Atomic Energy Central School No. 4 Rawatbhata

Multiple Choice Question Examination (October 2019)

Class XII (PCM) Subjects: Physics, Chemistry and Mathematics MM: 120

Name:________________________________ Class/Sec: ___________

OMR Roll No:________________Invigilator's Sign:____________________

Instruction: 1) Fill & darken roll number field correctly on OMR Sheet. In case of any error, OMR Answer Sheet will be not be read by the OMR Scanner.

2) Darken the most suitable option no. on OMR Answer Sheet.

3) There is no negative marking.

Physics

1. An inductance L having a resistance R is connected to an alternating source of angular frequency w. The quality factor of the inductance is: **1**

a) $\frac{R}{wL}$
b) $\left(\frac{wL}{R}\right)^2$
c) $\left(\frac{R}{wL}\right)^{\frac{1}{2}}$
d) $\frac{\omega L}{R}$

2. In a pure inductive circuit with a.c. source, the current lags behind emf by phase angle of **1**

a) $\frac{\pi}{2}$
b) $\frac{\pi}{4}$
c) 2π
d) π

3. Given magnetic field B, area A and length l of a solenoid. The magnetic energy per unit volume is **1**

a) $\frac{1}{2\mu_0}B^2A$
b) $\frac{3}{2\mu_0}B^2Al$
c) $\frac{1}{2\mu_0}B^3Al$
d) $\frac{B^2}{2\mu_0}$

4. On a cylindrical rod two coils are wound one above the other. What is the coefficient of mutual inductance if the inductance of each coil os 0.1H? **1**

a) 0.15H
b) 0.05H
c) 0.20H
d) 0.10H

5. Assume that a motor in which the coils have a total resistance of 10Ω is supplied by a voltage of 120 V. When the motor is running at its maximum speed, the back emf is 70 V. Current in the coils when the motor is turned on and when it has reached maximum speed are **1**

a) 16 A, 5 At
b) 14 A, 5 A
c) 12 A, 4 A
d) 12 A, 5 A

6. If two coils of inductances L_1 and L_2 are linked such that their mutual inductance is M, then **1**

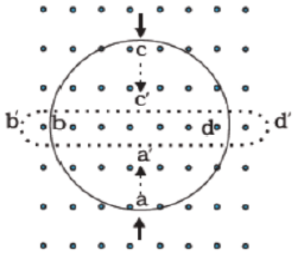
a) $M = L_1 - L_2$
b) $M = L_1 + L_2$
c) $M = L_1 \times L_2$
d) The maximum value of M is $\sqrt{(L_1L_2)}$

7. Use Lenz's law to determine the direction of induced current in the situations described by the Figure **1**

a. A wire of irregular shape turning into a circular shape;

(a)

b. A circular loop being deformed into a narrow straight wire. The directions for (a) and (b) respectively are



(b)

a) anti-clockwise, clockwise
b) clockwise, clockwise
c) clockwise, anti-clockwise
d) anti-clockwise, anti-clockwise

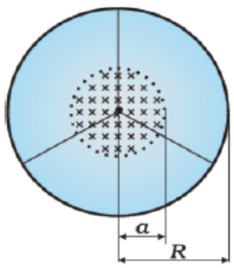
8. A step up transformer operates on a 230 volt line and a load current of 2 ampere. The ratio of the primary and secondary windings is 1 : 25. The current in the primary is: **1**

a) 15 amp
b) 25 amp
c) 12.5 amp
d) 50 amp

9. A horizontal ring of radius r spins about it's axis with an angular velocity ω in a uniform magnetic field of magnitude B. Emf induced in the ring is **1**

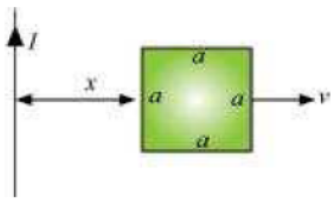
a) $r^2\omega B$
b) $\pi r^2\omega B$
c) $\pi r^3\omega B$
d) Zero

10. A line charge λ per unit length is lodged uniformly onto the rim of a wheel of mass M and radius R. The wheel has light non-conducting spokes and is free to rotate without friction about its axis (see figure). A uniform magnetic field extends over a circular region within the rim. It is given by, $B = B_0\hat{k}$ $(\mathrm{r} \leq \mathrm{a}; \mathrm{a} < \mathrm{R}) = 0(\text{otherwise})$ **1**
What is the angular velocity of the wheel after the field is suddenly switched off?



a) $\frac{B\pi a^2\lambda}{MR}\hat{k}$
b) $\frac{\pi a^2\lambda}{MR}k$
c) $\frac{Ba^2\lambda}{MR}k$
d) $\frac{B\pi a^3\lambda}{MR}k$

11. A straight wire carries a current of 50 A and the loop as in figure is moved to the right with a constant velocity, $\mathrm{v} = 10\mathrm{m/s}$. Take $\mathrm{a} = 0.1\mathrm{m}$ and assume that the loop has a large resistance. Induced emf in the loop at the instant when x = 0.2 m is **1**



a) $2.3 \times 10 - 5\mathrm{V}$
b) $2.6 \times 10^{-5}\mathrm{V}$
c) $2.0 \times 10 - 5\mathrm{V}$
d) $1.7 \times 10^{-5}\mathrm{V}$

12. Two coils are placed close to each other. The mutual inductance of the pair of coils depends upon: **1**

a) the rates at which currents are changing in the two coils
b) the materials of the wires of the coils
c) relative position and orientation of the two coils
d) the currents in the two coils

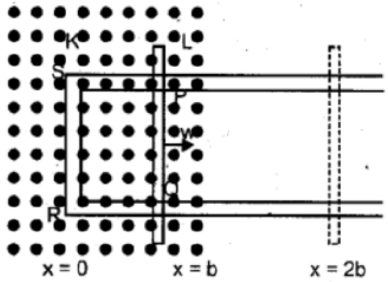
13. For a coil having L = 2 × 10^3 H, current flows at the rate of 10^{-3} A/s. The emf induced is: **1**

a) 3 V
b) 2 V
c) 4 V
d) 1 V

14. When a coil is joined to a cell,current grows with a time constant τ The current will reach 10% of it's steady-state value in time **1**

a) τ
b) $\tau\ln(10/9)$
c) $\tau\ln(0.9)$
d) 2τ

15. The arm PQ of the rectangular conductor is moved from $\mathrm{x}=0$, outwards. The uniform magnetic field is perpendicular to the plane and extends from $\mathrm{x}=0$ to $\mathrm{x}=\mathrm{b}$ and is zero for $\mathrm{x}>\mathrm{b}$. Only the arm PQ possesses substantial resistance r. Consider the situation when the arm PQ is pulled outwards from $\mathrm{x}=0$ to $\mathrm{x}=2\mathrm{b}$, and is then moved back to $\mathrm{x}=0$ with constant speed v. flux and emf for $\mathrm{b} \leq \mathrm{x} < 2\mathrm{b}$ are **1**



a) Blb, zero
b) Blx, -Bv
c) Bl, -Blv
d) Bx, -Blv

16. At $\mathrm{t}=0$, an inductor of zero resistance is joined to a cell of emf ε through a resistance. The current decreases with a time constant τ The emf across the coil after time t is **1**

a) $|e| = Ee^{-t/\tau}$
b) $\varepsilon\left(1-\mathrm{e}-\mathrm{t}/\tau\right)$
c) $2\varepsilon\mathrm{e}-\mathrm{t}/\tau$
d) $\varepsilon\mathrm{e}-2\mathrm{t}/\tau$

17. A 500-loop circular wire coil with radius 4.00 cm is placed between the poles of a large electromagnet. The magnetic field is uniform and makes an angle of 60° with the plane of the coil; it decreases at 0.200 T/s . Magnitude of induced emf is **1**

a) 0.435 V
b) 0.455 V
c) 0.495 V
d) 0.475 V

18. What should be the core of an electromagnet? **1**

a) none of above
b) soft iron
c) hard iron
d) rusted iron

19. A capacitor of capacity C has reactance X. If capacitance and frequency are doubled, the reactance would be: **1**

a) 4X
b) 2X
c) $\frac{X}{2}$
d) $\frac{X}{4}$

20. The wiring for a refrigerator contains a starter capacitor. A voltage of amplitude 170 V and frequency 60.0 Hz applied across the capacitor is to produce a current amplitude of 0.850 A through the capacitor. Capacitance required is **1**

a) 17.8 $\mu\mathrm{F}$
b) 13.3 $\mu\mathrm{F}$
c) 15.3 $\mu\mathrm{F}$
d) 23.4 $\mu\mathrm{F}$

21. A circuit containing a 80 mH inductor and a 60 $\mu\mathrm{F}$ capacitor in series is connected to a 230 V, 50 Hz supply. The resistance of the circuit is negligible. Average powers transferred to the inductor and to the capacitor are respectively **1**

a) 10 W, 10 W
b) 0 W,0 W
c) 10 W, 10 W
d) 20 W, 10 W

22. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R = 3 Ω, L = 25.48 mH, and C = 796 $\mu\mathrm{F}$. Power dissipated in the circuit; and the power factor are **1**

a) 4800 W, 0.6
b) 4000 W, 0.4
c) 3800 W, 0.6
d) 4400 W, 0.6

23. In an L-R-C series circuit, the rms voltage across the resistor is 30.0 V, across the capacitor it is 90.0 V, and across the inductor it is 50.0 V. Rms voltage of the source is **1**

a) 55.0 V
b) 50.0 V
c) 60.0 V
d) 65.0 V

24. You have a 200.0 Ω resistor, a 0.400-H inductor, a 5.0 $\mu\mathrm{F}$ capacitor, and a variable frequency ac source with an amplitude of 3.00 V. You connect all four elements together to form a series circuit. Frequency at which current in the circuit is greatest and its amplitude are **1**

a) 123 Hz, 15mA
b) 143 Hz, 35mA
c) 113 Hz, 25mA
d) 113 Hz, 15mA

25. A coil of inductance 0.50 H and resistance 100 Ω is connected to a 240 V, 50 Hz ac supply.Maximum current in the coil and time lag between the voltage maximum and the Current maximum are **1**

a) 1.62 A, 3.82 ms
b) 2.82 A , 3.82 ms
c) 1.82 A, 3.2 ms
d) 1.82 A , 2.82 ms

26. For high frequency capacitor offers: **1**

a) Less resistance
b) More resistance
c) None of these
d) Zero resistance

27. Domestic power supply in India is --------- **1**

a) 230 V, 50 Hz
b) 416 V, 60 Hz
c) 24 V DC
d) 110 V, 60 Hz

28. You have a special light bulb with a very delicate wire filament. The wire will break if the current in it ever exceeds 1.50 A, even for an instant. What is the largest root-mean-square current you can run through this bulb? **1**

a) 1.26 A
b) 1.46 A
c) 1.06 A
d) 1.56 A

29. An inductor with L = 9.50 mH is connected across an ac source that has voltage amplitude 45.0 V. Phase angle for the source voltage relative to the current is **1**

a) 120°
b) 90°
c) 180°
d) -90°

30. A series circuit has an impedance of 60 ohm and a power factor of 0.720 at 50.0 Hz. The source voltage lags the current **1**

a. What circuit element, an inductor or a capacitor, should be placed in series with the circuit to raise its power factor?
b. What size element will raise the power factor to unity?

