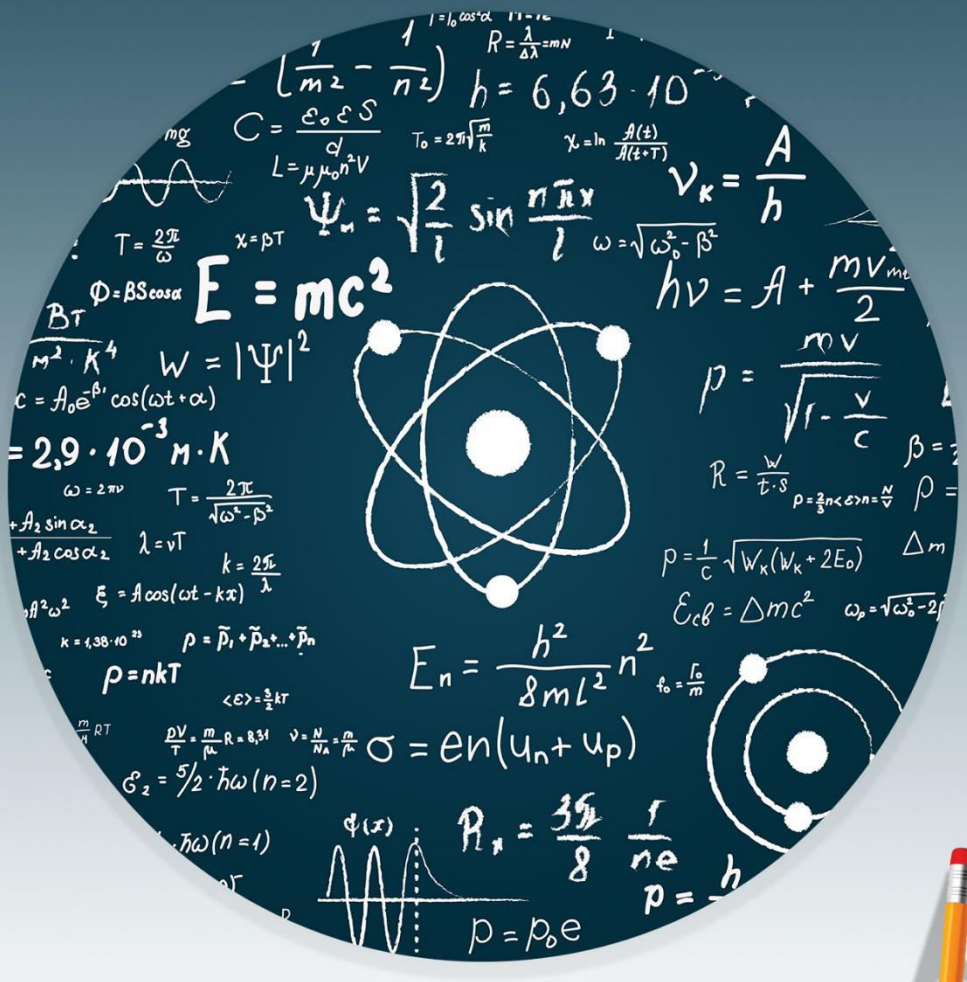
PHYSICS



WORKSHEET-9

STEP

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Worksheet-9

Topics:- Alternating Current (Complete)

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1. The basic difference between A.C and D.C is:

A. Direction reversal by A.C

B. Changing magnitude by A.C

C. Both A and B

D. None of these

2. An A.C current is given by I=100 sin100πt. It will achieve value of 50 A after _____ second.

A. $\frac{1}{600}$ B. $\frac{1}{1800}$

C. $\frac{1}{300}$ D. $\frac{1}{900}$

3. A bulb is connected with A.C supply. The intensity of light from the bulb:

A. Changes continuously

B. Decreases and becomes zero

C. Increases and reaches to its maximum

D. Remains constant

4. Two A.Cs are represented by $I_1 = 100\,sin\,100\pi t$ and $I_2 = 100\,sin\,200\pi t$, the relation between the frequencies of these A.Cs is:

