EAMCET

ENGINEERING ENTRANCE EXAM

SOLVED PAPER–1996

PHYSICS

1. A solid wooden block resting on a frictionless surface is hit by a bullet. The bullet gets embedded. During this process :
   (a) only kinetic energy is conserved
   (b) only momentum is conserved
   (c) both momentum and kinetic energy are conserved
   (d) neither momentum nor kinetic energy is conserved

2. The directions of velocity and acceleration of a projectile at the highest point on the trajectory are :
   (a) parallel to each other
   (b) antiparallel to each other
   (c) perpendicular to each other
   (d) no specific relationship exist between them

3. A bomb is dropped from an aircraft travelling horizontally at 150 m/s at a height of 490 m. The horizontal distance travelled by the bomb before it hits the ground is (in metre) :
   (a) 1000 (b) 1200
   (c) 1500 (d) 1800

4. The angle made by the vector $\vec{A} = \hat{i} + \hat{j}$ with x-axis is :
   (a) 90° (b) 45°
   (c) 22.5° (d) 30°

5. The modulus of elasticity dimensionally equivalent to :
   (a) stress (b) surface tension
   (c) strain (d) coefficient of viscosity

6. The length of the closed pipe whose fundamental frequency is equal to that of open pipe of 60 cm, length is :
   (a) 20 cm (b) 24 cm
   (c) 28 cm (d) 30 cm

7. For a constant volume gas thermometer one should fill the gas at :
   (a) high temperature and high pressure
   (b) high temperature and low pressure
   (c) low temperature and low pressure
   (d) low temperature and high pressure

8. A body does not emit heat energy at :
   (a) 0°C (b) 0K
   (c) 273°C (d) 373°C

9. A piece of lead falls from a height of 100 m on a fixed non-conducting slab which brings it to rest. The temperature of the piece immediately after collision increases by (specific heat of lead is 30.6 cal/kg °C and $g = 9.8\ m/s^2$) :
   (a) 0K (b) 27°C (c) 7.63°C (d) 4.2K

10. An amount of water of mass 20 g at 0°C is mixed with 40 g of water at 10°C. Final temperature of mixture is :
    (a) 20°C (b) 6.67°C
    (c) 5°C (d) 0°C

11. A nuclear reactor has power of 16 kW. If the energy per fission is 200 MeV, the number of fissions per second are :
    (a) 5×10^{16} (b) 5×10^{17}
    (c) 5×10^{14} (d) 5×10^{15}

12. The mass number of a nucleus is :
    (a) always less than atomic number
    (b) always more than atomic number
    (c) equal to atomic number
    (d) sometimes more than and sometimes equal to atomic number

13. In which of the following decays, the element does not change ?
    (a) α-decay (b) β^+-decay
    (c) β-decay (d) γ-decay

14. Two pieces, one of germanium and the other of aluminium are cooled from T_1 K to T_2 K. The resistance of :
(a) aluminium increases and that of germanium decreases
(b) each of them decreases
(c) aluminium decreases and that of germanium increases
(d) each of them increases

15. When a *p-n* junction diode is reverse biased, the thickness of the depletion layer :
(a) increases (b) decreases
(c) become zero (d) remains constant

16. The element which was first observed in the solar spectrum is :
(a) helium (b) xenon
(c) neon (d) argon

17. A bar magnet of magnetic moment 2.0 Am^2 is free to rotate about a vertical axis passing through its centre. The magnet is released from rest from east-west position. Then the kinetic energy of the magnet as it takes north-south position is (horizontal component of earth field is 25 μT) :
(a) 25 μ J (b) 50 μ J (c) 100 μ J (d) 12 . 5 μ J

18. In a deflection magnetometer experiment the deflections produced separately by two short bar magnets kept at the same distance are 45° and 30°. Then the ratio of the magnetic moments of the two magnets is :
(a) $\sqrt{3} : 2$ (b) $\sqrt{3} : 1$
(c) $\sqrt{2} : 1$ (d) $1 : \sqrt{3}$

19. The moment of a magnet is 1 micro Wb-m and the force acting on each pole in a uniform magnetic field of strength 0.38 oersted is 1.024×10^{-4} N. Distance between the poles of the magnet is :
(a) 1.56×10^{-4} cm (b) 0.37×10^{-4} cm
(c) 2.34×10^{-4} cm (d) 1.17×10^{-4} cm

20. The potential difference across the terminals of a battery is 50 V when 11A are drawn and 60 V when 1A is drawn. The emf and the internal resistance of the battery are :
(a) 62 V, 2 Ω (b) 63 V, 1 Ω
(c) 61 V, 1 Ω (d) 64 V, 2 Ω

21. If the temperature of a liquid is increased, then its surface tension :
(a) decreases
(b) increases
(c) remains the same
(d) increase and then decreases

22. To keep correct time, modern watches are fitted with a balance wheel made of :
(a) platinum (b) stainless steel
(c) invar (d) tungsten

23. The variation of density of a solid with temperature is given by the formula :
(a) $d_2 = \frac{d_1}{1 + \gamma (t_2 - t_1)}$ (b) $d_2 = \frac{d_1}{1 - \gamma (t_2 - t_1)}$
(c) $d_2 = \frac{d_1}{1 - 2\gamma (t_2 - t_1)}$ (d) $d_2 = \frac{d_1}{1 + 2\gamma (t_2 - t_1)}$

24. Coefficient of real expansion of mercury is 0.18×10^{-3} /°C. If the density of mercury at 0°C is 13.6 g/cc, its density at 473 K will be :
(a) 13.11 g/cc (b) 13.65 g/cc
(c) 13.51 g/cc (d) 13.22 g/cc

25. A glass vessel just holds 50 g of a liquid at 0°C. If the coefficient of linear expansion of glass is 8×10^{-4} /°C. The mass of the liquid, it holds at 50° C is :
(a) 46 g (b) 48 g (c) 56 g (d) 42 g

26. When a dielectric material is introduced between the plates of a charged condenser the electric field between the plates :
(a) decreases
(b) increases
(c) does not change
(d) may increase or decrease