a) inductor, 0.193 H
b) inductor, 0.173 H
c) inductor, 0.153 H
d) inductor, 0.133 H

31. The voltage across the terminals of an ac power supply varies with time according to $V\cos\omega t$. The voltage amplitude is V = 45.0 V. Root-mean-square potential difference is **1**

a) 35.8 V
b) 31.8 V
c) 37.8 V
d) 33.8 V

32. An LC circuit contains a 20 mH inductor and a 50 μF capacitor with an initial charge of 10 mC. The resistance of the circuit is negligible. Natural frequency of the circuit is **1**

a) 159 Hz
b) 129 Hz
c) 139 Hz
d) 149 Hz

33. The phase difference between the current and voltage at resonance is: **1**

a) 0
b) $-\pi$
c) π
d) $\frac{\pi}{2}$

34. In an LRC series circuit R = 300.0 Ω, X_C = 300.0 Ω and X_L = 500.0 Ω. The average power consumed in the resistor is 60.0 W. What is the power factor of the circuit? **1**

a) 0.881
b) 0.831
c) 0.931
d) 0.911

35. The voltage across the terminals of an ac power supply varies with time according to $V\cos\omega t$. The voltage amplitude is V = 45.0 V. Average potential difference between the two terminals of the power supply is **1**

a) 35.8 V
b) 33.8 V
c) 37.8 V
d) zero V

36. In an LRC series circuit R = 300.0 Ω, X_C = 300.0 Ω and X_L = 500.0 Ω. The average power consumed in the resistor is 60.0 W. rms voltage of the source is **1**

a) 151 V
b) 141 V
c) 161 V
d) 131 V

37. A parallel-plate capacitor having square plates 4.50 cm on each side and 8.00 mm apart is placed in series with an ac source of angular frequency 650 rad/s and voltage amplitude 22.5 V, a 75.0 Ω resistor, and an ideal solenoid that is 9.00 cm long, has a circular cross section 0.500 cm in diameter, and carries 125 coils per centimeter. What is the resonance angular frequency of this circuit? **1**

a) $3.99 \times 10^7 \text{rad/s}$
b) $3.59 \times 10^7 \text{rad/s}$
c) $3.79 \times 10^7 \text{rad/s}$
d) $3.89 \times 10^7 \text{rad/s}$

38. An inductor with L = 9.50 mH is connected across an ac source that has voltage amplitude 45.0 V. Frequency of the source that results in a current amplitude of 3.90 A is **1**

a) 180 Hz
b) 129 Hz
c) 193 Hz
d) 150 Hz

39. A power transmission line feeds input power at 2300 V to a step-down transformer with its primary windings having 4000 turns. Number of turns in the secondary in order to get output power at 230 V is **1**

a) 325
b) 380
c) 425
d) 400

40. A series circuit consists of an ac source of variable frequency, a 115.0 Ω resistor, a 1.25 μF capacitor, and a 4.50-mH inductor. Impedance of this circuit when the angular frequency of the ac source is adjusted to twice the resonant angular frequency is **1**

a) 146.0 Ω
b) 176.0 Ω
c) 166.0 Ω
d) 156.0 Ω

Chemistry

41. Decomposition of benzene diozonium chloride by using Cu Cl /HCl to form chlorobenzene is **1**

a) Wurtz – Fittig reaction
b) Friedel – Crafts reaction
c) Sandmeyer's reaction
d) Finkelstein reaction

42. Arrange the following in the increasing order of nucleophilicity: **1**
I^-, Cl^-, Br^-

a) $Cl^- < Br^- < I^-$
b) $I^- < Cl^- < Br^-$
c) $Br^- < Cl^- < I^-$
d) $I^- < Br^- < Cl^-$

43. To prepare alkanes containing odd number of carbon atoms, Wurtz reaction is not preferred because **1**

a) a lot of reaction mixture goes wasted
b) a mixture of three different alkyl halides has to be used
c) a mixture of four different alkyl halides has to be used
d) a mixture of two different alkyl halides has to be used

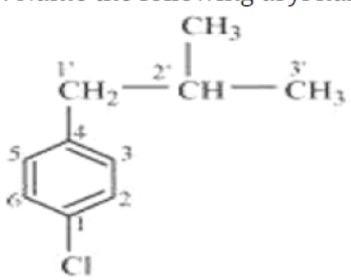
44. Anisole reacts with a mixture of concentrated sulphuric and nitric acids to yield a mixture of ortho and paranitroanisole **1**

a) None of these
b) minor product is orthonitroanisole
c) major product is paranitroanisole
d) ortho and para in equal amounts.

45. p – Dichlorobenzene has ____________ than those of o – and m – isomers **1**

a) higher melting point and lower solubility
b) low melting point and low solubility
c) lower melting point and higher solubility
d) higher melting point and higher solubility

46. Name the following aryl halide as per the IUPAC system **1**



a) 1 - chlorobenzyl - 2 - methyl propane
b) 4 - chloro - 1 - (2 - methyl propyl) benzene
c) 1 - chloro - 4 - (2 - methylpropyl) benzene
d) 4-(methylpropyl)-1-chlorobenzene

47. Chloroform is stored in closed dark coloured bottles completely filled because it **1**

a) both gets slowly oxidised by air in presence of light and form a poisonous gas
b) forms an extremely poisonous gas in the presence of light

c) can change its colour in presence of light and get spoilt by action of light

d) gets slowly oxidised by air in the presence of light

48. IUPAC name of (CH) CCl **1**

a) n – butyl chloride

b) 3 – chloro butane

c) t – butyl chloride

d) 2 – chloro 2 methyl propane

49. The best method for the conversion of an alcohol into an alkyl chloride is by treating the alcohol with **1**

a) $SOCl_2$ in presence of pyridine

b) PCl_3

c) Dry HCl in the presence of anhydrous $ZnCl_2$

d) PCl_5

50. The iodine containing hormone produced by our body is **1**

a) progesterone

b) insulin

c) thyroxine

d) adrenalin

51. p, p' – Dichlorodiphenyltrichloroethane is a **1**

a) antiseptic drug

b) degreasing agent

c) Refrigerant

d) Pesticide

52. Which one of the following forms propane nitrile as the major product? **1**

a) Propyl bromide + alcoholic KCN

b) Ethyl bromide + alcoholic KCN

c) Propyl bromide + alcoholic AgCN

d) Ethyl bromide + alcoholic AgCN

53. The most common freons in industrial use is manufactured by **1**

a) Swarts reaction

b) Fittig reaction

c) Sandmeyer reaction

d) Wurtz reaction

54. Methyl bromide is converted into ethane by heating it in ether medium with **1**

a) Na

b) Al

c) Cu

d) Zn

55. Which branched chain isomer of the hydrocarbon with molecular mass 72u gives only one isomer of mono substituted alkyl halide? **1**

a) Tertiary butyl chloride

b) Neohexane

c) Isohexane

d) Neopentane

56. In alkyl halide **1**

a) All of these

b) the carbon atom of C-halogen bond bears a partial positive charge

c) the halogen atom bears a partial negative charge

d) the carbon-halogen bond of alkyl halide is polarised

57. Carbon tetra chloride has a dipole moment **1**

a) $\mu = 0$

b) $\mu = 1$

c) $\mu = 2$

d) $\mu = 4$

58. Ethyl benzene cannot be prepared by ______. **1**

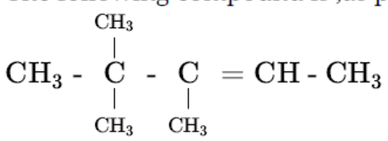
a) Clemmensen reduction

b) Wurtz – Fittig reaction

c) Friedel – Crafts reaction

d) Wurtz reaction

59. The following compound is ,as per the IUPAC system **1**



a) 3, 4, 4 - triethyl pent - 2 - ene

b) 2 diethyl, 3 - ethyl pentene

c) None of these

d) 2, 2, 3 - triethyl pent - 4 - ene

60. When a haloalkane with – hydrogen atom is heated with alcoholic solution of potassium hydroxide, **1**

a) All of these

b) elimination of halogen atom from α – carbon

c) elimination of hydrogen atom from β– carbon

d) alkene is formed as a product

61. Williamson's synthesis is used for the preparation of **1**

a) aldehydes

b) ethers

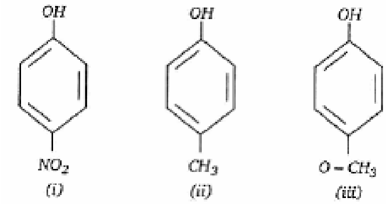
c) alkyl halides

d) alcohols

62. The compound formed as a result of oxidation of ethyl benzene by KMnO is **1**

a) Acetophenone b) Benzoic acid
c) Benzophenone d) Benzyl alcohol

63. The increasing order of acidic strength of the following is: **1**



a) (ii) < (iii) < (i) b) (iii) < (ii) < (i)
c) (i) < (ii) < (iii) d) (i) < (iii) < (ii)

64. A hydrocarbon C H does not react with chlorine in dark but gives a single monochloro compound C H Cl 1 in bright sunlight. The hydrocarbon is

a) Cyclopentene b) Cyclosporine
c) Cycloalkyne d) Cyclopentane

65. An organic compound containing oxygen, upon oxidation forms a carboxylic acid as the only organic product with its molecular mass higher by 14 units. The organic compound is ______. **1**

a) a ketone b) a primary alcohol
c) an aldehyde d) a secondary alcohol

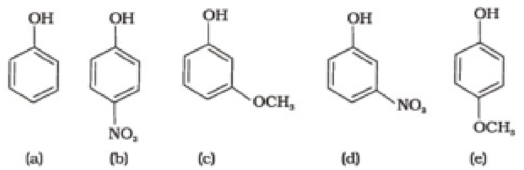
66. With dilute nitric acid at low temperature (298 K), phenol yields **1**

a) a mixture of ortho and para nitro phenols b) p – Nitrophenol
c) m – Nitrophenol d) o – Nitrophenol

