EAMCET

ENGINEERING ENTRANCE EXAM

SOLVED PAPER–1998

PHYSICS

1. An iron block of sides 50 cm × 8 cm × 15 cm has to be pushed along the floor. The force required will be minimum when the surface in contact with ground is :
   (a) 8 cm × 15 cm surface
   (b) 5 cm × 15 cm surface
   (c) 8 cm × 5 cm surface
   (d) force is same for all surface

2. A simple pendulum hanging freely and at rest is vertical because in that position :
   (a) kinetic energy is zero
   (b) kinetic energy is minimum
   (c) potential energy is zero
   (d) potential energy is minimum

3. A car of mass 400 kg and travelling at 72 km/h crashes into a truck of mass 4000 kg and travelling at 9 km/h, in the same direction. The car bounces back at a speed of 18 km/h. The speed of the truck after the impact is :
   (a) 9 km/h (b) 18 km/h
   (c) 27 km/h (d) 36 km/h

4. The relation $\vec{F} = m\,\vec{a}$, cannot be deduced from Newton's second law, if :
   (a) force depends on time
   (b) momentum depends on time
   (c) acceleration depends on time
   (d) mass depends on time

5. A person throws a bottle into a dustbin at the same height as he is 2 m away at an angle of 45°. The velocity of the throw is :
   (a) g (b) $\sqrt{g}$ (c) $2g$ (d) $\sqrt{2g}$

6. A person standing on the edge of a well throws a stone vertically upwards with an initial velocity 5 m/s. The stone goes up, comes down and falls in the well making a sound. If the person hears the sound 3s after throwing, the water is at a depth from ground given by (neglect time of travel for the sound and take $g = 10\ m/s^2$) :
   (a) 1.25 m (b) 21.25 m
   (c) 30 m (b) 32.50 m

7. A car starts from rest, attains a velocity of 36 km/h with an acceleration of 0.2 m/s^2, travels 9 km with this uniform velocity and then comes to halt with a uniform deaceleration of 0.1 m/s^2. The total time of travel of the car is :
   (a) 1050 s (b) 1000 s (c) 950 s (d) 900 s

8. If a body is in equilibrium under a set of non-collinear forces, the minimum number of forces has to be :
   (a) four (b) three (c) two (d) five

9. The position of a particle is given by $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k})$ momentum $\vec{p} = (3\hat{i} + 4\hat{j} - 2\hat{k})$. The angular momentum is perpendicular to :
   (a) x-axis (b) y-axis (c) z-axis
   (d) line at equal angles to all the three axes

10. Dimensions of ohm are same as (h = Planck's constant, e = charge) :
    (a) $\frac{h}{e}$ (b) $\frac{h^2}{e}$ (c) $\frac{h}{e^2}$ (d) $\frac{h^2}{e^2}$

11. A stone tied to a string is rotated in a vertical circle. The minimum speed with which the string has to be rotated :
    (a) decreases with increasing mass of the stone
    (b) is independent of the mass of the stone
    (c) decreases with increasing in length of the string
    (d) is independent of the length of the string

12. Value of g :
(a) maximum at poles
(b) maximum at equator
(c) same everywhere
(d) minimum at poles

13. The maximum speed with which a car can be driven round a curve of radius 18 m without skidding (when $g = 10\ m/s^2$ and the coefficient of friction between rubber tyres and the roadway is 0.2) is :
(a) 36.0 km/h (b) 18.0 km/h
(c) 21.6 km/h (d) 14.4 km/h

14. For an electron circulating around the nucleus, the centripetal force is supplied by :
(a) electromagnetic force
(b) electrostatic force
(c) gravitational force
(d) magnetic force

15. A satellite is revolving near the earth's surface. Its orbital velcoity is :
(a) 5.8 km/s (b) 18.4 km
(c) 11.2 km/s (d) 8.0 km/s

16. The equation of motion of a particle is given by $\frac{dp}{dt} + m\omega^2 n = 0$, where p is the momentum and n is the position. Then the particle :
(a) moves along a straight line
(b) moves along a parabola
(c) execute simple harmonic motion
(d) falls freely under gravity

17. The Poisson's ratio σ should satisfy the relation :
(a) $-1 < \sigma < 0.5$ (b) $-0.5 < \sigma < 1.0$
(c) $0.5 < \sigma < 1.0$ (d) $-1.0 < \sigma < 0.5$

18. Neglecting gravity, the potential energy of a molecule of a liquid on the surface of the liquid when compared to the potential energy of a molecule inside the liquid is :
(a) greater
(b) less
(c) equal
(d) depending on the liquid, sometimes less sometimes more

19. A steel bridge in a town is 200 m long. Where minimum temperature in winter is 10°C and maximum in summer is 40°C. The change in length of the bridge from winter to summer is [for steel alpha is $11 \times 10^{-6}/°C$] :
(a) 3.3 cm (b) 6.6 cm (c) 6.6 m (d) 8.3 m

20. A glass flask of volume 200 cm^3 is completely filled with mercury at 20°C. The amount of mercury that spilt over when the flask is heated to 80°C is (coefficient of volume expansion for glass $27 \times 10^{-8}/°C$, mercury $0.18 \times 10^{-8}/°C$) :
(a) 0 cm^3 (b) 0.32 cm^3
(c) 1.84 cm^3 (d) 2.40 cm^3

21. A real gas can be approximated to an ideal gas at :
(a) low density (b) high pressure
(c) high density (d) low temperature

22. One litre of helium gas at a pressure of 76 cm-Hg and temperature 27°C is heated till its pressure and volume are doubled. The final temperature attained by the gas is :
(a) 900 °C (b) 927 °C
(c) 627 °C (d) 327 °C

23. The First Law of thermodynamics states that :
(a) system can do the work
(b) system has temperature
(c) system has pressure
(d) heat is a form of energy

24. A lead bullet of mass 21g travelling at a speed of 100 m/s comes to rest in a wooden block. If no heat is taken away by the wood, the rise in temperature of the bullet in the wood nearly is (sp. heat of lead = 30 cal/kg °C) :
(a) 25 °C (b) 28 °C (c) 33 °C (d) 39 °C

25. In order that heat is conducted from one part of a solid to another part, what is required is ?
(a) Uniform density
(b) Uniform temperature
(c) Temperature gradient
(d) Density gradient

26. The equation of wave is :
$y = 1.0 \cos 2\pi \left(\frac{t}{0.02} - \frac{x}{10} \right)$ where t is in second. The frequency of the wave is :
(a) 50 Hz (b) 315 Hz
(c) 10 Hz (d) 63 Hz

27. A string in a musical instrument is 50 cm long and its fundamental frequency is 270 Hz. If the desired frequency of 1000 Hz is to be produced, the required string length is :
(a) 13.5 cm (b) 2.7 cm
(c) 5.4 cm (d) 10.8 cm

28. A man stands in front of a hillock and fires a gun. He hears an echo after 1.5 s. The distance of the hillock from the man is (velocity of sound in air is 330 m/s) :
(a) 220 m (b) 247.5 m
(c) 268.5 m (d) 292.5 m

29. An object is placed 40 cm in front of a convex mirror of radius of curvature 20 cm. The image :
(a) is real and 8 cm behind the mirror
(b) is real and 8 cm in front of the mirror
(c) is virtual and 8 cm in front of the mirror
(d) is virtual and 8 cm behind the mirror

30. A compound microscope has an objective of focal length 4 mm and an eye piece of focal length 25 mm. The objective produces a real image at a distance of 180 mm. If the eye-piece is in normal adjustment the magnification is :
(a) 45 (b) 90 (c) 225 (d) 440

31. In the achromatic prism, we have :
(a) deviation without dispersion
(b) deviation without division
(c) refraction without deviation
(d) deviation and dispersion

32. Fraunhofer lines are due to :
(a) absorption by chromosphere of the light emitted by photosphere
(b) absorption by photosphere of the light emitted by chromosphere
(c) light emitted by photosphere
(d) light emitted by chromosphere

33. The null points are on the equatorial line of a bar magnet when the north pole of the magnet is pointing :
(a) north (b) south
(c) east (d) west

34. Diamagnetic substance are :
(a) feebly attracted by magnets
(b) strongly attracted by magnets
(c) feebly repelled by magnets
(d) strongly repelled by magnets

35. The charges $+5\ \mu C$ and $+10\ \mu C$ are placed 20 cm apart. The electric field at the mid point between the two charges is :
(a) 4.5×10^6 N/C directed towards $+5\ \mu C$
(b) 4.5×10^6 N/C directed towards $+10\ \mu C$
(c) 13.5×10^6 N/C directed towards $+5\ \mu C$
(d) 13.5×10^6 N/C directed towards $+10\ \mu C$

36. A parallel plate condenser with oil between the plates (dielectric constant of oil $K = 2$) has a capacitance C. If the oil is removed, the capacitance of the capacitor becomes :
(a) $\sqrt{2}C$ (b) $2C$ (c) $\frac{C}{\sqrt{2}}$ (d) $\frac{C}{2}$

37. A wire of resistance $10\ \Omega$ is elongated by 10%, the resistance of the elongated wire :
(a) $11\ \Omega$ (b) $11.1\ \Omega$
(c) $12.1\ \Omega$ (d) $13.1\ \Omega$

38. In a meter bridge the balancing length from the left end (standard resistance of one ohm is in the right gap) is found to be 20 cm. The value of the unknown resistance is :
(a) $0.3\ \Omega$ (b) $0.25\ \Omega$
(c) $0.4\ \Omega$ (d) $0.5\ \Omega$

39. If a long hollow copper pipe carries a current, the magnetic field produced will be :
(a) inside the pipe only
(b) outside the pipe only
(c) neither inside nor outside the pipe
(d) both inside and outside the pipe

40. A galvanometer has a resistance of $50\ \Omega$ and a current of 0.01 A will cause full scale deflection. To convert this into an ammeter with full scale deflection for 5 A, we have to connect approximately :
(a) $0.1\ \Omega$ in series
(b) $0.1\ \Omega$ in parallel
(c) $0.2\ \Omega$ in series
(d) $0.2\ \Omega$ in parallel

41. A current carrying wire produces in the neighbourhood :
(a) electric and magnetic fields
(b) electric field only
(c) magnetic field only
(d) no field

42. The photoelectric work function of a metal surface is 2 eV. When light of frequency 1.5×10^{15} Hz is incident on it, the maximum kinetic energy of the photo electrons, approximately is :
(a) 8 eV (b) 6 eV (c) 2 eV (d) 4 eV

43. The radius of the Bohr orbit depends on n as :
(a) $\frac{1}{n}$ (b) $\frac{1}{n^2}$ (c) n (d) n^2

44. An electron remains undeflected when passing perpendicular to mutually perpendicular electric and magnetic fields. If the magnetic field is 8 Gauss and the electric field is 400 V/m, the velocity of the electron is :
(a) 2×10^6 m/s (b) 5×10^5 m/s
(c) 6×10^6 m/s (d) 7.5×10^6 m/s

45. When $_{15}P^{30}$ decays to become $_{14}Si^{30}$ the particle released is :
(a) electron (b) α- particle
(c) neutron (d) positron

46. The number of α and β particles, respectively, emitted in the radioactive decay $_{90}X^{200} \longrightarrow {}_{80}Y^{168}$ are :
(a) 8 α & 8 β (b) 6 α & 8 β
(c) 8 α & 6 β (d) 6 α & 6 β

47. Among electron, proton, neutron and α-particle the maximum penetration capacity is for :
(a) electron (b) proton
(c) neutron (d) α-particle

48. In the carbon cycle of fusion :
(a) four $_1H^1$ fuse to form $_2He^4$ and two positrons
(b) four $_1H^1$ fuse to form $_2He^4$ and two electrons
(c) two $_1H^2$ fuse to form $_2He^4$
(d) two $_1H^2$ fuse to form $_2He^4$ and two neutrons

49. A hole is :
(a) a positively charged electron
(b) an electron in the valence band
(c) an unfulfilled covalent bond
(d) an excess electron in covalent bond

50. The potential in the depletion layer is due to :
(a) electrons (b) holes
(c) both (a) and (b) (d) forbidden band

CHEMISTRY

1. Which one of the following set of the quantum numbers is not possible for a 4*p* electron ?
(a) $n = 4, l = 1, m = +1, s = +\frac{1}{2}$
(b) $n = 4, l = 1, m = 0, s = +\frac{1}{2}$
(c) $n = 4, l = 1, m = 2, s = +\frac{1}{2}$
(d) $n = 4, l = 1, m = -1, s = -\frac{1}{2}$

2. The radius of the nucleus is related to the mass number A by :
(a) $R = R_0 A^{1/2}$ (b) $R = R_0 A$
(c) $R = R_0 A^2$ (d) $R = R_0 A^{1/3}$

3. 10.6 g of a substance of molecular weight 106 was dissolved in 100 mL. 10 mL of this solution was pipetted out into a 1000 mL flask and made up to the mark with distilled water. The molarity of the resulting solution is :
(a) 1.0 M (b) 10^{-2} M
(c) 10^{-3} M (d) 10^{-4} M

4. Which of the following species has the highest ionization potential ?
(a) Li (b) Mg^+ (c) Al^+ (d) Ne

5. One mole of argon gas will have least density at :
(a) STP
(b) 0°C and 2 atm
(c) 273°C and 2 atm
(d) 273°C and 1 atm

6. As per the modern periodic law the physical and chemical properties of elements are periodic functions of their :
(a) atomic number
(b) electronic configuration
(c) atomic weight
(d) atomic size

7. How much litres of CO_2 at STP will be formed when 100 mL of 0.1 M H_2SO_4 reacts with excess of Na_2CO_3 ?
(a) 22.4 (b) 2.24 (c) 0.224 (d) 5.6

8. The pH of a solution is increased from 3 to 6. Its H^+ ion concentration will be :
(a) reduced to half
(b) doubled
(c) reduced by 1000 times
(d) increased by 1000 times

9. Liquid benzene burns in oxygen according to
$$2C_6H_{6(l)} + 15O_{2(g)} \longrightarrow 12CO_{2(g)} + 6H_2O_{(g)}$$
How much litres of oxygen are required for complete combustion of 39 g of liquid C_6H_6 ?
(a) 11.2 (b) 22.4 (c) 42 (d) 84

10. Silver chlorides dissolve in excess of NH_4OH. The cation present in this solution is :
(a) Ag^+ (b) $[Ag(NH_3)_2]^+$
(c) $[Ag(NH_3)_4]^+$ (d) $[Ag(NH_3)_6]^+$

11. Which one of the following can be used as an anaesthetic ?
(a) N_2O (b) NO (c) NCl_3 (d) NO_2

12. Reaction of benzene with alkyl halide in the presence of anhydrous $AlCl_3$ is called :
(a) Friedel Crafts reaction
(b) Wurtz-reaction
(c) Williamson synthesis
(d) Baeyer reaction

13. Be^{2+} is isoelectronic with :
(a) Mg^{2+} (b) Na^+ (c) Li^+ (d) H^+

14. Hg sticks to the surface of the glass when it comes in contact with :
(a) H_2O (b) HNO_3 (c) grease (d) O_3

15. The conjugate base of NH_2^- is :
(a) NH_3 (b) NH^{2-} (c) NH_4^+ (d) N_3^-

16. The effective atomic number of Cr in $[Cr(NH_3)_6]Cl_3$ is :
(a) 35 (b) 36 (c) 27 (d) 33

17. An organic compound having carbon and hydrogen has 80% carbon. The empirical formula of the hydrocarbon is :
(a) CH (b) CH_2 (c) CH_3 (d) CH_4

18. The first emission line of hydrogen atomic spectrum in the Balmer series appears at (R = Rydberg constant) :
(a) $\frac{5R}{36}\ cm^{-1}$ (b) $\frac{3R}{4}\ cm^{-1}$
(c) $\frac{7R}{36}\ cm^{-1}$ (d) $\frac{9R}{400}\ cm^{-1}$

19. The cell reaction of a cell is
$$Mg_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Cu_{(s)} + Mg^{2+}_{(aq)}$$
If the standard reduction potentials of magnesium and copper are –0.33 and +2.38 V respectively, the e.m.f. of the cell is :
(a) + 2.03 V (b) – 2.03 V
(c) + 2.71 V (d) – 2.71 V

20. 4.5 moles each of hydrogen and iodine heated in a sealed 10 L vessel. At equilibrium 3 moles of HI were found. The equilibrium constant for
$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ is :
(a) 1 (b) 10 (c) 5 (d) 0.33

21. 75% of first order reaction is completed in 32 minutes 50% of the reaction would have been completed in :
(a) 24 min (b) 16 min (c) 18 min (d) 24 min

22. Which of the following solutions cannot act as a buffer ?
(a) $NaH_2PO_4 + H_3PO_4$
(b) $CH_3COOH + CH_3COONa$
(c) $HCl + NH_4Cl$
(d) $H_3PO_4 + Na_2HPO_4$

23. The heat of combustion of CH_4, C (graphite) and $H_{2(g)}$ are respectively 20 kcal, 40 kcal and –10 kcal. The heat of formation of CH_4 is :
(a) 40 kcal (b) + 40 kcal
(c) 80 kcal (d) none of these

24. A gas decolourises Br_2 in CCl_4 and forms a precipitate with ammoniacal silver nitrate. The gas is :
(a) C_2H_2 (b) C_2H_4 (c) C_2H_6 (d) CH_4

25. Mortar is a mixture of :
(a) plaster of Paris + silica
(b) slaked lime+ plaster of Paris+ H_2O
(c) $CaCO_3$ + silica + H_2O
(d) cement + silica + H_2O

26. Which one of the following reacts with concentrated sulphuric acid ?
(a) Au (b) Ag (c) Pt (d) Pb

27. Which one of the following reactions does not yield an alkyl halide ?
(a) Diethyl ether + Cl_2
(b) Diethyl ether + HI
(c) Diethyl ether + PCl_5
(d) Diethyl ether + $SOCl_2$

28. The element which can displace three other halogens from their compounds is :
(a) Cl (b) F (c) Br (d) I

29. The number of moles of AgCl precipitated when excess $AgNO_3$ is added to one mole of $[Cr(NH_3)_4 Cl_2]$ Cl is :
(a) zero (b) 1.0
(c) 2.0 (d) 3.0

30. Cassiterite is concentrated by :
(a) levigation
(b) electromagnetic separation
(c) floatation
(d) liquation

31. A mixture contains four solid organic compounds *A, B, C, D*. On heating only *C* changes from solid to vapours state. *C* can be separated from the rest in the mixture by :
(a) distillation
(b) sublimation
(c) fractional distillation
(d) crystallization

32. Which of the following is the strongest Lewis acid ?
(a) BI_3 (b) BBr_3
(c) BCl_3 (d) BF_3

33. Which one of the following reactions is an example of calcination process ?
(a) $2Ag + 2HCl + (O) \longrightarrow 2AgCl + H_2O$
(b) $2Zn + O_2 \longrightarrow 2ZnO$
(c) $2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$
(d) $MgCO_3 \longrightarrow MgO + CO_2$

34. Acetic acid reacts with PCl_5 to form :
(a) $CH_2Cl\,COOH$
(b) $CHCl_2COOH$
(c) CH_3COCl
(d) CH_3COOCl

35. Silver containing lead as an impurity is removed by :
(a) poling (b) cupellation
(c) lavigation (d) distillation

36. Which of the following sets of elements does not belong to transitional element set ?
(a) Fe, Co, Ni (b) Cu, Ag, Au
(c) Ti, Zr, Hf (d) Ga, In, Tl

37. Carbogen is :
(a) pure form of carbon
(b) $COCl_2$
(c) mixture of CO and CO_2
(d) mixture of O_2 and CO_2

38. Hydrolysis of trichloromethane with aqueous KOH gives :
(a) methanol (b) chloral
(c) acetylene (d) potassium formate

39. The homologue of ethyne is :
(a) C_2H_4 (b) C_2H_6
(c) C_3H_8 (d) C_3H_4

40. In Wurtz reaction the reagent used is :
(a) Na (b) Na/liq, NH_3
(c) Na/dry ether (d) Na/dry ethanol

41. By which of the following reactions can one get N-methyl aniline from aniline ?
(a) Alkylation (b) Acetylation
(c) Benzoylation (d) Bromination

