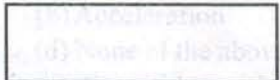# CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

Odisha's First Pvt. Multi-Sector State University

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UNIVERSITY
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QUESTION BOOKLET

INSTRUCTIONS

Roll Number ☐☐☐☐☐☐☐☐☐☐☐

Please read the following instructions carefully :

1) Mention carefully your Roll Number, Question Booklet number and series of the Question Booklet in the OMR Answer Sheet and sign at the appropriate place. Write your Roll number on the question booklet.

2) Strictly follow the instructions given by the Centre Supervisor / Room Invigilator and those given on the Question Booklet.

3) Please mark the answer ONLY with a Black ball point pen on the OMR Answer Sheet.

4) Candidates are not allowed to carry any papers, notes, books, log table, calculators or calculating devices, scanning devices, communication devises like cellular phone/pager/ducopen, etc. to the Examination hall. