GRADE 12 PHYSICS EUEE (2000 – 2011 E.C)

CHAPER 1

1. If the internal energy of the system decreases, then what can be concluded about the heat and the work done?

A. Heat is added to the system and work is done by the system
B. Heat is removed from the system and work is done by the system
C. Heat is removed from the system and work is done on the system
D. Heat is added to the system and work is done on the system

2. If a thermodynamic system undergoes a process in which its internal energy increased by 400J while doing 200J of work on its surrounding, then what is the energy absorbed in or extracted from it in the form of heat?

A. -600J B. -200J C. 600J D. 200J

3. Which the following statement is **NOT** correct?

A. The spontaneous transfer of energy from a cooler body to hotter body is quite possible
B. A system can absorb heat from a hot reservoir and can convert it entirely into work without additional changes in the system and its surrounding
C. No process is possible in which there is an overall decrease in the entropy of the universe
D. The complete conversion of energy from hot source into work is not possible

4. A heat engine operating between 100^0c and 700^0c has efficiency equal to 40% of the maximum theoretical efficiency. How much energy does this engine extract from the hot reservoir in order to do 5000J of mechanical work?

A. 810.8J B. 81J C. 20.3J D. 20259.32J

5. On unknown scale X, the ice point temperature is 50^0X and the steam point temperature is 200^0X. If the temperature is 60^0c, then what is the reading in ^{0}X?

A. 90^0X B. 140^0X C. 15^0X D. 333^0X

6. Three metals are in contact and are in thermal equilibrium. The metals have different specific heat capacity. What can be concluded about the temperature of the metals?

A. Since they have different pacific heat capacity, they must have different temperature at thermal equilibrium
B. They must have the same temperature at thermal equilibrium
C. They must have different internal energy
D. They must have different kinetic energy

7. A certain heat engine draws 500cal/s from a water bath at 27^0c and rejects 400cal/s to a reservoir at lower

temperature .What is the efficiency of this engine?

A. 80% B. 75% C. 25% D. 20%

8. Which of the following statement is correct?
   A. Irreversible process is a process that can be reversed though finite change in the system
   B. Complete conversion of energy from a hot source into work is possible
   C. There are processes in which there is an overall decrease in entropy
   D. Entropy is a measure of the disorder of a system
9. The change in entropy is Zero for
   A. Reversible isobaric processes C. Reversible isothermal processes
   B. reversible adiabatic processes D. Repressible process during which no work is done
10. An ideal gas is at a temperature of 300 K. If we wish to double the root mean square (rms) speed of the molecules of the gas, to what value must we raise its temperature?

A. 450K B. 600K C. 800 K D. 1200 K

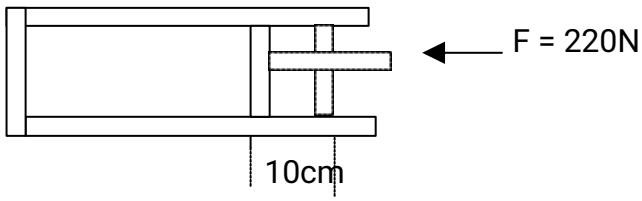
11. A heat engine is being designed to have a Carnot efficiency of 65.0% when operating between two energy reservoirs. If the temperature of the cold reservoir is 20.0^0C, what must be the temperature of the hot reservoir?

A. 57^0C B. 310^0C C. 564^0C D. 807^0C

12. Which statement is **NOT** among the assumptions made in the kinetic theory of gases?
   A. There is no interaction between particles or between particles and the wall except during collision.
   B. Collisions between particles and between particles and walls are perfectly elastic.
   C. The distribution of velocities of particles is uniform
   D. The volume occupied by the particle us negligible compared to the volume of the whole gas
13. A cup of coffee at a temperature of 80^oC is placed on a table in a 20^oC room. What happens to the thermal energy and molecular motion of the coffee when it is left on the table?
   A. The thermal energy decrease and the molecules move more slowly
   B. The thermal energy increase and the molecules move more slowly
   C. The thermal energy decreases and the molecules move faster
   D. The thermal energy increases and the molecules
14. What does a curve drawn between two points on P-V diagram represent?
   A. The state of the system B. A thermodynamic process
   C. Work done in a cyclic process D. Work done on or by the system
15. The temperature of a gas is due to
   A. The kinetic energy of the molecules C. The attractive force between the molecules
   B. The potential energy of the molecules D. The repulsive force the molecules
16. The direction of heat flow is from:
   A. high pressure to low pressure
   B. a point of higher emissivity to lower one
   C. high density to low density
   D. high temperature to low temperature

17. External force of 220N applied on a piston of a cylinder containing 1.25g of ammonia gas move 10cm as shown
in the diagram below. Assuming adiabatic process, what is the rise in temperature of the gas? (Specific heat
capacity of ammonia ,c=2200J/Kg K)

A. 4 K B. 0.004 K
C. 8 K D. 0.008K



18. Which of the following statement is correct (Here ρ is the density of an ideal gas, m is the mass of the gas and c is
speed of particles)

A. P (pressure of an ideal gas) = $\frac{1}{2}\ \rho\langle c^2\rangle$

B. For a mixture of two different gases with equal partial pressure and equal number of molecules in a
Container, $\frac{m_2}{m_1} = \frac{\langle c_1^2\rangle}{\langle c_2^2\rangle}$

C. For a mixture of two gases in equilibrium in a container, $\frac{P2}{P1} = \sqrt{\frac{\langle C_1^2\rangle}{\langle C_2^2\rangle}}$

D. For a mixture of two gases in equilibrium in a container, $\frac{P2}{P1} = \sqrt{\frac{\langle C_2^2\rangle}{\langle C_1^2\rangle}}$

19. Which of the following statement is NOT correct?

A. No process is possible in which there is an overall decrease in the entropy of the universe.
B. The spontaneous transfer of energy from cooler body to a hotter body is not possible.
C. The complete conversion of energy from a hot source into work is not possible.
D. Spreading out of random kinetic energy through heating does not represent an overall increase in entropy.

20. A heat engine operating at maximum efficiency has an efficiency of 25%. The temperature of the cold reservoir is 300 K. What is the temperature of the hot reservoir? A. 500 K B. 450 K C. 350 K

D .400 K 21. Which of the following statements is correct for any thermodynamic system?

A. The internal energy changes in all processes.

B. Internal energy and entropy are state functions.

C. The change in entropy can never be zero.

D. The work done in an adiabatic process is always zero.

22. Two cylinders A and B fitted with pistons contain equal amounts of an ideal diatomic gas at 300 K. The piston of A is free to move, while that of B is held fixed. The same amount of heat is given to the gas in each cylinder. If the rise in temperature of the gas in A is 30 K, then the rise in temperature of the gas in B is

A. 30 K B. 18 K C. 50 K D. 42 K

23. Two identical containers A and B with frictionless pistons contain the same ideal gas at the same temperature and the same volume V. The mass of the gas in A is mA and that in B is mB. The gas in each cylinder s now allowed expanding isothermally to the same final volume 2V. The changes in the pressure in A and B are found to be ΔP and 1.5 ΔP respectively. Then

A. 4mA = 9mB B. 2mA = 3mB C. 3mA = 2mB D. 9mA = 4mB

24. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately

A. 540 nm B. 400 nm C. 310 nm D. 220 nm

25. When heating one mole of a certain gas at constant volume an energy transfer of 400J produce an increase in temprature of 20^0K. What temprature increase would be if the same amount of the gas was heated in the same way at constant pressure?

A. 12K B. 10K C. 33.3K D. 20K

26. Which of the following *IS NOT TRUE* about assumptions made in the kinetic theory of ideal gas?

A. The molecules are in constant random motion and obey Newton's second law of motion.

B. The internal energy of the gas is made up of random kinetic energies of the particles.

C. The molecules interact long rang forces during inelastic collusions

D. Collusions between particles with there is no loss of kinetic energy during collusions.

27. The key difference between diesel engine and petrol engine is:

A. In addind heat to the system C. in compression of gas

B. Expanssion of gas D. in combustion

28. The heat engine operating between 127^0C and 527^0C has an efficiency equal to 40% of the maximum theoretical efficiency. How much energy does this engine extracted from the hot reservoir in order to do 4KJ of work?

A. 4KJ B. 20KJ C. 0.8KJ D. 5KJ

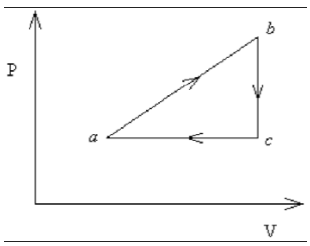
29. The point in the phase diagram where the fusion curve, the vapor pressure curve, and the sublimation curve join is called the

A. boiling point. B. triple point. C. critical point. D. melting point.

30. A heat engine operating at maximum efficiency has an efficiency of 25%. The temperature of the cold reservoir is 300 K. What is the temperature of the hot reservoir?

A. 500 K B. 450 K C. 350 K D .400 K

31. An ideal gas undergoes the process as shown in figure . The heat gained in process ab is 576 J, while in process bc the system loses 67 J. In process ab the system performs 320 J of work, while in process ca work is done on the system in the amount of 238 J. How much heat is gained by the system in process ca?



A.238 J
B. -256 J
C. -427 J
D. -67 J

32. If a system undergoes a reversible process,

A. the system must not interact with its surroundings.
B. it must be possible to restore the surroundings to their original state.
C. it must be possible to restore both the system and the surroundings to their original states.
D. it must be possible to restore the system to its original state.

33 .Your lungs hold 4.2 L of air at a pressure of 101.3 kPa. If you are holding your breath and dive into a pool to a depth of 5.0 m below the surface of the water, what is the volume of the air in your lungs assuming that the temperature remains the same?

A. 2.9 L B. 2.8 L C. 3.3 L D. 3.2 L

34. Two metal spheres are made of the same material and have the same diameter, but one is solid and the other is hollow. If their temperature is increased by the same amount,

A. the two spheres remain equal.
B. the solid sphere becomes heavier and the hollow one lighter.
C. the hollow sphere becomes bigger than the solid one.
D. the solid sphere becomes bigger than the hollow one.

