1. A simple pendulum has a period T inside a lift when it is stationary. The lift is accelerated upwards with constant acceleration 'a'. The period
   a) decreases
   b) increases
   c) remains same
   d) becomes infinite

2. 90dB sound is 'x' times more intense than 40dB sound, then x is
   a) 5
   b) 50
   c) 10^5
   d) 500

3. A star is moving away from the Earth with speed V. Change in wavelength ($d\lambda$) observed on Earth is
   a) $\lambda V/C$
   b) $\lambda V/(C+V)$
   c) $\lambda C/(C+V)$
   d) $\lambda C/V$

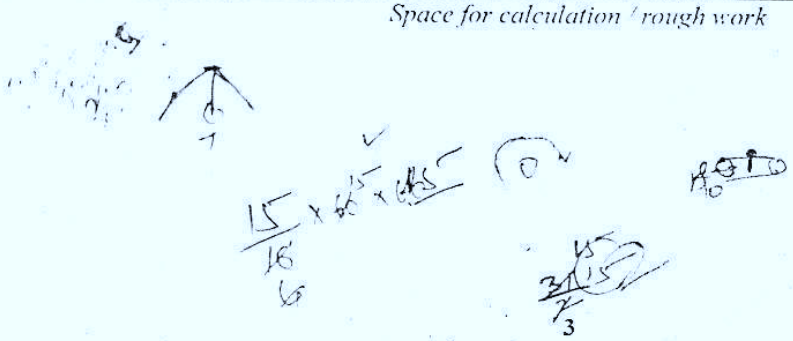
4. An open pipe emits a fundamental frequency n_o when it emits the 3rd harmonic, the pipe can accommodate
   a) 2 nodes 2 antinodes
   b) 3 nodes 4 antinodes
   c) 3 nodes 3 antinodes
   d) 1 node 2 antinodes

5. In an adiabatic process
   a) temperature remains constant
   b) pressure remains constant
   c) volume remains constant
   d) there is no transfer of heat.

6. Carnot's heat engine takes 300J of heat from a source at 627°C and gives some part of it to sink at 27°C. Work done by engine in one cycle is
   a) 200J
   b) 300J
   c) 150J
   d) 120J

7. 15/16th of a radioactive sample disintegrates in 2 hrs. Mean life of radioactive sample is approximately,
   a) 30 min
   b) 43 min
   c) 21 min
   d) 15min

Space for calculation / rough work



8. Clear images of soft tissues can be well studied using
   a) MRI
   b) X-rays
   c) Ultrasonics
   d) I.R rays

9. Particles which are not composite and hence truly elementary are
   a) mesons
   b) protons
   c) neutrons
   d) leptons

10. A logic gate whose output will be in logic 0 state only when all inputs are in logic 1 state is called
   a) AND
   b) OR
   c) NOR
   d) NAND

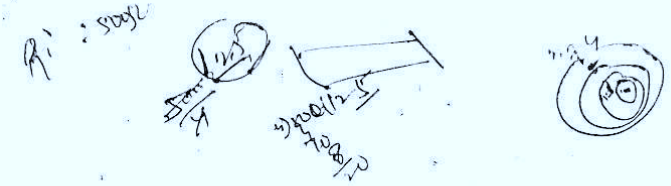
11. n type and p type semiconductors can be obtained by doping pure silicon respectively with
   a) Arsenic Phosphorous
   b) Indium Aluminium
   c) Phosphorous Indium
   d) Aluminium Boron

12. In a CE amplifier $\beta=50$, $R_L=4K\Omega$, $R_i=500\Omega$. Power gain of the amplifier is
   a) 2×10^4
   b) 2×10^2
   c) 2×10^3
   d) 2×10^1

13. Electrons are excited from n 1 to n 4 state. During downward transitions, possible number of spectral lines observed in Balmer series is
   a) 4
   b) 3
   c) 2
   d) 1

14. IR region lies between
   a) radio waves and microwave regions
   b) microwaves and visible
   c) visible and UVregion
   d) UV rays and X-ray region.

Space for calculation / rough work



5. A proton and an alpha particle are subjected to same potential difference V. Their de-Broglie wavelengths λ_p, λ_α will be in the ratio
   a) 2:1
   b) $2\sqrt{2}$:1
   c) 4:1
   d) 1:2

6. 'Raman Shift' depends on
   a) incident wavelength
   b) incident intensity
   c) resolving power of the spectrograph used
   d) molecular energy levels of the scatterer.

