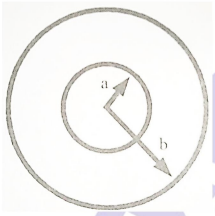
NEW STANDARD ACADEMY

Marks: 150

Date : 28-04-25 **CLASS : 12TH** **Time: 2hours**

PHYSICS

1. If the electric potential of the inner metal sphere is 10 volt & that of the outer shell is 5 volt, then the potential at the centre will be:



(a) 10 volt (b) 5 volt
(c) 15 volt (d) 0

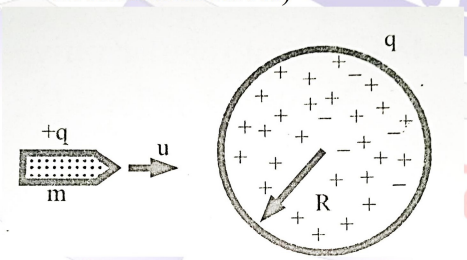
2. Three concentric metallic spherical shell A,B and C of radii a, b and c (a < b < c) have surface charge densities -σ,+σ and - σ respectively. The potential of shell A is:

(a) (σ/ε_o) [a+b-c] (b) (σ/ε_o)[a-b+c]
(c) (σ/ε_o) [b-a-c] (d) none

3. An infinite non conducting sheet of charges has a surface charges density of 10^{-7}C/m². The separation between two equipotential surfaces near the sheet whose potential differ by 5V is

(a) 0.88cm (b) 0.88mm
(c) 0.88m (d) 5×10^{-7} m

4. A bullet of mass m and charge q is fired towards a solid uniformly charged sphere of radius R and total charge +q. If it strikes the surface of sphere with speed u, find the minimum speed u so that it can penetrate through the sphere. (Neglect all resistance forces or friction acting on bullet except electrostatics forces)



(a) $\frac{q}{\sqrt{2\pi\varepsilon_0 mR}}$ (b) $\frac{q}{\sqrt{4\pi\varepsilon_0 mR}}$
(c) $\frac{q}{\sqrt{8\pi\varepsilon_0 mR}}$ (d) $\frac{q\sqrt{3}}{\sqrt{2\pi\varepsilon_0 mR}}$

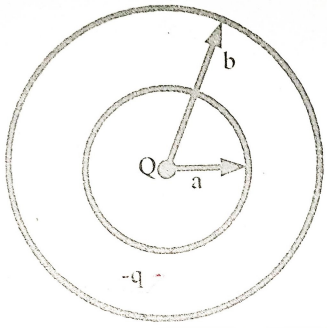
5. The equation of an equipotential line in an electric field is y = 2x then the electric field strength vector at (1,2) may be

(a) $4\hat{\imath}+3\hat{\jmath}$ (b) $4\hat{\imath}+8\hat{\jmath}$
(c) $8\hat{\imath}+4\hat{\jmath}$ (d) $-8\hat{\imath}+4\hat{\jmath}$

6. Uniform electric field of magnitude 100V/m in space is directed along the line y = 3 + x . Find the potential difference between point A(3,1)& B(1,3)

(a) 100V (b) $200\sqrt{2}V$
(c) 200 V (d) 0

Both questions (a) and (b) refer to the system of charges as shown in the figure. A spherical shell with an inner radius 'a' and an outer radius "b' is made of conducting material. A point charge +Q is placed at the centre of the spherical shell and a total charge - q is placed on the shell.