27. An electric current passes through a long straight wire. At a distance 5 cm from the wire, the magnetic field is *B*. The field at 20 cm from the wire would be :
(a) $2B$ (b) $\frac{B}{4}$ (c) $\frac{B}{2}$ (d) B

28. If in a wheatstone bridge the battery and galvanometer are interchanged the condition for balance :
(a) is disturbed
(b) is not disturbed
(c) depends on the internal resistance of the bridge
(d) depends on the values of the resistances in the bridge

29. Two circular coils are made of two identical wires of the same length. If the number of turns in the two coils are 4 and 2, then the ratio of magnetic inductions at the centre will be :
(a) 4 : 1 (b) 2 : 1 (c) 1 : 2 (d) 1 : 1

30. A parallel plate condensor is charged and disconnected from the battery. If the plates of the capacitor are moved further apart by means of insulating handles :
(a) the charge in the capacitor becomes zero
(b) the capacitance becomes infinite
(c) the charge in the capacitor increases
(d) the voltage across the plates increases

31. An observer is moving away from a sound source of frequency 100 Hz. If the observer is moving with a velocity 49 m/s and the speed of sound in air is 330 m/s. The observed frequency is :
(a) 85 Hz (b) 91 Hz
(c) 100 Hz (d) 149 Hz

32. An incandescent filament emits a spectrum which is a :
(a) line spectrum
(b) band spectrum
(c) continuous spectrum
(d) characteristic spectrum

33. Reflection of a light wave at a fixed point results in a phase difference between the incident and reflected wave of :
(a) $\frac{3\pi}{2}$ rad (b) 2π rad
(c) π rad (d) $\frac{\pi}{2}$ rad

34. In a Huygen's eye piece the eye lens has a focal length of 'f'. The equivalent focal length of eye piece is :
(a) $\frac{4}{3}f$ (b) $4f$ (c) $2f$ (d) $\frac{3f}{2}$

35. An astronomical telescope has a length of 310 cm and a magnifying power of 30. The focal length of its objective is :
(a) 310 cm (b) 300 cm
(c) 155 cm (d) 150 cm

36. A fan is making 600 rev/min. If it makes 1200 rev/min, what is the increase in its angular velocity?
(a) 10π rad/s (b) 20π rad/s
(c) 60π rad/s (d) 40π rad/s

37. The angular velocity of a rickshaw wheel is 70 rad/s. If the radius of the wheel is 0.5 m, the linear velocity is :
(a) 10 m/s (b) 1 m/s
(c) 35 m/s (d) 70 m/s

38. The escape velocity of a body from the earth is u. What is the escape velocity from a planet whose mass and radius are twice those of the earth ?
(a) $2u$ (b) u
(c) $4u$ (d) $16u$

39. Average energy in one time period of a simple harmonic oscillator whose amplitude is A, angular velocity is ω and mass is m is :
(a) $m\omega^2A^2$ (b) $2m\omega^2A^2$
(c) $m\omega^2A^2/2$ (d) zero

40. A wire whose cross-sectional area is 2 mm^2 is stretched by 0.1 mm by a certain load. If a similar wire of triple the area of cross-section is stretched by the same load, the elongation of the second wire would be :
(a) 0.33 mm (b) 0.033 mm
(c) 3.3 mm (d) 0.0033 mm

41. An infinite number of charges of equal magnitude q, but of opposite sign are placed along the x-axis at $x=1, x=2, x=4, x=8$ and so on. The electric potential at the point $x=0$ due to these charges will be proportional to :
(a) $\frac{q}{2}$ (b) $\frac{q}{3}$
(c) $\frac{2q}{3}$ (d) $\frac{3q}{2}$

42. Two capacitors 2 μF and 4 μF are connected in series and a potential of 100 volt is applied across the combination. Energy stored in the capacitors is :
(a) 0 . 0067 J (b) 0 . 067 J
(c) 0 . 0033 J (d) 0 . 057 J

43. In a photoelectric phenomenon, the number of photoelectrons emitted depends on :
(a) the intensity of incident radiation
(b) the frequency of incident radiation
(c) the velocity of incident radiation
(d) the work function of the photo cathode

44. According to the Moseley's law, the frequency of a spectral line in X-ray spectrum varies as :
(a) atomic number of the element
(b) square of atomic number of the element
(c) square root of atomic number of element
(d) fourth power of atomic number of the element

45. The photoelectric work function for a metal surface is 4 . 125 eV. The cut-off wavelength for this surface is :
(a) 4125 Å (b) 2062.5 Å
(c) 3000 Å (d) 6000 Å

46. Two bodies with kinetic energies in the ratio of 4 : 1 are moving with equal linear momentum. The ratio of their masses is :
(a) 1 : 2 (b) 1 : 1
(c) 4 : 1 (d) 1 : 4

47. If a particle tied to the end of string is set in circular motion then the tension of the string is :
(a) always parallel to the velocity of the particle
(b) always perpendicular to the velocity of the particle
(c) perpendicular to the velocity of the particle only at one instant
(d) parallel to the velocity of the particle only at one instant

48. A body of weight 50 N is placed on a smooth surface. If the force required to move the body on the rough surface is 30 N the coefficient of friction is :
(a) 0 . 60 (b) 1 . 2 (c) 0 . 3 (d) 1 . 67

49. A motor cycle is travelling on a curved track of radius 500 m. If the coefficient of friction between the tyres and road is 0.5, with $g = 10\ m/s^2$. What should be the maximum speed to avoid skidding?
(a) 500 m/s (b) 250 m/s
(c) 50 m/s (d) 10 m/s

50. A wheel of mass 10 kg has a moment of inertia of 160 kg. m^2 about its own axis. The radius of gyration is :
(a) 10 m (b) 4 m (c) 5 m (d) 6 m

CHEMISTRY

1. When sodium argentocyanide is treated with zinc dust, silver precipitates because :
(a) silver is more electropositive than zinc
(b) zinc is more electropositive than silver
(c) zinc forms a complex readily with cyanide
(d) both Zn^{2+} and Ag^+ ions have d^{10} electronic configuration

2. The molecular weight of an organic compound is 180. Its empirical formula is CH_2O. The molecular formula is :
(a) $C_6H_{12}O_6$ (b) $C_7H_{16}O_5$
(c) $C_8H_4O_5$ (d) $C_5H_8O_7$