42. Compound *A* reacts with PCl_5 to give *B* which on treatment with KCN followed by hydrolysis gave propanoic acid. What is *A* and *B* respectively ?
(a) C_2H_6 and C_3H_7Cl
(b) C_2H_6 and C_2H_5Cl
(c) C_2H_5Cl and $C_2H_5Cl_2$
(d) C_2H_5OH and C_2H_5Cl

43. When an alkyl halide reacts with an alkoxide the product is :
(a) hydrocarbon
(b) unsaturated hydrocarbon
(c) ether
(d) alcohol

44. The reagent used for converting ethanoic acid to ethanol is :
(a) $LiAlH_4$ (b) BH_3
(c) PCl_3 (d) $K_2Cr_2O_7/H^+$

45. Acetaldehyde when treated with dilute NaOH gives :
(a) CH_3CH_2OH
(b) CH_3COOH
(c) $CH_3—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_2—CHO$
(d) $CH_3—CH_3$

46. If the equilibrium constant for the reaction $2AB \rightleftharpoons A_2 + B_2$ is 49; what is the value of equilibrium constant for
$AB \rightleftharpoons \frac{1}{2}A_2 + \frac{1}{2}B_2$?
(a) 49 (b) 2401
(c) 7 (d) 0.02

47. C_2H_5CHO and $(CH_3)_2CO$ can be distinguished by testing with :
(a) phenyl hydrazine
(b) hydroxyl amine
(c) Fehling's solution
(d) sodium bisulphite

48. Among the following compounds which have more than one type of hybridization for carbon atom :
1. $CH_3.CH_2.CH_2.CH_3$
2. $CH_3.CH=CH.CH_3$
3. $CH_2=CH—CH=CH_2$
4. $H—C\equiv C—H$
(a) 2 and 3 (b) 2
(c) 3 and 4 (d) 3

49. Which of the following does not participate in the Solvay's process for the manufacture of Na_2CO_3 ?
(a) NH_3 (b) NaCl solution
(c) CO_2 (d) H_2SO_4

50. Silica is soluble in :
(a) HCl (b) HNO_3 (c) H_2SO_4 (d) HF

MATHEMATICS

1. If $f: R^+ \to R$, such that $f(x) = \log_3 x$, then $f^{-1}(x)$ is equal to :
(a) $\log_x 3$ (b) 3^x (c) 3^{-x} (d) $3^{1/x}$

2. Domain of $f(x) = \frac{1}{6}\sqrt{\log_{10}(5x - x^2)}$ is :
(a) (0, 5) (b) (1, 4) (c) (1, 3) (d) (2, 3)

3. $\tan^{-1} x + \cot^{-1}(x+1)$ is equal to :
(a) $\tan^{-1}(x^2 + x)$
(b) $\cot^{-1}(x^2 + x + 1)$
(c) $\tan^{-1}(x^2 + x + 1)$
(d) $\cot^{-1}(x^2 + x)$

4. $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$, then :
(a) $a^3 + b^3 + c^3 = 3abc$ (b) $a^3 + b^3 + c^3 = 0$
(c) $a^2 + b^2 + c^2 = 0$ (d) $a + b + c = 0$

5. A group consists of 6 men and 3 women. A committee is to be formed with 5 people choosing 3 men and 2 women. The number of different committees that can be formed, is :
(a) ${}^9C_5$ (b) ${}^6C_3 \times {}^3C_2$
(c) ${}^6C_3$ (d) ${}^5C_2$

6. If $x = 2\sqrt{2} + \sqrt{7}$, then $x + \frac{1}{x}$ is equal to :
(a) $2\sqrt{2}$ (b) $4\sqrt{2}$ (c) 8 (d) $\sqrt{7}$

7. If $a = 1 + \log_x yz$, $b = 1 + \log_y zx$, $c = 1 + \log_z xy$, then $ab + bc + ca$ is equal to :
(a) 0 (b) $2abc$
(c) $a^2 + b^2 + c^2$ (d) abc

8. The term independent of x in the expansion of $\left(2x^2 - \frac{3}{x^3}\right)^{15}$, is :
(a) ${}^{15}C_9\, 2^5\, 3^7$ (b) ${}^{15}C_9\, 2^{10} . 3^5$
(c) ${}^{15}C_9\, 2^{15}$ (d) ${}^{15}C_9\, 3^6 . 2^9$

9. If C_n is the coefficient of x^n in the expansion of $(1 + x)^n$, then $C_1 + 2C_2 + 3C_3 + \ldots + nC_n$ is equal to :
(a) 2^n (b) $n . 2^n$
(c) $n . 2^{n+1}$ (d) $n . 2^{n-1}$

10. If $\frac{(x+1)^2}{x^3 + x} = \frac{A}{x} + \frac{Bx + C}{x^2 + 1}$, then $\sin^{-1}(A/C)$ is equal to :
(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

11. The sum of the series
$1 + 3x + 5x^2 + 7x^3 + \ldots + (2n-1)x^{n-1} + \ldots$
is :
(a) $\frac{1+x}{1-x}$ (b) $\frac{1+x}{(1-x)^2}$
(c) $\frac{(1+x)^2}{1-x}$ (d) $\left(\frac{1+x}{1-x}\right)^2$

12. Maximum and minimum values of $\sin^2(120^\circ + \theta) + \sin^2(120^\circ - \theta)$ are respectively :
(a) $\frac{3}{2}, \frac{1}{2}$ (b) $\frac{1}{2}, 0$ (c) $\frac{3}{2}, 0$ (d) $\frac{3}{2}, \frac{1}{3}$

13. If $A + B + C = 0$, then
$\sin^2 A + \sin^2 B + \sin^2 C$ is equal to :
(a) $2 + 2\cos A \cos B \cos C$
(b) $2 + 2\sin A \sin B \sin C$
(c) $2 - 2\cos A \cos B \cos C$
(d) $2 + \cos A \cos B \cos C$

14. If $\sqrt{\sin x} + \cos x = 0$, then $\sin x$ is equal to :
(a) $\frac{\sqrt{5}+1}{2}$ (b) $\frac{\sqrt{5}+1}{8}$
(c) $\frac{\sqrt{5}-1}{8}$ (d) $\frac{\sqrt{5}-1}{2}$

15. If $x = \tanh^{-1} y$, then $\log_e\left(\frac{1+y}{1-y}\right)$ then :
(a) x (b) $4x$ (c) $2x$ (d) $3x$

16. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$, then
$1 - xy - yz - zx$ is equal to :
(a) 0 (b) 1 (c) -1 (d) 2

17. If the sum of the squares of the roots of $x^2 + px - 3 = 0$ is 10, then the value of p is equal to :
(a) ± 2 (b) ± 3
(c) 5 (d) -5