A. $f_1 = f_2$ B. $f_1 = 2f_2$

C. $f_2 = 2f_1$ D. $f_1 = 10f_2$

5. The time taken by A.C to reach half of maximum value is _____ while initial phase of A.C is 0°.

A. $\frac{T}{8}$ B. $\frac{T}{6}$

C. $\frac{T}{12}$ D. $\frac{T}{4}$

6. How many times A.C achieves zero value in one cycle:

A.Once B. Twice

C. Thrice D. Four times

7. The rms value of A.C in 1st half is:

A. Zero B. $\frac{I_\circ}{2}$

C. $\frac{I_\circ}{\sqrt{2}}$ D. $\frac{2I_\circ}{\sqrt{2}}$

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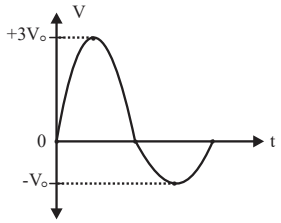
8. In the following waveform, the peak to peak value is:



A. $+2V_\circ$ B. $+3V_\circ$

C. $+1V_\circ$ D. $+4V_\circ$

9. Referring to question # 8, the rms value will be:

A. $\frac{V_\circ}{\sqrt{2}}$ B. $\sqrt{\frac{2}{5}}V_\circ$

C. $\sqrt{\frac{3}{2}}V_\circ$ D. $\sqrt{\frac{5}{2}}V_\circ$

10. The rate of heat production in a resistor due to an alternating current of rms value 10 A is same as that due to a direct current of:

A. 10 A B. $10\sqrt{2}\ A$

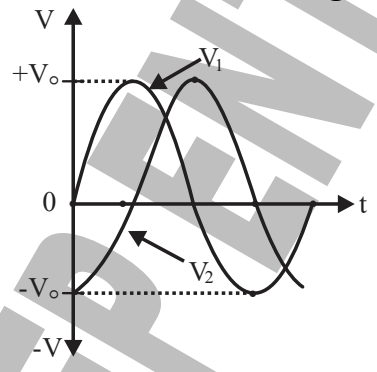
C. $10\sqrt{3}\ A$ D. 5 A

11. The voltage of domestic A.C is 220 volt what does this represent:

A. Mean voltage B. Peak voltage

C. Root mean voltage D. Root mean square voltage

12. Two A.C waveforms are shown in figure:



The phase relation between V_1& V_2 is:

A. V_1 leads V_2 by 90° B. V_2 lags V_1 by 90°

C. V_2 leads V_1 by 90° D. Both A and B

13. Referring to waveforms in Questions # 12, the expression for V_1 = _____ & V_2 =_____:

A. $V_\circ cos\theta,\ V_\circ sin\theta$ B. $V_\circ sin\theta,\ V_\circ sin(\theta + 90°)$

C. $V_\circ sin\theta,\ V_\circ sin(\theta - 90°)$ D. None of these

14. Phase lead or lag between two alternating quantities is conveniently shown by representing A.C quantities as:
A. Scalars
B. Vectors
C. One by scalar and other by vector
D. All may correct

15. The response of which one is same both in A.C and D.C:
A. Capacitor B. Resistor
C. Inductor D. Inductor and capacitor

16. A sinusoidal alternating current of peak value $I_\circ$ passes through a heater of resistance R. What is the mean power output of the heater?
A. $\frac{I_\circ^2 R}{2}$ B. $I_\circ^2 R$
C. $\frac{I_\circ^2 R}{\sqrt{2}}$ D. $\sqrt{2} I_\circ^2 R$

17. In a capacitive circuit, at low frequency, the reactance will be:
A. High B. Zero
C. Low D. Infinite

18. A 1 μF capacitor is connected across an AC source whose voltage amplitude is 50 V and angular frequency is 100 rad/s. The current amplitude will be:
A. 2.5 mA B. 10 mA
C. 5 mA D. 15 mA

19. For which component used in A.C circuit the power factor is zero:
A. Capacitor
B. Resistor
C. Inductor
D. Both capacitor and inductor

20. At what frequency will an inductor of 1.0 H have a reactance of 500 Ω?
A. 50 Hz B. 70 Hz
C. 60 Hz D. 80 Hz

21. An inductor is connected with A.C source, during 1st quarter cycle when both I and V are positive, this means energy is:
A. Supplied to inductor B. Zero in inductor
C. Returned by inductor D. Dissipated in heat