3. Action of zinc dust on tetra-bromo ethane gives :
(a) CH_2OH (b) $CH \equiv CH$
(c) $\begin{matrix} CH_2{=}CH_2 \\ | \\ CH_2OH \end{matrix}$ (d) $CH_3 - CH_3$

4. The number of isomeric structures possible for a molecule having molecular formula C_5H_{12}, is :
(a) 2 (b) 3 (c) 4 (d) 5

5. An isomer of ethanol is :
(a) methanol (b) dimethyl ether
(c) diethyl ether (d) ethylene glycol

6. At STP the density of a gas (molecular weight 45) in g/L is :
(a) 2 (b) 22.4 (c) 11.2 (d) 1000

7. Gases show ideal behaviour at :
(a) high pressure and high temperature
(b) low pressure and high temperature
(c) low pressure and low temperature
(d) high pressure and low temperature

8. The weight in grams of KCl (mol. wt. = 74.5) in 100 mL of a 0.1 M KCl solution is :
(a) 74.5 (b) 7.45 (c) 0.745 (d) 0.0745

9. The reaction taking place at the anode when an aqueous solution of $CuSO_4$ is electrolysed using inert Pt electrodes :
(a) $2SO_4^2 \rightarrow S_2O_4^2 + 2e^-$
(b) $Cu^2 + 2e^- \rightarrow Cu$
(c) $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$
(d) $2H^+ + 2e^- \rightarrow H_2$

10. The standard reduction potentials at 298 K for the following half cell reactions are given below :

$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s) - 0.762$

$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s) - 0.740$

$2H^+(aq) + 2e^- \rightarrow H_2(g) - 0.000$

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq) - 0.770$

Which one is the strongest reducing agent ?

(a) Zn (s) (b) Cr (s)

(c) H_2 (g) (d) Fe^{2+} (aq)

11. Which one of the following compounds is most acidic ?

(a) CH_3Cl (b) CH_3OH

(c) $H_2C{=}CH_2$ (d) $HC{\equiv}CH$

12. Which of the following reagents and conditions convert benzene to chlorobenzene ?

(a) Cl_2, sunlight, heat

(b) HCl, heat

(c) HCl, sunlight, heat

(d) Cl_2, $AlCl_3$, heat

13. Alkyl halide reacting with metallic sodium in dry ether solution is called :

(a) Friedel-Craft's reaction

(b) Sandmeyer's reaction

(c) Wurtz reaction

(d) Gabriel's reaction

14. When an alkyl halide reacts with an alkoxide the product is :

(a) hydrocarbon

(b) unsaturated hydrocarbon

(c) ether

(d) alcohol

15. Compound *A* reacts with PCl_5 to give *B* which on treatment with KCN followed by hydrolysis gave acid as the product. What is *A* ?

(a) Propane (b) Ethane

(c) Ethyl chloride (d) Ethyl alcohol

16. The de-Broglie wavelength associated with a particle of mass 1 mg moving with a velocity of 10 ms^{-1} is :

(a) 6.63×10^{-29} m (b) 6.63×10^{-31} m

(c) 6.63×10^{-34} m (d) 6.63×10^{-22} m

17. The rule that explains the reason for chromium to have [Ar] $3d^5 4s^1$ configuration instead of [Ar] $3d^4 4s^2$?

(a) Pauli's exclusion principle

(b) Aufbau principle

(c) Hund's rule

(d) Heisenberg principle

18. The state of hybridisation of boron in BCl_3 is :

(a) sp^3 (b) sp^2 (c) sp (d) spd^3

19. The effect of repulsion between the two lone pairs of electrons present on oxygen in water molecule is :

(a) no change in H-O-H bond angle

(b) inecrease in H-O-H bond angle

(c) decrease in H-O-H bond angle

(d) all atoms will be in one plane

20. The pair of elements that have similar chemical properties are :

(a) beryllium and boron

(b) aluminium and magnesium

(c) carbon and nitrogen

(d) lithium and magnesium

21. In the equilibrium reaction

$$A + B \rightleftharpoons C + D$$

The activation energy for the forward reaction is 25 kcal mol^{-1} and that of the backward reaction is 15 kcal mol^{-1}. Which one of the following statements is correct ?

(a) It is an exothermic process

(b) It is an endothermic process

(c) It is a reaction for which $\Delta H = 0$

(d) It is a sublimation process

22. The equilibrium concentration of C_2H_4 in the following gas phase reaction can be increased by

$C_2H_4(g) + H_2(g) \rightleftharpoons C_2H_6(g)$;

$\Delta H = 32.7$ kcal. :

(a) removal of C_2H_6

(b) removing H_2

(c) increase in temperature

(d) increase in pressure

23. Liquid benzene burns in oxygen according to

$2C_6H_6(l) + 15\,O_2(g) \longrightarrow 12CO_2(g) + 6H_2O(g)$

How many litres of oxygen are required for complete combustion of 39g of liquid C_6H_6 (atomic wt. of C = 12, O = 16) :

(a) 11.2 (b) 22.4 (c) 42 (d) 84

24. Hg sticks to the surface of the glass when it comes in contact with :
(a) H_2O (b) HNO_3 (c) O_3 (d) I_2

25. The temperature at which heavy water has maximum density is :
(a) 1.16°C (b) 4°C
(c) 4.6°C (d) 11.6°C

26. Poisonous gas present in the exhaust fumes of an automobile is :
(a) C_2H_6 (b) CO_2 (c) CO (d) CH_4

27. Superphosphate is a mixture of :
(a) $Ca(H_2PO_4)_2.H_2O + Ca\,Cl_2.2H_2O$
(b) $Ca(H_2PO_4)_2.H_2O + 2CaSO_4.2H_2O$
(c) $Ca_3(PO_4)_2.H_2O + 2CaSO_4.2H_2O$
(d) $Ca_3(PO_4)_2.H_2O + CaCl_2.2H_2O$

28. The bond angle of H_2X (where X is a sixth group element) as one goes down the group :
(a) increases
(b) decreases
(c) does not change
(d) changes irregularly