67. An organic compound X is oxidised by using acidified K Cr O . The product obtained reacts with Phenyl hydrazine but does not answer silver mirror test. The possible structure of X is **1**

a) $(CH_3)_2CHOH$ b) None
c) CH_3CHO d) CH_3CH_2OH

68. What will be the correct order of acidity of the following compounds? **1**



a) b>d>c>e>a b) b>d>c>a>e
c) d>b>c>a>e d) b>d>a>c>e

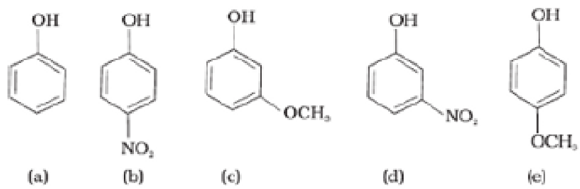
69. 3-Pentanol is an example of **1**

a) Primary alcohol b) Secondary alcohol
c) Tertiary alcohol d) Aromatic alcohol

70. One mole of an organic compound 'A' with the formula C H O reacts completely with two moles of HI to form X and Y. When 'Y' is boiled with aqueous alkali forms Z. Z answers the iodoform test. The compound 'A' is ______. **1**

a) methoxyethane b) ethoxyethane
c) Propan – 2 – o1 d) Propan – 1 – o1

71. Mark the correct order of decreasing acid strength of the following compounds. **1**



a) d > e > c > b > a b) b > d > c > a > e
c) e > d > b > a > c d) e > d > c > b > a

72. The reaction 2 $H_5ONa + C_2H_5I \rightarrow C_2H_5OC_2H_5 + NaI$ is known as **1**

a) Williamson's synthesis
b) Grignard's synthesis
c) Wurtz's synthesis
d) Kolbe's synthesis

73. Dow's process involves **1**

a) Nucleophilic substitution
b) Electrophilic addition
c) Nucleophilic addition
d) Electrophilic substitution

74. n – propyl bromide on treating with alcoholic KOH produces **1**

a) propanol
b) propene
c) propyne
d) propane

75. Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method. **1**

a) alkyl group is hindered.
b) None of these
c) alkyl group should be unhindered
d) elimination competes over substitution and alkenes are easily formed

76. Phenol on distillation with zinc dust gives **1**

a) benzaldehyde
b) benzophenone
c) benzene
d) benzonic acid

77. Anisole can be prepared by the action of methyl iodide on sodium phenate. The reaction is called **1**

a) Fittigs reaction
b) Wurtzs reaction
c) Williamsons reaction
d) Etards reaction

78. Which of the following compounds will react with sodium hydroxide solution in water? **1**

a) $C_6H_5CH_2OH$
b) $(CH_3)_3COH$
c) C_2H_5OH
d) C_6H_5OH

79. Alkenes react with water in the presence of acid as catalyst to form alcohols. **1**

a) nucleophilic attack of water on carbocation
b) Protonation of alkene and carbocation
c) Deprotonation to form alcohol
d) All of these

80. Which of the following reagents can be used to oxidise primary alcohols to aldehydes? **1**

a) All of these
b) CrO_3 in anhydrous medium..
c) Heat in the presence of Cu at 573K.
d) Pyridinium chlorochromate.

Mathematics

81. $\int_0^{\pi} \sqrt{1+\sin x}$ dx is equal to **1**

a) $2\sqrt{2}$
b) 2
c) 1
d) 4

82. If $\int_{-2}^{5} f(x)dx = 4, \int_{0}^{5} (1+f(x))dx = 7$, then the value of the integral $\int_{-2}^{0} f(x)$ dx is equal to **1**

a) –3
b) 2
c) 3
d) 5

83. $\int_0^1 e^{-\sin^2 x}$ dx is equal to **1**

a) $1+\frac{1}{e}$
b) 2
c) None of these
d) – 1

84. $\int_0^{\pi/2}$ log(cot x) dx is equal to **1**

a) $-\frac{\pi}{2}\log 3$
b) $\frac{\pi}{2}\log 2$
c) $\frac{3\pi}{2}\log 5$
d) 0

85. $\int_{-8}^{8} (\sin^{93} x + x^{295})$ dx is equal to **1**

a) $2(8^{295} + 1)$
b) 1
c) $2 + 8^{295}$
d) 0

86. $\int_0^{\pi/6} \frac{\cos 2x}{(\cos x - \sin x)^2} dx$ 1

a) $-\log\left(\frac{\sqrt{3}-1}{2}\right)$ b) $\ln 2 - \ln\sqrt{3}$

c) $\log\left(\frac{\sqrt{3}+1}{\sqrt{2}}\right)$ d) $-\log\left(\frac{\sqrt{3}+1}{2}\right)$

87. $\int_{-\pi/2}^{\pi/2}$ cos t dt is equal to 1

a) 1 b) 0

c) – 1 d) 2

88. $\int_0^2 [2x]$ is equal to , where [.] denotes the Greatest Integer Function 1

a) 2 b) 0

c) 3 d) 4

89. The function$(x) = \int_0^x \log(t + \sqrt{1+t^2})dt$ is 1

a) an odd function b) an even function

c) Neither odd nor Even d) a periodic function

90. $\frac{1}{e^x+1}dx$ is equal to 1

a) $\log\left(1+e^{-2x}\right)+C$ b) $\log(e^{-2x}-2x)+C$

c) – log(1 + e^{-x}) + C d) $\log(e^{3x}+x)+C$

91. $\int_{-2}^{2} x\,|x|dx$ is equal to 1

a) -2 b) $\frac{8}{3}$

c) $\frac{-8}{3}$ d) 0

92. $(\log(\log x) + (\log x)^{-1})$dx is equal to 1

a) x log (log x) $-\frac{x}{\log x}$ + C b) $x - \frac{\log 2x-1}{x+2} + C$

c) x log (log x) + $\frac{x}{\log x}$ + C d) x log (log x) + C

93. $\frac{x^2-1}{x^4+3x^2+1}dx$ is equal to 1

a) $\tan\left(x+\frac{1}{x}\right)+C$ b) $\tan^{-1}\left(x+\frac{1}{x}\right)+C$

c) $\tan^{-1}\left(3x^2+2x\right)+C$ d) $\tan^{-1}\left(x^2+1\right)+C$

94. $\frac{\cos(\log x)}{x}dx$ is equal to 1

a) – sin (log x)+C b) $\log(\sin x)+C$

c) sin(log x)+C d) $\frac{\sin(\log x)}{x}+C$

95. $\int_0^{\pi/2} \sin x \sin 2x \; dx$ is equal to 1

a) 1 b) $\frac{2\pi}{3}$

c) $\frac{2}{3}$ d) $\frac{\pi}{3}$

96. $\int_{-1}^{1} |2x-1|$dx is equal to 1

a) $\frac{-1}{2}$ b) – 2

c) $\frac{1}{2}$ d) $\frac{5}{2}$

97. If f (x) = f (a –x), then , $\int_0^a x\,f(x)dx$ is equal to 1

a) $\frac{a}{2}\int_0^a f(x)dx$

b) $\int_0^a f(x)dx$

c) $\frac{a^2}{2}\int_0^a f(x)dx$

d) $-\frac{a^2}{2}\int_0^a f(x)dx$

98. $\int_{-\pi/12}^{\pi/12} \frac{1}{\cos 2x}dx =$ **1**

a) $\frac{1}{2}\log 3$

b) log 3

c) $\frac{1}{3}\log 2$

d) log9

99. $\frac{\cos 4x+1}{\cot x+\tan x}dx$ is equal to **1**

a) $-\frac{1}{6}\cos^3 2x + C$

b) $\frac{1}{6}\cos^3 2x + C$

c) $-\frac{1}{6}\sin^3 2x + C$

d) $-\frac{1}{2}\sin^2 6x + C$

100. $\int_0^{\pi/2} \frac{1}{1+\sin x}dx$ is equal to **1**

a) $\frac{3}{2}$

b) 0

106. The area bounded by the curve $= x^2 + 1$ and the line x + y = 3 is **1**

a) $\frac{16}{3}$

b) $\frac{9}{2}$

c) $\frac{35}{3}$

d) $\frac{32}{3}$

107. The area bounded by the parabolas y = x^2 and $y - 9 = 2x^2$ is **1**

a) 12 $\sqrt{2}$ $sq. units$

b) 12 $\sqrt{3}$ sq. units

c) 6 $\sqrt{2}$ $sq. units$

d) 4 $\sqrt{3}$ $sq. units$

108. Ratio of the area cut off from a parabola by any double ordinate is that of the corresponding rectangle contained by that double ordinate and its distance from the vertex is **1**

a) 1 : 2

b) 2 : 3

c) 1 : 3

d) 1 : 1

c) $\frac{1}{2}$

d) 1

101. $\int_0^{\pi} \sqrt{1-\cos x}$ is equal to **1**

a) $2\sqrt{2}$

b) 2

c) $\frac{\sqrt{3}}{2}$

d) 1

102. $\int_0^{\pi/2} \frac{1}{1+\sqrt{\cot x}}dx$ is equal to **1**

a) $\frac{\pi}{4}$

b) $-\pi$

c) π

d) $\frac{3\pi}{4}$

103. $\frac{\tan^{-1}x}{1+x^2}dx$ is equal to **1**

a) $(\log(1+x^2))\tan^{-1}x + C$

b) $\log\ |\tan^{-1}x| + C$

c) $\tan^{-1}x + \sec^{-1}x + C$

d) $\frac{1}{2}(\tan^{-1}x)^2 + C$

104. $|x|dx$ **1**

a) $\frac{x|x|}{2} + C$

b) $-\frac{2x^2}{3} + C$

c) 1

d) $\frac{x^2}{2}$ + C

105. $\int_0^{\pi/2} \log(\sin x)\ dx$ **1**

a) $\pi\ log\ 2$

b) $\frac{\pi}{2}\ log\ 3$

c) $-\pi\ log\ 5$

d) $-\frac{\pi}{2}\log 2$

109. The area bounded by the curve y =x[x], the x – axis and the ordinates x = 1 and x = -1 is given by **1**

a) 0 b) $\frac{2}{3}$

c) $\frac{1}{2}$ d) none of these

110. The area bounded by the curve y = 2x - x and the line x + y = 0 is **1**

a) $\frac{35}{6}$ sq. units b) $\frac{19}{6}$ sq. units

c) none of these d) $\frac{9}{2}$ sq. units

111. If the area cut off from a parabola by any double ordinate is k times the corresponding rectangle contained by that double ordinate and its distance from the vertex, then k is equal to 1