7. Charge - q is distributed on the surfaces as

(a)-Q on the inner surface, -q on outer surface
(b)-Q on the inner surface, - q + Q the outer surface
(c) +Q on the inner surface,-q-Q on the outer surface
(d) The charge -q is spread uniformly between the inner and outer surface

8. Assume that the electrostatic potential is zero at an infinite distance from the spherical shell. The electrostatic potential at a distance R(a < R < b) from the centre of the shell is

(a) 0 (b) $\frac{kQ}{a}$
(c) $K\frac{Q-q}{R}$ (d) $K\frac{Q-q}{b}$

9. A positive charge q is placed in a spherical cavity made in a positively charged sphere. The centres of sphere and cavity

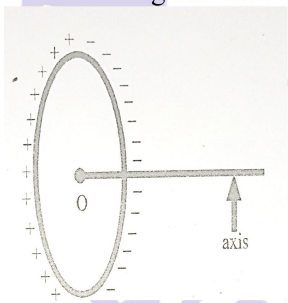
are displaced by a small distance $\vec{l}$. Force on charge q is:

(a) in the direction parallel to vector $\vec{l}$.
(b) in radial direction
(c) in a direction which depends on the magnitude of charge density in sphere
(d) direction cannot be determined

10. A conducting sphere of radius r has a charge. Then

(a) The charge is uniformly distributed over its surface, if there is an external electric field
(b) Distribution of charge over its surface will be non uniform if no external electrical field exist in space
(c) Electric field strength inside the sphere will be equal to zero only when no external electric field exists
(c) Potential at every point of the sphere must be same

11. The figure shows a non conducting ring which has positive and negative charge non uniformly distributed on it such that the total charge is zero. Which of the following statements is true?



(a) The potential at all the points on the axis will be zero.
(b) The electric field at all the points on the axis will be zero.
(c) The direction of electric field at all points on the axis will be along the axis
(d) If the ring is placed inside a uniform external electric field then net torque and force acting on the ring would be zero.

12. A point charge Q is located at the centre of a hollow spherical conductor of inner radius R_1, and outer radius R_2, the conductor being uncharged initially. The potential at the inner surface will be

(a) $KQ\left[\frac{1}{R_1}+\frac{1}{R_2}\right]$ (b) $KQ\left[\frac{1}{R_1}+\frac{1}{R_2}\right]$
(c) $KQ\left[\frac{1}{R_1}n\frac{1}{R_2}\right]$ (d) none of these

13. A dipole of $2\mu C$ charges each consists of the positive charge at the point P (1,-1) and the negative charge is placed at the point Q(-1,1). The work done in displacing a charge of $1\mu C$ from point A(-3, -3) to B (4, 4) is

(a) 1.6×10 J (b) 3.2×10^{-19} J
(c) zero (d) 4.8eV

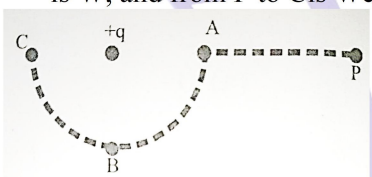
14. A and B are two concentric spheres if A is given a charge Q while B is earthed, then

(a) the charge densities of A and B are same
(b) the field inside and outside A is zero
(c) the field between A and B is not zero
(d) the field inside and outside B is zero.

15. The maximum electric field intensity on the axis of uniformly charged ring of charge q and radius R will be

(a) $\frac{1}{4\pi\varepsilon_0}\frac{q}{3\sqrt{3}R^2}$ (b) $\frac{1}{4\pi\varepsilon_0}\frac{2q}{3R^2}$
(c) $\frac{1}{4\pi\varepsilon_0}\frac{2q}{3\sqrt{3}R^2}$ (d) $\frac{1}{4\pi\varepsilon_0}\frac{3q}{3\sqrt{3}R^2}$

16. Consider the situation as shown in the adjacent figure. The work done in taking a point charge from P to A is W. from P to B is W, and from P to Cis We. Therefore,

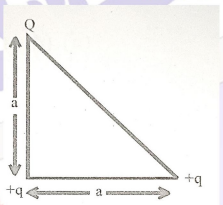


(a) $W_A < W_B < W_C$
(b) $W_A > W_B > W_C$
(c) $W_A = W_B = W_C$
(d) $W_A > W_B < W_C$

17. If charges q/2 and 2q are placed at the centre of face and at the corner of a cube, then the total flux through the cube will be

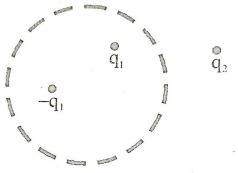
(a) $\frac{q}{2\varepsilon_0}$ (b) $\frac{q}{\varepsilon_0}$
(c) $\frac{q}{6\varepsilon_0}$ (d) $\frac{q}{8\varepsilon_0}$