29. With respect to both oxygen and ozone, which one of the following statements is not correct ?
(a) Both have similar reactivity with water
(b) Oxygen is colourless and ozone is coloured
(c) Oxygen valency is 2 in both
(d) Oxygen has 2 bonds and ozone has 3 bonds

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

31. Which of the following is used to bombard $_{13}Al^{27}$ to give $_{15}P^{30}$ and a neutron ?
(a) Proton (b) α-particle
(c) β-particle (d) Deuteron

32. Urine normally has a pH of 6. If a patient eliminates 1.3 L of urine per day, how many moles of H^+ ions does he urinate ?
(a) 1.3×10^{-3} (b) 1.3×10^{-6}
(c) 1.3×10^{-7} (d) 1.3×10^{6}

33. If the pH of a solution is increased from 3 to 6, its hydrogen ion concentration will be :
(a) reduced to half
(b) doubled
(c) reduced by 1000 times
(d) increased by 1000 times

34. When Zn metal is added to $CuSO_4$ solution, Cu is precipitated, it is due to :
(a) oxidation of Cu^{2+}
(b) reduction of Cu^{2+}
(c) hydrolysis of $CuSO_4$
(d) ionisation of $CuSO_4$

35. The volume in litres of CO_2 liberated at STP when 10 g of 90% pure limestone is heated completely is :
(a) 2.016 (b) 20.16 (c) 2.24 (d) 22.4

36. Bleaching action of SO_2 is due to its :
(a) oxidising action
(b) ability to hydrolyse
(c) acidic nature
(d) reducing action

37. The element that can exhibit highest number of oxidation states amongst the following :
(a) V (b) Mn (c) Ni (d) Co

38. The number of moles of AgCl precipitated when excess $AgNO_3$ is mixed with one mole of $[Cr(NH_3)4Cl_2]\,Cl$ is :
(a) 0 (b) 1
(c) 2 (d) 3

39. The molecular formula of cryolite is :
(a) $3NaF.AlF_3$ (b) AlF_3
(c) $2NaF.AlF_3$ (d) $NaF.AlF_3$

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

41. Diethyl ether is prepared by passing ethyl alcohol vapours over a catalyst under high pressure and temperature. The catalyst is :
(a) SiO_2 (b) CuO
(c) Al_2O_3 (d) Ag_2O

42. Acetone on reaction with chlorine gives normally :
(a) mono-chloro acetone
(b) dichloro acetone
(c) trichloro acetone
(d) hexachloro acetone

43. The reagent used for converting ethanoic acid to ethanol :
(a) $LiAlH_4$ (b) BH_3
(c) PCl_5 (d) $K_2Cr_2O_7$

44. Aniline when heated with $NaNO_2$ and HCl at 0.5°C the product formed is :
(a) chloro aniline
(b) benzene diazonium chloride
(c) chloro benzene
(d) dichloro benzene

45. Oxidation of aniline with potassium dichromate and sulphuric acid gives :
(a) *o*-nitro aniline
(b) *n*-nitrosoaniline
(c) *p*-benzoquinone
(d) *o*-benzoquinone

46. Sodium amalgam is useful as :
(a) oxidising agent (b) catalyst
(c) reducing agent (d) bleaching agent

47. The oxidation state of sodium in sodium amalgam is :
(a) +1 (b) −1 (c) zero (d) +2

48. The alum used for purifying water is :
(a) ammonium alum (b) chrome alum
(c) ferric alum (d) potash alum

49. The chemical formula of diaspore, an ore of aluminium is :
(a) $Al_2O_3.3H_2O$ (b) $Al_2O_3.2H_2O$
(c) $Al_2O_3.H_2O$ (d) Al_2O_3

50. The inert form of carbon is :
(a) diamond (b) graphite
(c) coal (d) charcoal

MATHEMATICS

1. $\int \sin^2 x \cos^3 x\, dx$ is equal to :
(a) $\frac{1}{3}\sin^3 x - \frac{1}{5}\sin^5 x + c$
(b) $\frac{1}{3}\cos^3 x - \frac{1}{5}\sin^5 x + c$
(c) $\frac{1}{5}\sin^3 x - \frac{1}{3}\sin^5 x + c$
(d) $\frac{1}{3}\tan^3 x - \frac{1}{5}\sin^5 x + c$

2. $\int_0^1 \frac{1-x}{1+x}\, dx$ is equal to :
(a) $2\log 2 - 1$ (b) $1 + \log 4$
(c) $\log 2 - 1$ (d) $2\log 2$

3. $\int \frac{xe^x\, dx}{(2+x)^3}$ is equal to :
(a) $\frac{e^x}{(2+x)^2} + c$ (b) $\frac{xe^x}{(2+x)^2} + c$
(c) $\frac{e^x}{(2+x)^2} + c$ (d) $\frac{xe^x}{(2+x)^2} + c$

4. AOB is the positive quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where $OA = a$, $OB = b$. The area between the arc AB and the chord AB of the ellipse is :
(a) πab sq unit
(b) $(\pi - 2)ab$ sq unit
(c) $\frac{ab(\pi - 2)}{2}$ sq unit
(d) $\frac{ab(\pi - 2)}{4}$ sq unit

5. The area of the segment cut off from the parabola $x^2 = 8y$ by the line $x - 2y + 8 = 0$ (in sq unit) is :
(a) 12 (b) 24 (c) 48 (d) 36

6. $\begin{vmatrix} a+b & a & b \\ a & a+c & c \\ b & c & b+c \end{vmatrix}$ is equal to :
(a) $4abc$ (b) abc
(c) $a^2b^2c^2$ (d) $4a^2bc$

7. If the matrix A is such that $A\begin{bmatrix} -1 & 2 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$, then A is :
(a) $\begin{bmatrix} 1 & 1 \\ 2 & -3 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ -2 & 3 \end{bmatrix}$
(c) $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 1 \\ 2 & 3 \end{bmatrix}$

8. $A = \begin{bmatrix} -1 & 2 \\ 3 & 2 \end{bmatrix}$, $8A^{-1}$ is equal to :
(a) $\begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} -2 & 2 \\ 3 & 1 \end{bmatrix}$
(c) $\begin{bmatrix} -1 & 3 \\ 2 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 3 \\ 2 & -2 \end{bmatrix}$

