Chap # 11 (HEAT)

1. Find the change in volume of an aluminum sphere of 0.4m radius when it is heated from 0°C t0 100°C. ($\alpha = 24 \times 10^{-6} C^{-1}$) **(2019)**

0.00193 m^3

2. A system absorbs 1147 joules of heat, loses 233 joules of heat by conduction to the surroundings and delivers 614 joules of work. Calculate the change in the internal energy of the system. **(2018)**

300 J

3. Calculate the temperature at which the root mean square speed of hydrogen molecules is 3300 m/s. Give your answer in degree Celsius. (3.32×10^{-27} kg) **(2017)**

600.3 ℃

4. The high temperature reservoir of a Carnot engine is at 200°C and has an efficiency of 35% to increase the efficiency to 45% by how many degrees should the temperature of cold reservoir be decreased if the temperature of the high temperature reservoir remains constant? **(2016)**

47.3 K

5. A heat engine performs 200 J of work in each cycle and has an efficiency of 30 percent. For each cycle of operation, **(2015)**

(a) How much heat is absorbed?

(b) How much heat is expelled?

666.6 J, 466.66 J

6. Calculate root mean square speed of Oxygen molecule at 800K, its molar mass is 32 gm and universal gas constant. (R = 8.314 J/mole-K) **(2014)**

789.616 m/s

7. The difference of temperature between a hot and a cold body is 120°C. If the heat engine is 30% efficient, find the temperature of the hot and the cold body. **(2013)**

1310 K, 917 K

8. A Carnot engine whose low temperature reservoir is 200 K has an efficiency of 50%. It is desired to increase this to 75% .By how many degrees must the temperature of the higher temperature reservoir remains constant. **(2012)**

100 K

9. A 200-gm piece of metal is heated to 150°C and then dropped into an aluminum calorimeter of mass 500 gm containing 500 gm of water initially at 25°C. Find the final equilibrium temperature of the system if the specific heat of metal is 128.100 J/Kg-K, specific heat of aluminum is 903 J/Kg-K while the specific heat of water 4200 J/Kg-K. **(2011)**

296.03 K

10. A heat engine performing 400 J of work in each cycle has an efficiency of 25%. How much heat is absorbed and rejected in each cycle? **(2010)**

1600 J, 1200 J

Chap # 12 (ELETROSTATICS)

11. A Proton of mass 1.67 x 10^{-27} kg and charge 1.6x10^{-19} C is to be held motionless between two horizontals parallel plates; the potential difference applied between the plates is 1.02x10^{-8} volt. Calculate the distance between the plates. **(2021)**

12. Two capacitors of $2\mu F$ and $4\mu F$ are connected in series to 40 volt battery. Calculate the charge on these capacitors and potential difference across each. **(2019)**
5.33 x 10^{-5} Coulomb, 26.65 V, 13.325 V

13. Two unequal point charges repel each other by a factor of 10 N when they are 10 cm apart. Find the force which they exert on each other when they are 1 cm apart. If the magnitude of one point charge is -4.25x10^{-6} C, find the magnitude of the other. **(2018)**
999 N

14. A particle of mass 1.67 x 10^{-27} kg and charge 1.6x10^{-19} C is to be held motionless between two horizontals parallel plates; the voltage applied between the plates is 14.32x10^{-9} volt. Calculate the distance between the plates. **(2017)**
0.1399 m

15. An α-particle of charge 3.2 x 10^{-19} C and mass 6.68 X10^{-27} kg is held motionless between two horizontal parallel plates separated by 10 cm. Find the potential difference between the plates.
2.055 x 10^{-8} Volt **(2016)**

16. A thin infinite sheet of uniformly distributed positive charge attracts a light sphere having a charge -5 x 10^{-6} C with a force of 1.695 N. Calculate the surface charge density of the sheet.
6 x 10^{-6} c/m^2 (ϵ_0 = 8.85 x 10^{-12} C^2 /Nm^2). **(2015)**

17. How many electrons should be removed from each of the two similar spheres, each of mass 10g so that electrostatic repulsion is balanced by the gravitational force?
(G = 6.67 x 10^{-11} Nm^2/kg^2 and K = 9 x 10^9 Nm^2/C^2) **(2015, 10)**
5.380 x 10^6 electrons

18. The surface charge density on a vertical metal plate is 25 x 10^{-6} C/m^2. Find the force experienced by a charge of 2 x 10^{-10} C placed in front close to the sheet.
(ε_0 = 8.85 x 10^{-12}C/Nm^2) **(2013)**
2.824 x 10^{-4} N

19. Two-point charges of +2 x 10^{-4} and -2 x 10^{-4} coulomb are placed at a distance of 40cm from each other. A charge of +5 x 10^{-5} coulomb is placed midway between them. What is the magnitude and direction of force on it? (K = 9 x 10^9 N-m^2/C^2) **(2012)**
4500 N