18. $\begin{vmatrix} x & 1 & y+z \\ y & 1 & z+x \\ z & 1 & x+y \end{vmatrix}$ is equal to :
(a) $1 + x + y + z$ (b) $x + y + z$
(c) 0 (d) 1

19. The matrix $\begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 1 & 1 \end{bmatrix}$ is :
(a) non-singular
(b) singular
(c) skew symmetric
(d) symmetric

20. A square, non-singular matrix A satisfies $A^2 - A + 2I = 0$, then A^{-1} is equal to :
(a) $I - A$ (b) $(I - A)/2$
(c) $I + A$ (d) $(I + A)/2$

21. In a triangle ABC, if $\angle C = 60^\circ$, then $\frac{a}{b+c} + \frac{b}{c+a}$ is equal to :
(a) 2 (b) 1 (c) 3 (d) 4

22. If the area of the triangle ABC is $a^2 - (b-c)^2$, then $\tan\frac{A}{2}$ is equal to :
(a) $\frac{1}{2}$ (b) 0 (c) $\frac{1}{4}$ (d) $\frac{3}{4}$

23. If the angles of depression of the upper and lower ends of a lamp post from the top of a hill of height h meters are α and β respectively, then the height of the lamp post is equal to :
(a) $h\sin(\beta - \alpha)$ (b) $h\cos(\beta - \alpha)$
(c) $-\frac{h\sin(\beta-\alpha)}{\cos\alpha\sin\beta}$ (d) $h\sin\alpha\sin\beta$

24. If P represent $z = x + iy$ in the argand plane and $|z-1|^2 + |z+1|^2 = 4$, then the locus of P is :
(a) $x + y = 2$ (b) $x^2 + y^2 = 1$
(c) $x^2 + y^2 = 2$ (d) $x^2 + y^2 = 4$

25. If $1, \omega, \omega^2$ are the cube roots of unity and a, b are real and $x = a + b$, $y = a\omega^2 + b\omega$, $z = a\omega + b\omega^2$, then $x^2 + y^2 + z^2$ is equal to :
(a) $6ab$ (b) $12ab$ (c) $8a^2b^2$ (d) $4a^2b^2$

26. The value of
$\left(\frac{1-\sqrt{3}i}{2}\right)^{36} + \left(\frac{-1-\sqrt{3}i}{2}\right)^{36}$ is equal to :
(a) 0 (b) 1 (c) 2 (d) 3

27. If $1, \omega, \omega^2$ are the cube roots of unity, then $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5$ is equal to :
(a) 8 (b) 12 (c) 16 (d) 32

28. $A = (-9, 0)$ and $B = (-1, 0)$ are two points. If $P = (x, y)$ is a point such that $3PB = PA$, then the locus of P is :
(a) $x^2 - y^2 = 9$ (b) $x^2 - y^2 = -9$
(c) $x^2 + y^2 = 9$ (d) $x^2 + y^2 = 3$

29. The angle at which the axes are to be rotated to remove the xy term in the equation $x^2 + 2\sqrt{3}xy = y^2$ is :

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

30. k is non-zero constant. If $k = \frac{a+b}{ab}$, the straight line $\frac{x}{a} + \frac{y}{b} = 1$ passes through the point :

(a) (k, k) (b) $\left(\frac{1}{k}, \frac{1}{k}\right)$ (c) $(1, 1)$ (d) $\left(k, \frac{1}{k}\right)$

31. Let a and b be non-zero real numbers such that $a \neq b$. Then the equation of the line passing through the origin and the point of intersection of $\frac{x}{a} + \frac{y}{b} = 1$ and $\frac{x}{b} + \frac{y}{a} = 1$ is :

(a) $ax + by = 0$ (b) $bx + ay = 0$
(c) $y - x = 0$ (d) $x + y = 0$

32. The perpendicular distance from $(1, 2)$ to the straight line $12x + 5y = 7$, is :

(a) $\frac{15}{13}$ (b) $\frac{12}{13}$ (c) $\frac{5}{13}$ (d) $\frac{7}{13}$

33. The equation of the pair of lines through $(1, -1)$ and perpendicular to the pair of lines $x^2 - xy - 2y^2 = 0$ is :

(a) $2x^2 - xy - y^2 + 5x + y + 2 = 0$
(b) $2x^2 - xy - y^2 - 5x - y + 2 = 0$
(c) $x^2 - xy - 2y^2 - 5x - y - 2 = 0$
(d) $2x^2 - xy - y^2 + 5x + y - 2 = 0$

34. The angle between the pair of lines $2(x+2)^2 + 3(x+2)(y+2) - 2(y-2)^2 = 0$ is :

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

35. If the pair of lines given by $(x^2 + y^2)\sin^2\alpha = (x\cos\alpha - y\sin\alpha)^2$ are perpendicular to each other, then α is equal to :

(a) 0 (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{4}$

36. If a, h, b are in A.P., then the triangular area formed by the pair of lines $ax^2 + 2hxy + by^2 = 0$ and the line $x - y = -2$ (in square units) is :

(a) $\left|\frac{a+b}{a-b}\right|$ (b) $\left|\frac{a^2+b^2}{a-b}\right|$
(c) $\left|\frac{(a-b)^2}{a+b}\right|$ (d) $\left|\frac{a^2+b^2}{a+b}\right|$

37. The equation of the line common to the pairs of lines
$(p^2 - q^2)x^2 + (q^2 - r^2)xy + (r^2 - p^2)y^2 = 0$ and
$(f - m)x^2 + (m - n)xy + (n - f)y^2 = 0$ is :
(a) $x + y = 0$ (b) $x - y = 0$
(c) $x + y = pqr$ (d) $x - y = pqr$

38. $\lim\limits_{x \to 0} \log\left|\frac{\log(1+x)}{x}\right|$ is equal to :

(a) 0 (b) 1 (c) e (d) $\frac{1}{e}$

39. If $f : R \to R$ is continuous such that $f(x+y) = f(x) + f(y)$, $\forall \quad x, y \in R$ and $f(1) = 2$, then $f(100)$ is equal to :
(a) 100 (b) 50 (c) 0 (d) 200

40. $\lim\limits_{x \to \infty} \frac{1}{\sin^2 x} - \frac{1}{\sinh^2 x}$ is equal to :

(a) $\frac{2}{3}$ (b) 0
(c) $\frac{1}{3}$ (d) $-\frac{2}{3}$

41. $\lim\limits_{x \to \infty} \left|\frac{a^{1/x} + b^{1/x} + c^{1/x}}{3}\right|^x$, where a, b, c are real and non-zero is equal to :

(a) 0 (b) $(abc)^{1/3}$
(c) $(abc)^{-1/3}$ (d) $\frac{abc}{3}$

42. $\lim\limits_{x \to 0} \frac{\sin ax}{\sin bx}$ is equal to :