9. If A is a 3×3 matrix and $\det(3A) = k \det(A)$, k is :
(a) 9 (b) 6 (c) 1 (d) 27

10. In the group $(Z, *)$ of integers, where $a * b = a + b + 1$ for $a, b \in Z$, then inverse of $-2 \in Z$ is :
(a) 2 (b) 1 (c) 0 (d) -1

11. The eccentricity of the ellipse $9x^2 + 5y^2 - 30y = 0$ is :
(a) $\frac{1}{3}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

12. If the length of the major axis of an ellipse is three times the length of minor axis, its eccentricity is :
(a) $\frac{1}{3}$ (b) $\frac{2}{\sqrt{3}}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{2\sqrt{2}}{3}$

13. If the normal at 't_1' on the parabola $y^2 = 4ax$ meets it again at 't_2', then t_2 is :
(a) $t_1 + \frac{2}{t_1}$ (b) $-t_1 - \frac{2}{t_1}$
(c) $t_1 + \frac{1}{t_1}$ (d) $t_1 - \frac{1}{t_1}$

14. The length of the latus rectum of the hyperbola $x^2 - 4y^2 = 4$ is :
(a) 2 (b) 1 (c) 4 (d) 3

15. The condition that the line $y = mx + c$ may be tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is :
(a) $c^2 = a^2m^2 - b^2$ (b) $c^2 = b^2 - a^2m^2$
(c) $c^2 = a^2 - b^2m^2$ (d) $c^2 = a^2 + b^2m^2$

16. If $f : A \to B$ is a bijective function, then $f^{-1}of$ is :
(a) fof^{-1}
(b) f
(c) f^{-1}
(d) I_A (Identity mapping of the set A)

17. If $f(y) = \frac{y}{\sqrt{1+y^2}}$, $g(y) = \frac{y}{\sqrt{1-y^2}}$, then $(fog)y$ is equal to :
(a) $\frac{y}{\sqrt{1-y^2}}$ (b) $\frac{y}{\sqrt{1+y^2}}$
(c) y (d) $\frac{1-y^2}{\sqrt{1-y^2}}$

18. If $f : R \to R$ is defined by $f(x) = 2x + |x|$, then $f(3x) - f(-x) - 4x$ is :
(a) $f(x)$ (b) $-f(x)$
(c) $f(-x)$ (d) $2f(x)$

19. If $x = \frac{2}{3+\sqrt{7}}$, then $(x-3)^2$ is equal to :
(a) 1 (b) 3 (c) 7 (d) 6

20. If $(1.5)^a = (0.15)^b = 100$, then $\frac{1}{a} - \frac{1}{b}$ is equal to :
(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

21. There are two towers on a horizontal line from the mid point of the line joining their feet. The tops of the higher and lowers appear at an angle of elevations on 60° and 30° respectively. The first tower has a height of 100 metres. The height of the second tower is :
(a) $\frac{100}{\sqrt{3}}$ m (b) $\frac{100}{\sqrt{5}}$ m
(c) $\sqrt{2}$ 100 m (d) $\frac{100}{3}$ m

22. The horizontal distance between two towers is 60 m and the angular depres- sion of the top of the first as seen from the second, which is 150 metre high is 30°. The height of the first tower is :
(a) $(150 + 20\sqrt{3})$ m (b) $(150 + 15\sqrt{3})$ m
(c) $(150 - 20\sqrt{5})$ m (d) $(150 - 20\sqrt{3})$ m

23. The probability that a number selected at random from the set of numbers {1, 2, 3, ... 100} is a cube, is :
(a) $\frac{1}{25}$ (b) $\frac{2}{25}$ (c) $\frac{3}{25}$ (d) $\frac{4}{25}$

24. When two dice are thrown. The probability of getting 10 or 11 is :
(a) $\frac{7}{36}$ (b) $\frac{5}{36}$ (c) $\frac{5}{18}$ (d) $\frac{7}{18}$

25. The probability of getting exactly 4 heads in 6 tosses of a coin, is :
(a) $\frac{15}{60}$ (b) $\frac{15}{64}$ (c) $\frac{13}{64}$ (d) $\frac{10}{64}$

26. $0.0001 < n < 0.001$, then :
(a) $-4 < \log n < -3$
(b) $-3 < \log n < -2$
(c) $-2 < \log n < -1$
(d) $-5 < \log n < -4$

27. The number of diagonals for n-sided polygon is :

(a) $\frac{n(n-1)}{2}$ (b) $\frac{n(n-1)(n-2)}{6}$

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

28. If $\frac{3x+4}{x^2-3x+2} = \frac{A}{x-2} - \frac{B}{x-1}$, then (A, B) is:

(a) (7, 10) (b) (10, 7)

(c) (10, – 7) (d) (– 10, 7)

29. If $C_0, C_2, C_4, \ldots$ are binomial coefficients in the expansion of $(1+x)^9$, then $C_0 + C_2 + C_4 + C_6 + C_8$ is equal to :

(a) 2^7 (b) 256 (c) 2^9 (d) 258

30. If T_r denotes the rth term in the expansion of $\left(x + \frac{1}{x}\right)^{23}$, then :

(a) $T_{12} = T_{13}$ (b) $x^2 - T_{13} = T_{12}$

(c) $T_{12} = x^2 T_{13}$ (d) $T_{12} + T_{13} = 25$

31. If $A = (-3, 4)$, $B = (-1, -2)$, $C = (5, 6)$ and $D = (x, -4)$ are vertices of a quadrilateral such that $\Delta ABD = 2\Delta ACD$, then x is :

(a) 6 (b) 9 (c) 69 (d) 96

32. The angle between the lines $x\cos\alpha + y\sin\alpha = p_1$, and $x\cos\beta + y\sin\beta = p_2$, where $\alpha > \beta$ is :