a) $\frac{2}{3}$ b) 3

c) $\frac{1}{3}$ d) $\frac{3}{2}$

112. The area enclosed between the curves y $=\sqrt{x}$, $x = 2y + 3$ and the x-axis is **1**

a) none of these b) 9

c) 27 d) 18

113. The area of the plane region bounded by the curves $x + y^2 = 0$ and $x + 3y^2 = 1$ is $equal$ to **1**

a) none of these b) $\frac{4}{3} sq.\ units$

c) $\frac{1}{3} sq.\ units$ d) $\frac{5}{3} sq.\ units$

114. The area bounded by the curves $x^2 = 4y$ and $x = 4y - 2$ is **1**

a) $\frac{9}{2}$ $sq.units$ b) $\frac{9}{8}$ $sq.units$

c) $\frac{9}{4}$ $sq.units$ d) 9 $sq.units$

115. The area enclosed between the curves $^2 = x$ and $y = |x|$ is **1**

a) none of these b) $\frac{1}{6} sq.\ units$

c) $\frac{2}{3} sq.\ units$ d) 1 sq. units

116. The area of bounded by the curve $\sqrt{x} + \sqrt{y} = 1$ and the coordinate axes is **1**

a) $\frac{1}{6}$ b) 1

c) none of these d) $\frac{1}{2}$

117. The area bounded by the curves y = |x - 1| and y = 1 is given by **1**

a) 1 b) $\frac{1}{2}$

c) 2 d) none of these

118. The area bounded by the curve y = x (x – 1) (x – 2) and the x – axis is equal to **1**

a) $= \frac{1}{2} sq.units$ b) none of these

c) 1 d) $\frac{1}{4}$

119. The area bounded by the lines y = 2 + x , y = 2 – x and x = 2 is **1**

a) 16 b) 8

c) 3 d) 4

120. The area included between the curves $\sqrt{x} + \sqrt{|y|} = 1$ and $|x| + |y| = 1$ is equal to **1**

a) none of these b) $\frac{2}{3}$

c) $\frac{1}{6}$ d) $\frac{4}{3}$

Solution

Class 12 - Physics

Multiple Choice Examination (October-2019)

Section A

1. (d)
$\frac{\omega L}{R}$

Explanation:
The quality factor of an inductor is the ratio of its inductive reactance to its resistance at a given frequency, and is a measure of its efficiency.
quality factor = $\frac{\omega L}{R}$

2. (a)
$\frac{\pi}{2}$

Explanation:
$E = E_0 \sin \omega t$
$i = i_0 \sin\left(\omega t - \frac{\pi}{2}\right)$

3. (d)
$\frac{B^2}{2\mu_0}$

Explanation:
$U = \frac{1}{2\mu_0} B^2 Al$
$\frac{U}{V} = \frac{B^2}{2\mu_0}$

4. (d)
0.10H

Explanation:
As one coil is wound over the other so that coupling is tight i.e. k = 1
$M = k\sqrt{L_1 L_2} = 1\sqrt{0.1 \times 0.1} = 0.1H$

5. (d)
12 A, 5 A

Explanation:
when motor is turned on
$i = \frac{V}{R} = \frac{120}{10} = 12A$
when it has reached maximum speed, the back emf is 70 V then current will be
$i = \frac{V}{R} = \frac{120-70}{10} = 5A$

6. (d)
The maximum value of M is $\sqrt{(L_1 L_2)}$

Explanation:
$M = k\sqrt{L_1 L_2}$
here k is coefficient of coupling. Its maximum value is 1 for tight coupling.

7. (d)
anti-clockwise, anti-clockwise

Explanation:

a. for a given Periphery the area of a circle is maximum. When a coil takes a circular shape, the magnetic flux linked with the coil increases, so the current induced in the coil will tend to decrease the flux and so it will produce a magnetic field upward. As a result, the current induced in the coil will flow in anti clockwise direction.
b. When circular coil takes the shape of narrow straight wire, The magnetic flux linked with the coil decreases. So the current induced in the coil will tend to oppose the decrease in magnetic flux. Hence it will produce an upward magnetic field so that the current induced in the coil will flow in anticlockwise direction.

8. (d)
50 amp

Explanation:
$\frac{N_s}{N_p} = \frac{i_p}{i_s} = \frac{V_s}{V_p} = r$
given that $\frac{N_p}{N_s} = \frac{1}{25}$
i_s = 2 amp
$\frac{25}{1} = \frac{i_p}{2}$
i_p = 50 amp

9. (d)
Zero

Explanation:
Induced EMF is zero because flux linked with it remains constant.

10. (a)
$\frac{B\pi a^2\lambda}{MR}\hat{k}$

Explanation:
rotational kinetic energy = work done
$\frac{1}{2}I\omega^2 = eq$
e = emf
$e = \frac{1}{2}B\omega a^2$
average value of emf is
$\frac{1}{2}e = \frac{1}{2}\left(\frac{1}{2}B\omega a^2\right) = \frac{1}{4}B\omega a^2$
now,
$q = \lambda \times 2\pi R$
$\frac{1}{2}I\omega^2 = eq$
$\frac{1}{2}MR^2\omega^2 = 2\pi R\lambda \times \frac{1}{4}B\omega a^2$
$\omega = \frac{\pi B a^2 \lambda R}{MR^2} = \frac{\pi B a^2 \lambda}{MR}$ considering direction
$\overrightarrow{\omega} = -\frac{\pi B_0 a^2 \lambda}{MR}\hat{k}$

11.

12. (c)
relative position and orientation of the two coils

Explanation:
Mutual inductance of the pair of coils depends upon the geometry of the coils, distance between the coils, relative position and orientation of the coils, number of turns in the coil, permeability of the medium in the coils and degree of coupling.

13. (b)
2 V

Explanation:
$e = L\frac{di}{dt} = 2 \times 10^3 \times 10^{-3} = 2\text{V}$

14. (b)
$\tau \ln(10/9)$

Explanation:
$I = I_0\left(1 - e^{\frac{-t}{\tau}}\right)$
$I = 0.1I_0$
$e^{\frac{-t}{\tau}} = \frac{9}{10}$
$\frac{t}{\tau} = \ln\frac{10}{9}$
$t = \tau\ln\frac{10}{9}$

15. (a)
Blb, zero

Explanation:
$\phi = Blb$
$E = -\frac{d\phi}{dt} = 0$

16. (a)
$|e| = Ee^{-t/\tau}$

Explanation:
$i = i_0\left(1 - e^{-t/\tau}\right)$
$\frac{di}{dt} = \frac{i_0}{\tau}e^{-t/\tau}$
$\frac{di}{dt} = \frac{E}{R} \times \frac{R}{L}e^{-t/\tau}\left(\tau = \frac{L}{R}\right)$
$|e| = L\frac{di}{dt} = L \times \frac{E}{L}e^{-t/\tau} = Ee^{-t/\tau}$

17. (a)
0.435 V

Explanation:
$e = \frac{d\phi}{dt} = 0.2 \times 500 \times 3.14 \times \left(4 \times 10^{-2}\right)^2 \times \sqrt{\frac{3}{2}} = 0.435\text{V}$

18. (b)
soft iron

Explanation:
soft iron

19. (d)
$\frac{X}{4}$

Explanation:
Increasing the frequency will also decrease the opposition offered by a capacitor. This occurs because the number of electrons which the capacitor is capable of handling at a given voltage will change plates more often. As a result, more electrons will pass a given point in a given time (greater current flow). The opposition which a capacitor offers to ac is therefore inversely proportional to frequency and to capacitance. This opposition is called CAPACITIVE REACTANCE. You may say that capacitive reactance decreases with increasing frequency or, for a given frequency, the capacitive reactance decreases with increasing capacitance. The symbol for capacitive reactance is X_C.

$X=\frac{1}{2\pi\nu C}$
Let New Reactance After changing frequency and capacitance is X'_C
So $X'=\frac{1}{2\pi(2\nu)(2C)}$
$\Rightarrow X'=\frac{1}{4(2\pi\nu C)}$
$\Rightarrow X'=\frac{X}{4}$

20. (b)
13.3 μF

Explanation:
V = 170volt
f = 60Hz
i = 0.85A
$V=iX_C=i\frac{1}{\omega C}=\frac{i}{2\pi fC}$
Capacitance required
$C=\frac{i}{2\pi fV}=\frac{0.85}{2\times 3.14\times 60\times 170}=13.3\times 10^{-6}F=13.3\mu F$

21. (b)
0 W,0 W

Explanation:
$P=VI\cos\phi$
average power consumed by inductor is zero as actual voltage leads the current by $\frac{\pi}{2}$
average power consumed by capacitor is zero as actual voltage lags the current by $\frac{\pi}{2}$
$\left(\cos\frac{\pi}{2}=0\right)$

22. (a)
4800 W, 0.6

Explanation:
$R=3\Omega$
L = 25.48mH
$C=796\mu F$
V_{rms} = 283V
f = 50Hz
Impedance
$X_L=2\pi fL=2\times 3.14\times 50\times 25.48\times 10^{-3}=8\Omega$
$X_C=\frac{1}{2\pi fC}=\frac{1}{2\times 3.14\times 50\times 796\times 10^{-6}}=4\Omega$
$Z=\sqrt{R^2+(X_L-X_C)^2}=\sqrt{3^2+(8-4)^2}=5\Omega$
Power dissipated in the circuit
P = i^2R
$i=\frac{i_m}{\sqrt{2}}=\frac{1}{\sqrt{2}}\frac{V_{rms}}{Z}=\frac{1}{\sqrt{2}}\times\frac{283}{5}=40A$
$P=i^2R=40\times 40\times 3=4800W$
power factor
$\cos\phi=\frac{R}{Z}=\frac{3}{5}=0.6$

23. (b)
50.0 V

Explanation:
$V_R=30V$
VC = 90V

VL = 50V

$V=\sqrt{(V_C-V_L)^2+V_R^2}=\sqrt{(90-50)^2+30^2}=\sqrt{40^2+30^2}$

V = 50volt

24. (d)

113 Hz, 15mA

Explanation:

$R=200\Omega$

L = 0.4H

$C=5\mu F=5\times10^{-6}F$

E = 3volt

current $i=\frac{E}{Z}$

hence current will be maximum when impedance $Z=\sqrt{R^2+(X_L-X_C)^2}$ will be minimum.