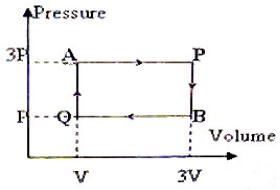
35. The weather outside is frightful. The temperature is -22^0F. What is the corresponding temperature in the Celsius scale?

A. -20^0C B. -35^0C C. -30^0C D. -12^0C

36. Which of the reversible processes listed below are used to form a Carnot cycle?

A. Isometric, isobaric B. Isobaric, adiabatic C. Isometric, adiabatic D. Isothermal, adiabatic

37. In the cyclic process on an ideal gas shown in the adjoining PV diagram, what is the net work done on the gas during the cycle?



A. 2PV C. -4PV

B. -2pv D. zero

38. A device for transforming heat energy to mechanical energy is referred to as:

A. Transformer B. Refrigerant C. generator D. engine

39. The number of joules of heat energy required to raise the temperature of a body by 1 K is:

A. Heat capacity C. expansion coefficient

B. Specific heat capacity D. calorific value

40. Two bodies that are separately in thermal equilibrium with third body must be in thermal equilibrium with each other. This statement is a statement of:

A. The first law of thermodynamics. C. The second law of thermodynamics.

B.The zeroth law of thermodynamics. D. The third law of thermodynamics

41. In the adiabatic process of thermodynamics:

A. heat can be transferred in to the system but not out of the system

B. heat is transferred neither into nor out of the system

C. heat can be transferred out of the system but not in to the system

D. heat transfer is possible in to and out of the system

CHAPTER 2

1. What makes the oscillatory motion a simple harmonic motion?

A. The acceleration of the motion is directly proportional to the velocity

B. The velocity of the motion is directly proportional to the displacement

C. The acceleration of the motion is directly proportional in magnitude but opposite in direction to

the displacement

D. The velocity of the motion is inversely proportional to the displacement

2. The two end fixed string of length 0.5m has a mass per unit length 2g/m. If the tension in the string is 80N, what is the second harmonic frequency?

A. $100\sqrt{2}$ Hz B. 200Hz C.600Hz D. 400Hz

3. Which one of the following is **NOT** the use of Doppler Effect?

A. Energy transmission B. blood flow measurement C. Radar D. Astronomy

4. Which of the following is **NOT** correct about a simple harmonic oscillator?

A. Total mechanical energy is conserved
B. The acceleration is directly proportional to and opposite in direction to displacement
C. The period of small oscillation of a pendulum with string length l, a bob mass m attached to it is $T = 2\pi\sqrt{\frac{l}{g}}$
D. The frequency of an oscillating mass attached to a massless spring is independent of the spring constant

5. Which of the following indicates the wavelength of a travelling wave?

A. The distance between an adjacent trough and a peak
B. The amplitude of then wave
C. The distance between a node and antinodes
D. The distance between two adjacent points which are in phase

6. The total energy of a practice executing simple harmonic motion is

A. Zero C. Directly proportional to the square of the amplitude
B. Directly proportional to the amplitude D. Inversely proportional to the square of the amplitude

7. The loudness of sound changes from $L_1 = 30d\beta$ to $L_2 = 60d\beta$. What is the ration of intensities I_2/I_1 in the two cases?

A. 2 B. 4 C. 600 D. 1000

8. A point source broadcasts sound into a uniform medium. If the distance from the source is tripled, how does the intensity change?

A. It remains unchanged. C. It becomes one-third as large
B. It becomes three times larger D. It becomes one-ninth as large

9. A transverses sinusoidal wave is traveling on a string. Which statement is correct about appoint on the string?

A. The point moves in the same direction as the wave.
B. The point moves in simple harmonic motion with a different frequency than that of the wave.
C. The point moves in simple harmonic motion with the same angular frequency as the wave.
D. The point moves in uniform circular motion with a different angular speed than the wave.

10. An object of mass M is hung from a spring and set into oscillation. The frequency of the oscillation is

measure

and recorded as f. if the object of mass M is replaced with an object of mass 2m and set into oscillation, what will

be the frequency of the motion?

A. f/√2 B. f C. (√2)f D. 2f

11. The sound level at a distance of 4.00 m from a source is 120 dβ. At what distance is the sound level 100 dβ?

A. 0.40m B. 4.80 m C. 40 m D. 48 m

12. The period of oscillation of a particle undergoing simple harmonic motion is :

A. Independent of the amplitude of the motion

B. Directly proportional to the frequency of oscillation

C. Independent of the frequency of oscillation

D. Directly proportional to mass of oscillating object

13. Which of the following indicates the wavelength of a travelling wave?

A. The distance between an adjacent trough and a peak C. The distance between a node and antinodes

B. The amplitude of then wave D. The distance between two adjacent points which are in phase

14. A pipe, 68 cm long, is point at one end and closed at the other. When air is blown across, the open-end sound is

produce at110Hz. What is the velocity of sound along the pipe?

A. 598.4 m/s B. 334.6m/s C. 299.2m/s D. 149.6m/s

15. A mass suspended from the end of a spring vibrates up and down 24 times in 36 s .what are the frequency and

period of the vibration?

A 1.5 Hz, 0.67s B. 0.67Hz, 1.5s C. 0.0012 Hz, 864 s D. 864 Hz , 0.0012 s

16. If the amplitude of a sine wave is doubled, the intensity

A. Remains the same B. Increase by a factor of 2 C. Increase by a factor of 4 D. Increase by a factor of

17. A 50 cm pipe is open at one end and closed at the other end. When air is blow at 150 Hz. What is the velocity of

The sound along the pipe A. 300 m/s B. 100 m/s C 330 m/s D. 150 m/s

18. Traveling wave is given by the equation Y= A cos (kx-ωt), where k is the wave number and ω is the angular

frequency. What is the distance that the wave travels in the time t=T/2?

A. half the wavelength B. full wavelength C. a quarter of the wavelength D. at the origin

19. Which one of the following is not an example of simple harmonic motion?

A. A mass attached to a spring system oscillating in horizontal direction to the surface of the Earth

B. Rotation of second pointer in hand watch

C. Oscillation of simple pendulum

D. A mass attached to a spring system 0Scillating in vertical direction to the surface of the Earth

21. The displacement y of a wave travelling in the x – direction is given by

$y = 10^{-4} \sin (600t - 20x + \pi / 3)$ meters, where x is expressed in meters and t in seconds. What is the speed of the wave motion? A. 200 m/s B. 300 m/s C. 600 m/s D. 1200 m/s

22. An observer is moving towards a stationary source of frequency 250 Hz with a velocity of 40 m /s. If the velocity of sound is 330 m /s, the apparent frequency heard by the observer will be

A. 320 Hz B. 300 Hz C. 280 Hz D. 260 Hz

23. Damping forces in an osillator *ARE NOT*:

A. Resistive C. energy dissipative

B. Energy conservative D. Always acting in the opposite direction of the velocity.

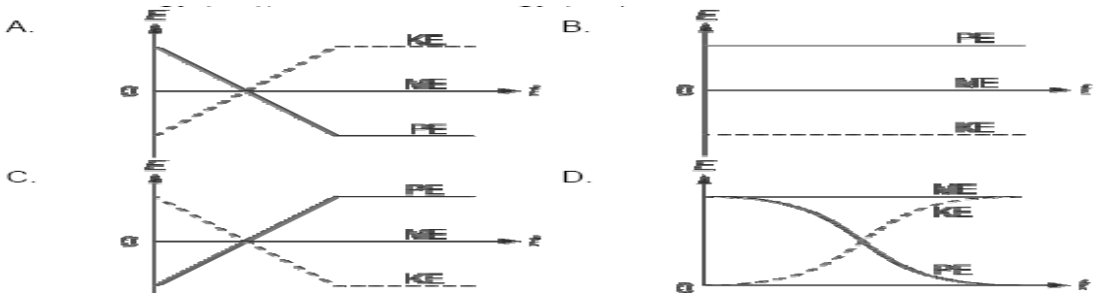
24. A transversal wave of frequency 10Hz and amplitude 0.01m, travels through a string of linear density μ=0.2Kg/m . The tension through the string is 20N. Suppose a point at left end of the string is disturbed in such a way that it moves toward the positive Y direction at time t=0. What it wave number?

A. 2π/m B. $2/\pi$m C. π/m D. 4π/m

25. Which of the following is the application of doppler's effect?

A. Radar B. Medical imaging C. Astronomy D. all

26. A pendulum bob is hung on the ceiling. It is pulled aside to certain height and then released from rest. Which of the following graphs correctly describe the relation between potential energy (PE), kinetic energy (KE), mechanical energy (ME) and time?



27. Anybody moving with simple harmonic motion is being acted by a force that is

A. constant.

B. proportional to a sine or cosine function of the displacement.

C. directly proportional to the displacement.

D. proportional to the square of the displacement.

28. A system consists of a mass vibrating on the end of a spring. The total mechanical energy of this system

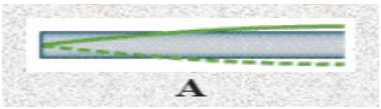
A. varies as a sine or cosine function.

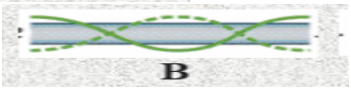
B. is constant only when the mass is at maximum displacement.

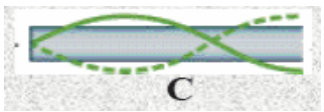
C. is a maximum when the mass is at its equilibrium position only.