22. The reactance of an inductor at 50 Hz is 10 Ω. Its reactance at 100 Hz is:
A. 2.5 Ω B. 10 Ω
C. 5 Ω D. 20 Ω

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23. A resistor R and capacitor C are connected in series across an A.C source of rms voltage 5 V. If the rms voltage across C is 3 V then that across R is::

A. 1 V B. 3 V

C. 2 V D. 4 V

24. The impedance of a circuit consist of 3 Ω resistance and 4 Ω reactance. The power factor of circuits is:

A. 0.4 B. 0.8

C. 0.6 D. 1

25. Dimension of L/CR is same as that of:

A. L B. C

C. R D. None of these

26. Unit of impedance is:

A. VA^{-1} B. VA

C. V^{-1} A D. None of these

27. In an LCR series circuit, the capacitor is changed from C to 4C. For the same resonant frequency, the inductance should be changed from L to:

A. 2L B. $\frac{L}{4}$

C. $\frac{L}{2}$ D. 4L

28. In an A.C circuit, a resistance R is connected in series with an inductance L. If the phase angle between voltage and current be 45°, the value of inductive reactance will be:

A. $\frac{R}{4}$

B. R

C. $\frac{R}{2}$

D. Cannot of found with the given data

29. In an A.C circuit containing an inductance and a capacitance in series the current is found to be maximum when the value of inductance is 0.5 henry and capacitance is 8 μF, the angular frequency of the input voltage must be equal to:

A. $500\frac{rad}{s}$ B. $4000\frac{rad}{s}$

C. $5\times10^{6}\frac{rad}{s}$ D. $5000\frac{rad}{s}$

30. The current in resistance at resonance in series resonance circuit is:

A. Zero B. Maximum but finite

C. Minimum but finite D. Infinite

31. The advantage of three phase A.C supply is:

A. Total load is divided B. Two values of voltage

C. No phase is overloaded D. All of these

32. Common terminal of three coils in 3-phase A.C supply is at:

A. Maximum Potential B. Negative potential

C. Zero potential D. High potential

33. If the phase voltage of a 3-phase A.C supply is $\frac{200}{\sqrt{3}}$ volts, then line to line voltage is:

A. 100 V B. 200 V

C. $200\sqrt{3}$ V D. None of these

34. Which of following is called oscillator circuit?

A. RC-circuit B. RL-circuit

C. LC-circuit D. RLC-circuit

35. The natural frequency of oscillator circuit is:

A. $2\pi\sqrt{LC}$ B. $\frac{1}{\sqrt{LC}}$

C. $\frac{1}{2\pi\sqrt{LC}}$ D. None of these

36. In metal detectors when a metal comes near search coil, its inductance _____& corresponding oscillator frequency _____.

A. Increases, increases B. Increases, decreases

C. Decreases, increases D. Decreases, decreases

37. Speed of X-rays in vacuum is:

A. $\sqrt{\mu_\circ\varepsilon_\circ}$ B. $\mu_\circ\varepsilon_\circ$

C. $\frac{1}{\mu_\circ\varepsilon_\circ}$ D. $\frac{1}{\sqrt{\mu_\circ\varepsilon_\circ}}$

38. A choke is a coil which has:

A. Thick copper wire B. Large self-inductance

C. Very small resistance D. All of these

39. Which device controls A.C most efficiently?

A. Capacitor B. Resistor

C. Inductor D. All of these

40. Out of following which waves have maximum wavelength?

A. X-rays B. Infrared rays

C. γ-rays D. Radio waves

41. A charge at rest gives rise to _____ field & a charge moving with constant velocity gives rise to _____field.

A. Electric, electric B. Electric, magnetic
C. Magnetic, electric D. None of these

42. If electrons in transmitting antenna vibrate 94,000 times each second, they produces radio waves of frequency _____.
A. 94 MHz B. 47 MHz
C. 47 kHz D. 94 kHz

43. In the tuning circuit of radio which component is not present:
A. Variable capacitor B. Inductor
C. Both A and B D. Resistor

44. In the modulation process the high frequency wave which carries the low frequency signal is:
A. A radio wave B. Carrier wave
C. Modulation signal D. Both A and B

45. The low frequency signal in modulation process is:
A. Modulated signal B. Modulation signal
C. Carrier wave D. None of these