Z will be minimum when

$(X_C - X_L) = 0$

$X_L = X_C$

hence

$\omega L=\frac{1}{\omega C}$

$\omega=\frac{1}{\sqrt{LC}}$

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

$f=\frac{1}{2\pi\sqrt{LC}}=\frac{1}{2\times3.14\sqrt{0.4\times5\times10^{-6}}}=113Hz$

current in this case will be $i=\frac{E}{Z}=\frac{3}{200}=0.015A=15mA$

(if $X_L = X_C$ then Z = R)

25. (c)

1.82 A, 3.2 ms

Explanation:

L = 0.5H

$R=100\Omega$

V = 240 volt

f = 50Hz

Peak voltage $V_0=V\sqrt{2}=240\sqrt{2}=339.41volt$

angular frequency $\omega=2\pi f=2\times3.14\times50=314rad/\sec$

maximum current in circuit

$i_0=\frac{V_0}{\sqrt{R^2+\omega^2L^2}}=\frac{339.41}{\sqrt{(100)^2+(314)^2(0.5)^2}}=1.82A$

$\tan\phi=\frac{\omega L}{R}=\frac{314\times0.5}{100}=1.57$

$\phi=57.5^\circ=\frac{57.5\pi}{180}rad$

$\phi=\omega t$

$\frac{57.5\pi}{180}=314t$

$t=\frac{57.5\times3.14}{180\times314}=3.19\times10^{-3}s=3.2ms$

26. (a)

Less resistance

Explanation:

capacitive reactance

$X_C=\frac{1}{\omega C}=\frac{1}{2\pi fC}$

$X_C \propto \frac{1}{C}$
hence, for high frequency capacitor offers less resistance.

27. (a)
230 V, 50 Hz

Explanation:
India uses ac power supply of frequency 50 Hz and voltage 230V while America uses ac supply of frequency 60Hz and voltage 110V.

28. (c)
1.06 A

Explanation:
maximum value of current $i_0 = 1.5A$
root-mean-square current
$i_{rms} = \frac{i_0}{\sqrt{2}} = \frac{1.50}{\sqrt{2}} = 1.06A$

29. (b)
90°

Explanation:
If only inductor is present in circuit then R = 0
$\tan\phi = \frac{X_L}{R} = \frac{X_L}{0} = \infty$
hence, phase angle $\phi = 90^\circ$

30. (d)
inductor, 0.133 H

Explanation:
For power factor to be unity,
$\cos\phi = 1$
$\phi = 0^\circ$
it means that
$\omega L = \frac{1}{\omega C_{eff}}$
$L = \frac{1}{\omega^2 C_{eff}}$
impedance
$Z = \sqrt{R^2 + \left(\frac{1}{\omega C_{eff}}\right)^2}$
$C_{eff} = \frac{1}{\omega\sqrt{Z^2 - R^2}}$
$\cos\phi = \frac{R}{Z}$
$R = Z\cos\phi$
$C_{eff} = \frac{1}{\omega\sqrt{Z^2 - Z^2\cos^2\phi}} = \frac{1}{\omega Z\sqrt{1-\cos^2\phi}}$
$L = \frac{1}{\omega^2 C_{eff}} = \frac{Z\sqrt{1-\cos^2\phi}}{\omega} = \frac{60\sqrt{1-(0.72)^2}}{2\times 3.14\times 50}$
L = 0.133H

31. (b)
31.8 V

Explanation:
maximum voltage across the terminals V = 45 volt
Root-mean-square potential difference

$V_{rms} = \frac{V}{\sqrt{2}} = \frac{45}{\sqrt{2}} = 31.8 volt$

32. (a)
159 Hz

Explanation:
$L = 20 mH = 20 \times 10^{-3} H$
$C = 50 \mu F = 50 \times 10^{-6} F$
frequency
$f = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2 \times 3.14 \sqrt{20 \times 10^{-3} \times 50 \times 10^{-6}}}$
f = 159Hz

33. (a)
0

Explanation:
Phase factor in series LCR circuit
$\tan\phi = \frac{X_L - X_C}{R}$
at resonance $X_L = X_C$
$\tan\phi = \frac{X_L - X_C}{R} = 0$
$\phi = 0^\circ$

34. (b)
0.831

Explanation:
$R = 300\Omega$
$X_L = 500\Omega$
$X_C = 300\Omega$
power factor $\cos\phi = \frac{R}{Z}$
$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{300^2 + (500 - 300)^2} = 100\sqrt{13}$
$\cos\phi = \frac{300}{100\sqrt{3}} = 0.831$

35. (d)
zero V

Explanation:
average value of AC voltage for a half cycle is positive and similarly, the mean value of AC voltage for other half cycle is negative.
Average potential difference between the two terminals for complete full cycle
$V_{av} = (0.637V_0) + (-0.637V_0) = 0$

36. (c)
161 V

Explanation:
$R = 300\Omega$
$X_L = 500\Omega$
$X_C = 300\Omega$
$P_{av} = 60W$
$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{300^2 + (500 - 300)^2} = 100\sqrt{3}$
$P_{av} = V_{rms} \times i_{rms} \times \cos\phi$
$i_{rms} = \frac{V_{rms}}{Z}$

$\cos\phi = \frac{R}{Z}$

$P_{av} = \frac{(V_{rms})^2}{Z} \times \frac{R}{Z} = \frac{(V_{rms})^2 R}{Z^2}$

$60 = \frac{(V_{rms})^2 \times 300}{100\sqrt{3} \times 100\sqrt{13}}$

$V_{rms} = \sqrt{\frac{60 \times 100 \times 13}{3}} = 161V$

37. (b)

3.59 $\times 10^7$rad/s

Explanation:

for capacitor,

$A = 4.5 \times 4.5 \times 10^{-4} m^2$

$d = 8 \times 10^{-3} m$

$C = \frac{A\varepsilon_0}{d} = \frac{4.5 \times 4.5 \times 10^{-4} \times 8.85 \times 10^{-12}}{8 \times 10^{-3}} = 224 \times 10^{-14} F$

self inductance of solenoid

$L = \frac{\mu_0 A N^2}{l}$

$A = \pi r^2 = 3.14 \times \left(\frac{0.5}{2} \times 10^{-2}\right)^2 = 19.625 \times 10^{-6} m^2$

$N = 125 \times 9 = 1125$

$l = 9 \times 10^{-2} m$

$\mu_0 = 4\pi \times 10^{-7}$

$L = \frac{4 \times 3.14 \times 10^{-7} \times 19.625 \times 10^{-6} \times 1125 \times 1125}{9 \times 10^{-2}} = 346.6 \times 10^{-6} H$

resonant angular frequency

$\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{224 \times 10^{-14} \times 346.6 \times 10^{-6}}} = 3.59 \times 10^7 rad/s$

38. (c)

193 Hz

Explanation:

V = 45volt

L = 9.5mH

i = 3.9A

f = ?

$V = iX_L = i \times \omega L = i \times 2\pi f L$

Frequency of the source

$f = \frac{V}{i \times 2\pi L} = \frac{45}{3.9 \times 2 \times 3.14 \times 9.5 \times 10^{-3}} = 0.193 \times 10^3$

f = 193Hz

39. (d)

400

Explanation:

N_p = no. of turns in primary coil = 4000

N_s = no. of turns in primary coil

V_p = input voltage = 2300 V

V_s = output voltage = 230 V

$\frac{V_s}{V_p} = \frac{N_s}{N_p}$

$\frac{230}{2300} = \frac{N_s}{4000}$

N_s = 400

40. (a)

146.0 Ω

Explanation:

$R = 115\Omega$

$C = 1.25\mu F = 1.25 \times 10^{-6} F$

$L = 4.5mH = 4.5 \times 10^{-3} H$

resonant angular frequency

$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{4.5 \times 10^{-3} \times 1.25 \times 10^{-6}}} = \frac{1}{7.5 \times 10^{-5}}$

given that the angular frequency of the ac source $\omega = 2\omega_0 = \frac{2}{7.5 \times 10^{-5}} = 26666.6 rad/s$

impedance

$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2} = \sqrt{115^2 + \left[(26666.6 \times 4.5 \times 10^{-3}) - \left(\frac{1}{26666.6 \times 1.25 \times 10^{-6}}\right)\right]^2}$

$Z = 146\Omega$

Solution

Class 12 - Chemistry

Multiple Choice Test (October-2019)

Section A

41. (c)
Sandmeyer's reaction

Explanation:
$C_6H_5N_2^+Cl^- + Cu_2Cl_2/HCl \rightarrow C_6H_5Cl.$
Mixing the solution of freshly prepared diazonium salt with cuprous chloride or cuprous bromide results in the replacement of the diazonium group by –Cl or –Br. This is called sandmeyer's reaction.

42. (a)
$Cl^- < Br^- < I^-$

Explanation:
Nucleophilicity means the tendency of a nucleophile to attack a center of positive charge. As size of the nucleophile increases, its basicity decreases and hence its nucleophilicity increases. As we move down the group 17 size of the anions increases and thus the nucleophilicity increases as $Cl^- < Br^- < I^-$

43. (d)
a mixture of two different alkyl halides has to be used

Explanation:
Alkyl halides on treatment with sodium metal in dry ethereal (free from moisture) solution give higher alkanes. This reaction is known as Wurtz reaction and is used for the preparation of higher alkanes containing even number of carbon atoms. Many side products are formed when two different alkyl halides are used. So this method is not preferred to prepare alkanes having odd number of C atoms.

44. (c)
major product is paranitroanisole

Explanation:
OCH_3 is activator and o/p director out of which para is major product.

45. (a)
higher melting point and lower solubility

Explanation:
The para-isomers of dihalobenzenes are high melting as compared to their ortho- and meta-isomers. It is due to symmetry of para-isomers that fits in crystal lattice better as compared to ortho- and meta-isomers. These compounds have lower solubility in water but higher solubility in organic solvents.

46. (c)
1 - chloro - 4 - (2 - methylpropyl) benzene

Explanation:
Here we have selected the benzene ring as the parent compound with chloro group at position 1 and 2-methylpropyl group present at the position 4. Here halogen has been numbered in preference to the alkyl substituent. Thus the correct IUPAC name would be 1-chloro-4-(2-methylpropyl) benzene.