18. Three charge Q. q and q are placed at the vertical of a right angled isosceles triangle as shown in the adjacent figure. The net electrostatic energy of the configuration will be zero if Q is equal to



(a) $\frac{-q}{1+\sqrt{2}}$ (b) $\frac{-2q}{2+\sqrt{2}}$
(c) -2q (d) +q

19. A Gaussian surface in the figure is shown by dotted line. The electric field on the surface will be



(a) due to q_1 and q_2 only

(b) due to q_2 only
(c) zero
(d) due to all

20. Two concentric spherical shell of radii R and r have similar charges with equal surface density(σ). The electric potential at their common centre is

(a) σ/ε_0 (b) $\frac{\sigma}{\varepsilon_0}$(R-r)
(c) $\frac{\sigma}{\varepsilon_0}$(R+ r) (d) None of the above

21. A ring of radius R carries a charge +q. A test charge $-q_o$ is released on its axis at a distance √3R from its centre. How much kinetic energy will be acquired by the test charge when it reaches the centre of the ring?

(a) $\frac{1}{4\pi\varepsilon_0}\frac{qq_0}{R}$ (c) $\frac{1}{4\pi\varepsilon_0}\left(\frac{qq_0}{2R}\right)$
(c) $\frac{1}{4\pi\varepsilon_0}\left(\frac{qq_0}{\sqrt{3}R}\right)$ (d) $\frac{1}{4\pi\varepsilon_0}\left(\frac{qq_0}{3R}\right)$

22. A charge Q is distributed over two concentric hollow spheres of radii r and R (R> r) such that their surface densities are equal. Find the potential at the common centre$\left(given\ k = \frac{1}{4\pi\varepsilon_0}\right)$

(a) $\frac{kQ}{R+r}$ (b) $\frac{kQ(R+r)}{R^2+r^2}$
(c) $\frac{kQ}{r}$ (d) $\frac{kQ}{R}$

23. A uniform electric field exists is x y plane. The potential of points A(2m, 2m), B(-2m, 2m) and C(2m, 4m) are 4V, 16V and 12V respectively. The electric field is

(a) $(4\hat{\imath} + 5\hat{\jmath})\frac{V}{m}$ (b) $(3\hat{\imath} + 4\hat{\jmath})\frac{V}{m}$
(c) $-(3\hat{\imath} + 4\hat{\jmath})\frac{V}{m}$ (d) $(3\hat{\imath} - 4\hat{\jmath})\frac{V}{m}$

24. A point charge q = 50 μC is located in the x - y plane at the point of position vector $\overrightarrow{r_0} = 2\hat{\imath} + 3\hat{\jmath}$ What is the electric field at the point of position vector $\overrightarrow{r_0} = 8\hat{\imath} - 5\hat{\jmath}$?

(a) 1200Vr/m (b) 4×10^{-2} V/m
(c) 900 V / m (d)(4500 Vr/m)

25. In a certian region of space, the potential is given $V = k[2x^2 - y^2 + z^2]$. The electric field at the point (1, 1, 1) has magnitude

(a) k√6 (b) 2k √6)
(c) 2k√3 (d) 4k√3

CHEMISTRY

26. The standard reduction potentials of Zn^{2+} | Zn, Cu^{2+} |Cu and Ag | Ag are, respectively, -0.76, 0.34 and 0.8 V. The following cells were constructed

(I) Zn | Zn^{2+} || Cu^{2+} | Cu
(II) Zn | Zn^{2+} || Ag^+ | Ag
(III) Cu | Cu^{2+} || Ag^+ | Ag

What is the correct order of Eo of these cells?
cell

(a) II > III > I (b) II > I > III
(c) I > II > III (d) III > I > II

27. Calculate the emf of the cell
Cu (s) | Cu^{2+} (aq) || Ag^+ (aq) | Ag (s)
Given: $E°_{(Cu2+/Cu)} = +0.34$ V, $E^0_{(Ag+/Ag)} =$ 0.80V,
(a) +0.46 V (b) +1.14 V
(c) 0.57V (d) -0.46 V