(a) $\frac{b}{a}$ (b) 0 (c) $\frac{a}{b}$ (d) 1

43. If $y = e^{-x^2}\int_0^x e^{t^2}\,dt$, then $\frac{dy}{dx} + 2xy$ is equal to :

(a) 0 (b) 1 (c) 2 (d) -2

44. If $y = \sqrt{\cos 2x}$, then $y\frac{d^2y}{dx^2} + 2y^2$ is equal to :

(a) 0 (b) $-\left(\frac{dy}{dx}\right)^2$ (c) $\left(\frac{dy}{dx}\right)^2$ (d) $y\frac{dy}{dx}$

45. If $\tan y = \frac{2t}{1-t^2}$, $\sin x = \frac{2t}{1+t^2}$, then $\frac{dy}{dx}$ is equal to :
(a) 0 (b) $\cos x$ (c) $\tan x$ (d) 1

46. If the side of an equilateral triangle expands at the rate of 2 cm/sec, then the rate of increase of its area when the side is 10 cm is (in sq cm) :
(a) $10\sqrt{2}$ (b) $10\sqrt{3}$ (c) 10 (d) 5

47. If $\log y = \tan^{-1} x$, then
$(1+x^2)\frac{d^2y}{dx^2} + (2x-1)\frac{dy}{dx}$ is equal to :
(a) 0 (b) $2 \log y$ (c) 4 (d) 1

48. If x and y are strictly positive such that $x + y = 1$, then the minimum value of $x \log x + y \log y$ is :
(a) log2 (b) $-\log 2$ (c) $2 \log 2$ (d) 0

49. If $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ x - \frac{\pi}{2} & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$, then $\frac{df}{dx}$ at $x = \frac{\pi}{2}$ is :
(a) 1 (b) 2 (c) $\frac{\pi}{2}$ (d) 8

50. If at any point on the curve $y = f(x)$ the length of the subnormal is constant, then the curve will be a/an :
(a) circle (b) ellipse
(c) parabola (d) straight line

51. The minimum value of $x^2 - 8x + 17$, $x \in R$, is :
(a) 17 (b) 1 (c) -1 (d) 2

52. If the system of equations
$$3x - 2y + z = 0$$
$$\lambda x - 14y + 15z = 0$$
$$x + 2y - 3z = 0$$
have non-zero solution, then λ is equal to :
(a) 1 (b) 0 (c) 3 (d) 5

53. If $a + b + c = 0$, then one root of $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ is :
(a) $a + b$ (b) 0
(c) $b + c$ (d) $a + c$

54. The inverse of the matrix $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ is :
(a) $\frac{1}{5}\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ (b) $\frac{1}{5}\begin{bmatrix} 3 & -1 \\ -1 & 2 \end{bmatrix}$
(c) $\frac{2}{5}\begin{bmatrix} -3 & 1 \\ 1 & 2 \end{bmatrix}$ (d) $\frac{1}{5}\begin{bmatrix} -3 & 1 \\ 1 & 2 \end{bmatrix}$

55. Let $Q_1 = Q - \{1\}$ the set of all rationals except 1, $*$ is the operation defined on Q_1, as $a * b = a + b - ab \ \forall \ a, b \in Q_1$. The inverse of 2 is :
(a) 2 (b) 1 (c) 0 (d) -2

56. If the operation $*$ is defined on R, the set of all real numbers, as $a * b = ab + 1$ $\forall \ a, b \in R$, then $a * (b * c)$ is equal to :
(a) $abc + 1$ (b) $abc + a + 1$
(c) $a + bc + 1$ (d) $abc + a + b + 1$

57. If $x^x y^y z^z = \text{constant}$, then $\frac{dz}{dx}$ is equal to :
(a) $-\frac{(1 + \log_e x)}{(1 + \log_e z)}$ (b) $-\frac{(1 + \log_e z)}{(1 + \log_e x)}$
(c) $x^y y^y$ (d) $x^z y^y z$

58. If $z = \sin^{-1}\left\{\frac{x+y}{\sqrt{x} + \sqrt{y}}\right\}$, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ is equal to :
(a) $\cot z$ (b) $\frac{1}{2}\tan z$
(c) $\frac{1}{2}\cot z$ (d) $\tan z$

59. The equation of a circle with centre (4, 1) and having $3x + 4y - 1 = 0$ as tangent, is ...
(a) $x^2 + y^2 - 8x - 2y - 8 = 0$
(b) $x^2 + y^2 - 8x - 2y + 8 = 0$
(c) $x^2 + y^2 - 8x + 2y - 8 = 0$
(d) $x^2 + y^2 - 8x - 2y + 4 = 0$

60. The locus of point of intersection of perpendicular tangents to the circle $x^2 + y^2 = a^2$ is :
(a) $x^2 + y^2 = 2a^2$ (b) $x^2 + y^2 = 4a^2$
(c) $x^2 + y^2 = 6a^2$ (d) $x^2 + y^2 = 8a^2$

61. The pole of line $8x - 2y = 11$ with respect to the circle $2x^2 + 2y^2 = 11$ is :
(a) (4, 1) (b) (4, – 1)
(c) (3, 1) (d) (4, 2)

62. The radical axis of circles
$x^2 + y^2 - 6x - 4y - 44 = 0$ and
$x^2 + y^2 - 14x - 5y - 24 = 0$ is :
(a) $8x + y - 30 = 0$ (b) $8x + y + 20 = 0$
(c) $8x + 3y - 20 = 0$ (d) $8x + y - 20 = 0$

63. If (1, 2), (4, 3) are the limiting points of a system of coaxial circles, then the radical axis of the system is :
(a) $3x + 2y - 10 = 0$ (b) $3x + y - 10 = 0$
(c) $2x + y - 10 = 0$ (d) $x + y + 6 = 0$

64. The length of the tangent from (6, 8) to the circle $x^2 + y^2 = 4$ is :
(a) $\sqrt{6}$ (b) $2\sqrt{6}$ (c) $4\sqrt{6}$ (d) $5\sqrt{6}$

65. The equation of the normal to the circle $x^2 + y^2 - 2x - 2y - 2 = 0$ at the point (3, 1) on it is :
(a) $x = 1$ (b) $y = 2$
(c) $y = -1$ (d) $y = 1$

66. The equation of the directrix to the parabola $y^2 - 2x - 6y - 5 = 0$ is :
(a) $2x + 5 = 0$ (b) $x + 5 = 0$
(c) $2x + 13 = 0$ (d) $x + 2 = 0$

67. The pole of the line $2x + 3y - 4 = 0$ with respect to the parabola $y^2 = 4x$, is :
(a) (2, 3) (b) (2, – 3)
(c) (1, 1) (d) (– 2, – 3)

68. The eccentricity of ellipse $9x^2 + 4y^2 = 36$ is :
(a) $\frac{\sqrt{5}}{9}$ (b) $\frac{5}{9}$
(c) $\frac{5}{3}$ (d) $\frac{\sqrt{5}}{3}$