46. In Amplitude modulation the amplitude of modulated signal is maximum when modulation signal amplitude is:
A. Maximum B. Zero
C. Minimum D. None of these

47. In amplitude modulation the amplitude of modulated signal is zero when modulation signal amplitude is:
A. Zero B. Maximum
C. Negative maximum D. None of these

48. The FM transmission frequency range is:
A. 540 kHz to 1600 kHz B. 540 MHz to 1600 MHz
C. 88 MHz to 108 MHz D. 88 kHz to 108 kHz

49. In FM the frequency of modulated signal is equal to carrier wave frequency when:
A. Frequency of modulation signal is maximum
B. Frequency of modulation signal is minimum
C. Amplitude of modulated signal is zero
D. Amplitude of modulation signal is zero

50. Which is advantage of AM waves over FM waves?
A. Higher quality transmission
B. Less effect of electrical interference
C. Long distance range
D. Greater frequency bandwidth

ANSWER KEY (Worksheet-9)									
1	A	11	D	21	A	31	D	41	B
2	A	12	D	22	D	32	C	42	D
3	A	13	C	23	D	33	B	43	D
4	C	14	B	24	C	34	C	44	D
5	C	15	B	25	C	35	C	45	B
6	B	16	A	26	A	36	C	46	A
7	C	17	A	27	B	37	D	47	C
8	D	18	C	28	B	38	D	48	C
9	D	19	D	29	A	39	C	49	D
10	A	20	D	30	B	40	D	50	C

SOLUTIONS

Chapter – 16 (WS-9)

1. Answer is "A"

Solution:- Basic difference between A.C and D.C is direction reversal, otherwise magnitude can change for both A.C and D.C

2. Answer is "A"

Solution:- $I = 100\sin 100\pi t$

$50 = 100\sin 100\pi t$ solve it

3. Answer is "A"

Solution:- Intensity $\propto I_{ins}$

4. Answer is "C"

Solution:- Compare I_1 and I_2

5. Answer is "C"

Solution:- $I = I_\circ \sin\left(\frac{2\pi}{T}\right)t$, put $I = \frac{I_\circ}{2}$ & solve it.

6. Answer is "B"

Solution:- A.C achieves zero value twice in one cycle.

7. Answer is "C"

Solution:- $I_{rms} = \frac{I_\circ}{\sqrt{2}}$

8. Answer is "D"

Solution:- V_{PP} = sum of +ve & -ve peaks without signs

9. Answer is "D"

Solution:-

rms value = $\sqrt{\frac{0 + 9V_\circ^2 + 0 + V_\circ^2}{4}}$

10. Answer is "A"

Solution:- $I_{rms} \rightarrow effective\ value\ of\ A.C$

11. Answer is "D"

Solution:- We consider root mean square value of alternating voltage or current as effective value so by A.C of 220 V domestic we means it's rms value.

12. Answer is "D"

Solution:- As "V_1" is at 0 V when V_2 is at "-Ve" peak, so it means "V_1" reaches it's minimum or maximum value earlier than "V_2" so it must be leading and phase difference must be $90°$

13. Answer is "C"

Solution:- $V = V_\circ \sin(\theta + \phi)$

14. Answer is "B"

Solution:- We consider them phasor vectors and draw their phasor vector diagrams to calculate phase difference between them.

15. Answer is "B"

Solution:- Resistance of resistor remains same both in A.C or D.C as it does not depend on frequency.

16. Answer is "A"

Solution:- $P = V_{rms} I_{rms} \cos\theta$

17. Answer is "A"

Solution:- $X_C = \frac{1}{2\pi fC}$

18. Answer is "C"

Solution:- $I_\circ = \frac{V_\circ}{X_c} = \frac{V_\circ}{\frac{1}{\omega C}} \Rightarrow I_\circ = \omega C V_\circ$

19. Answer is "D"

Solution:- For capacitor and inductor:

θ=90°; P.F=Cos 90°

P.F=0

20. Answer is "D"

Solution:- $X_L = 2\pi fL$

21. Answer is "A"

Solution:- As both "I" and "V" are positive then power will be taken as positive and hence source provides energy to the inductor which is stored in inductor in the form of magnetic field.