47. (a)
both gets slowly oxidised by air in presence of light and form a poisonous gas

Explanation:

In presence of light choloroform slowly oxidizes in air to form phosgene (carbonyl chloride $COCl_2$), which is poisonous gas. It is therefore stored in closed dark coloured bottles completely filled so that air is kept out.

$$2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$$

48. (d)
2 – chloro 2 methyl propane

Explanation:
Longest chain will be of three carbon to which Cl and CH_3 will be attached at 2 position.

49. (a)
$SOCl_2$ in presence of pyridine

Explanation:
The hydroxyl group of an alcohol is replaced by halogen on reaction with concentrated halogen acids, phosphorus halides or thionyl chloride. Thionyl chloride ($SOCl_2$) is preferred because the other two products SO_2 and HCl are escapable gases. Hence the reaction gives pure alkyl halides.

$$ROH + SOCl_2 \rightarrow RCl + SO_2(g) + HCl(g)$$

50. (c)
thyroxine

Explanation:
Our body produces iodine containing hormone, thyroxine, the deficiency of which causes a disease called goiter

51. (d)
Pesticide

Explanation:
p,p' –**Dichlorodiphenyltrichloroethane** (**DDT**) is a colorless, tasteless, and almost odorless known for its pesticidal properties and environmental impacts.

52. (b)
Ethyl bromide + alcoholic KCN

Explanation:
$CH_3CH_2Br + KCN \rightarrow CH_3CH_2CN + KBr$

53. (a)
Swarts reaction

Explanation:
The chlorofluorocarbon compounds of methane and ethane are collectively known as freons. They are extremely stable, unreactive, non-toxic, non-corrosive and easily liquefiable gases. Freon 12 (CCl_2F_2) is one of the most common freons in industrial use. It is manufactured from tetrachloromethane by Swarts reaction

54. (a)
Na

Explanation:
$2CH_3Br + 2Na \rightarrow CH_3CH_3 + 2NaBr$

55. (d)
Neopentane

Explanation:
Neopentane has all same type of hydrogen and has molecular weight 72u

56. (a)
All of these

Explanation:
Since halogen atoms are more electronegative than carbon, the carbon-halogen bond of alkyl halide is polarised; the carbon atom bears a partial positive charge whereas the halogen atom bears a partial negative charge.

57. (a)
μ= 0

Explanation:
CCl_4 is symmetrical hence dipole moment is zero.

58. (d)
Wurtz reaction

Explanation:
Alkyl halides react with sodium in dry ether to give hydrocarbons containing double the number of carbon atoms present in the halide. This reaction is known as Wurtz reaction.
$2RX + 2Na \rightarrow R - R + 2NaX$
So $C_6H_5CH_2CH_3$ is not prepared by Wurtz reaction.

59. (a)
3, 4, 4 - triethyl pent - 2 - ene

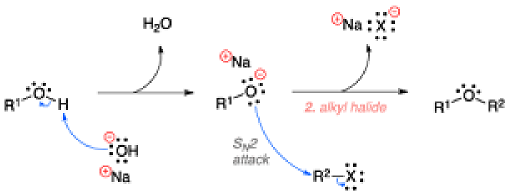
Explanation:
Longest chain contains double bond.

60. (a)
All of these

Explanation:
When a haloalkane with β-hydrogen atom is heated with alcoholic solution of potassium hydroxide, there is elimination of hydrogen atom from β-carbon and a halogen atom from the α-carbon atom. As a result, an alkene is formed as a product. Since β-hydrogen atom is involved in elimination, it is often called β-elimination.

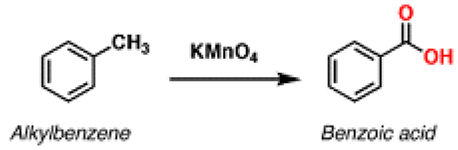
61. (b)
ethers

Explanation:
The Williamson ether synthesis is an organic reaction, forming an ether from an organohalide and deprotonated alcohol (alkoxide). This reaction was developed by Alexander Williamson in 1850. Typically it involves the reaction of an alkoxide ion with a primary alkyl halide via an S_N^2 reaction.



62. (b)
Benzoic acid

Explanation:
Oxidation of aromatic alkanes with KMnO4 to give carboxylic acids.
Description: Treatment of an alkylbenzene with potassium permanganate results in oxidation to give the benzoic acid.



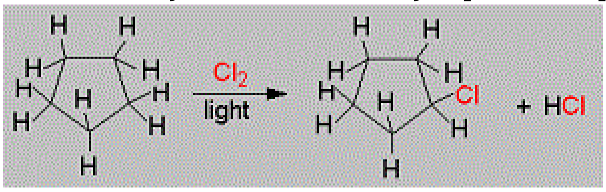
Key bonds formed	Key bonds broken
C-O(π)	C-H
C-O	C-H
C-OH	C-H

63. (b)
(iii) < (ii) < (i)

Explanation:
The nitro-group is an electron-withdrawing group. The presence of this group in the para position decreases the electron density on the benzene ring. which in turn decreases the electron density on the oxygen of O-H bond. As a result, it is easier to lose a proton. Also, the p-nitrophenoxide ion formed after the loss of protons is stabilized by resonance. Hence, ortho nitrophenol is a stronger acid. On the other hand, methoxy group is an electron-releasing group. Thus, it increases the electron density on the oxygen of the O-H bond and hence, the proton cannot be given out easily. For this reason, para-nitrophenol is more acidic than para-methoxyphenol.

24. (d)
Cyclopentane

Explanation:
Cyclopentane is nearly inert chemically, they react with halogens in the presence of light through the substitution of one hydrogen atoms. Since the cyclic structure confers a high degree of symmetry on the molecule, only one monochloro cyclopentane is possible.



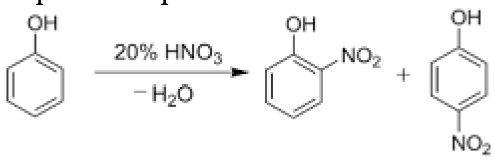
65. (b)
a primary alcohol

Explanation:
When $–CH_2OH$ group is replaced by –COOH group then only molecular wt will increase by 14units.

66. (a)
a mixture of ortho and para nitro phenols

Explanation:
Nitration of phenols: Phenols upon treatment with dilute nitric acid undergoes nitration at low temperature (298 K) to give a mixture of ortho and para nitrophenols. The mixture formed is further separated into ortho and para nitrophenols by steam distillation on the basis of their volatility. Due to intramolecular and intermolecular hydrogen bonding, ortho nitrophenols are lesser volatile in comparison

to para nitrophenols which involves only intermolecular hydrogen bonding.



67. (a)

$(CH_3)_2CHOH$

Explanation:

Secondary alcohol on oxidation forms ketone which reacts with hydrazine bus doesnot gives silver mirror test.

68. (b)

b>d>c>a>e

Explanation:

The acidity of phenols depends on the group attached to the benzene ring. Groups showing electron withdrawing nature i.e. -I and -R effect will increase the acidity while group showing electron donating nature like +I and +R effect will decrease acidity. Resonance effect of group (-R or +R) attached to benzene system is operative only ortho and para position of the benzene system, while at meta position only inductive effect is operative.

Clearly, b will be most acidic because $-NO_2$ group attached will show strong -R effect. In d, $-NO_2$ is present at meta position where only -I is effective. -I effect of $-NO_2$ is more than $-OCH_3$ group so, d will be more acidic than c, e will be least acidic as $-OCH_3$ group is attached at para position and shows +R effect.

69. (b)

Secondary alcohol

Explanation:

A secondary alcohol is a compound in which a hydroxy group, –OH, is attached to a saturated carbon atom which has two other carbon atoms attached to it.

$$\begin{array}{ccccccccccc} & & H & & H & & H & & H & & H & & \\ & & | & & | & & | & & | & & | & & \\ H & - & C & - & C & - & C & - & C & - & C & - & H \\ & & | & & | & & | & & | & & | & & \\ & & H & & H & & OH & & H & & H & & \end{array}$$

70. (a)

methoxyethane

Explanation:

Ether react with HI to form alcohol and alkyl iodide. Alcohol on oxidation will give iodoform test.

71. (b)

b > d > c > a > e

Explanation:

B will be most acidic because of –M effect of NO_2. Followed by d, in d -I effect of NO_2 operates only.Then c will come as -I of OCH_3 < - I of NO_2 and least will be e because of +M effect of OCH_3 that will decrease the acidity.

72. (a)

Williamson's synthesis

Explanation:

Williamson's synthesis: When an alkyl halide reacts with sodium alkoxide, ether is formed. This reaction is known as Williamson's synthesis. The reaction generally follows S_N2 mechanism for primary alcohols.

$$R - X + R' - \ddot{\underset{..}{O}}\overset{+}{Na} \rightarrow R - \ddot{\underset{..}{O}} - R' + Na\ X$$
$$\textit{Williamson's synthesis}$$

73. (a)
Nucleophilic substitution

Explanation:
The Dow process is the electrolytic method of bromine extraction from brine, and was Herbert Henry Dow's second revolutionary process for generating bromine commercially.
Dow's Process may also refer to the hydrolysis of chlorobenzene in the preparation of phenol. Benzene can be easily converted to chlorobenzene by electrophilic aromatic substitution. It is treated with dilute sodium hydroxide at 350 °C and 300 bar to convert it to sodium phenoxide, which yields phenol upon acidification.
This reaction is quickened manifold in the presence of electron withdrawing groups (such as $-NO_2$) ortho and/or para to the halogen group.

74. (b)
propene

Explanation:
Alkenes can be prepared from alkyl halides by treatment with alcoholic solution of caustic potash (KOH) at about 353-363 K. This reaction is known as dehydrohalogenation of alkyl halides.

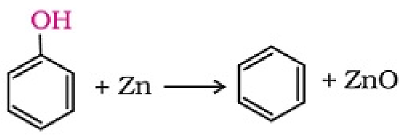
$$\underset{n-\text{Pr}opyl\ bromide}{CH_3CH_2CH_2Br} + KOH \xrightarrow[353-363K]{C_2H_5OH} \underset{\text{Pr}opene}{CH_3CH = CH_2} + KBr + H_2O$$

75. (d)
elimination competes over substitution and alkenes are easily formed

Explanation:
The formation of ethers by dehydration of the alcohol is a bimolecular reaction (S_N2) involving the attack of an alcohol molecule on a protonated alcohol molecule. In the method, the alkyl group should be unhindered. In case of secondary or tertiary alcohols, the alkyl group is hindered. As a result, elimination dominates substitution as 3° carbocation is more stable.
Hence, in place of ethers, alkenes are formed.