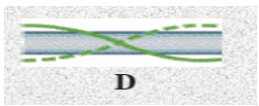
D. is constant, regardless of the displacement of the mass from the equilibrium

29. Which diagram best represents the first harmonic that can be set up in a pipe open at both ends?

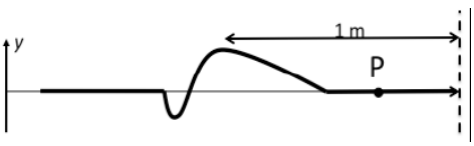


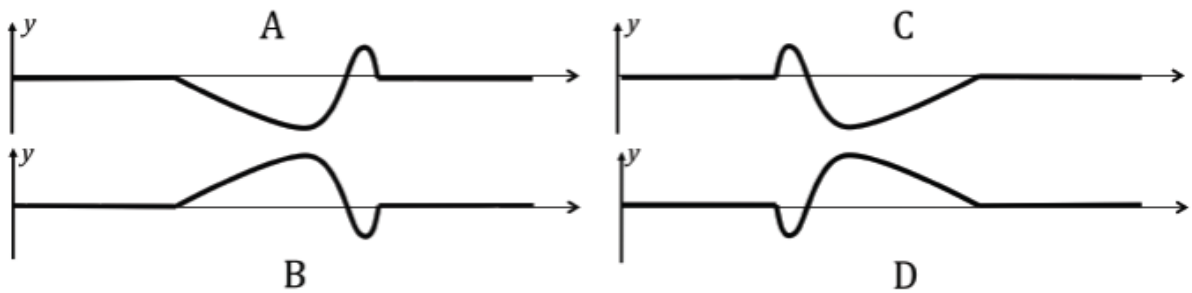






30. The picture shows a snapshot of a pulse passing over a rope. A point on the rope is marked with paint (P) Which of the graphs below qualitatively depict the graph of the vertical displacement of the point P versus time?





31. The direction of propagation of an electromagnetic wave is the same as:

A.E B. B.E C. BXE D. EXB

32. Two bodies M and N of equal masses are suspended from two separate massless springs of spring constants K_1 and K_2, respectively. If the two bodies oscillate vertically such that their maximum velocities are equal, then the ratio of the amplitude of vibration of M to that of N is

A. $\sqrt{(K_2/K_1)}$ B. K_1/K_2 C. $\sqrt{(K_1/K_2)}$ D. K_2/K_1

32. For an object performing SHM the magnitude of maximum velocity is given by

A. $\omega\sqrt{(A^2 - x^2)}$ B. $\omega\sqrt{(x^2 - A^2)}$ C. ωA D. $\omega^2 A$

33. 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

34. A train whistle has an acoustic power output of 100 W. If the sound energy spreads out spherically, what is the intensity level in dB at a distance of 100 m from the train? (Given that $I_0 = 10^{-12}$ W m^{-2}.)

A. 55 dB B. 89 dB C. 95 dB D. 120 dB

35. A simple pendulum is made using a long, thin metal wire. what happens to the period of the pendulum when the temperature drops?

A. Increase C. period of oscillation has random dependence on temperature

B. decrease D. Remain the same

CHAPTER 3

2. A 632.8 nm laser light produces an interference pattern on screen of 4m from a pair of slits. The slit space is equal to 0.2mm.What is the fringe width?

A. 6.33mm B. 25.3mm C. 12.7mm D. 15.3cm

3. Why is an interference pattern **NOT** observed between the lights produced from a pair of car headlights?

A. The light sources are not collimated C. Interference is observed only in laboratory conditions

B. The light sources are not coherent D. The spread of light as it travels out of the source

4. In a Young's experiment, there are two slits, rather one. What do you think the reason?

A. To increase the intensity C. One slit is for frequency, the other for wavelength

B. One slit for electric fields, the other is for magnetic fields D. To create a path length difference

5. A light of wavelength 590nm is incident normally on a grating with spacing 1.67x10^{-6}m. How many orders of diffraction maxima can be obtained(including the zero order)?

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

6. Which of the following statements is correct?

A. Interference is not superposition of waves

B. Constructive interference results in a decrease in the intensity

C. Destructive interference results in an increase in the intensity

D. Path difference which is integer multiple of wavelength result in constructive interference

7. Which phenomenon is responsible for the colors seen on a thin oil film on the water surface?

A. Diffraction B. Interference C. Superposition D. refraction

8. When soap is in air, it exhibits different colures under sunlight. The absence of a particular color in a region is due to

A. Double refraction B. Diffraction C. interference D. Reflection

9. What happens if the monochromatic light used in young's double slit experiment is replaced by white light?

A. No fringes are observed
B. All bright fringes become white
C. All bright fringes have colors between violet red
D. Only the central fringe is white, all other fringes colored.

10. A viewing screen is separated from a double slit by 4.80 m. the distance between the two slits is 0.030 mm.

Monochromatic light is directed toward the double slits and forms an interference pattern on the screen. The first dark fringe is 4.50 cm from the center line on the screen. What is the wavelength of the light?

A. 1250nm B. 1875 nm C. 2500 nm D. 5625nm

11. Two separate coherent source produce whose wavelengths are 0.10 m. which statement is correct about points that are 3.2m away from one source?

A. Constructive interference occurs if the points ar3 3.0 m from the other source.
B. constructive interference occurs if the points are 3.05 m from the other source
C. Constructive interference occurs if the points are 2.95 from the other source
D. Destructive interference occurs if the points are 3.2 m from the other source.

12. Suppose that the index of refraction of a soap bubble film is 1.25, what is the minimum thickness of the soap – bubble film that results in constructive interference in the reflected light if the film is illuminated with light whose wavelength in free space is 600 nm?

A. 120 nm B. 150nm C. 300nm D. 450 nm

13. In Young's double slit experiment, if the slit separation is 1.2mm and the average spacing of the bright fringes Observed on a screen placed 4m away from the source 2 mm. What is the wavelength of the light source?

A. 550nm B. 750nm C. 630nnm D. 600nm

14. The colors seen from soap bubbles and oil slicks are manifestation of thin film interference. What is the cause of This interference

A. Interference from refraction of light
B. Interference from diffraction of light
C. Interference from reflection of light from the two surfaces of the film
D. the interterence from superposition of lights that are incident and reflected

16. Two beams of coherent light travel different paths arriving at point P. If the maximum constructive interference is to occur at point P, the two beams must

A. arrive 180^0 out of phase.
B. arrive 90^0 out of phase.
C. travel paths that differ by a whole number of wavelengths.
D. travel paths that differ by an odd number of half-wavelengths.

17. A diffraction grating has 4000 lines per cm. The angle between the central maximum and the third order maximum is 36^0. What is the wavelength of the light? A. 240 nm B. 490 nm C. 570 nm D.

620 nm 18. A single slit forms a diffraction pattern, with the first minimum at an angle of 40° from central maximum. Monochromatic light of 450-nm wavelength is used. The same slit, illuminated by a different monochromatic light source, produces a diffraction pattern with the second minimum at a 60° angle from the central maximum. The wavelength of this light, in nm, is closest to: A. 375 B. 357 C. 303 D. 321 19. A light beam shines through a thin slit and illuminates a distant screen. The central bright fringe on the screen is 1.00 cm wide, as measured between the dark fringes that border it on either side. Which of the following actions would *decrease* the width of the central bright fringe? A. decrease the width of the slit C. increase the wavelength of the light B. it is impossible to decrease the width of the central bright fringe D. increase the width of the slit 20. Photons always propagate with speed c , but light appears to travel at a speed different from c in dense media. How can we account for this phenomenon?

A. Propagation in media depends on re-radiation by electron-oscillators, which takes a finite time to occur B. Electron oscillators in the medium introduce a phase change upon re-radiation C. A medium is a different reference frame to vacuum, so the difference in the observed speed of light is a consequence of relativity.

D. Light is slowed down because it does not take a straight line path through the dense medium

21. Two beams of coherent light travel different paths arriving at point P. If the maximum constructive interference is to occur at point P, the two beams must

A. arrive 180^0 out of phase.. C. travel paths that differ by a whole number of wavelengths.

B. arrive 90^0 out of phase D. travel paths that differ by an odd number of half-wavelengths.

22. A diffraction grating has 4000 lines per cm. The angle between the central maximum and the third order maximum is 36^0. What is the wavelength of the light? A. 240 nm B. 490 nm C. 570 nm D. 620 nm

23. If θ_m is the angle of diffracted wave with the direction of incidence and d is the width of slit, then m^{th} order minima is obtained for $\sin\theta_m$ equal to A. $d\lambda/m$ B. $m\lambda/d$ C. md/λ D. $m/\lambda d$

CHAPTER 4

1. Suppose that three point charges are placed along a straight line and the electrostatic force on the middle charge is zero. What can we concluded about the charges?

A. The charge at the ends must have the same sign B. The signs of the three charges should be the same

C. The middle charge should be placed at the center between the two charges

D. The charge at the middle and at the left end should have the same sign

2. Two parallel plates are kept at 3V and 5V as shown below. If an electron is released at O, then which way will the electron move?

B +5V

O e^-

A +3V

A. toward A C. remains at O B. parallel to the plates D. towards B

3. A capacitor of 12μF capacitance can be charged after it is connected between potential differences of

9V.

How much electrical energy is used in charging the capacitor?

A. $1x10^{-3}J$ B. $54x10^{-4}J$ C. $4.86x10^{-4}J$ D. $9.72x10^{-4}J$

4. The capacitance of a parallel plate capacitor is 10μF. If the distance b/n the plates is halved, keeping all other

quantities constant, then what is the new capacitance of the capacitor ?

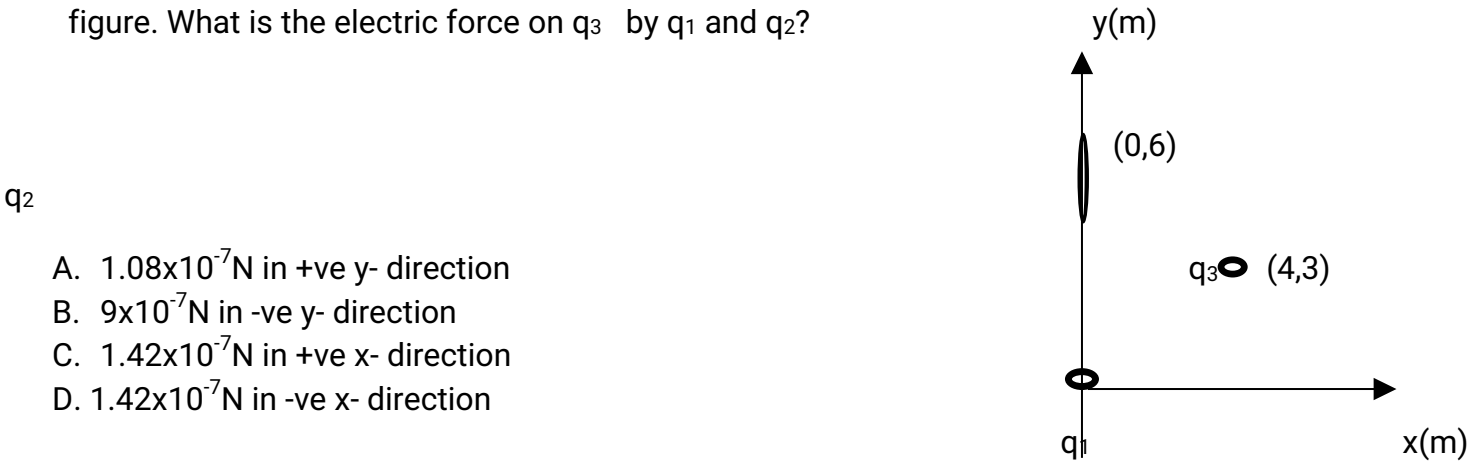
A. 0.2 μF B. 5 μF C. 10 μF D. 20 μF

5. Two positive charges of magnitude $2.4x10^{-9}C$ and $1.6x10^{-9}C$ are separated in air by a distance of 2cm. How

much electrostatic potential is produced by the two charges at midway b/n them?