(a) $\alpha + \beta$ (b) $\alpha - \beta$

(c) $\alpha\beta$ (d) $2\alpha - \beta$

33. The foot of the perpendicular from the point (3, 4) on the line $3x - 4y + 5 = 0$ is :

(a) $\left(\frac{81}{25}, \frac{92}{25}\right)$ (b) $\left(\frac{92}{25}, \frac{81}{25}\right)$

(c) $\left(\frac{46}{25}, \frac{54}{25}\right)$ (d) $\left(-\frac{81}{25}, \frac{92}{25}\right)$

34. If $ax^2 + 6xy + by^2 - 10x + 10y - 6 = 0$, represents a pair of perpendicular straight lines, then a is equal to :

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

35. The point of intersection of the pair of lines $x^2 + xy + 2y^2 - 5x + 2y + 4 = 0$ is :

(a) (1, 2) (b) (– 1, 2)

(d) (– 2, 1) (d) $\left(\frac{22}{7}, -\frac{9}{7}\right)$

36. In the multiplication group of integers modulo 7 the inverse of 5 is :

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

37. If $x = \sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$, then $\frac{2x}{1-x^2}$ is :

(a) $\sin\theta$ (b) $\cos\theta$ (c) $\tan\theta$ (d) $\cot\theta$

38. $\frac{3\cos\theta + \cos 3\theta}{3\sin\theta - \sin 3\theta}$ is equal to :

(a) $\cos^2\theta + 1$ (b) $\cot^4\theta$

(c) $\cot^3\theta$ (d) $2\cot\theta$

39. $\cos^2\frac{3\pi}{5} + \cos^2\frac{4\pi}{5}$ is equal to :

(a) $\frac{4}{5}$ (b) $\frac{5}{2}$ (c) $\frac{5}{4}$ (d) $\frac{3}{4}$

40. If $A = \sin^2\theta + \cos^4\theta$, then for all values of θ, where :

(a) $+1 \le A \le 2$ (b) $\frac{3}{4} \le A \le 1$

(c) $0 \le A \le 1$ (d) $\frac{1}{4} \le A \le \frac{1}{2}$

41. If in a binomial distribution the mean is 20 and standard deviation is $\sqrt{15}$. Then p is :

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

42. If the mean is λ and the variance is σ^2 in a poisson distribution, then :

(a) $\lambda = \frac{1}{2}\sigma^2$ (b) $\sigma^2 = \frac{1}{2}\lambda$

(c) $\lambda = \sigma^2$ (d) $\sigma^2 = \lambda^2$

43. The area of the triangle formed by the co-ordinate axes and the line $4x + 5y = 20$ is (in square units) :

(a) 5 (b) 10 (c) 15 (d) 20

44. The angle between the lines formed by joining the points (2, – 3), (– 5, + 1) and (7, – 1), (0, 3) is :

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) 0 (d) $\frac{\pi}{6}$

45. The variable line $\frac{x}{a} + \frac{y}{b} = 1$ is such that $a + b = 10$, the locus of the mid point of the portion of the line intercepted between the axes is :

(a) $x + y = 10$ (b) $10x + 5y = 1$

(c) $x + y = 5$ (d) $5x + 10y = 1$

46. The equation of the tangent to the curve $6y = 7 - x^3$ at (1, 1) is :
(a) $2x + y = 3$ (b) $x + 2y = 3$
(c) $x + y = 1$ (d) $x + y + 2 = 0$

47. The percentage error in measuring the side of a cube is 0.5. The percentage error in its volume, is :
(a) $\frac{1}{2}$ (b) 1 (c) $\frac{3}{2}$ (d) 2

48. If $y = (x^2 - 1)^n$, then
$(x^2 - 1)\, y_{n+2} + 2xy_{n+1}$ is equal to :
(a) $(n^2 + 1)y_n$ (b) $(n^2 - 1)y_n$
(c) $(n^2 + 1)y_n$ (d) $n(n + 1)y_n$

49. The slope of the normal to the curve $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ at $\theta = \frac{\pi}{2}$ is :
(a) 0 (b) 1
(c) -1 (d) $\frac{1}{\sqrt{2}}$

50. $\frac{d}{dx}\left[\sin^2 \cot^{-1}\sqrt{\frac{1+x}{1-x}}\right]$ is equal to :
(a) 0 (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) -1

51. From the origin, chords are drawn to the circle $x^2 + y^2 - 2y = 0$. The locus of the middle point of these chords is :
(a) $x^2 + y^2 - y = 0$ (b) $x^2 + y^2 - x = 0$
(c) $x^2 + y^2 - 2x = 0$ (d) $x^2 + y^2 - x - y = 0$

52. If the circles of same radius 'a' and centres at (2, 3) and (5, 6) cut orthogonally, then a is :
(a) 3 (b) 4
(c) 6 (d) 10

53. The radius of the circle which has the lines $x + y - 1 = 0$ and $x + y - 9 = 0$ as tangent, is :
(a) $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $\frac{3}{\sqrt{2}}$ (d) $\frac{4}{\sqrt{2}}$

54. Axis of the parabola $x^2 - 3y - 6x + 6 = 0$ is :
(a) $x = -3$ (b) $y = -1$
(c) $x = 3$ (d) $y = 1$

55. The eccentricity of the hyperbola $9x^2 - 16y^2 + 72x - 32y - 16 = 0$ is :
(a) $\frac{5}{4}$ (b) $\frac{4}{5}$ (c) $\frac{9}{16}$ (d) $\frac{16}{9}$

56. If $\vec{\alpha} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{\beta} = -\hat{i} + \hat{j} + \hat{k}$, then the unit vector parallel to the vector $\vec{\alpha} + \vec{\beta}$ is :
(a) $\frac{2}{3}\hat{i} - \frac{1}{3}\hat{j} + \frac{2}{3}\hat{k}$
(b) $\frac{2}{5}\hat{i} - \frac{1}{5}\hat{j} + \frac{2}{5}\hat{k}$
(c) $\frac{2}{\sqrt{3}}\hat{i} - \frac{1}{\sqrt{3}}\hat{j} + \frac{2}{3}\hat{k}$
(d) $-\frac{2}{\sqrt{3}}\hat{i} - \frac{1}{\sqrt{3}}\hat{j} - \frac{2}{\sqrt{3}}\hat{k}$