22. Answer is "D"

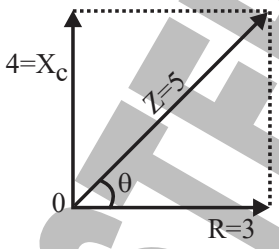
Solution:- $X_L = 2\pi fL \Rightarrow X_L \propto f$

23. Answer is "D"

Solution:- $V = \sqrt{V_R^2 + V_c^2}$

24. Answer is "C"

Solution:- Draw impedance



$\cos\theta = \frac{base}{hyp} = \frac{3}{5}$

25. Answer is "C"

Solution:- RC=t=second and L = $\frac{V\,s}{A}$

26. Answer is "A"

Solution:- As impedance is nothing but resistance so it must be measured in "Ω" or "VA^{-1}".

27. Answer is "B"

Solution:- $f_r = \frac{1}{2\pi\sqrt{LC}}$

28. Answer is "B"

Solution:- $\theta = tan^{-1}\left(\frac{X_L}{R}\right)$ "θ" will be 45° only if X_L=R

29. Answer is "A"

Solution:- $\omega = \frac{1}{\sqrt{LC}}$

30. Answer is "B"

Solution:- As at resonance "X_L" and "X_C" cancels out each other leaving only resistance to act so the net opposition becomes minimum, current maximum but finite.

31. Answer is "D"

Solution:- There are three major advantages of A.C three phase supply;

- Load gets divided
- No over-loading
- There are two values of voltage, one just 240V other 400V.

32. Answer is "C"

Solution:- The common terminal is always grounded.

33. Answer is "B"

Solution:- Voltage line to line $= V_{LL} = \sqrt{3}\,(Phase\ voltage)$

34. Answer is "C"

Solution:- An "LC" circuit is also known as an oscillator circuit which has oscillation frequency such as;

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

35. Answer is "C"

Solution:- Oscillator consist of LC-parallel circuit.

36. Answer is "C"

Solution:- When metal comes near search coil then inductance decreases due to which using relation $f_r = \frac{1}{2\pi\sqrt{LC}}$, "f_r" of search coil increases and hence $f_1 - f_2 \neq 0$ and beats are produced and a sound is heard through beat amplifier.

37. Answer is "D"

Solution:- Speed of electromagnetic waves;

$$c = \frac{1}{\sqrt{\mu_\circ \varepsilon_\circ}} = 3 \times 10^8 \, m \, s^{-1}$$

38. Answer is "D"

Solution:- A choke is actually solenoid or a coil which must be made up of thick wire to make resistance very small and inductance very large.

39. Answer is "C"

Solution:- An inductor is the one which opposes and has the ability to control A.C so it can control A.C most efficiently.

40. Answer is "D"

Solution:- Radio waves have smallest frequency so it must have maximum wavelength.

41. Answer is "B"

Solution:- At rest charge can only produce a constant electric field while in dynamic equilibrium or moving with constant velocity it produces a constant magnetic field due to its motion.

42. Answer is "D"

Solution:- We must remember that the frequency of radio-waves must be the same as vibrations of electrons per second.

43. Answer is "D"

Solution:- In tuning circuit we have $f_r = \frac{1}{2\pi\sqrt{LC}}$ and we have a variable capacitor and a fixed inductor but we do not have a resistor.

44. Answer is "D"

Solution:- In the process of modulation the high frequency wave which carries low frequency signal on it is called a carrier wave.

45. Answer is "B"

Solution:- The low frequency signal is called modulation signal.

46. Answer is "A"

Solution:- In amplitude modulation process the amplitude of carrier wave changes with change in amplitude of modulation signal so the point where amplitude of signal is maximum it changes amplitude of carrier wave at that point to be maximum and vice versa.

47. Answer is "C"

Solution:- In amplitude modulation process the amplitude of carrier wave

changes with change in amplitude of modulation signal so the point where amplitude of signal is maximum it changes amplitude of carrier wave at that point to be maximum and vice versa.

48. Answer is "C"

Solution:- For frequency modulation frequency ranges from 88 MHz to 108 MHz.

49. Answer is "D"

Solution:- They can be equal if amplitude of modulation signal is zero.

50. Answer is "C"

Solution:- AM have longer distance range than FM.

STEP

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