28. The potential of the following cell is 0.34 V at 25°C. Calculate the standard reduction potential of the copper half-cell.
Pt | H_2 (1 atm) | H^+ (1 M) || Cu^{2+} (1 M) | Cu
(a) -3.4 V (b) +3.4 V
(c) -0.34 V (d) +0.34 V

29. $2Fe^{3+} + 3I^- \longrightarrow 2Fe^{2+} + I_3^-$
The standard reduction potentials in acidic conditions are 0.77 and 0.54V respectively, for Fe^{3+}/Fe^{2+} and I_3^-/I^- couples. The equilibrium constant for the reaction is
(a) 6.26×10^{-7} (b) 5.33×10^{-4}
(c) 6.26×10^7 (d) 5.33×10^4

30. Which is the correct representation for Nernst equation?

(a) $E_{RP} = E_{RP}° + \frac{0.059}{n} \log \frac{[oxidant]}{[reductant]}$
(b) $E_{op} = E_{op}° + \frac{0.059}{n} \log \frac{[oxidant]}{[reductant]}$
(c) $E_{op} = E_{op}° + \frac{0.059}{n} \log \frac{[oxidant]}{[reductant]}$
(d) All of the above

31. If the ΔG° of a cell reaction,
$AgCl + e^- \rightarrow Ag^+ + Cl^-$ is -21.20 kJ;
The standard emf of the cell is
(a) 0.220 V (b) -0.220 V
(c) 0.229 V (d) -0.110 V

32. Which of the following expression is correct?
(a) $\Delta G° = -nFE°_{cell}$
(b) $\Delta G° = +nFE°_{cell}$
(c) $\Delta G° = -2.303RTnF\ E°_{cell}$
(d) $\Delta G° = -nF \log K_c$

33. Using the following data, for the electrode potentials calculate ΔG°, in kJ, for the indicated reaction
$5Ce^{4+}(aq) + Mn^{2+}(aq) + 4H_2O(l) \rightarrow 5Ce^{3+}(aq) + MnO_4^-(aq) + 8H^+(aq)$
Given: $MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(1)$ E° = +1.51 V
$Ce4^+(aq) + e^- \rightarrow Ce^{3+}(aq)$ E° = +1.61 V
(a)-36.24 (b)-48.25
(c) -31.54 (d) -19.65

34. Which of the following does not conduct electricity?
(a) Fused NaCl (b) Solid NaCl
(c) Brine solution (d) Copper

35. The cell constant is
(a) l/a (b) a/l

(c) $a \times l$ (4) κ/R

36. The one which decreases with dilution is
(a) Molar conductance
(b) Conductance
(c) Specific conductance
(d) Equivalent conductance

37. Resistance of a conductivity cell filled with a solution of an electrolyte of concentration 0.1 M is 100 Ω. The conductivity of this solution is 1.29 S m^{-1} Resistance of the same cell when filled with 0.2 M of the same solution is 520 Ω. The molar conductivity of 0.02 M solution of the electrolyte will be
(a) 124×10^{-4} S m^2 mol^{-1}
(b) 1240×10^{-4} S m^2 mol^{-1}
(c) 1.24×10^{-4} S m^2 mol^{-1}
(d) 12.4×10^{-4} S m^2 mol^{-1}

38. E° values of Mg^{2+}/Mg is -2.37 V, of Zn^{2+}/Zn is -0.76 V and Fe^{2+}/Fe is -0.44 V.
Which of the following statements is correct?
(a) Zn will reduce Fe2+
(b) Zn will reduce Mg2+
(c) Mg oxidises Fe
(d) Zn oxidises Fe

39. The metal that does not displace hydrogen from an acid is
(a) Ca (b) Al
(c) Zn (d) Hg

40. Reduction potential of four elements P, Q, R, S is -2.90, 0.34, +1.20 and -0.76 V, respectively. Reducing character decreases in the order
(a) P > Q > R > S
(b) S > R > Q > P
(c) P > S > Q > R
(d) Q > S > R > P