7. ${}_6C^{14}$ and ${}_7N^{15}$ are the examples of
   a) isotopes
   b) isobars
   c) isotones
   d) mirror nuclei

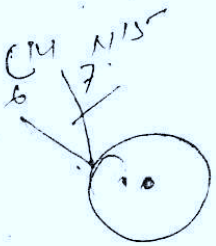
8. In an interference experiment, intensity ratio at the bright to dark fringe is 9:1. Amplitudes of interfering waves are in the ratio
   a) 3:1
   b) 9:1
   c) 2:1
   d) 4:1

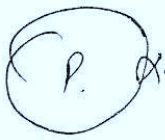
19. In Young's double slit experiment. Ist dark fringe occurs directly opposite to a slit. Wavelength of light used is
   a) d^2/D
   b) d/D
   c) D^2/d
   d) $2d^2/D$

20. Newton's ring pattern in reflected system, viewed under white light consists of
   a) equally spaced bright and dark bands with central dark spot
   b) equaliy spaced bright and dark bands with central white spot
   c) a few coloured rings with central dark spot
   d) a few coloured rings with central white spot

21. It is difficult to observe diffraction in case of light waves, because
   a) light waves can travel through vacuum
   b) speed of light is more
   c) light waves are transverse in nature
   d) wavelength of light is small.

Space for calculation / rough work





λ_P λ_α

22. A calcite crystal is placed over a dot on a paper sheet and the crystal is rotated. On viewing through the calcite one sees
a) A single stationary dot
b) two stationary dots.
c) two dots rotating about one another
d) one dot rotating about the other stationary dot-sometimes coinciding with it

23. Critical angle of the medium is 45°. Polarising angle of incidence at the surface of the medium is
a) 45°
b) 38°
c) 22.5°
d) 54.7°

24. If only 2% of the main current is to be passed through a Galvanometer of resistance G, the resistance of shunt should be
a) G/50
b) G/49
c) 50G
d) 49G

25. A small current carrying loop of area A behaves like a tiny magnet of magnetic moment M. Current in the loop is
a) MA
b) A/M
c) A^2M
d) M/A

26. Two concentric circular coils, each having 10 turns with radii 0.2m and 0.4m carry currents 0.2A and 0.3A respectively in opposite direction. Magnetic field at the centre is
a) $(2/3)\mu_0$
b) $(5/4)\mu_0$
c) $(1/4)\mu_0$
d) $(1/6)\mu_0$

27. Material of permanent magnet has
a) high retentivity and high coercivity
b) low retentivity and high coercivity
c) low retentivity and low coercivity
d) high retentivity and low coercivity.

28. Power factor of a series LCR circuit is
a) R
b) Z/R
c) R/Z
d) RZ

Space for calculation / rough work

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29. An inductor 1H is connected across 220V 50Hz supply. Peak value of current is approximately,
a) 0.5A
b) 0.7A
c) 1A
d) 1.4A

30. Plane polarised light is passed through an analyser and the intensity of emerging light is reduced by 75%. Optical vibrations make an angle θ with the axis of analyser. Then θ is
a) 60^0
b) 45^0
c) 30^0
d) 58^0

31. A charge 10 nC is situated in a medium of relative permittivity 10. The potential due to this charge at a distance of 0.1 m is
a) 900V
b) 90V
c) 9V
d) 0.09V

32. Dielectric constant of a metal is
a) zero
b) infinite
c) finite
d) unpredictable

33. Distance between the two point charges is increased by 20%. Force of interaction between the charges
a) increases by10%
b) decreases by 20%
c) decreases by 17%
d) decreases by 31%

34. Potential energy of 2 charges 10 nC each separated by a distance of 0.09m in air is
a) 10 μJ
b) 1 mJ
c) 10 mJ
d) 10 J

35. A metal plate of thickness d/2 is introduced in between the plates of a parallel plate air capacitor with plate separation of d. Capacity
a) decreases 2 times
b) increases 2 times
c) remains same
d) becomes zero.

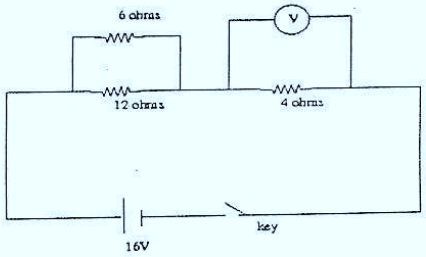
Space for calculation / rough work

36. Specific resistance of a conductor material increases with
a) increase with area of cross section
b) decrease in length
c) decrease in area of cross section
d) increases with temperature

37. The resistance of mercury at 4.2K is
a) infinity
b) greater than at lab temperature
c) same as that of lab temperature
d) almost zero.

38. Temperature coefficient of resistance of platinum is 4×10^{-3} /K at 20°C. Temperature at which increase in resistance of platinum is 10% its value at 20°C is
a) 25°C
b) 70°C
c) 45°C
d) 100°C

39. Ideal voltmeter connected as shown reads



a) 16V
b) 12V
c) 4V
d) 8V

40. When a charged particle moves perpendicular to a uniform magnetic field, then
a) its momentum changes total energy is same.
b) both momentum and total energy remain the same.
c) both momentum and its total energy will change
d) total energy changes. Momentum remains same.