A. 3.6KV B. 0.72KV C. 2.16KV D. 1.44KV

6. A charge of $q_1 = -10x10^{-9}C$, $q_2 = +10x10^{-9}C$ and $q_3 = -2.5x10^{-8}C$ are placed on x-y plane as shown in the figure. What is the electric force on q_3 by q_1 and q_2?



q_2

A. $1.08x10^{-7}N$ in +ve y- direction
B. $9x10^{-7}N$ in -ve y- direction
C. $1.42x10^{-7}N$ in +ve x- direction
D. $1.42x10^{-7}N$ in -ve x- direction

7. Three capacitors of capacitance 8μF, 12 μF, and 24μF are connected (a) in series and then (b) in parallel. What is

the ratio of the equivalent capacitance in case (a) to that in case (b)?

A. 1:11 B. 11:1 C. 1:1 D. 1:3

8. What is the potential energy of two equal positive point charges 1μF each held 1m apart in air?

A. 1J B. 1ev C. $9 \times 10^{-3}J$ D. zero

9. A hollow metal sphere of radius 10cm is charged to a potential of 100V. What is the potential at the center of the

sphere?

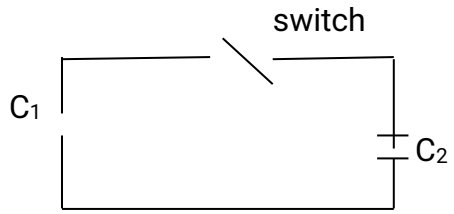
A. Zero C. The same as that as point 50cm from the surface
B. 100V ` D. The same as that at a point 10cm away from the surface

10. A capacitor $c_1$is charged to a potential difference v_0=6.0v,using a battery. The charging battery is then removed &

the capacitor is connected as shown in the figure below to uncharged capacitor c_2.charege then starts to flow

from $c_1$to $c_2$until an equilibrium is established with both capacitors at the same potential difference V. What is

the common potential difference in volts?(C_1= 2μF, and C_2= 4μF,)



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

11. Two capacitors, 1μF and 3μF, are connected in a parallel across a 300v potential difference. What is the total energy in joules stored in the capacitors?

A. 0.27 B. 0.18 C. 0.32 D. 0.41

12. An electric field, which is constant in space, has a magnitude of 50v/m directed along the positive x-axis. A charge Q=5μc moves under the action of the electric field from the origin to the x=5cm and y=5cm.what is the potential difference in volts through which the charge moved?

A. -2.5 B. -2.0 C. -1.5 D. -1.0

13. Two points charges $Q_1$and Q_2 having positive sign are placed on the x axis. They are separated by a distance of a and $Q_1=4Q_2$.at what distance on the x axis b/n the charges &measured from charge Q_1will the electric field vanishes? A. 2a B. 2a/3 C. a/3 D. a & c

14. If the coulomb force b/n two like charges Q_1 and Q_2 separated by a distance r is equal to F_o, what would be the new force of repulsion if the magnitude of the charges Q_1 is doubled and that of Q_2 is halved?

A. $F_o/3$ B. $F_0/2$ C. F_o D. $2F_0$

15. What is the SI-unit of electric field?

A. Am^{-1} B. Vm^{-1} C. NC^{-1} D. Cm

16. What is electric potential energy of a system of 4 point charges, each charge q located at the corners of a square of side a?

A. $\frac{\sqrt{2}\,kq}{a}(2\sqrt{2}+1)$ C. $\frac{\sqrt{2}\,kq^2}{a}(2\sqrt{2}+1)$

B. $\frac{\sqrt{2}\,kq^2}{a}(2\sqrt{2}-1)$ D. $\frac{\sqrt{2}\,kq}{a}(2\sqrt{2}-1)$

17. A circle of radius r is drawn with center as charge +q a charge q_0 is taken from one point to another diametrically opposite point along the circumference of the circle. What is the value of the work done?

A. $\frac{1}{4\Pi\varepsilon_0}\frac{q_0}{r^2}$ x 2r C. $\frac{1}{4\Pi\varepsilon_0}\frac{qq_0}{r^2}$ x 2r

B. $\frac{1}{4\Pi\varepsilon_0}\frac{qq_0}{r}$ x 2r D. zero

18. When the voltage applied to a capacitor increases from 80v to 110v, the charge on the capacitor increase by

$9x10^{-5}$c.What is the capacitance of the capacitor?

A. 4μF B. 3μF C. 2μF D. 5μF

19. Consider a uniformly charged insulating spherical shell of inner radius $R_1$and outer radius R_2.What are the

electric fields at $r>R_2$ and $r<R_1$ respectively?

A. $\frac{q}{4\Pi\varepsilon_0 r^2}$, 0 C. $\frac{q}{4\Pi\varepsilon_0 R_1^2}$, 0

B. $\frac{q}{4\Pi\varepsilon_0 R^2}$, 0 D. $\frac{q}{4\Pi\varepsilon_0 (R_1^2 - R_2^2)}$, 0

20. A certain capacitor is charged to a potential v. If you wish to increase its stored energy by 10%, then by what

percentage should you increase V?

A. 4.88% B. 5.92% C. 6.98% D. 5.13%

21. Consider a uniformly charged conducting spherical shell of inner radius $R_1$and outer radius R_2carring a total of

negative charge q.a point positive charge of magnitude q is placed at the center of the spherical shell. What are

the electric fields at $r<R_1$,$R_1<r<R_2$,and $r>R_2$,respectively?

A. $\frac{q}{4\Pi\varepsilon_0 r^2}$, 0, $\frac{q}{4\Pi\varepsilon_0 (R_2^2 - R_1^2)}$

B. $\frac{q}{4\Pi\varepsilon_0 R_2^2}$, 0 , $\frac{q}{4\Pi\varepsilon_0 r^2}$

C. $\frac{q}{4\Pi\varepsilon_0 r^2}$, 0 , 0

D. $\frac{q}{4\Pi\varepsilon_0 (R_2^2 - R_1^2)}$, 0, 0

22. If a hollow metal sphere placed on an insulting stand is charged positively, then what is the electric potential

inside the sphere?

A. Zero C. The same as on the surface

B. greater than the potential on the surface D. less than the potential on the surface

23. Why is it logical to say that the potential of a ground object is zero?

A. the earth is an insulator

B. the net charge on earth is practically zero

C. a grounded object can neither give nor take charge from the earth

D. a grounded object can neither is at a higher potential than the earth

24. Two negative point charges are 2 meters apart and repel each other with a force of 2 Newton. When the distance between the charges is doubled, the force between them is

A. One fourth as great B. One-half as great C. Twice as great D. Four times as great

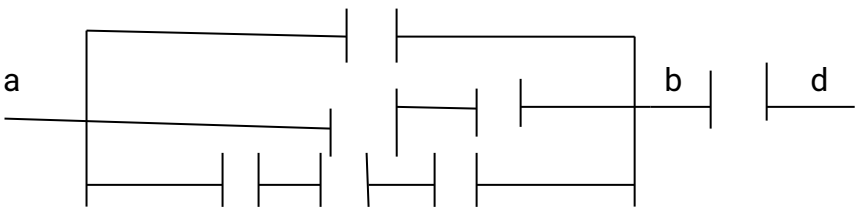
25. Consider the network of identical capacitors, each having capacitance C between terminal a and b and a capacitor of capacitance $\frac{11}{5}C$ between terminal b and d shown in figure below. What is the effective capacitance between terminal a and d ?(figure)

A. $\frac{121}{30}C$

B. 1C

C. $\frac{11}{6}C$

D. 3C



26. AN air –filled parallel – plate capacitor has a capacitance of 1pF. The plate separation is doubled and the space between them is completely filled with Wax. If the capacitance increases to 2pF, what is the dielectric constant of wax? A. 2.0 B. 4.0 C. 60.0 D. 8.0

27. An object having a net charge of 24 C is placed in a uniform electric field of 610N/C directed vertically. What is the mass of the object if it floats in this electric field?

A. 14.640kg B. 1.464gm C. 14.460gm D. 14.460kg

28. Which of the following is NOT property of a conductor in electrostatic equilibrium?

A. The electric field is zero everywhere inside the conductor

B. Any net charge on the conductor resides entirely on its surface

C. On an irregularly shaped conductor, the surface charge density is greatest where the radius of curvature of the surface is the smallest.

D. The electric field just outside the conductor is tangent to its surface

29. Coulomb's law for the force between electric charges most closely resembles

A. The law of conservation of energy C. Newton's law of gravitation

B. Newton's second law of motion D. The law of conservation of mass

30. What is the magnitude of the electric force between two protons separated by 2×10^{-15}m?

A. 67.5N B. 115.0N C. 57.5N D. 83.4N

31. What is the SI unit of Electric field? A. Am^{-1} B. Vm^{-1} C. Cm D. NC^{-1}

32. A small object of mass m carries a charge q and is suspended by a thread between the vertical plates of a parallel – plate capacitor. The plate separations d. if the thread makes an angle θ with the vertical. What is the potential difference between the plates?