41. Resistance of 0.2 M solution of an electrolyte is 50Ω. The specific conductance of the solution is 1.3s m^{-1} If resistance of the 0.4 M solution of the same electrolyte is 260 Ω, its molar conductivity is
(a) 6250S m^2 mol^{-1}
(b) 6.25×10^{-4} S m^2 mol^{-1}
(c) 625×10^{-4} S m 2 mol^{-1}
(d) 62.5S m^2 mo l^{-1}

42. Consider the following cell reaction:
$2Fe(s)+O_2(g)+4H^+(aq) \rightarrow 2Fe^{2+}(aq) + 2H_2O(l)$, E°= 1.67 V
At $[Fe^{2+}] = 10^{-3}$ M $p(O_2)$ = 0.1 atm and pH = 3, the cell potential at 25 °C is
(a) 1.47 V
(b) 1.77 V
(c) 1.87 V
(d) 1.57 V

43. A solution contains Fe^{2+}, F e^{3+} and I^- ions. This solution was treated with iodine at 35°C E° for F e^{3+},Fe^{2+} is +0.77 V and E° for I_2 $|2I^-$ = 0.536V The favourable redox reaction is
(1) I_2 will be reduced to I-
(2) there will be no redox reaction
(3) I^- will be oxidised to I_2
(4) Fe will be oxidised to Fe

44. The number of moles of electrons required to deposit 36 g of Al from an aqueous solution of Al $(NO_3)_3$ is
(atomic mass of Al = 27)
(a) 4 (b) 2
(c) 3 (d) 1

45. Calculate the emf in V of Daniell cell containing 0.1 M $ZnSO_4$, and 0.01 M $CuSO_4$, solutions. Their respective electrodes is $E°_{Cu2+|cu}$ =0.34 V and $E°_{Zn2+|Zn}$ = - 0.76V
(a) 1.10 V (b) 1.16 V
(c) 1.13 V (d) 1.07 V

46. 0.1 M solution of an electrolyte A^+B^- placed in a Conductivity cell with electrodes 4 cm apart and each with area of cross-section equal to 2 sq cm was found to have a resistance of 200Ω. The molar conductivity of the solution is
(a) 25 Ω^{-1} c m^2
(b) 100 Ω^{-1} cm^2
(c) 0.25 Ω^{-1} cm^2
(d) 400 Ω^{-1} cm^2

47. The specific conductance of a solution is 0.0356 ohm^{-1} cm and when placed in a cell, the conductance is 0.0268 ohm^{-1}. The cell constant is
(1) 0.0751c m^{-1}
(2) 0.33cm^{-1}
(3) 0.3836 c m^{-1}
(4) 1.33c m^{-1}

48. The conductivity of 0.01mol / dm^3 aqueous acetic acid at 300 K is 19.5×10^{-5} ohm^{-1} cm^{-1} and the limiting molar conductivity of acetic acid at the same temperature is 390 ohm^{-1} cm^2 mol^{-1}. The degree of dissociation of acetic acid is
(a) 0.5 (b) 0.05
(c) 5×10^{-3} (d) 5×10^{-7}

49. A conductivity cell having cell constant 8.76 cm^{-1} placed Jin 0.01 M solution of an electrolyte offered a resistance of 1000 ohms. What is the conductivity of the electrolyte?
(a) 8.76×19^{-4} ohm^{-1} cm^{-1}
(b) 8.76×10^{-3} ohm^{-1} cm^{-2}
(c) 8.76×10^2 ohm^{-1} cm^{-1}
(d) 8.76×10^{-1} ohm^{-1} cm^{-1}

50. A factory produces 40 kg of calciurn in two hours by electrolysis. How much aluminium can be produced by the same current in two hours?
(a) 22 kg (b) 18 kg

