    C. 0.4A
    D. 60A

45. A 4Ω speaker is connected across the output terminals of a power amplifier that delivers 64W to it. The current supplied to the speaker is _____
    A. 2A
    B. 8A
    C. 4A
    D. 16A
46. The current in a resistor R connected across a certain battery is 2A. When an additional 3Ω resistor is connected in parallel, the current increases to 6A. What is the resistor R?
    A. 4Ω
    B. 8Ω
    C. 6Ω
    D. 12Ω
47. The equivalent resistance of two resistors R and 2R when they are connected in parallel is 8Ω. What is the equivalent resistance of the two resistors when they are connected in series?
    A. 36Ω
    B. 18Ω
    C. 24Ω
    D. 12Ω
48. A solar cell generates a potential difference of 0.1V when a 500 Ω resistor is connected across it and a potential difference of 0.15V when a 1000 Ω resistor is replaced. What are the emf and the internal resistance of the solar cell?
    A. 0.3V, 1500
    B. 0.23V, 1000
    C. 0.3V, 1000
    D. 0.35V, 1300
49. What is the value of the current in the 12Ω resistor in the circuit show in the diagram below?



    A. 0.249
    B. 0.529
    C. 0.349
    D. 0.429
50. How many coulombs of charge flow through a circuit carrying a current of 10 A in 1 minute?
    A. 10
    B. 600
    C. 60
    D. 1200