A. $\frac{mgd\tan\theta}{q}$ C. $\frac{mgd\sin\theta}{q}$

B. $\frac{md\tan\theta}{q}$ D. $\frac{md\sin\theta}{q}$

33. Five capacitors 10 μF capacity each is connected to A, D, and C potential of 100 volt as shown in the next figure.

What is the equivalent capacitance between A and B? A. 10 μF B. 20 μF C. 30 μF D. 60 μF

34. Moving 2.5 X 10^{-6} coulomb of charge from point A to point B in an electric field requires 6.3 X 10^{-4} joule of work. The potential difference between points A and B is approximately

A. 4.0 x10^{-3}V B. 2.5x 10^{-2}V C. 1.6x10^{-19}V D. 1.0x 10^{-14}V

35. A capacitor made of parallel plates is charged by connecting it to a battery. The distance between plates is much less than the surface area of each plate After fully charged if the plates are disconnected from the battery and pulled apart a little what will happen to the total stored energy the electric field and the potential difference between the plates?

A. The electric field between the plants increases.
B. The potential difference between the plates decreases.
C. The total energy stored in the capacitor increases.
D. The electric field the potential difference and the stored energy remain the same.

36. The distance between two point charges is doubled. What will happen to the force of interaction between the charges?

A. The force will be doubled. C .The force will be reduced by a factor of 1/4
B. The force will be reduced by half. D. The force will not be affected.

37. Two different capacitors of capacitances C_1 = 2 μF and C_2 = 3μF are connected in series across a 120 V supply line. The charged capacitors are disconnected from the line and from each other, and reconnected with terminals of like sign together. What will be the final charges on C_1 and C_2, respectively?

A. 57.6 μc and 86.4μ C B. 115.2μ C and 127.8μ C C. 144μC across each D. 288μC arcos each

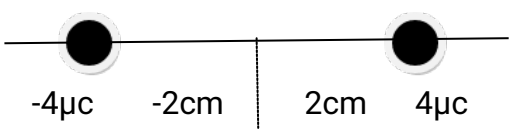
39. A sheet of polythene (ϵ_r= 2.3) and 0.25 mm thick is to be used in a capacitor by Sandwiching it between two sheets of aluminum foil. What area must the sheets have it the capacitor is to have a capacitance of 0.5μF?

A.12 m^2 B. 0.6 m^2 C. 6.14 m^2 D. 0.12 m^2

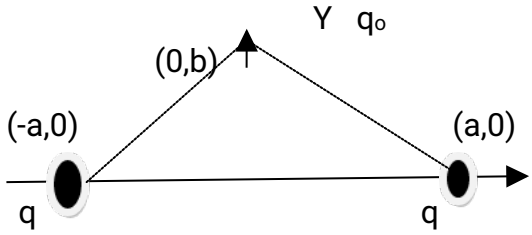
40. Two equal and opposite charges are located along X-axis at-2.0 cm and +2.0c m as shown in the figure below.

How much would be the electric potential at the origin?

A.1.8 MV C. 3.6 MV
B. Zero D. 4.5 MV



41. Two like charges of value q are fixed at x= a and x= -a as shown in the diagram below. If a test charge q_o is released at y =b, which path will it follow?



A. a long y-axis

B. along a line $y= -\frac{b}{a}x + b$

C. along a line $y = \frac{b}{a}x + b$

D. It stays at y=b

42. When two capacitors are connected in parallel, the effective capacitance is 4μF. If the same capacitors are connected in series; the effective capacitance is one-fourth the capacitance of one of the two capacitors. What is the capacitance of the two capacitors?

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

43. A capacitor of capacitance 8nF is charged until the potential difference is 12V across it. The battery is removed and uncharged capacitor of capacitance 4nF is connected across the charged capacitor. What is the new potential across the 8nF capacitor? A. 8V B. 12V C. 6V D. 9V

45. A dielectric is inserted into a capacitor while the charge on it is kept constant. What happens to the potential difference and the stored energy?

A. The potential difference decreases and the stored energy increases

B. Both the potential difference and the stored energy increase

C. The potential difference increases and the stored energy decreases

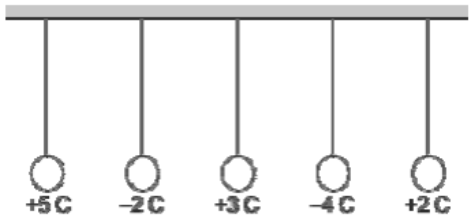
D. Both the potential difference and the stored energy decrease

46. What is the capacitance of an LC circuit that oscillate at resonance frequency $\frac{500}{\pi}$Hz , when the inductance is 2h?

A. 2nF B. 4nF C. 500nF D. 5nF

47. The diagram shows five charged metal spheres suspended by strings. The charge of each sphere is +5 C, −2 C, +3 C, −4 C and +2 C as shown. If the five spheres simultaneously contact together, what is the net charge on them.

A. +16 C
B. +4 C
C. −4 C
D. −16 C



48. Five particles are shot from the left into a region that contains a uniform electric field. The numbered lines show the paths taken by the five particles. A negatively charged particle with a charge $-3Q$ follows path 2 while it moves through this field. Do not consider any effects due to gravity. In which direction does the electric field point? (refer Fig.z)

A. toward the top of the page
B. toward the left of the page
C. toward the right of the page
D. toward the bottom of the page
E. out of the page, toward the reader

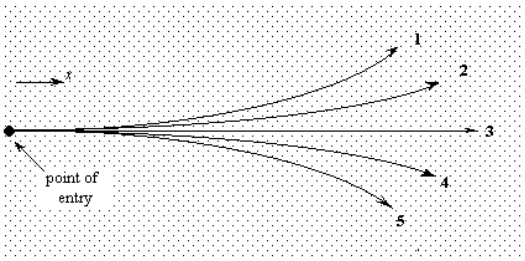


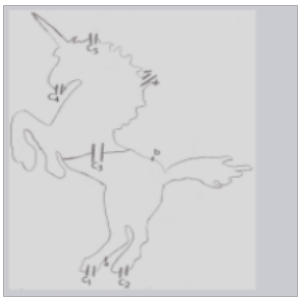
Fig.z

49. Which path would be followed by a charge $+6Q$?(refer Fig.z)

A. path 1 B. path 2 C. path 3 D. path 4 E. path 5

50. What is the equivalent capacitance if each the capacitor in the network has capacitance c?

A. 5c
B. c/5
C. 3c/8
D. c/2

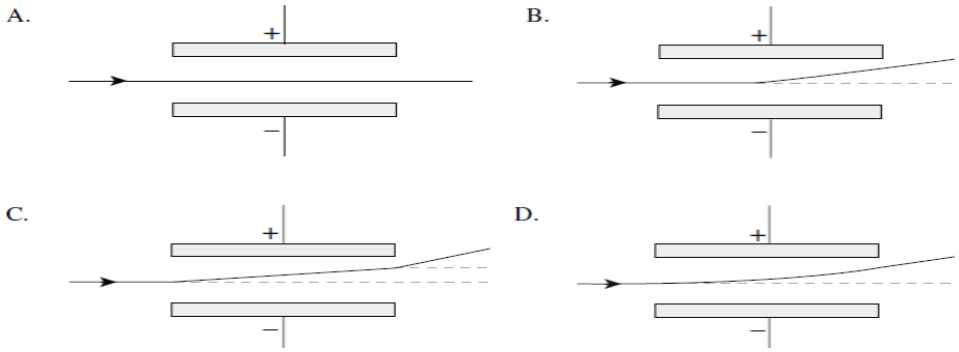


51. A parallel plate capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are moved farther apart by means of insulating handles

A. the charge on the capacitor increases
B. the voltage across the plates increases
C. the capacitance increases

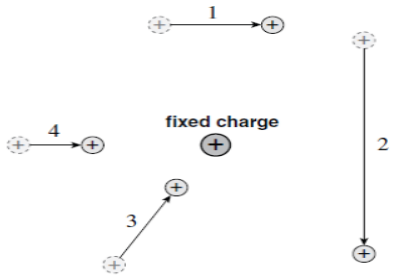
D. the electrostatic energy stored in the capacitor increase

52. Which diagram best represents the path of an electron travelling between charged parallel plates?



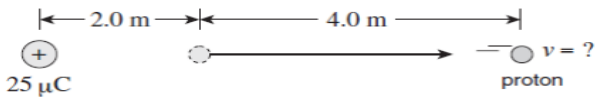
53. A small sphere with an electric charge may be moved in four different ways near a fixed electric charge as shown in the figure.
Which displacement requires the most wor

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



54. A proton initially held at rest 2.0 m away from a fixed 25μC charge is released.
The proton accelerates to the right as shown. What is the speed of the proton when it is 6.0 m away from the 25μC charge?

A. 2.7 x10^6 m/s
B. 3.3 x10^6 m/s
C. 3.8 x10^6 m/s
D. 4.6 x10^6 m/s



CHAPTER 5

1. A copper wire of cross- sectional area 2mm^2 carries a current of 1.5A. If the drifty velocity of the electron is
0 .00028m/s, what is the number of charge carriers (free electrons) per unit volume in the copper wire?
A. 1.67x10^{28}/m^3 B.1 .5x10^{32}/m^3 C. 1.5x10^{25}/m^3 D. 1.67x10^{32}/m^3

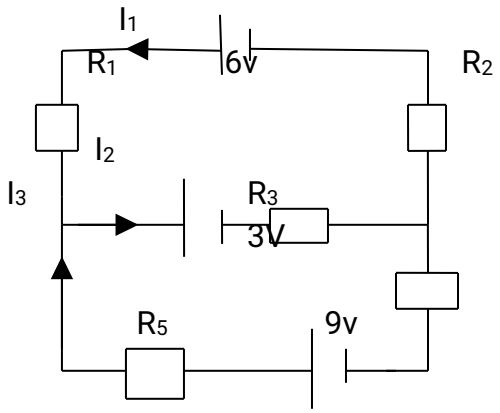
2. Which of the following statement is correct?
A. Galvanometer can be converted to voltmeter of different scale by connecting low valued resistance in
parallel
B. Low valued internal resistance increases accuracy of voltmeter
C. Galvanometer can be converted to ammeter of different scale by connecting verity of low valued is
shunt resistance in parallel

D. High valued internal resistance increases accuracy of ammeter

3. In the circuit shown below, each resistor has a value of 3Ω. What is the value of the current through R_4?

A. 0.125A B. 0.75A

C. 0.625A D. 1A



R4

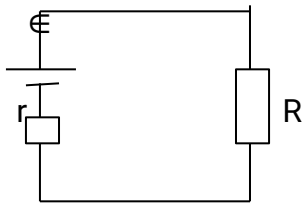
4. Which of the following is **NOT** correct about the circuit shown below?