20. A Proton of mass 1.67 X 10^{-17} kg & charge 1.6 X 10^{-19} C is to be held motionless between two parallel horizontals plate. Find the distance between the plates when the potential difference of 6 x 10^{-19} volt is applied across the plates. **(2011)**
0.0587 m

Chap # 13 (CURRENY ELECTRICITY)

21. How many electrons per second pass through the cross section of a wire carrying a current of 0.7 ampere? **(2021)**

22. A rectangular bar of iron is 2cm x 2cm in cross section and 20 cm long. What will be its resistance at 500°C? if α = 0.0052 k^{-1} and ρ = 11 x 10^{-8} Ω-m **(2019, 14, 11)**
2.230 x 10^{-5}Ω

23. Find the potential difference across the two ends of 15m long copper wire 0.5 mm in diameter to maintain steady current of 4 amperes. (Resistivity of copper = 1.54 x$10^{-8}\Omega$m). **(2018)**
4.7 V

24. The resistance of a platinum resistance thermometer is 200 ohms at 0℃ and 257.6 ohms when immersed in a hot bath. What is the temperature of the bath? (α = 0.00392/℃) **(2017)**
73.47 ℃

25. Find the resistance at 100℃ of a Silver wire, 1 mm in diameter and 1000 cm long. **(2016)**
0.266 Ω

26. A 50 ohm resistor is to be wound from a platinum wire 0.1 mm in diameter. How much wire is needed? **(2015)**
3.569 m

27. Three resistors each of 50 Ω can be connected in four different ways. Find the equivalent resistance for each combination. **(2014)**
150 Ω, 16, 66 Ω, 33.33 Ω, 75 Ω

28. Two resistors of 5 Ω and 2 Ω are connected in parallel with 9 V batteries. Calculate the current and power dissipated in each resistance. **(2013)**
1.8 Amp, 4.5 Amp, 16.2 watt, 40.5 watt

29. You are given three resistors each of 2 ohms. How would you arrange these to obtain equivalent resistance of: (i) 1.33 Ohms (ii) 3 Ohms (iii) 6 Ohms Verify the results mathematically. **(2012)**

30. A water heater that will deliver 1 kg of water per minute is required. The water is supplied at 20℃ and an output temperature of 80℃ is desired. What should be the resistance of the heating elements in water if the line voltage is 220 V? (specific heat of water = 4200 J/Kg℃) **(2010)**
11.52 Ω

Chap # 14 (MAGNETISM and ELECTROMAGNETISM)

31. A coil of 400 turns in AC Generator having an area of 0.1 m^2 is rotating in a magnetic field of 50 T. in order to generate a maximum voltage of 220 volts, how fast is the coil to be rotated?Express your answer in revolutions/second. **(2019)**

32. A current of 6.25 amperes is maintained in a long straight conductor by a source. Calculate the force per meter on similar parallel conductor in air at a distance of 0.5 m from the first and carrying a current of 2 amperes. ($\mu_0 = 4\pi$ x 10^{-7}) **(2018)**
5 x 10^{-6} N

33. An alternating current generator operates at 79 Hz. The area of the coil is 500cm^2. Calculate the number of turns in the coil when a magnetic field induction 0.06 tesla produces a maximum Potential difference of 149 volts. **(2017, 13)**
100 turns

34. An iron core solenoid with 600 turns has a cross section area of 2.0cm^2. A current of 4.0 ampere passing through it produces B = 0.4 weber/m^2 .What is its self-inductance? **(2016)**
0.24 Volts, 12 *m*H

35. A proton of charge 1.6 x 10^{-19} C and mass 1.67 x 10^{-27} kg is accelerated by a potential difference of 6 x 10^5 volts. Then it enters perpendicularly into a magnetic field of intensity 0.5 Tesla. Find the radius of the circular path of the proton. **(2016)**
22.375 *m*

36. An e.m.f. of 45 millivolts is induced in a coil of 500 turns. When the current in a neighboring coil changes form 15 amps to 4 amps in 0.2 seconds,

(i) What is the mutual inductance of the coils?