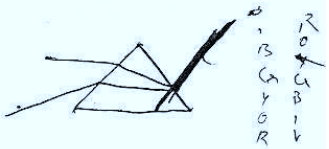
Space for calculation / rough work

41. 0.04 m of glass contains the same number of waves as 0.05m of water, when monochromatic light passes through them normally. Refractive index of water is 4/3. Refractive index of glass is
    a) 5/3
    b) 5/4
    c) 5/2
    d) 4/5

42. Critical angle will be maximum, when light travels from
    a) Glass to air
    b) Glass to water
    c) Water to air
    d) Diamond to air

43. A ray of light incident on one face of an equilateral prism at 60°enters and leaves the prism symmetrically Refractive index of the prism material is
    a) 1.5
    b) 1.62
    c) 1.73
    d) 1.8

44. In the spectrum of visible light produced by a prism dispersion is
    a) Uniform throughout the spectrum
    b) Maximum in the middle decreases on either sides.
    c) Maximum towards yellow
    d) Maximum towards violet.



45. Convex lens of focal length f made of glass of Refractive index 1.5 is immersed in water of Refractive index 4/3. Focal length is
    a) f
    b) greater than f
    c) less than f
    d) -f

$\mu = 1.5 = 3/2$

$\mu = 4/3$

46. Two co-axial lenses of power +4D and -2D are placed in contact. The focal length of combination is
    a) 0.5m
    b) 0.25m
    c) 0.16m
    d) -0.5m

2D

$f = 1/2 = 0.5$

47. Eddy currents are produced in a material when it is
    a) heated
    b) placed in a time varying magnetic field.
    c) placed in an electric field
    d) placed in a uniform magnetic field.

$1/4 \rightarrow 1/2 \Rightarrow \frac{2-4}{4}$

$\Rightarrow -2/4 = -1/2$

Space for calculation / rough work

48. Transformer works on 220V. Its efficiency is 80%. Out put power is 8KW. Primary current is approximately,
    a) 35A
    b) 18A
    c) 22A
    d) 45A

49. Quality factor of a series LCR circuit decreases from 3 to 2. Resonant frequency is 600Hz. Change in band width is
    a) zero
    b) 100Hz increase
    c) 100Hz decrease
    d) 300Hz increase

50. A stone dropped from the top of the tower reaches ground in 4 sec. Height of the tower is ($g=10m/s^2$)
    a) 20m
    b) 40m
    c) 60m
    d) 80m

51. Liquid crystal phase which are more close to the solid than to liquid is
    a) Nematic
    b) Smectic
    c) Lyotropic
    d) Cholesteric

52. If the Earth shrinks in its size (radius) mass remaining the same, the value of g on its surface will
    a) increase
    b) decrease
    c) remains same
    d) is reduced to zero.

53. Two rods of same area of cross section and lengths, and conductivities K_1 and K_2 are connected in series. Then in steady state conductivity of the combination is
    a) $(K_1+K_2)/(K_1K_2)$
    b) $2K_1K_2/(K_1+K_2)$
    c) $(K_1+K_2)/2$
    d) $K_1K_2/(K_1 + K_2)$

54. The square of the resultant of two equal forces acting at a point is equal to three times their product. Angle between them is
    a) 30^0
    b) 45^0
    c) 60^0
    d) 90^0

Space for calculation / rough work

55. With the addition of impurities surface tension of a liquid
    a) increases
    b) decreases
    c) remains constant.
    d) may increase or decrease depending on impurities

56. Viscosity decreases with increase in temperature is the reason for
    (i) hot water moving faster than cold water
    (ii) more viscous oils are used in motor cars during summer than in winter
    a) only (i) is correct
    b) only (ii) correct
    c) both (i) and (ii) are correct
    d) both are wrong.

57. Moment of momentum of an electron revolving in second Bohr orbit of hydrogen is
    a) $2\pi h$
    b) $h/2\pi$
    c) h/π
    d) $2h/3\pi$

58. The existence of excitation and ionisation energies in an atom is an evidence for
    a) stability of an atom
    b) electrical neutrality of an atom
    c) small size of the atom
    d) stationary orbits in an atom.

59. Work function of a photosensitive metal is 3eV. The wavelength of incident radiations which can just eject photo-electrons from the metal is
    a) 600nm
    b) 510nm
    c) 414nm
    d) 378nm

in

60. Three identical capacitors are first connected in series and then in parallel. The ratio of effective capacitances in the two cases is
    a) 9:1
    b) 3:1
    c) 1:3
    d) 1:9

61. To dry ammonia gas the drying agent used is
    a) Con. H_2SO_4
    b) P_2O_5
    c) soda lime
    d) anhydrous $CaCl_2$

Space for calculation / rough work