A. Voltage across R is $\frac{R}{r+R} \in$

B. Current flowing through R is $\frac{\in}{r+R}$

C. Current flowing through r is $\frac{r}{r+R} \in$

D. Power drop in R is $\frac{R}{(r+R)^2}\in^2$



5. If a cell supplies a current of 0.9A when connected to a 2Ω resistor and a current of 0.3A, then what will be the

internal resistance of the cell when connected to a 7Ω resistor?

A. 2 Ω B. 1.2 Ω C. 1 Ω D. 0.5 Ω

6. A galvanometer of full- scale deflection 10mA is to be converted into a 0 – 10A ammeter. If its coil has a resistance of 100Ω, then what value of shunt resistance must be fitted?

A. 0.1 Ω B. 10 Ω C. 9.99 Ω D. 0.999 Ω

7. Household light bulbs are normally connected in parallel to a power supply. Suppose a 40w and a 60W light bulbs are, instead, connected in series. Which bulb is brighter?

A. The 60W bulb C. The bulbs are equally bright

B. The 40W bulb D. The bulbs will not give fight in series connection

8. Consider a long cylindrical charge distribution of radius R with a uniform charge density p. What is the magnitude

of electric field at distance r from the axis where r <R?

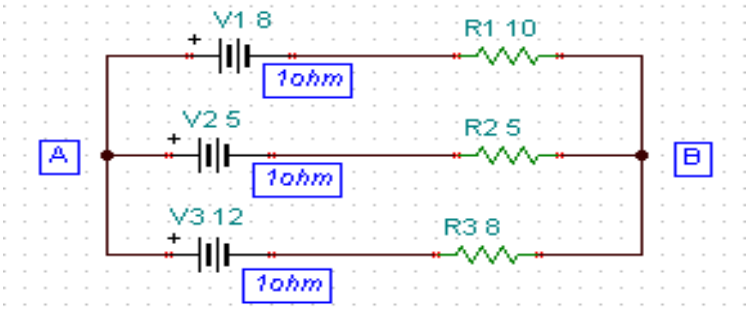
A.. $\frac{pr}{3\varepsilon_0}$ B. . $\frac{pr}{2\varepsilon_0}$ C .. $\frac{pr}{7\varepsilon_0}$ D .. $\frac{pr}{5\varepsilon_0}$

9. What is the ratio of power dissipated by the combined network of resistors, with resistance R, between terminals a and b to the power dissipated by a resistor of resistance R between terminals b and c, shown in the figure below. The two terminals a and c of the network are connected to a battery such that current I flows from terminal a to terminal

A.. $\frac{7}{13}$ B.. $\frac{6}{13}$ C.. $\frac{7}{11}$ D.. $\frac{6}{11}$

10. Determine the current in the 5 Ω resistor in the figures shown below

A. 7.85 A
B. 1.09 A
C. 0.48 A
D. 0.18 A



11. A cell supplies a current of 0.9 A through a 2 Ω resistor and a current of 0.3 A through a 7 Ω resistor. The internal resistance of the cell is?

A. O.5 Ω B. 1.0 Ω C. 1.2 Ω D. 2.0 Ω

12. A rod is made of two materials connected to each other. Each conductor has a square cross – section of 3mm on a side. The first material has resistivity of $\rho_1 = 4x\ 10^{-3}$ Ω m and is 25cm long while the second material has resistivity of $\rho_2 = 6 \times 10^{-3}$ Ωm and is 40cm long. What is the resistance between the ends of the rod? A. A. 378 Ω B. 267 Ω C. 436 Ω D. 363 Ω

13. The maximum power delivered to the load resistance R occurs when the load resistance R and internal resistance r have the following relation:

A. r = 2R B. r = R C. r = 3R D. r = 7R

14. There is a current of 2A in the system of conductors shown in the figure below. The potential difference V_A – V_B is A. -2 V B. -1 V C. +1V D. +2V

15. A galvanometer many as used as an ammeter by

A. Shunting the galvanometer with a high resistance
B. Connecting a low resistance in parallel with the galvanometer
C. Connecting a high resistance in series
D. connecting a high resistance in series

16. Wire B has twice the length and twice the radius of wire A. Both wires are made from the same material. If v wire A has a resistance R, what is the resistance of Wire B?

A. 4R B. 2R C. R/2 D. R/4

17. If the terminals of a battery with Zero internal resistance are connected across two identical resistors in series, the total power delivered by the battery is 8 W. If the same battery is connected across the same resistors in parallel, what is the total power deceived by the battery?

A. 2W B. 4W C. 16W D. 32W

18. If a piece of aluminum is cooled from room temperature to 80K, then the resistance of the piece?
    A. Increase B. Decrease C. Remain the same.
    B. It is not possible to tell, as all material do not show the same electrical characteristics upon cooling.

19. A copper wire is stretched so that its length increases & its diameter decreases as a result its
    A. resistance decreased & its resistivity remains the same
    B. resistivity decrease & its resistance remains the same
    C. resistance increase & its resistivity remains the same
    D. resistivity increase & its resistance remains the same

20. The terminal voltage of a cell supplying energy to a circuit is usually less than its emf because of the cell's
    A. Size B . Internal resistance C. mass D. Energy

21. Which of the following statement is NOT TRUE?
    A. Any device such as battery or generator can be considered as source of emf
    B. The terminal voltage can be equal to emf in real system
    C. Emf forces electrons move in a direction opposite to the electrostatic force
    D. Emf can be defined as work done per unit charge

22. Two resistors connected in series have an equivalent resistance of $7\,\Omega$. When they are connected in parallel,
    their equivalent resistance is $\frac{10}{5}\Omega$. What is the resistance of each resistor?
    A. 5.5Ω , 1.5 Ω B. 5 Ω , 2 Ω C .6 Ω , 1 Ω D. 4 Ω , 3 Ω

23. In Figure 8, the current in the 16Ω resistor is:-

    A. 0.64A
    B. 0.15 A
    C. 0.49 A
    D. 1.28A

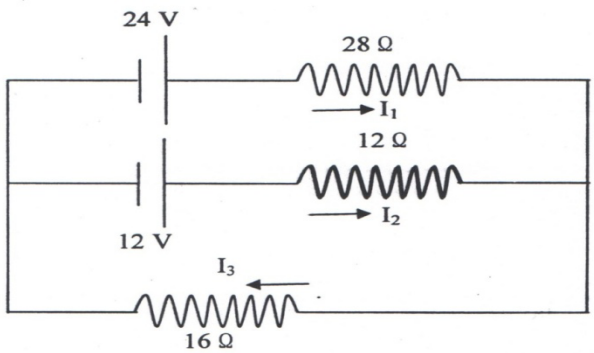


Fig. 8

23. The statement of Kirchhoff's point rule follows from:
    A. dependence of resistance on temperature B. conservation of energy
    C. Ohm's law D. conservation of charge

24. A metal rod is measured to have a resistance R. If the same metal rod is stretched to reduce its radius by half
    without affecting its density, what is its new resistance?
    A. 2R B. 16R C.8R D. 4R

25. You are given the bridge circuit as shown in the diagram below. The resistance R is used to limit the

current in
the galvanometer. Which of the following is correct in measuring R_x?

A. The bridge balance condition is given by $\frac{R_x}{R_3} = \frac{R_2}{R_1}$

C. $\frac{R_x}{R_3} = \frac{R_1}{R_4}$

B. The bridge is balanced when $\frac{R_1}{R_2} = \frac{R_3}{R_4}$

D. $\frac{R_x}{R_3} = \frac{R_2}{R_4}$

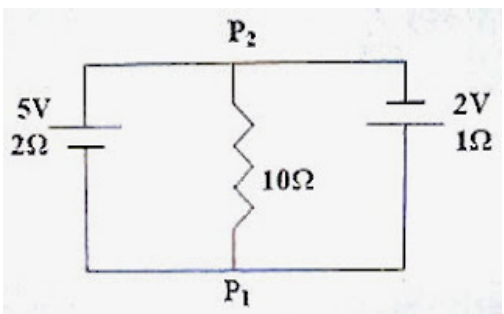
26. A Series circuit consisting of 50 Ω resistor and capacitor of capacitive reactance 50Ω are connected to alternating
source of voltage (rms) 100V. What is the average power output and power factor of the circuit?
A.141.4W, 0.8 B. 200W, 0.8 C. 100W. 0.707 D. 70.7W, 0.707

37. A 9 V battery is composed of six 1.5 V cells, which are connected in series. Each cell has an internal resistance of 0.2Ω. What is the highest current that can be obtained from such a battery?

A. 7.5A B. 4.5A C. 2A D. 3A

27. A 5 V battery with internal resistance 2 Ω and a 2 V battery with internal resistance 1Ω are connected to a 10 Ω resistor as shown in the figure. The current in the 10 Ω resistor is

A. 0.27 A, P_1 to P_2 B. 0.27 A, P_2 to P_1



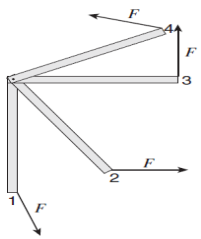
C. 0.03 A, P_1 to P_2 D. 0.03 A, P_2 to P_1

28. A 9 V battery is composed of six 1.5 V cells, which are connected in series. Each cell has an internal resistance of 0.2 Ω. What is the highest current that can be obtained from such a battery?

A. 7.5A B. 4.5A C. 2A D. 3A

A force is used to rotate a beam. As the beam rotates, the direction of the force changes but its magnitude does not. What happens to the torque on the beam due to this force as the beam is rotated from position 1 to position 4?