(ii) What is the rate of change of flux in the second coil? **(2015)**

8.18×10^{-4} , 9×10^{-5} web/Sec

37. An iron core solenoid with 500 turns has a cross section area of $5cm^2$. A current of 2.3 ampere passing through it produces of flux of B = 0.53 Tesla. How large an e.m.f. is induced in it, if the current is turned off in 0.1 second? **(2014)**

1.325 Volts

38. Find the current required to produce a magnetic field of induction B = 2.512×10^{-3} weber/m^2 in a 50 cm long solenoid having 4000 turns of wire. ($\mu_0 = 4\pi \times 10^{-7}$) **(2012)**

0.24977 Ampere

39. An alternating current Generator operating at 50Hz has a coil of 200 turns, while the coil has an area of 120cm^2. Calculate the coil to produce the maximum voltage. **(2011)**

40. The inner & the outer diameters of the Toroid are 22 cm and 26 cm. if current of 5.0 amp is passed which produces 0.025 tesla flux density inside core, find the approximate length of the Wire wound on the toroid. ($\mu_0 = 4\pi \times 10^{-7}$) **(2011)**

1885.714 m

Chap # 15 (ELECTRICAL MEASURING INSTRUMENT)

41. A Galvanometer has a resistance of 50 Ω and it deflects full scale when a current of 500 micro amperes flows in it. How can it be converted into ammeter of range 15 ampere and voltmeter of range 300 volts? ` **(2021)**

42. A 400 volts meter has a total resistance of 40,000. What additional series resistance must be connected to it to increase its range to 750 volts? **(2017)**

35000 Ω

43. A galvanometer, whose resistance is 60 ohms, deflects full scale for a potential diff. of 100 millivolts across its terminals. What shunt resistance must be connected to convert it into an ammeter of 5 ampere range? **(2015)**

0.01998 Ω

44. A galvanometer, having resistance 50 ohms, deflects full scale for a potential difference of 100 mV across the terminals. What resistance should be connected to increase its range to 50 Volts?

24950 Ω **(2014, 10)**

45. A galvanometer of resistance 50 ohms gives full scale deflection with a current of 10 mA. A shunt of 0.05 ohms is connected in parallel to convert it into an ammeter. Find the range of the ammeter. **(2012)**

10.01 Amp

46. A voltmeter measuring up to 200 volts has a total resistance of 20,000 ohms. What additional series resistance must be connected to it to increase its range to 600 volts? **(2013)**

40000 Ω

Chap # 16 (ELECTROMAGNETIC WAVES)

47. Calculate the speed of electromagnetic wave. given that, **(2015)**
(ϵ_0 = 8.85 x 10^{-12} C^2 /Nm^2 $\mu = 4\pi\ x\ 10^7$ web/m)
3 X 10^8 m/s

Chap # 17 (ADVEENT OF MODERN PHYSICS)

48. A sodium surface is exposed to a light of wavelength 3 x 10^{-7} m. If the work function of sodium metal is 2.46 eV. Find the K.E. of the photoelectrons and cut off wavelength.
(h = 6.63 x 10^{-34} J.S, C= 3x10^8 m/s) **(2021, 12)**
1.682 eV, 5.05 x 10^3 A^0

49. What will be the velocity and momentum of a particle whose rest mass is m_0 and kinetic energy is equal to twice of its rest mass energy. **(2019, 15, 14, 11)**
$\frac{\sqrt{8}}{9}$ **C,** $\sqrt{8}\mathbf{m_0C}$

50. X-rays of wavelength 3.64 x 10^{-10} m are used in Compton scattering process. Find the fractional change in wavelength for a scattering angle of 120^0.
(Give h = 6.63 X 10^{-34} Js, m_0 = 9.1 x 10^{-31} kg, C = 3 x 10^8 m/s) **(2017)**
1 %

51. A photon of wavelength 0.004 A in the vicinity of a heavy nucleus produces an electron-positron pair. Find the kinetic energy of each particle of the pair in MeV, If the kinetic energy of positron is twice that of electron.(m_0c^2 = 8.19 x 10^{-14} joules, h = 6.63x10^{-34}j.s and c = 3x10^8 m/s) **(2017)**
0.693 MeV, 1.386 MeV

52. Sodium surface is show with light of wavelength 3 x10^{-7} m. Find the kinetic energy of the emitted photo electron and the cut-off wavelength of sodium. Work function of sodium is 2.46 eV. **(2016)**
1.684 eV, 5053.3 A^0

53. Find the shortest wavelength of photon emitted in the Balmer series and determine its energy in eV. (R_H = 1.097 X 10^7 m^{-1}) **(2015)**
3.647 x 10^{-7} m, 3.4 eV

54. In a TV picture tube, an electron is accelerated by a potential difference of 12000 V. Determine the De-Broglie's wavelength given that
(h = 6.63 x 10^{-34} JS, e = 1.6 x10^{-19} C, m_e = 9.11 X 10^{-19} kg.) **(2014)**
0.112 A^0

55. Pair annihilation occurred due to a head-on-collision of a 2 electron a positron having the same kinetic energy, producing pair of photons each having of 2.5 MeV. What were their kinetic energies before collision? Given m_0c^2 = 0.511 MeV **(2013)**
1.989 MeV

56. Given m_0c^2 = 0.511 MeV Find the total energy "E" and the kinetic energy "K.E" of an electron moving with a speed V=0.85c. (m_0= 9.1 x 10^{-31} kg C= 3 x 10^8 m/s) **(2012)**
0.97 MeV, 0.459 MeV