57. If $\vec{a} = \hat{i} + \hat{j} + t\,\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$, the values of '$t$' for which $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ are perpendicular is :
(a) ± 2 (b) $\pm 2\sqrt{2}$
(c) $\pm 2\sqrt{3}$ (d) ± 3

58. If the volume of the tetrahedron with edges $\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + a\hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} - \hat{k}$ is one cubic unit, then a is :
(a) 1 (b) -1 (c) 2 (d) -2

59. If the three vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + \lambda\hat{j} + 5\hat{k}$ are coplanar, then λ is equal to :
(a) 2 (b) 3 (c) -4 (d) 4

60. The area of the triangle formed by the points whose position vectors are $3\hat{i} + \hat{j}$, $5\hat{i} + 2\hat{j} + \hat{k}$, $\hat{i} - 2\hat{j} + 3\hat{k}$ is :
(a) $\sqrt{23}$ sq unit (b) $\sqrt{21}$ sq unit
(c) $\sqrt{29}$ sq unit (d) $\sqrt{33}$ sq unit

61. The coefficient of x^5 in the expansion of $(1 + x^2)^5\,(1 + x)^4$ is :
(a) 20 (b) 30 (c) 60 (d) 55

62. In the argand diagram, all the complex numbers z satisfying $|z - 4i| + |z + 4i| = 10$ lie on a/an :
(a) straight line (b) circle
(c) ellipse (d) parabola

63. The product of all nth roots of unity $(n > 1)$ is :
(a) 0 (b) $(-1)^{n-1}$
(c) (-1) (d) 1

64. If $|z - 3 + i| = 4$, then the locus of z is :
(a) $x^2 + y^2 - 6x + 2y - 6 = 0$
(b) $x^2 + y^2 - 6 = 0$
(c) $x^2 + y^2 - 3x + y - 6 = 0$
(d) $x^2 + y^2 = 0$

65. Area of the triangle on the argand diagram formed by the complex numbers $z, iz, z+iz$, where $z = x+iy$ is :
(a) $|z|$ (b) $|z|^2$
(c) $2|z|^2$ (d) $\frac{1}{2}|z|^2$

66. The equation of the chord $y^2 = 6x$ having middle point at $(-1, 1)$ is :
(a) $y - 3x = 4$ (b) $y - 3x + 4 = 0$
(c) $3x - y = 0$ (d) $3x - y = 1$

67. The point of contact of the line $2x - y + 2 = 0$ with the parabola $y^2 = 16x$ is :
(a) $(2, 4)$ (b) $(3, 4)$
(c) $(1, 4)$ (d) $(-2, 1)$

68. The number of normals that can be drawn from a point to an ellipse is :
(a) 1 (b) 2 (c) 3 (d) 4

69. $\frac{d}{dx}\left\{\sin^{-1}\left(\frac{3x}{2} - \frac{x^3}{2}\right)\right\}$ is equal to :
(a) $\frac{3}{\sqrt{4-x^2}}$ (b) $-\frac{3}{\sqrt{4-x^2}}$
(c) $\frac{1}{\sqrt{4-x^2}}$ (d) 70. $\frac{-1}{\sqrt{4-x^2}}$

70. The point on the curve $y = x^2$, which is nearest to $(3, 0)$, is :
(a) $(1, -1)$ (b) $(-1, 1)$
(c) $(-1, -1)$ (d) $(1, 1)$

71. If one of the two lines given by $ax^2 + 2hxy + by^2 = 0$ bisects the angle between the coordinate axes, then :
(a) $a^2 + b^2 = 2h^2$ (b) $a^2 + b^2 = h^2$
(c) $(a+b)^2 = h^2$ (d) $(a+b)^2 = 4h^2$

72. The polar of $(-2, 3)$ with respect to $x^2 + y^2 - 4x - 6y + 5 = 0$ is :
(a) $x = 0$ (b) $y = 0$
(c) $x = 1$ (d) $y = 1$

73. Equation of the tangent at $(1, 1)$ to the circle $2x^2 + 2y^2 - 2x - 5y + 3 = 0$ is :
(a) $2x + y - 1 = 0$ (b) $2x - y - 1 = 0$
(c) $x + 2y - 1 = 0$ (d) $2x + y + 1 = 0$

74. Given the circle $x^2 + y^2 = 25$, the equation of its chord with $(1, -1)$ as the mid point :
(a) $x + y = 2$ (b) $x + y + 2 = 0$
(c) $x - y = 2$ (d) $2x - y = 2$

75. If $(0, 0)$ is one limiting point of a coaxial system of circles whose common radical axis is the line $x + y = 1$, then the other limiting point is :
(a) $(1, 1)$ (b) $(-1, -1)$
(c) $(1, -1)$ (d) $(-1, 1)$

76. The angle between the curves $y^2 = 4ax$ and $ay = 2x^2$ is :
(a) $\tan^{-1}\left(\frac{3}{4}\right)$ (b) $\tan^{-1}\left(\frac{3}{5}\right)$
(c) $\tan^{-1}\left(\frac{4}{3}\right)$ (d) $\tan^{-1}\left(\frac{5}{3}\right)$

77. The approximate percentage reduction in the volume of a cube of ice, if each side of the ice cube is reduced by 0.7% due to melting is :
(a) 2.1% (b) 2.5% (c) 3.2% (d) 3.3%

78. If $y \sin x = x + y$, then $\left(\frac{dy}{dx}\right)_{(0,0)}$ is equal to :
(a) 1 (b) -1 (c) 0 (d) 2

79. If the rate of decrease of $\frac{x^2}{2} - 2x + 5$ is twice the rate of decrease of x, then x is :
(a) 2 (b) 3 (c) 4 (d) 1

80. If the length of a simple pendulum is decreased by 3%, the present error in its period T is :
(a) 2% (b) 2.5% (c) 1.8% (d) 1.5%

81. $(1 - \cos\theta + i\sin\theta)^8$ is equal to :
(a) $256\sin^8\frac{\theta}{2}(\cos 4\theta + i\sin 4\theta)$
(b) $256\cos^8\frac{\theta}{2}(\cos 4\theta - i\sin 4\theta)$
(c) $256\sin^8\frac{\theta}{2}(\sin 4\theta - i\cos 4\theta)$
(d) $256\sin^8\frac{\theta}{2}(\cos 4\theta - i\sin 4\theta)$