A. always increases
B. always decreases
C. increases then decreases
D. decreases then increases



CHAPTER 6

1. Suppose you obtain a piece of iron from your laboratory shelf. How can you experimentally determine, for use,

that it is magnetized?

A. If it attracts another magnet C. If it diverges a charged electroscope

B. There is no single and sure way to determine its magnetization D. If it repels another magnet

2. Two parallel wires each carrying 5A current in the same direction are separated by 2.5cm. What is the magnitude of the force per unit length acting on the wires?

A. $4x10^{-6}$ N/m, repulsive C. $2x10^{-4}$ N/m, attractive

B. B. $8x10^{-5}$ N/m, repulsive D. $5x10^{-6}$ N/m attractive

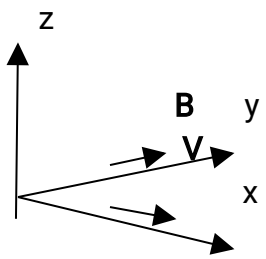
3. A positive charged particle of charge $q = 3.2x10^{-19}C$ is moving parallel to x- axis with speed of 1000m/s in a magnetic field of 0.5T parallel to y- axis as shown in the diagram below. What is the magnetic force on the charge?.

A. $8x10^{-16}$N in – ve z

B. $3.2x10^{-16}$N in – ve x

C. $8x10^{-17}$N in + ve x

D. $1.6x10^{-16}$N in + ve z



4. A charged particle moves perpendicular to a uniform magnetic field. Which statement is correct about the motion of the particle?

A. Both kinetic energy and linear momentum of the particle change

B. The kinetic energy of the particle change but not its linear momentum

C. The linear momentum of the particle changes but not its kinetic energy

D. Both the energy and momentum do not change

5. Which of the following statement is **NOT** correct about magnetic field?

A. Magnetic field lines are closed C. The closer the field lines are, the stronger the magnetic field

B. Magnetic monopoles exist D. Magnetic field is produced by moving charge

6. A wire withy mass of 0.5 g/cm carries a 2 A current horizontally towards the south. What are the direction and magnitude of the minimum magnetic field needed to lift this wire vertically upward/

A. 0.25 T towards west C. 0.50 T towards west

B. 0.25 T towards east D. 0.50T towards east

7. Two parallel cooper wires are 1cm apart. Lightning sends a 10,000 A pulse of current along each conductor. What is the force per unit length on one conductor /

A. 1000 N/m B. 200 N/m C. 20 N/m D. 2000N/m

8. Find the magnitude of the force felt by an electron traveling at an angle of 60^0 to the earth's magnetic field at 1.4×10^7 m/s. The charge on an electron is 1.6×10^{-19} C and the magnitude of the earth's magnetic field is 5×10^{-5} T

A. 0 N B. 9.7×10^{-17} N C. 1.1×10^{-16} N D. 8.6×10^{-17} N

9. A wire carries a steady current of 2.4 A. A straight section of the wire is 0.75 m long and lies in xy-plane

along
the x axis within a uniform magnetic field, B = 1.6**k** T. If the current is in the positive x direction, what is the
magnetic force on the section of wire?

A. 2.88N, in the negative y direction
B. 2.88 N, in the positive y direction
C. 3.84 N, in the negative y direction
D. 3.84 N, in the positive y direction

10. A long straight wire carrying a steady current of 3A flowing in direction parallel to a unit vector $\frac{1}{\sqrt{3}}(i + j + k)$ is

placed in a magic field $B = (0.75\ i + 0.4\ k)$T. What is the magnetic force per unit length of the wire?

A. $(0.69\ i - 0.61\ j - 1.3\ k)\frac{N}{M}$
B. $(0.49\ i - 0.5\ j - 1.37\ k)\frac{N}{M}$
C. $(0.49\ i - 0.51\ j - 1.37\ k)\frac{N}{M}$
D. $(0.59\ i - 0.7\ j - 0.13\ k)\frac{N}{M}$

11. A changed particle is moving in a UNIFORM magnetic field. If the direction of motion of the charged particle is
parallel to the magnetic field, the shape of the charged particle's path will be

A. Circular B. Straight C. Spiral D. elliptical

12. A rectangular loop 0 of area $0.4m^2$ is placed in a magnetic field that is changing at a rate of 100T/s. If the normal
of the loop makes angle 60^0 with the magnetic field. What is the magnitude of induced emf?

C. 34.64V B. 20V C. 80v D. 40V

13. Two 1ong wires of 10 m in length carries a current of 2.0 A and 0.5A in the same direction. The wires are
separated by 4.0 cm. What is the magnetic force wires exerted on each other?

A. $5x10^{-6}N$ B. $5x10^{-5}N$ C. $4x10^{-6}N$ D. $5x\ 10^{-7}N$

14. What is the expression of the centripetal acceleration of a particle of charge n mass m moving in a uniform
magnetic field B on a circle of radius r it B is perpendicular to the particle's direction of motion?

A. $\frac{q^2B^2}{m^2}r$ B. $\frac{2qB}{mr}$ C. $\frac{q^2B^2}{m}r$ D. $\frac{qB}{m}$

15. A current of 5A flows through the circuit when the switch in the figure below is closed. What would be the
copper wire suspended on the clamp ?A .experience no force B. be deflected outward
C. be deflected inward D. be lifted upward

19. A positively charged particle in a uniform magnetic field moves in a circular path in the clockwise direction, parallel to the plane of the page. In what direction do the magnetic field lines point?

A. Out of the page B. Into the page C. To the left D. To the right

20. A charged particle is moving in a circular orbit in a magnetic field. If the strength of the magnetic field doubles,how does the radius of the particle's orbit change?

A. It is quartered B. It is halved C. It is doubled D. It is quadrupled

21. An electron moving horizontally along the +x axis enters a region of space with a horizontal uniform magnetic field pointing in the +y direction. The electron will be deflected:

A. -y direction B. +y direction C. -z direction D. +z direction

22. Two parallel wires 150mm apart. If there is a current of 2.0A in one of the wire and 5.0A in the same direction in the other, what is the force per unit length?

A. 1.87×10^{-6}N/m B. 1.3×10^{-4}N/m C. 2.6×10^{-5}N/m D. 1.3×10^{-5}N/m

CHAPTER 7

1. An inductor has a self-inductance of 12mH. The current in the circuit decreases at a rate of 2A/s. What is the magnitude of the induced electromotive force?

A. 2.4×10^{-2}V B. 1.2πV C. 2.4πV D. 1.2×10^{-2}V

2. Which of the following is **correct** about the characteristic of current and voltage in a.c. circuits?

A. If the current is in phase with the voltage, the circuit is inductive
B. If the current leads the voltage, it is inductive circuit
C. If the current lags the voltage, the circuit is capacitive
D. If the current leads the voltage, its capacitive reactance is greater than inductive reactance

3. An RLC circuit is designed to have a resistance of 400Ω, capacitive reactance of 350Ω and inductive reactance of 50Ω. The circuit is connected to an alternative voltage source of effective (rms) value 50V, and frequency of 50Hz. What is the output average power?

A. 400W B. 4W C. 40W D. 62.5W

4. Which of the following has an electronvolt unit?

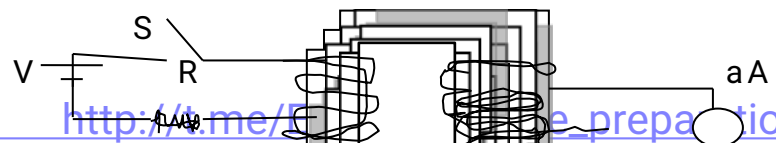
A. energy B. potential difference C. charge D. electromagnetic intensity

5. A magnetic field of strength 5×10^{-5} T passes through an area of 20cm^2 that is at an angle of 60^0 to the magnetic field. What is the magnetic flux?

A. 0Wb B. 2.5×10^{-8} Wb C. 8.7×10^{-8} Wb D. 5×10^{-8} Wb

6. An electric generator has a coil of 400 turns and cross- sectional area 5m^2 rotating at angular frequency 0.524rad/s in a uniform magnetic field of 0.2T. What is the induced e.m.f. produced from the electric generator in each second? A .209.6V B. 104.8V C. 200V D. 182.4V

7. The primary coil of a transformer is connected to a battery, a resistor, and a switch. The secondary coil is connected to an ammeter. What does the ammeter show when the switch is thrown closed?



A. Zero current as transformer is not working on DC C. A steady current
B. A nonzero current for a short instant D. e.m.f. will be induced but not current

8. Which of the following statement is correct?
   A. The direction of induced e.m.f. is such a direction as to enforce the change produces it
   B. Self inductance of a coil is e.m.f. divided by magnitude of rate change of current with time
   C. The induced e.m.f. in a coil is inversely proportional to its number of turns
   D. Self inductance of a coil is inversely proportional to the cross- sectional area of the coil

9. The induced electromotive force in a current carrying coil placed in a magnetic field does **NOT** depend on
   which of the following?
   A. The speed at which the coil moves if the relative motion does not result in changing the magnetic flux
   B. The length of the coil that is moving in a direction perpendicular to that of the magnetic field
   C. The area of the coil outside the field D. The change of magnetic flux density

10. Which statement is correct about a purely inductive circuit?
   A. The current leads the voltage by π/2
   B. The current is in phase with the voltage
   C. The current lags behind the voltage by π/2
   D. The current lags by π/2 at law frequencies and leads by $\frac{\pi}{2}$ a high frequencies.

11. What is the main reason why alternation current is used to transmit electricity?
   A. To minimize power gain C. To maximize voltage gain
   B. To minimize energy loss D. To maximize current gain

12. Two coils, held in fixed positions, have a mutual inductance of 100 μH. what is the peak voltage in one when
   the sinusoidal current given by I (t) = (10.0 A) sin (1000 t) flows in the other?
   A. 1.0 μV B. 100.0 V C. 10.0 V D. 1.0V

13. A condition rod of length L moves with a constant velocity V perpendicular to along, strait wire carrying current I. what is the magnitude of the emf generated between the ends of the rod?
   A. $\frac{\mu 0\ VL}{2\pi}$ C . $\frac{\mu 0\ VL}{2}$ r
   B . $\frac{\mu 0\ VL}{2\pi}$ r D . $\frac{\mu 0\ VL}{2r}$

14. Two rectangular loops of wire lie in the plane of this paper shown in Fing.1 if the current I in the outer loop is
   Counter clockwise increases with time, which one of the following statements is correct about the current
   induced in the inner loop?