(c) 9 kg (d) 27 kg

BIOLOGY

51. After ovulation, the collapsed ovarian follicle shrinks and becomes:
    (a) Corpus atresia
    (b) Corpus adiposum
    (c) Corpus luteum
    (d) Corpus albicans
52. In the fertile human female, approximately on which day of menstrual cycle does ovulation take place ?
    (a) Day 1 (b) Day 8
    (c) Day 14 (d) Day 18
53. Fertilized ovum in human is implanted on the uterus, how many days after ovulation ?
    (a) 1 day (b) 7 days
    (c) 10 days (d) 14 days
54. Menstruation is found in which type of mammals?
    (a) Primates (b) Carnivores
    (c) Ungulates (d) All of these
55. In the human male, the tube used to carry both sperm and urine is the:
    (a) Ureter (b) Seminiferous tubule
    (c) Vas deferens (d) Urethra
56. Ovulation is triggered by :
    (a) Testosterone (b) LH
    (c) Estrogen (d) FSH
57. What is the function of the sertoli cells in the male testes?
    (a) Produce the sperm cell through meiosis.
    (b) Produce alkaline fluid added to semen.
    (c) Activate the sperm cells so they can swim rapidly.
    (d) Nourish the sperms
58. Trace the correct path of the sperm during ejaculation.
    (a) Urethra-vas deferens- seminal vesicles-testes
    (b) Testes - urethra - vas deferens - penis
    (c) Seminiferous tubules – epididymis - vas deferens - urethra
    (d) Seminiferous tubules - vas deferens – Epididymis - urethra
59. The luteal phase of the ovarian cycle occurs, in a 28-day cycle, at about:
    (a) Days 1-5 (b) Days 6-13
    (c) Day 14 (d) Days 15-28
60. Trace the path of the sperm through the female reproductive tract :
    (a) Vagina - uterus - oviduct - cervix
    (b) Urethra - vagina- oviduct - cervix
    (c) Vagina – cervix - uterus - oviduct
    (d) Urethra – uterus – cervix - fallopian tube
61. What two hormones influence the development of the secondary sexual characteristics of the female?
    (a) Testosterone and estrogen
    (b) Androgen and estrogen
    (c) FSH and LH
    (d) Progesterone and estrogen
62. Menopause refers to:
    (a) The menstrual phase
    (b) Premenstrual phase
    (c) Cessation of menstruation.
    (d) Onset of menstruation.
63. Antrum is the cavity of :
    (a) Graafian follicle (b) Gastrula
    (c) Blastula (d) Ovary
64. Bartholin's glands are situated :
    (a) At reduced end of tail of birds
    (b) On either side of vagina in humans
    (c) On either side of vas deferens in humans
    (d) On sides of head of some amphibians
65. In humans, at the end of first meiotic division, the male germ-cells differentiate into:
    (a) Spermatids
    (b) Spermatogonia
    (c) Primary spermatocyte
    (d) Secondary spermatocyte
66. Seminal plasma of human is rich in :
    (a) Fructose, calcium and certain enzymes
    (b) Fructose and calcium but no enzyme
    (c) Glucose and certain enzymes but no calcium
    (d) Fructose and certain enzymes but poor in calcium
67. The correct sequence of spermatogenetic stages leading to the formation of sperms in a mature human testes is:
    (a) Spermatocyte → spermatogonia → spermatid → sperms
    (b) Spermatogonia → spermatocyte → spermatid → sperms
    (c) Spermatid → spermatocyte → spermatogonia → sperms
    (d) Spermatogonia → spermatid →spermatocyte → sperms
68. First polar body is formed at which stage of oogenesis ?
    (a) Ist meiosis (b) 2nd meiosis
    (c) Ist mitosis (d) Differentiation
69. The part of Fallopian tube closest to the ovary is:
    (a) Isthmus (b) Infundibulum
    (c) Cervix (d) Ampulla
70. The number of autosomes in human primary spermatocyte is:
    (a) 46 (b) 44
    (c) 23 (d) 22

71. Which one of the following statements is false in respect of viability of mammalian sperm ?
(a) Sperm is viable for only 24 hours.
(b) Survival of sperm depends on pH and is more active in alkaline medium.
(c) Viability of sperm is determined by its motility.
(d) Sperms must be concentrated in a thick suspension.