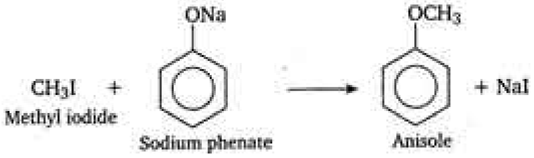
76. (c)
benzene

Explanation:
Phenol is reduced to benzene when it is distilled with zinc dust or its vapour is passed over granules of zinc at 400^oC.



77. (c)
Williamsons reaction

Explanation:
The reaction of an alkyl halide with sodium alkoxide to give ether (alkoxy alkane), is known as Williamson's synthesis. In this reaction, an ether (anisole) is prepared by the action of alkyl halide (methyl iodide) on sodium alkoxide (sodium phenate), so it is an example of Williamson's synthesis.



78. (d)
C_6H_5OH

Explanation:
Phenol is more soluble in NaOH than in water is because phenol is slightly more acidic than alcohols. The Ka for phenol in water is 1e-10 which is not very strong. But by mixing with NaOH, it causes the phenol to release the H+ to form sodium phenoxide.

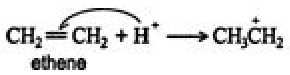
79. (d)
All of these

Explanation:
The addition of water to an alkene in the presence of a catalytic amount of strong acid leads to the formation of alcohols (hydroxy-alkanes).

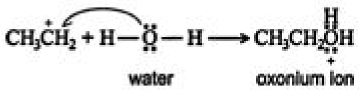
$$CH_2 = CH_2 + H_2O \xrightarrow{H^+} CH_3CH_2OH$$

This reaction proceeds via a standard carbocation mechanism and follows the Markovnikov rule.
The mechanism for the addition of water to ethene follows.

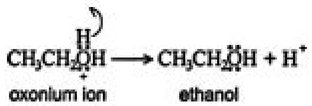
1. The hydrogen ion is attracted to the π bond, which breaks to form a σ bond with one of the double-bonded carbons. The second carbon of the original double-bonded carbons becomes a carbocation.



2. An acid-base reaction occurs between the water molecule and the carbocation, forming an oxonium ion.



3. The oxonium ion stabilizes by losing a hydrogen ion, with the resulting formation of an alcohol.



80. (a)
All of these

Explanation:
Oxidation of alcohols to aldehydes is partial oxidation; aldehydes are further oxidized to carboxylic acids. Conditions required for making aldehydes are heat and distillation.
In aldehyde formation, the temperature of the reaction should be kept above the boiling point of the aldehyde and below the boiling point of the alcohol. Reagents useful for the transformation of primary alcohols to aldehydes are normally also suitable for the oxidation of secondary alcohols to ketones. These include:

- **Chromium-based reagents**, such as Collins reagent ($CrO_3·Py_2$)
- PDC or PCC.
- Heat in the presence of Cu at 573K.

Solution

Class 12 - Mathematics

Multiple Choice Examination (October-2019)

Section A

81. (d)
4

Explanation:
$\int\limits_0^{\pi}(sin\frac{x}{2}+cos\frac{x}{2})dx \Rightarrow 2\left[-\cos\frac{x}{2}+\sin\frac{x}{2}\right]_0^{\pi} \Rightarrow 4$

82. (b)
2

Explanation:
$\because \int\limits_0^5(1+f(x))dx=7$
$\therefore \int\limits_0^5 dx+\int\limits_0^5 f(x)dx=7$
$\Rightarrow [x]_0^5+\int\limits_0^5 f(x)dx=7$
$\Rightarrow \int\limits_0^5 f(x)dx=7-5=2,$
Also, $\int\limits_{-2}^5 f(x)dx=4$
$\Rightarrow \int\limits_{-2}^0 f(x)dx+\int\limits_0^5 f(x)dx=4$
$\Rightarrow \int\limits_{-2}^0 f(x)dx=2$

83. (c)
None of these

Explanation:
$\int\limits_0^1 e^{-\sin^2 x}$ dx cannot be evaluated

84. (d)
0

Explanation:
$\int\limits_0^{\pi/2} \log(\cot x)dx$
$I=\int\limits_0^{\pi/2}\{\log(\cos x)-\log(\sin x)\}dx \quad \ldots\ldots(1)$
$I=\int\limits_0^{\pi/2}\{\log(\sin x)-\log(\cos x)\}dx \quad \ldots\ldots(2)$
Adding (1) and (2)
$2I=\int\limits_0^{\pi/2} 0.dx \implies 0$

85. (d)
0

Explanation:
Given function is an odd function. Whenever f(x) is an odd function $\int\limits_{-a}^{a} f(x)dx$= 0

86. (a)

$-\log\left(\frac{\sqrt{3}-1}{2}\right)$

Explanation:

$\int_0^{\pi/6} \frac{\cos 2x(cosx-sinx)^2}{d}x$

$= \int_0^{\pi/6} \frac{\cos^2 x-\sin^2 x}{(cosx-sinx)}dx$

$= \int_0^{\pi/6} \frac{\cos x+\sin x}{\cos x-\sin x}dx$

$= \int_0^{\pi/6} \tan(x+\frac{\pi}{4})dx$

$=\left[\log\left|\sec(x+\frac{\pi}{4}\right|\right]_0^{\pi/6}$

$= -\log(\frac{\sqrt{3}-1}{2})$

87. (d)
2

Explanation:

$= [\sin t]_{-\pi/2}^{\pi/2} = \sin\frac{\pi}{2} - \sin(\frac{-\pi}{2}) = 1+1 = 2$

88. (c)
3

Explanation:

$= \int_0^{1/2} [2x]\,dx + \int_{1/2}^{1} [2x]\,dx + \int_1^{3/2} [2x]\,dx + \int_{3/2}^{2} [2x]\,dx = 0 + \int_{1/2}^{1} 1dx + \int_1^{3/2} 2dx + \int_{3/2}^{2} 3dx\ = 3$

89. (b)
an even function

Explanation:

t = -u

f(-x) = $\int_0^x \log(-u+\sqrt{1+u^2})(-du)$

= $-\int_0^{\pi} \log\left(\frac{1+u+u^2}{\sqrt{1+u^2+u}}\right)(-du)$

= $\int_0^x \log(u+\sqrt{1+u^2})du$ = f(x)

$\Rightarrow$ f(-x) = f(x) $\Rightarrow$ f is an even function

90. (c)
$-\log(1 + e^{-x}) + C$

Explanation:

$\int \frac{e^{-x}}{1+e^{-x}}dx = -\int \frac{-e^{-x}}{1+e^{-x}}dx = -\log(1+e^{-x}) + C$

91. (d)
0

Explanation:

f(x) = x|x| is an odd function as :

$f(-x) = (-x)\,|-x| = -x\,|x| = -f(x)$

$\Rightarrow \int_{-2}^{2} x\,|x|\,dx = 0$

92. (d)
x log (log x) + C

Explanation:

$\int log(logx)dx + \int \frac{1}{\log x}dx = \log(logx).x - \int \frac{1}{\log x}\cdot\frac{1}{x}.xdx + \int \frac{1}{\log x}dx + C =\ x\,log(log\ x) + C$

93. (b)
$\tan^{-1}\left(x+\frac{1}{x}\right)+C$

Explanation:
Divide num. and deno. by x^2
Substitute $x+\frac{1}{x}=t$ then $(1-\frac{1}{x^2})dx=dt$
$\Rightarrow \int \frac{dt}{t^2+1}$
$\Rightarrow \tan^{-1}(x+\frac{1}{x})+C$

94. (c)
sin(log x)+C

Explanation:
Put log x = t , we get ;
$\int \frac{\cos(\log x)}{x}dx=\int \cos t dt=\sin t=\sin(\log x)+C$

95. (c)
$\frac{2}{3}$

Explanation:
$=2\int\limits_0^{\pi/2} \sin^2 x\cos x dx$
Substitute sin x = t, then cosx dx = dt
$\Rightarrow 2\int\limits_0^1 t^2\ dt=2\left[\frac{t^3}{3}\right]_0^1$ = $\frac{2}{3}$

96. (d)
$\frac{5}{2}$

Explanation:
$=\int\limits_{-1}^{1/2}|2x-1|dx+\int\limits_{1/2}^{1}|2x-1|dx$
$=\int\limits_{-1}^{1/2}(-(2x-1))dx+\int\limits_{1/2}^{1}(2x-1)dx$
$=(\frac{1}{2}-\frac{1}{4})-(-1-1)+(1-1)-(\frac{1}{4}-\frac{1}{2})$

97. (a)
$\frac{a}{2}\int\limits_0^a f(x)dx$

Explanation:
$I=\int\limits_0^a xf(x)dx$....(1)
$\Rightarrow I=\int\limits_0^a(a-x)f(a-x)dx\Rightarrow\int\limits_0^a f(a-x)dx$....(2)
Adding (1) and (2),
$2I=\int\limits_0^a af(x)dx\Rightarrow I=\frac{a}{2}\int\limits_0^a f(x)dx.$

98. (a)
$\frac{1}{2}\log 3$

Explanation:
= $2\int\limits_0^{\frac{\pi}{2}}\sec 2x dx=2\left[\frac{\log\left|\tan\left(\frac{\pi}{4}+x\right)\right|}{2}\right]_0^{\frac{\pi}{12}}$
= $\log\left|\tan\frac{\pi}{3}\right|-\log\left|\tan\frac{\pi}{4}\right|$
= $\log\sqrt{3}-\log 1=\frac{1}{2}\log 3$

99. (a)
$-\frac{1}{6}\cos^3 2x+C$

Explanation:
$\int \frac{\cos 4x+1}{\tan x+\cot x} dx$
$= \int \frac{2\ \cos^2 2x}{2\ cosec\ 2x} dx$
$= \int \frac{2\ \cos^2 2x}{2\ cosec\ 2x} dx$
substitute cos2x = t , then -2 sin2x dx = dt
$\frac{-1}{2} \int \frac{t^2}{2} dt \Rightarrow = \frac{-1}{2} \left(\frac{\cos^3 2x}{3} \right) + C$