82. If one root of the quadratic equation $ax^2 + bx + c = 0$ is $3 - 4i$, then $a + b + c$ is :
(a) 40 (b) 36
(c) -20 (d) 20

83. If $x^2 + 6x - 27 > 0$, $-x^2 + 3x + 4 > 0$, then x lies in the interval :
(a) $(3, 4)$ (b) $(-3, 4)$
(c) $(-\infty, 3) \cup (4, \infty)$ (d) $(-4, 3)$

84. If $(3, 4i)$ is a root of $x^2 + px + q = 0$, then (p, q) is :
(a) (6, 25) (b) (– 6, – 7)
(c) (6, 1) (d) (– 6, 25)

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

86. Area bounded by the curves $y = x$ and $y = x^3$ is :
(a) $\frac{1}{4}$ sq unit (b) $\frac{1}{6}$ sq unit
(c) $\frac{1}{12}$ sq unit (d) $\frac{1}{2}$ sq unit

87. The area in square units bounded by the x-axis, part of the curve $y = 1 + \frac{8}{x^2}$ and the co-ordinates as $x = -2$ and $x = 4$ is :
(a) 2 sq unit (b) 3 sq unit
(c) 4 sq unit (d) 5 sq unit

88. $\int_{-\pi/2}^{\pi/2} \cos 3\theta \, (1 + \sin\theta)^2 \, d\theta$ is equal to :
(a) $\frac{8}{5}$ (b) $\frac{5}{8}$ (c) $-\frac{8}{5}$ (d) $-\frac{5}{8}$

89. If $\hat{i} + \hat{j} + \hat{k}$, $\hat{i} - \hat{j}$, $\hat{i} + 2\hat{j} + a\hat{k}$ are coplanar, then a is :
(a) $\frac{3}{2}$ (b) 3 (c) – 3 (d) 0

90. If the position vectors of the vertices of a triangle are $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j}$, then it is :
(a) equilateral triangle
(b) isosceles triangle
(c) right angled isosceles triangle
(d) right angled triangle

91. $z = \log\left(\frac{x^2 + y^2}{xy}\right)$, then $\frac{\partial^2 z}{\partial x \, \partial y} - \frac{\partial^2 z}{\partial y \, \partial x}$ is equal to :
(a) 0 (b) 1
(c) – 1 (d) – 2

92. If $z = e^{ax+b} f(ax - by)$, then $b\left(\frac{\partial z}{\partial x}\right) + a\left(\frac{\partial z}{\partial y}\right)$ is equal to :
(a) 0 (b) abz (c) $2abz$ (d) z

93. $\int_0^a \sqrt{a^2 - x^2}\, dx$ is equal to :
(a) $\frac{\pi a}{4}$ (b) $\frac{\pi a^2}{4}$ (c) $\frac{3\pi a^2}{4}$ (d) $\frac{\pi a}{2}$

94. $\int_0^{\pi} x \sin^4 x \, dx$ is equal to :
(a) $\frac{3\pi}{16}$ (b) $\frac{3\pi^2}{16}$ (c) $\frac{16\pi}{3}$ (d) $\frac{6\pi^2}{3}$

95. $\int \frac{dx}{\sqrt{2 - 3x - x^2}}$ is equal to :
(a) $\tan^{-1}\left(\frac{2x+3}{\sqrt{17}}\right) + c$
(b) $\sec^{-1}\left(\frac{2x+3}{\sqrt{17}}\right) + c$
(c) $\sin^{-1}\left(\frac{2x+3}{\sqrt{17}}\right) + c$
(d) $\cos^{-1}\left(\frac{2x+3}{\sqrt{17}}\right) + c$

96. If $x = \gamma \cos\alpha \cos\beta \cos\gamma$,
$y = \gamma \cos\alpha \cos\beta \sin\gamma$,
$z = \gamma \sin\alpha \cos\beta$,
and $\mu = \gamma \sin\beta$,, then $x^2 + y^2 + z^2 + \mu^2$ is :
(a) 1 (b) 0 (c) γ^2 (d) $a\gamma^2$

97. $\cos\alpha \sin(\beta - \gamma) + \cos\beta \sin(\gamma - \alpha) + \cos\gamma \sin(\alpha - \beta)$ is :
(a) 1 (b) 0
(c) $\frac{1}{2}$ (d) $4 \cos\alpha \cos\beta \cos\gamma$

98. $\cos(\alpha + \beta + \gamma) + \cos(\alpha - \beta - \gamma) + \cos(\beta - \gamma - \alpha) + \cos(\gamma - \alpha - \beta)$ is equal to :
(a) $2 \cos\alpha \cos\beta \cos\gamma$
(b) $3 \cos\alpha \cos\beta \cos\gamma$
(c) $4 \cos\alpha \cos\beta \cos\gamma$
(d) $6 \cos\alpha \cos\beta \cos\gamma$

99. If $\sqrt{3} \cos\theta - \sin\theta = 1$, then θ is :
(a) π (b) $\frac{\pi}{2}$
(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

100. If $\sinh^{-1} x = \log(5 + \sqrt{26})$, then x is :
(a) 2 (b) 3
(c) 5 (d) 6

Answers

Physics

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

Chemistry

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

Mathematics

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

Hints & Solutions

PHYSICS

1. The bullet gets embedded in the block, so the collision is inelastic, therefore only momentum will remain conserve.

2. At the highest point of the projectile there is only horizontal component of velocity, but acceleration (acceleration due to gravity) always acts vertically downwards, so the direction of velocity and acceleration are perpendicular to each other.

3. $v = 150$ m/s, $h = 490$ m

Time taken by the bomb to cover the height

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 490}{9.8}}$$

$$= \sqrt{100} = 10 \text{ sec}$$

$\therefore$ Horizontal distance covered by the bomb

$$R = v \times t$$

(horizontal velocity of the bomb will be equal to horizontal velocity of plane)

$$R = 150 \times 10$$

$$= 1500 \text{ m}$$