57. A sodium surface is exposed to a light of wavelength 3 x 10^{-7} m. If the work function of sodium metal is 2.46 eV. Find the K.E. of the photoelectrons and cut off wavelength. (h = 6.63 x 10^{-34} J.S, C = 3x10^8 m/s)
1.682 eV, 5.05 x 10^3 A^0 **(2012)**

58. If the electron beams in a TV picture tube is accelerated by 10 K volt. What will be the de-Broglie wavelength of an electron? (h = 6.63 X 10^{-34} JS., e = 1.6 x 10^{-19} C , m_e= 9.11x10^{-31} kg)
1.227 X 10^{-11} m **(2011 , 10)**

Chap # 18 (ATOMIC SPECTRA)

59. Light of wavelength 486.3 *nm* is emitted by a hydrogen atom in Balmer series. What transition of hydrogen atom is responsible for this radiation? (R_H = 1.097 X 10^7 m^{-1}) **(2021)**

60. What is the wavelength of 3rd spectral line of Paschen series in hydrogen atom?
(R_H = 1.097 X 10^7 m^{-1}) **(2019)**
938 x 10^{-7}m

61. A photon of what minimum energy is required to excite a hydrogen atom from n=1 to n=3?
-12.1 eV (R_H = 1.097 X 10^7 m^{-1}) **(2018)**

62. How much energy is needed to ionize a hydrogen atom originally in ground state?
(Give h = 6.63 X 10^{-34} s, C = 3 x 10^8 m/s, RH = 1.097 X 10^7 m^{-1}) **(2017)**
13.6 eV

63. Find the shortest and longest wavelength of emitted photons in Hydrogen spectra in Pfund series. **(2016)**
2.279 x 10^{-6} m, 7.465x 10^{-6}m

64. Find the shortest wavelength of photon emitted in the Balmer series determines its energy in eV. (R_H = 1.097 x 10^7 m^{-1}) **(2015, 10)**
3.647x 10^{-7}m, 3.4 eV

65. Determine the longest and the shortest wavelength photons emitted in the Lyman series
(R_H = 1.097 X 10^7 m^{-1}) **(2014)**
9.115 x 10^{-8}m, 1.215 x 10^{-7}m

66. A hydrogen atom in the ground state gets excited by absorbing a photon of 12.15 eV. Find the quantum number of this state. **(2013)**
3

67. Find the value of the shortest and the longest wavelength of emitted photons in hydrogen spectra in Balmer series, where (R_∞ = 1.097 x 10^7 m^{-1}) **(2012)**
3.647x 10^{-7}m, 6.569 x 10^{-7}m

68. Calculate the energy of the longest wavelength radiation emitted in Paschen series in Hydrogen atom spectra. (R_H = 1.097 x 10^7 m^{-1} , h = 6.63 x 10^{-34} JS, C= 3x10^8 m/s) **(2011)**
1.8756x 10^{-6}m, 0.663 eV

Chap # 19 (THE ATOMIC NUCLEUS)

69. If the number of atoms per gram of $_{88}Ra^{266}$ is 2.666x10^{21} and it decays with the half-life of 1622 years, find the decay constant and activity of the sample. (1 Year = 3.15 x 10^4 sec)
1.345 x $10^{-11}s^{-1}$, 3.58 x 10^{10} Disintegration / Sec **(2019, 16, 13)**

70. Find the Q-Value of the reaction **(2018)**
$_{94}Pu^{239} \rightarrow {}_2He^4 + {}_{92}U^{22} + Q$
The isotopic mass of Plutonium=239.0522 u
The isotopic mass of Uranium=235.0439 u
The isotopic mass of alpha particle=4.0026 u
5.3 MeV

71. The half-life of $_{104}Po^{210}$ is 140 days. By what percent will its activity decrease per hour?
0.021 % **(2017)**

72. A deuteron of mass 3.3431×10^{-27} kg is formed when a proton of mass 1.6724×10^{-27} kg and neutron of mass 1.6748×10^{-27} kg combines. Calculate the mass defect and binding energy in MeV. **(2017, 10)**

4.1×10^{-30} Kg , 2.3 MeV

73. Sodium surface is shown with light of wavelength 3×10^{21} and it decays with a half-life of 1622 years. Find the activity and decay constant of the sample. **(2016)**

74. Find the binding energy and the packing fraction in MeV of ${}_{52}T_e^{126}$.
(m_p = 1.0078u, m_n = 1.0086u, m_{T_e} = 125.9033u and 1u=931.5 MeV) **(2016, 15, 14, 12)**

1061.731 MeV, 0.00937

نوٹ! یہ آزمائشی اشاعت ھے غلطیو ں کی گنجائش ھوسکتی ھے.