A. current is induced in the inner loop in the clockwise direction.

B. Current is induced in the inner loop in the counter clockwise direction.

C. The induced current in the inner loop creates a magnetic field inside the area bounded by the inner its

D. Its zero loop in the same direction of the magnetic that the outer loop produces in this same area.

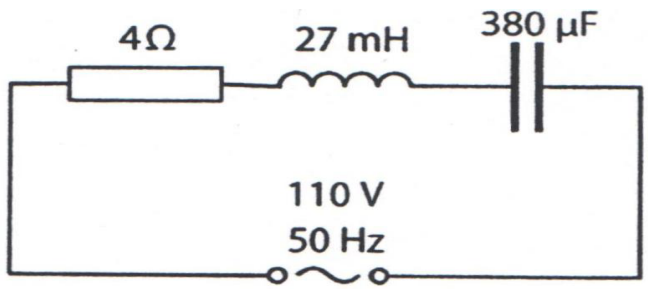
15. Determine the total impedance for the circuit shown blow

A . 0Ω

B. 4 Ω

C. 27 Ω

D. 31 Ω



16. A 6.00 – V battery is connected across the primary coil of a transformer having 50 turns. If the secondary coil of the transformer has 100 turns, what voltage appears across the secondary?

A. 24.0V B. 12.0V C. 6.00 V D. 3.00V

17. A coil formed by wrapping 50 turns of wire in the shape of a square is positioned in a magnetic field so that the normal to the plane of the coil makes an angel of 37^0 with the direction of the field. When the magnetic field is increased uniformly from 200 mT to 600 mT in 4.00 s, an emf of magnitude 160.0 mV is induced in the coil.

What is the total length of the wire in the coil?

A. 100 m B. 20m C. 300m D. 400m

18. In a LRC series circuit, suppose R = 300Ω , L= 60 mH, C= 0.5 μF , V = 50 v, and ω= 10,000 rad/s.

What is the average power delivered to the entire circuit ? A. 1.5W B. 2.3 W C. 3.5W D. 1.0W

19. The peak voltage of the alternating emf is 141 volts. The effective value of the voltage in volts is

A. 70.5 B. 100 C. 141 D. 200

20. The voltage output of a generator is given by V = (300V) sin (ωt). What is the rms current in the circuit when this generator is connected to a 100Ω resistor? A. 1.50A B. 2.12 A C. 1.12A D. 1.41A

21. An induced e.m.f. is ob tainted between the ends of a horizontal steel axle X of a train moving due east. This is because

A. X points due east B. The earth's magnetic field has a horizontal component

C. X moves parallel to the earth's field D. The earth has a vertical magnetic component

22. Which device functions with the principle of mutual induction?

A. Electromagnet B. Transformer C. Electric motor D. Transistor

23. A capacitance C = 2 μF and inductance L = 10H and coil resistance 5 Ω are in series in a circuit. When an alternating current of 2A rms flows, the power in watts in the circuit is

A. 100 B. 50 C. 20 D. 2

24. An inductive coil has a resistance of 100Ω. When an ac signal of frequency 1000Hz is fed to the coil, the applied voltage leads the current by 45^0. What is the inductance of the coil?

A. 10mH B. 12mH C. 16mH D. 20mH

25. Lenz's law in electromagnetic induction follows from which law of conservation

A. charge B. momentum C. energy D. mass

26. A Series circuit consisting of 50 Ω resistor and capacitor of capacitive reactance 50Ω are connected to alternating source of voltage (rms) 100V. What is the average power output and power factor of the circuit?

A.141.4W, 0.8 B. 200W, 0.8 C. 100W. 0.707 D. 70.7W, 0.707

26. The applied ac voltage and the resulting current, In a circuit element, is shown below. What is the circuit element? A. inductor B. resistor C. capacitor D. diode

27. Lenz's law in electromagnetic induction follows from which law of conservation

A. charge B. momentum C. energy D. mass

28. Self inductance is a quantity that describes:

A. the number of turns in a circuit.

(B) the 1nduction of an electric field by an AC current n lone coil.

C) the induction of a magnetic field by an AC current in a lone coil.

(D) the steady state current in a coil.

29. Which conversion process forms the basis for the function of an electric generator?

(A) alternating current to direct. (C) electrical energy to mechanical.

B) mechanical energy to electrical. (D) low voltage to high or vice versa.

30. What is the change in magnetic flux in a coil of area Sm as its orientation relative to the perpendicular of a uniform 3.0T magnetic field changes from 45^0 to 90^0

(A) OWb (B)7.5 Wb (C) -11Wb (D) 11 Wb

31. A simple transformer is illustrated in the Figure below load Resistor primary Secondary coil laminated iron core.

Why is it that the core is laminated?

A. To increase the induced current in the primary coil.

B. To increase the induced current in the secondary coil.

C. To avoid heat exchange between the primary and Secondary coils.

D. To reduce the loss in power in the Core auce to eddy currents.

32. A current in a coil changes from 25A to 35A in 0.001 sec and induce an emf of 100V. What is self

inductance of the coil? A. 4×10^{-3}H B. 1×10^{-4}H C. 1×10^{-2}H D. 2×10^{-2}H

33. Which of the following *IS NOT TRUE?*
    A. An emf produced when magnetic field changes near wire.
    B. The magnitude of induced emf is propertional to the rate of change in magnetic flux.
    C. The direction of induced emf is such as oppose the change creating it.
    D. Eddy current induced in solid metallic object when there is no change in magnetic flux.

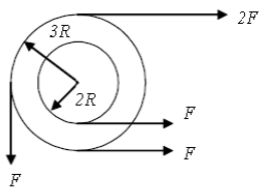
34. Which of the following *IS NOT* the main factor that determine the magnitude of self and mutual inductance?
    A. The magnetic flux C. number of turns of coil
    B. The temprature D. the current through coil

35. The phase angle between current and voltage is zero in a.c. circuit,when the circuit contains:
    A. Capacitance only C. inductance only
    B. Resistance only D. series combination of capacitance and inductance

36. Which of the following *IS NOT TRUE* about the power in a.c. circuit?
    A. The average power is zero in pure inductive circuit.
    B. The average power is zero in pure capacitive circuit.
    C. The average power is zero in RLC circuit.
    D. Real power is the power transferred when the load is pure resistive.

37. A system of two wheels fixed to each other is free to rotate about a frictionless axis through the common center of the wheels and perpendicular to the page. Four forces are exerted tangentially to the rims of the wheels, as shown below. The magnitude of the net torque on the system about the axis is

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



CHAPTER 8

1. In Rutherford experiment, a beam of positively charged alpha particles was projected into a thin piece of gold foil. The observation shows that some charged particles deflected through a large angle (10^0 to 90^0) are those concentrated in one place. What conclusion can be draw from this observation?
    A. Most of the atom is empty space C. All the atom is negative charge
    B. All the atom is positive charge D. Most the mass and all positive charge is in tiny central nucleus

2. The activity of radioactive substance reduces from 2000Bq to 1000Bq in 10^6 sec. What is the decay

constant?

A. 6.93×10^{5} decay/s B. 6.93×10^{-7} decay/s C. 2×10^{6} decay/s D. 5×10^{-7} decay/s

3. Which of the following phenomena clearly demonstrates the particles nature of light?

A. Refraction of light by prism
B. The photoelectric effect
C. Diffraction of light by double slit
D. Dispersion of white light

4. The half- life of radium – 224 is 3.5 days. What fraction of the sample remains undecay after fourteen days?

(if needed use ln2 = -ln (1/2) = 0.693). A. ½ B. ¼ C. 1/8 D. 1/16

5. Complete the following equation, which represents a nuclear fission reaction. What is the particle represented by

X? $^{235}U + {}_{0}^{1}n \rightarrow Rb + {}^{139}Cs + 2X + \text{energy}$?

A. Electron B. Neutron C. proton D. Alpha particle

6. When ultraviolet light is shone on a clean metal surface the surface will emit electrons. What is the necessary

Precondition for electrons to be ejected from the metal surface is ?

A. The intensity of light must be high enough
B. The frequency of the metal has to be less than that of ultraviolet light.
C. The wave length of the light has to be greater than that of ultraviolet light.
D. The minimum energy required to release the electron is the same as the work function of the metal

7. In photoelectric effect, the energy of photoelectrons proportional to the:

A. frequency of light B. intensity of light C. speed of light D. absorbance of the metal

8. The activity of a radioactive source falls to one sixteenth of Original value in 32 minutes. What is the half -life, in

minutes, of this decay process? A. 2 min B. 4 min C. 8 min D. 16 min

9. Which statement is NOT correct about emissions for radioactive isotopes?

A. Alpha particles are positively charged and les penetrating than beta and gamma.
B. Beta particles are negatively charged and more penetrating than alpha particles.
C. Alpha emissions are least influenced by magnetic field
D. The most penetrating emissions are gamma particles.

9. A common unit of energy in atomic physics is:

A. Plank's constant. B. electron volt. C. de Broglie wavelength. D. uncertainty principle

10. The maximum kinetic energy of photoelectrons emitted from a surface when photons of energy 6 eV fall on it is 4 eV. The stopping potential in volts is A. 2 B. 4 C. 6 D. 10

11. When the intensity of light shining on metal surface increases:

A. The number of photoelectron will increases. C. The kinetic energy of photoelectron will increases.

B. The work function increases.

D. The frequency of photoelectron emission increases.

12. Photons always propagate with speed c , but light appears to travel at a speed different from c in dense media. How can we account for this phenomenon?

A. Propagation in media depends on re-radiation by electron-oscillators, which takes a finite time to occur

B. Electron oscillators in the medium introduce a phase change upon re-radiation

C. A medium is a different reference frame to vacuum, so the difference in the observed speed of light is a consequence of relativity.

D. Light is slowed down because it does not take a straight line path through the dense medium

Credit:-@Yerasulwadajnegn

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