69. One of the focii of hyperbola is origin and the corresponding directrix is $3x + 4y + 1 = 0$. The eccentricity of the hyperbola is $\sqrt{5}$. The equation to the hyperbola is :
(a) $8x^2 + 15y^2 + 24xy + 6x + 8y + 1 = 0$
(b) $8x^2 + 9y^2 + 24xy + 6x + 6y + 1 = 0$
(c) $8x^2 + 9y^2 + 24xy + 6x + 8y + 1 = 0$
(d) $8x^2 + 9y^2 - 24xy + 6x + 8y + 1 = 0$

70. If $f(x) = \frac{\sin x}{x}$, $x \neq 0$, if $f(x)$ is to be continuous at $x = 0$, then $f(0)$ is equal to:
(a) 0 (b) 1 (c) – 1 (d) 2

71. $\frac{d}{dx}(\cos x^\circ)$ is equal to :
(a) $-\sin x^\circ$ (b) $-\frac{\pi}{180^\circ}\sin x^\circ$
(c) $\frac{\pi}{180^\circ}\sin x^\circ$ (d) none of these

72. Derivative of $\sin^2 x$ with respect to $(\log x)^2$ is :
(a) $\frac{x \sin x \cos x}{\log x}$ (b) $\frac{2 \sin x \cos x}{(\log x)^2}$
(c) $\frac{\sin^2 x}{2 \log x}$ (d) $x \log x$

73. $\frac{d}{dx}(x^x)$ is equal to :
(a) $x^x (1 + \log x)$ (b) $x \cdot x^{x-1}$
(c) $x^x \log x$ (d) $x^x (1 - \log x)$

74. $y = x^2 \sin 2x$, then nth derivative of y $(n = 4m)$ is :
(a) $2^{4m}(x^2 \sin 2x + x \cos 2x + 2 \sin 2x)$
(b) $2^{4m}(mx^2 \sin 2x + x \cos 2x + 2m \sin 2x)$
(c) $2^{4m}(x^2 \sin 2x - x \cos 2x - 2m \sin 2x)$
(d) $2^{4m}(x^2 \sin 2x - 4mx \cos 2x - m(4m - 1) \sin 2x)$

75. The solution of the differential equation $\frac{dy}{dx} - \frac{2xy}{1 + x^2} = 0$ is :
(a) $y = A(1 + x^2)$ (b) $y = A\sqrt{1 + x^2}$
(c) $y = \frac{A}{(1 + x^2)}$ (d) $y = \frac{A}{\sqrt{1 + x^2}}$

76. The maximum value of $f(x) = 2x^3 - 21x^2 + 36x + 20$, in the interval $0 \leq x \leq 2$, is :
(a) 30 (b) 32 (c) 34 (d) 37

77. The point on the curve $y^2 = 4x$ which is the nearest to the point (2, 1), is ...
(a) (4, 4) (b) (1, 2) (c) (9, 6) (d) (4, 6)

78. The value of $(127)^{1/3}$ upto 4 decimal places, is :
(a) 5.0267 (b) 5.4267
(c) 5.5267 (d) 5.0001

79. $\int \frac{x^5}{x^2+1}\,dx$ is equal to :

(a) $\frac{x^4}{4}+\frac{x^2}{2}+\tan^{-1}x+c$

(b) $\frac{x^4}{4}-\frac{x^2}{2}+\frac{1}{2}\log(x^2+1)+c$

(c) $\frac{x^4}{4}+\frac{x^3}{3}+\tan^{-1}x+c$

(d) $\frac{x^4}{4}+\frac{x^3}{3}-\tan^{-1}x+c$

80. $\int \frac{e^x(1+x\log x)}{x}\,dx$ is equal to :

(a) $\frac{e^x\log x}{x}+c$ (b) $e^x(1+\log x)+c$

(c) $e^x\log x+c$ (d) $xe^x\log x+c$

81. $\int_0^{\pi/2} \sin^6 x\cos^5 x\,dx$ is equal to :

(a) $\frac{8}{693}$ (b) $\frac{5}{693}$ (c) $\frac{4}{693}$ (d) $\frac{10}{693}$

82. The area bounded by $y=3x$ and $y=x^2$ is (in sq unit) :

(a) 10 (b) 5 (c) 4.5 (d) 9

83. $\int_0^a \sqrt{a^2-x^2}\,dx$ is equal to :

(a) πa^2 (b) $\frac{\pi a^2}{2}$ (c) $\frac{\pi a^2}{3}$ (d) $\frac{\pi a^2}{4}$

84. The equation $r=5\cos\theta+12\sin\theta$ represents :

(a) a circle (b) an ellipse

(c) a parabola (d) a straight line

85. A and B are mutually exclusive events with $P(A)=\frac{1}{2}P(B)$ and $A\cup B=S$ the sample space, then $P(A)$ is equal to :

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

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

86. A problem in EAMCET examination is given to 3 students A, B and C whose chance of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively, the probability that the problem is solved, is :

(a) $\frac{3}{4}$ (b) $\frac{1}{24}$ (c) $\frac{1}{4}$ (d) $\frac{23}{24}$

87. Two dice are thrown at a time and the sum of the numbers on them is 6. The probability of getting the number 4 on any of the dice, is :

(a) $\frac{2}{5}$ (b) $\frac{1}{5}$

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

88. A random variable X has the following distribution

X	x_1	x_2	x_3	x_4
$P(X)$	k	$2k$	$3k$	$4k$

the values of k and $P(X<3)$ are equal to:

(a) $k=\frac{1}{10}, P(X<3)=\frac{3}{5}$

(b) $k=\frac{1}{10}, P(X<3)=\frac{3}{10}$

(c) $k=\frac{3}{10}, P(X<3)=\frac{1}{10}$

(d) $k=\frac{1}{24}, P(X<3)=\frac{5}{12}$

89. A coin tossed 3 times. The probability of getting head once and tails two times, is:

(a) $\frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{3}{8}$ (d) $\frac{1}{2}$

90. A random variable X follows the following distribution

$X=x_1$	0	1	2	3
$P(X=x_1)$	$\frac{2}{3}$	$\frac{3}{6}$	$\frac{0}{6}$	$\frac{1}{6}$

The mean and the variance are :

(a) 1, 1 (b) 1, 2

(c) 2, 1 (d) 2, 2

91. The probability of a man hitting a target is $\frac{1}{4}$. If he fires 7 times, the probability of hitting the target at least twice is :

(a) $1-\frac{5}{2}\left(\frac{3}{4}\right)^6$ (b) $1-\frac{15}{2}\left(\frac{3}{4}\right)^6$