72. Signals for parturition originate from:
(a) Both placenta and fully formed foetus
(b) Oxytocin released from maternal pituitary
(c) Placenta only
(d) Fully developed foetus only

73. The number of autosomes in human secondery spermatocyte is:
(a) 46 (b) 44
(c) 23 (d) 22

74. Menstrual flow occurs due to lack of:
(a) Vasopressin (b) Progesterone
(c) FSH (d) Oxytocin

75. Which one of the following is not the function of placenta ? It:
(a) Secretes oxytocin during parturition
(b) Facilitates supply of oxygen and nutrients to embryo
(c) Secretes estrogen
(d) Facilitates removal of carbon dioxide and waste material from embryo

MATH

51. If $\theta \in R$,maximum value of
$\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+sin\theta & 1 \\ 1 & 1 & 1+cos\theta \end{vmatrix}$
(a) 1/2 (b) $\sqrt{3}/2$
(c) $\sqrt{2}$ (d) $3\sqrt{2}/4$

52. If $\Delta = \begin{vmatrix} -a & 8b & 0 \\ 0 & -a & 8b \\ 8b & 0 & -a \end{vmatrix} = 0$, then
(a) 1/b is a cube root of unity
(b) a is one of the cube roots of unity
(c) b is one of the cube roots of 8
(d) a/b is a cube roots of 8

53. $\begin{vmatrix} sin^2x & cos^2x & 1 \\ cos^2x & sin^2x & 1 \\ -10 & 12 & 2 \end{vmatrix} =$
(a) 0
(b) $12cos^2x-10sin^2x$
(c) $12sin^2x-10cos^2x-2$
(d) 10 sin 2x

54. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} =$ 0 are
(a) -1,-2 (b) -1,2
(c) 1,-2 (d) 1,2

55. $\begin{vmatrix} 1 & 1+ac & 1+bc \\ 1 & 1+ad & 1+bd \\ 1 & 1+ae & 1+be \end{vmatrix} =$
(a) 1 (b) 0
(c) 3 (d) a+b+c

56. If $\omega$is the cube root of unity , then
$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} =$
(a) 1 (b) 0
(c) ω (d) ω^2

57. The value of the determinant $\begin{vmatrix} bc & ac & ab \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix}$ is
(a) (a+b+c)
(b) a+b+c-ab
(c) $(a^2-b^2)(b^2-c^2)(c^2-a^2)$
(d) $a^2+b^2+c^2$

58. The following system of equation 3x -2y+z=0 λx-14y+15z=0, x+2y-3z=0 has a solution other then x = y = z = 0 for λ equal to
(a)1 (b) 2
(c) 3 (d) 5

59. The determinant
$\Delta \begin{vmatrix} \cos(\alpha+\beta) & -sin(\alpha+\beta) & cos2\beta \\ sin\alpha & cos\alpha & sin\beta \\ -cos\alpha & sin\alpha & cos\beta \end{vmatrix}$ is independent of
(a) α and β (b) β
(c) α (d) none of these

60. If ω is an imaginary cube root of unity , then the value of $\begin{vmatrix} 1 & \omega^2 & 1-\omega^4 \\ \omega & 1 & 1-\omega^5 \\ 1 & \omega & \omega^2 \end{vmatrix}$ is
(a) 4 (b) ω^2
(c) $\omega^2 - 4$ (d) -4

61. If $f(x) = \begin{vmatrix} \sin x & \cos x & tanx \\ x^3 & x^2 & x \\ 2x & 1 & x \end{vmatrix}$ then $\lim_{x \to \to 0} \frac{f(x)}{x^2} =$
(a) 0 (b) 3
(c) 2 (d) 1

62. If A+B+C = π, then
$\begin{vmatrix} \sin(A+B+C) & sinA & cosC \\ -sinB & 0 & tanA \\ \cos(A+B) & -tanA & 0 \end{vmatrix}$ equals
(a) 0 (b) 2sinBtanAcosC
(c) 1 (d) None of these