100. (d)
1

Explanation:
$I = \int\limits_0^{\pi/2} \frac{1}{1+\sin x} dx$
$= \int\limits_0^{\pi/2} \frac{1-\sin x}{1-\sin^2 x} dx$....(multiply num. and deno. by [1 - sinx])
$= \int\limits_0^{\pi/2} \frac{1-\sin x}{\cos^2 x} dx$
$= [\tan x - \sec x]_0^{\pi/2}$
$= \left[\frac{\sin x-1}{\cos x} \right]_0^{\pi/2}$
$= \left[\frac{-\cos x}{1+\sin x} \right]_0^{\pi/2}$

101. (a)
$2\sqrt{2}$

Explanation:
$= \sqrt{2} \int\limits_0^{\pi} \sin \frac{x}{2} dx = \sqrt{2} \left[\frac{-\cos \frac{x}{2}}{\frac{1}{2}} \right]_0^{\pi} = -2\sqrt{2} \left[\cos \frac{\pi}{2} - \cos 0 \right] = 2\sqrt{2}$

102. (a)
$\frac{\pi}{4}$

Explanation:
=$I = \int\limits_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$...(1)
=$I = \int\limits_0^{\frac{\pi}{2}} \frac{\sqrt{\cos x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$....(2)
Adding (1) and (2), we get;
= $2I = \int\limits_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}+\sqrt{\cos x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx = \int\limits_0^{\frac{\pi}{2}} 1.dx = [x]_0^{\frac{\pi}{2}}$
$\implies I = \frac{\pi}{4}$

103. (d)
$\frac{1}{2}(\tan^{-1} x)^2 + C$

Explanation:
Subsitute $\tan^{-1}x$ = t then $\frac{1}{1+x^2} dx = dt$
$\Rightarrow \int t\ dt = \frac{t^2}{2} + C \Rightarrow \frac{(tan^{-1} x)^2}{2} + C$

104. (a)
$\frac{x|x|}{2} + C$

Explanation:
(Case 1) for x > 0:
$\Rightarrow \int |x|\ dx = \int x\ dx = (1/2)x^2 + C'$
(Case 2) for x < 0 :

$\Rightarrow \int |x|\,dx = \int -x\,dx = -(1/2)x^2 + C''$
Combining both cases, we have $(\frac{1}{2})x|x| + C$

105. (d)
$-\frac{\pi}{2}\log 2$

Explanation:
$I = \int_0^{\pi/2} \log(\sin x)\,dx$.......(1)
$I = \int_0^{\pi/2} \log(\sin \frac{\pi}{2} - x)\,dx$.......(2)
Adding (1) and (2)
$2I = \int_0^{\pi/2} \log(\sin x \cos x)\,dx = \int_0^{\pi/2} \log(\frac{\sin 2x}{2})\,dx$
$2I = \int_0^{\pi/2} \log(\sin 2x)\,dx\ -\int_0^{\pi/2} \log 2\,dx$

106. (b)
$\frac{9}{2}$

Explanation:
The two curves parabola and the line meet where,
$3 - x = x^2 + 1 \Leftrightarrow x^2 + x - 2 = 0 \Leftrightarrow x = -2, 1$
Therefore , the required area is :
$\int_{-2}^{1} (y_{line} - y_{parabola})dx$
$= \int_{-2}^{1} \{3 - x - (x^2 + 1)\}\,dx$
$= \left[2x - \frac{x^2}{2} - \frac{x^3}{3}\right]_{-2}^{1} = \frac{9}{2}$

107. (b)
$12\sqrt{3}$ sq. units

Explanation:
Required area :
$\int_{-\sqrt{3}}^{\sqrt{3}} (9 + 2x^2 - 5x^2)dx$
$= 2\int_0^{\sqrt{3}} (9 - 3x^2)dx$
$= 2\left[9\sqrt{3} - 3\sqrt{3}\right]$
$= 12\sqrt{3} sq.units$

108. (b)
2 : 3

Explanation:
Let y^2 = 4x be a parabola and let x = b be a double ordinate. Then , A_1 = area enclosed by the parabola y^2 = 4ax and the double ordinate x = b .
$2\int_0^2 y dx = 2\int_0^b \sqrt{4ax}dx$
$= 4\sqrt{a}\int_0^b \sqrt{x^3}dx$
$= 4\sqrt{a}\left[\frac{2}{3}x^{\frac{3}{2}}\right]_0^b$
$= 4\sqrt{a}.\frac{2}{3}b^{\frac{3}{2}} = \frac{8}{3}a^{\frac{1}{2}}b^{\frac{3}{2}}$....(1)
And ,
A_2 = Area of of the rectangle
$= 2\sqrt{4ab}.b = 4a^{\frac{1}{2}}b^{\frac{3}{2}}$....(2)

Dividing (1) and (2),

$A_1 : A_2 = \frac{8}{3} a^{\frac{1}{2}} b^{\frac{3}{2}} : 4 a^{\frac{1}{2}} b^{\frac{3}{2}} = 2 : 3$

29. (b)

$\frac{2}{3}$

Explanation:

Required area :

$= \left| \int_{-1}^{1} x\,|x|\,dx \right|$

$= \left| \int_{-1}^{0} x\,|x|\,dx + \int_{0}^{1} x\,|x|\,dx \right|$

$= \left| \int_{-1}^{0} -x^2 dx \right| + \int_{0}^{1} x^2 dx$

$= \left| \left[\frac{-x^3}{3} \right]_{-1}^{0} \right| - \left[\frac{x^3}{3} \right]_{0}^{1}$

$= \frac{2}{3}$sq. units

110. (d)

$\frac{9}{2}$ sq. units

Explanation:

The equation y = $2x - x^2$ i.e.$y - 1 = -(x-1)^2$ represents a downward parabola with vertex at (1, 1) which meets x – axis where y = 0 .i .e . where x = 0 , 2. Also , the line y = - x meets this parabola where – x = $2x - x^2$ i.e. where x = 0 , 3.

Therefore , required area is :

$\int_{0}^{3} (y_{parabola} - y_{line}) dx = \int_{0}^{3} (2x - x^2 - (-x)) dx = \left[\frac{3x^2}{2} - \frac{x^3}{3} \right]_{0}^{3} = \frac{27}{2} - 9 = \frac{9}{2} sq.units$

111. (a)

$\frac{2}{3}$

Explanation:

Required area :

= $2 \int_{0}^{a} \sqrt{4ax}\,dx$

$= k\alpha (2\sqrt{4a\alpha})$

$= \frac{8\sqrt{a}}{3} \alpha^{\frac{3}{2}}$

$= 4\sqrt{a} k \alpha^{\frac{3}{2}} \Rightarrow k = \frac{2}{3}$

112. (b)

9

Explanation:

The two curves meet where;

$\sqrt{x} = \frac{x-3}{2}$...(i)

$\Rightarrow 4x = x^2 - 6x + 9$

$\Rightarrow x^2 - 10x + 9 = 0 \Rightarrow x = 9, 1.$

Therefore, the two curves meet where x = 9.

Therefore,required area:

$= \int_{0}^{9} \sqrt{x}\,dx - \int_{3}^{9} \frac{x-3}{2} dx = \frac{2}{3} \left[x^{\frac{3}{2}} \right]_{0}^{9} - \frac{1}{2} \left[\frac{(x-3)^2}{2} \right]_{3}^{9} = 9$

113. (b)

$\frac{4}{3} sq.\ units$

Explanation:

On solving the given curves , we get y = ±1 and x = - 2 . Required area :

$\left| \int_{-1}^{1} (x_1 - x_2) dy \right|$

$= \left|\int_{-1}^{1}(1-3y^2+2y^2)dy\right|$
$= \left|2\int_{0}^{1}(1-y^2)dy\right|$
$= \left|2\left[y-\frac{y^3}{3}\right]_0^1\right|$
$= \frac{4}{3}sq.units$

114. (b)
$\frac{9}{8}\ sq.units$

Explanation:
Eliminating y , we get :
$x^2-x-2=0 \Rightarrow x=-1,2$
Required area :
$= \int_{-1}^{2}\left(\frac{x}{4}+\frac{1}{2}-\frac{x^2}{4}\right)dx = \frac{1}{8}(4-1)+\frac{3}{2}-\frac{1}{12}(8+1) = \frac{3}{8}+\frac{3}{2}-\frac{3}{4} = \frac{9}{8}sq.units$

115. (b)
$\frac{1}{6}sq.\ units$

Explanation:
Required area :
$\int_{0}^{1}(\sqrt{x}-x)dx$
$= \left[\frac{2}{3}x^{\frac{3}{2}}-\frac{x^2}{2}\right]_0^1$
$= \frac{1}{6}sq.units$

116. (a)
$\frac{1}{6}$

Explanation:
Required area :
$\int_{0}^{1}ydx = \int_{0}^{1}(1-\sqrt{x})^2dx = \int_{0}^{1}(1-2\sqrt{x}+x)dx = 1-\frac{4}{3}+\frac{1}{2} = \frac{1}{6}sq.units$

117. (a)
1

Explanation:
The given curves are : (i) y = x – 1 , x > 1 . (ii) y = - (x – 1) , x < 1. (iii) y = 1 these three lines enclose a triangle whose area is : $\frac{1}{2}$.base.height = $\frac{1}{2}$.2 .1 = 1 sq. unit.

118. (a)
$= \frac{1}{2}sq.units$

Explanation:
y = f(x) = x(x - 1)(x - 2) is +ve for x > 2, is – ve for 1 < x < 2 ; +ve for 0 < x < 1 , is – ve for x< 0. Required area :
$\int_{0}^{1}ydx + \left|\int_{1}^{2}ydx\right|$
$\int_{0}^{1}(x^3-3x^2+2x)dx + \left|\int_{1}^{2}(x^3-3x^2+2x)dx\right|$
$= \left[\frac{x^4}{4}-x^3+x^2\right]_0^1 + \left|\left[\frac{x^4}{4}-x^3+x^2\right]_1^2\right|$
$= \frac{1}{2}$ sq. units

119. (d)
4

Explanation:

Reqd. area

$= \int_0^2 (y-2)\,dy + \int_2^0 (2-y)\,dy + \int_0^4 2dy = \left[\frac{y^2}{2} - 2y\right]_0^2 + \left[2y - \frac{y^2}{2}\right]_2^0 + [2y]_0^4 = (2-4) - (4-2) + 8 = 4\ sq.\ units$

120. (b)

$\frac{2}{3}$

Explanation:

Required area :

$= 2\int\limits_0^1 (2\sqrt{x} - 2x)dx$

$= 2\int\limits_0^1 (1-x) - (1-\sqrt{x})^2 dx$

$= \frac{2}{3} sq.units$