(c) $1-5.\frac{3^5}{6}$ (d) $1-\left(\frac{3}{9}\right)^6$

92. The three points whose position vectors are $\hat{i}+2\hat{j}+3\hat{k}$, $3\hat{i}+4\hat{j}+7\hat{k}$ and $-3\hat{i}-2\hat{j}-5\hat{k}$:
(a) are the vertices of an equilateral triangle
(b) are the vertices of a right angled triangle
(c) are collinear
(d) are the vertices of an isosceles triangle

93. If $2\hat{i}+3\hat{j}-6\hat{k}$, $6\hat{i}-2\hat{j}+3\hat{k}$, $3\hat{i}-6\hat{j}-2\hat{k}$ represent the sides of a triangle, then the perimeter of the triangle is :
(a) 6 (b) 7 (c) 14 (d) 21

94. If $\vec{A}=\hat{i}+\lambda\hat{j}+\hat{k}$, $\vec{B}=\hat{i}+\hat{j}+\hat{k}$, then for $|\vec{A}+\vec{B}| = |\vec{A}| + |\vec{B}|$ to be true, the value of λ is equal to :
(a) -1 (b) -2 (c) 1 (d) 2

95. If $\vec{A}, \vec{B}, \vec{C}$ are three vectors such that $|\vec{A}|=4$, $|\vec{B}|=5$, $|\vec{C}|=6$, then $[\vec{A}-\vec{B}\ \ \vec{B}-\vec{C}\ \ \vec{C}-\vec{A}]$ is equal to :
(a) 0 (b) 2 (c) 54 (d) 120

96. The angle between the planes $\vec{r}(2\hat{i}-\hat{j}+2\hat{k})=3$ and $\vec{r}(3\hat{i}-6\hat{j}+2\hat{k})=4$ is :
(a) $\cos^{-1}\left(\frac{4}{21}\right)$ (b) $\sin^{-1}\left(\frac{4}{21}\right)$
(c) $\cos^{-1}\left(\frac{1}{4}\right)$ (d) $\cos^{-1}\left(\frac{3}{4}\right)$

97. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c}=0$. Then $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$ is equal to :
(a) $\frac{3}{2}$ (b) $-\frac{3}{2}$
(c) $2[\vec{a}\ \vec{b}\ \vec{c}]$ (d) 0

98. If $\vec{\alpha}$ and $\vec{\beta}$ are non zero and different vector such that $|\vec{\alpha}+\vec{\beta}| = |\vec{\beta}-\vec{\alpha}|$, then the angle between $\vec{\alpha}$ and $\vec{\beta}$ is :
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

99. If $|\vec{a}|=5$, $|\vec{b}|=6$, $|\vec{a}.\vec{b}|=24$, then $|\vec{a}\times\vec{b}|$ is equal to :
(a) $\sqrt{224}$ (b) $\sqrt{300}$ (c) $\sqrt{254}$ (d) 18

100. If the vectors $\vec{a}=(1, x, -2)$ and $\vec{b}=(x, 3, -4)$ are mutually perpendicular, then x is :
(a) -2 (b) 2
(c) 4 (d) -4

Answers

Physics

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

Chemistry

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

Mathematics

1.	(b)	2.	(b)	3.	(c)	4.	(a)	5.	(b)	6.	(b)	7.	(d)	8.	(d)	9.	(d)	10.	(a)
11.	(b)	12.	(a)	13.	(c)	14.	(d)	15.	(c)	16.	(a)	17	(a)	18.	(c)	19.	(b)	20.	(b)
21.	(b)	22.	(c)	23.	(c)	24.	(b)	25.	(a)	26.	(c)	27.	(d)	28.	(c)	29.	(b)	30.	(b)
31.	(c)	32.	(a)	33.	(b)	34.	(d)	35.	(d)	36.	(c)	37.	(b)	38.	(a)	39.	(d)	40.	(b)
41.	(b)	42.	(c)	43.	(b)	44.	(b)	45.	(d)	46.	(b)	47.	(a)	48.	(b)	49.	(b)	50.	(c)
51.	(b)	52.	(d)	53.	(b)	54.	(b)	55.	(a)	56.	(b)	57.	(a)	58.	(b)	59.	(b)	60.	(a)
61.	(b)	62.	(d)	63.	(b)	64.	(c)	65.	(d)	66.	(c)	67.	(d)	68.	(d)	69.	(a)	70.	(b)
71.	(b)	72.	(a)	73.	(a)	74.	(d)	75.	(a)	76.	(d)	77.	(b)	78.	(a)	79.	(b)	80.	(c)
81.	(a)	82.	(c)	83.	(d)	84.	(a)	85.	(b)	86.	(a)	87.	(a)	88.	(b)	89.	(c)	90.	(a)
91.	(a)	92.	(c)	93.	(d)	94.	(c)	95.	(a)	96.	(a)	97.	(b)	98.	(d)	99.	(d)	100.	(a)

Hints & Solutions

PHYSICS

1. Force will be same for all the surfaces.
2. The simple pendulum hanging freely and rest in vertical position, because in this position its potential energy is minimum.

$$PE = \frac{1}{2} m \omega^2 y^2$$

[in vertical position $y = 0 \therefore PE = 0$ (min)]

3. $m_1 = 400$ kg,

$u_1 = 72$ km/h $= 72 \times \frac{5}{18} = 20$ m/s

$m_2 = 4000$ kg,

$u_2 = 9$ km/h $= 9 \times \frac{5}{18} = 2.5$ m/s

$v_1 = -18$ km/h $= -18 \times \frac{5}{18} = -5$ m/s

$v_2 = ?$

From law of conservation of momentum Total initial momentum = Total final momentum

$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$

$400 \times 20 + 4000 \times 2.5 = 400 \times -5 + 400 \times v_2$

$8000 + 10000 = -2000 + 4000 v_2$

$$v_2 = \frac{20000}{4000}$$

$= 5$ m/s

$= 5 \times \frac{18}{5} = 18$ km/h

4. The relation $\vec{F} = m \vec{a}$, can only be deduced from Newton's second law, if mass remains constant with time, if mass depends on time then this relation can not be obtained.
5. The horizontal range of the bottle $R = 2$ m

$$\therefore \quad R = \frac{u^2 \sin 2\theta}{g}$$

$$2 = u^2 \frac{\sin 2 \times 45°}{g}$$

$$2 = u^2 \frac{\sin 90°}{g} \Rightarrow 2 = \frac{u^2}{g}$$

$$\therefore \quad u = \sqrt{2g}$$

6. $u = 5$ m/s, at max height $v = 0$

From $v = u - g t$

$0 = 5 - 10 \times t$

$t = \frac{1}{2}$ s

Time taken by the stone to reach the edge of the well $= \frac{1}{2} + \frac{1}{2} = 1$ s

$\therefore$ Time taken by stone to reach the water level $= 3 - 1 = 2$ s

Depth of water level $h = u t + \frac{1}{2} g t^2$

$= 5 \times 2 + \frac{1}{2} \times 10 \times (2)^2 = 10 + 5 \times 4 = 30$ m