63. Let a,b,c$\in R$ such that no two of them are equal and satisfy $\begin{vmatrix} 2a & b & c \\ b & c & 2a \\ c & 2a & b \end{vmatrix} = 0$ then equation $24ax^2+4bx+c = 0$ has
(a) at least one root in [0,1]
(b) at least one root in [-1/2,1/2]
(c) at least one root in [-1,2]

(d) at least two roots in [0,2]

64. In triangle ABC,

$$\begin{vmatrix} 1 & 1 & 1 \\ \cot\frac{A}{2} & \cot\frac{B}{2} & \cot\frac{C}{2} \\ \tan\frac{B}{2}+\tan\frac{C}{2} & \tan\frac{C}{2}+\tan\frac{A}{2} & \tan\frac{A}{2}+\tan\frac{B}{2} \end{vmatrix}$$

= 0 then triangle must be

(a) equilateral (b) isosceles

(c) obtuse angled (none of these

65. If $f(x)$ =

$$\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$$

Then $f(500)$ is equal to

(a) 0 (b) 1

(c) 500 (d) -500

66. The value of the dereminant

$$\begin{vmatrix} n-1C_{r-1} & n-1C_r & n-1C_{r+1} \\ n-1C_r & n-1C_{r+1} & n-1C_{r+2} \\ nC_r & nC_{r+1} & nC_{r+2} \end{vmatrix}$$ is

(a) 0 (b) 1/2

(c) -1 (d) None of these

67. If A,B,C are the angle of a triangle then the value of determinant

$$\begin{vmatrix} \sin2A & \sin C & \sin B \\ \sin C & \sin2B & \sin A \\ \sin B & \sin A & \sin2C \end{vmatrix}$$ is

(a) π (b) 2π

(c) 0 (d) None of these

68. The system of linear equation x+y+z= 2, 2x+y-z=3, 3x+2y+kz= 4 has a unique solution if

(a) k≠ 0 (b) – 1< k < 1

(c) -2 < k< 2 (d) k=0

69. The equation

X + y + z -6 = 0

X+ y – z – 1= 0

and X+y-2z+3 =0 have

(a) unique solution

(b) infinite many solution

(c) no solution

(d) none of these

70. If three linear equations x+4ay +az = 0, x +3by +bz = 0 and x +2cy +cz = 0 have a non – trivial solution , then a,b,c are in

(a) H.P. (b) G.P.

(c) A.P. (d)None

71. If c < 1 and the system of equation x + y -1= 0 2x-y-c =0 and –bx+3by-c = 0 is consistent then the possible real values of b are

(a) b ∈ $\left(-3,\frac{3}{4}\right)$ (b) b ∈ $\left(-\frac{3}{2},4\right)$

(c) b ∈ $\left(-\frac{3}{4},3\right)$ (d) None of these

72. If the system of equations x+4y-z= $\lambda, 7x+9y+\mu z=-3, 5x+y+2z=-1$ *has infinitely many solutions,* then $(2\mu+3\lambda)$ *is equal to*

(a) 2 (b) 3

(c) -2 (d) -3

73. If the system of equations

2x+ 3y –z = 5

x + $\alpha y + 3z = -4$

3x – y + $\beta z = 7$

Has infinitely many solutions, then $13\alpha\beta$ *is equal to*

(a) 1110 (b) 1120

(c) 1210 (d) 1220

74. $\begin{vmatrix} 2a & 2b & b-c \\ 2b & 2a & a+c \\ a+b & a+b & b \end{vmatrix}$ is divisible by

(a) (a-b) (b) $(a-b)^2$

(c) a+b (d) (a + b +c)

75. If bc +qr= ca +rp = ab +pq = -1 then the value of $\begin{vmatrix} ap & a & p \\ bq & b & q \\ cr & c & r \end{vmatrix}$ *is*

(a) Independent of a,b,c

(b) Independent of p,q,r

(c) dependent on a, b, c

(d) dependent on p,q,r