

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_0 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. $15/16$ th 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

$$\frac{15}{16} \times 60 \times 60 = 540$$

$$\frac{540}{3} = 180$$

Physics and Chemistry

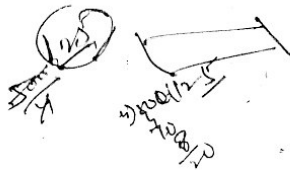
Physics and

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 UV region
 ✓ d) UV rays and X-ray region.
5. A proton λ_n will be
 a) 2:1
 ✓ b) $2\sqrt{2}$
 c) 4:1
 d) 1:2
6. Raman
 a) inci
 b) inci
 c) reso
 d) mo
7. C^{14} and
 a) iso
 b) iso
 ✓ c) iso
 d) mi
8. In an int.
 the ratio
 a) 3:1
 ✓ b) 9:1
 c) 2:1
 d) 4:1
19. In Young
 a) d
 b) d
 c) D
 d) 2d
20. Newto
 a) eq
 b) eq
 ✓ c) a
 d) a
21. It is di
 a) li
 ✓ b) sp
 c) li
 d) v

Space for calculation / rough work

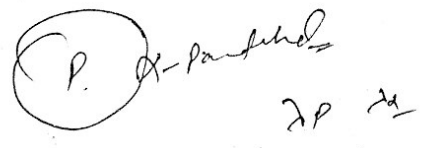
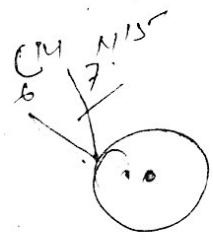
$R_L = 4K, R_i = 500\Omega$

$R_i = 500\Omega$



5. A proton and an alpha particle are subjected to same potential difference V . Their de-Broglie wavelengths λ_p 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. $^{14}_6\text{C}$ and $^{15}_7\text{N}$ 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, 1st 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) equally 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



Physics and Chemistry

Physics

22. A calcite crystal is placed over a dot on a paper sheet and the crystal is rotated. On viewing through the calcite or 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

Handwritten notes and diagrams for problem 22:

- Diagram of a current loop with magnetic moment M/A .
- Diagram of two concentric circular coils with radii 0.2m and 0.4m and currents 0.2A and 0.3A.
- Algebraic expressions: $G/50$, $C=$, $4/23$, $10/13$, 0.2 , 10 , 0.4 .

Physics and Chemistry

Ver D

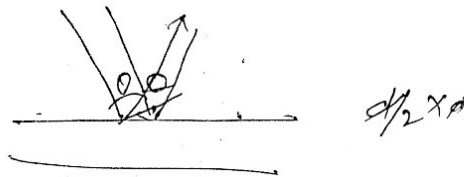
- Ver D An inductor L is connected across 220V 50Hz supply. Peak value of current is approximately,
- the calcite or
- 0.5A
 - 0.7A
 - 1A
 - 1.4A
30. Plane polarised light is passed through an analyser and the intensity of emerging light is reduced by 75%. Optical vibrations make an angle θ with the axis of analyser. Then θ is
- 60°
 - 45°
 - 30°
 - 58°
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
- shunt
- 900V
 - 90V
 - 9V
 - 0.09V
32. Dielectric constant of a metal is
- is
- zero
 - infinite
 - finite
 - unpredictable
33. Distance between the two point charges is increased by 20%. Force of interaction between the charges
- A respec-
- increases by 10%
 - decreases by 20%
 - decreases by 17%
 - decreases by 31%
34. Potential energy of 2 charges 10 nC each separated by a distance of 0.09m in air is
- 10 μ J
 - 1 mJ
 - 10 mJ
 - 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
- decreases 2 times
 - increases 2 times
 - remains same
 - becomes zero.

Space for calculation / rough work

$Q = 20 \text{ nC}$
 10 nC 0.09 m in air is

$I = \frac{V}{R}$

$\frac{220}{20} = 11$ $\frac{10 \times 10^{-9}}{7}$



Physics and Chemistry

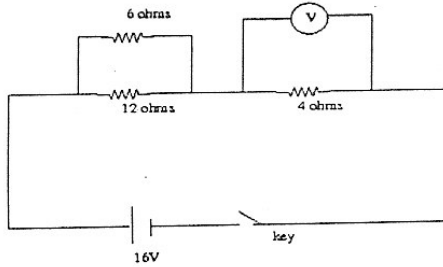
Physics

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

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.

- 0.04 m
- them ne
- a) 5/3
- b) 5/4
- c) 5/2
- d) 4/3

2. Critical
- a) Gl
 - b) Gl
 - c) W
 - d) Di

3. A ray of index of
- a) 1.7
 - b) 1.6
 - c) 1.5
 - d) 1.8

4. In the s
- a) Un
 - b) M
 - c) M
 - d) M

5. Conve
- Focal l
- a) f
 - b) g
 - c) l
 - d) -f

6. Two c
- a) 0
 - b) 0
 - c) -0
 - d) -0

17. Eddy
- a) h
 - b) p
 - c) p
 - d) p

Handwritten note: $4 \times 10^{-3} \times 100 = 0.4$
 $100 + 0.4 = 100.4$
 $100.4 - 20 = 80.4$
 $\approx 80^\circ C$

Space for calculation / rough work

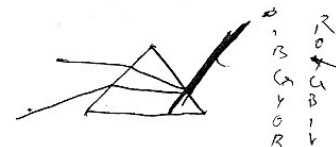


41. 0.04 m of glass contains the same number of waves as 0.05m of water, when monochromatic light passes through them normally. Refractive index of water is $\frac{4}{3}$. Refractive index of glass is
- $\frac{5}{3}$
 - $\frac{5}{4}$
 - $\frac{5}{2}$
 - $\frac{4}{5}$

42. Critical angle will be maximum, when light travels from
- Glass to air
 - Glass to water
 - Water to air
 - 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
- 1.5
 - 1.62
 - 1.73
 - 1.8

44. In the spectrum of visible light produced by a prism dispersion is
- Uniform throughout the spectrum
 - Maximum in the middle decreases on either sides.
 - Maximum towards yellow
 - 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 $\frac{4}{3}$. Focal length is
- f
 - greater than f
 - less than f
 - $-f$

Handwritten calculations for question 45:

$$\mu = 1.5 = \frac{3}{2}$$

$$\mu = \frac{4}{3}$$

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

Handwritten calculations for question 46:

$$2D \quad f = \frac{1}{2} = 0.5$$

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

Handwritten calculations for question 47:

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

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

$$\frac{V_1 I_1}{100} = \frac{8000}{10} \quad I = 10$$

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

$$s = 4$$

$$v = u + at$$

$$v =$$

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) $(K_1 + K_2)/(K_1 K_2)$
- b) $2K_1 K_2 / (K_1 + K_2)$
- c) $(K_1 + K_2)/2$
- d) $K_1 K_2 / (K_1 + K_2)$

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°
- b) 45°
- c) 60°
- d) 90°

$$(F_1 + F_2)^2 = 3 F_1 F_2$$



Space for calculation / rough work

Handwritten notes and calculations at the bottom right of the page.

55. With the addition of impurities surface tension of a liquid
- increases
 - decreases
 - remains constant.
 - may increase or decrease depending on impurities
56. Viscosity decreases with increase in temperature is the reason for
- hot water moving faster than cold water
 - more viscous oils are used in motor cars during summer than in winter
- only (i) is correct
 - only (ii) correct
 - both (i) and (ii) are correct
 - both are wrong.
57. Moment of momentum of an electron revolving in second Bohr orbit of hydrogen is
- $2\pi h$
 - $h/2\pi$
 - h/π
 - $2h/3\pi$
58. The existence of excitation and ionisation energies in an atom is an evidence for
- stability of an atom
 - electrical neutrality of an atom
 - small size of the atom
 - 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
- 600nm
 - 510nm
 - 414nm
 - 378nm
60. Three identical capacitors are first connected in series and then in parallel. The ratio of effective capacitances in the two cases is
- 9:1
 - 3:1
 - 1:3
 - 1:9
61. To dry ammonia gas the drying agent used is
- Con. H_2SO_4
 - P_2O_5
 - soda lime
 - anhydrous $CaCl_2$

Space for calculation / rough work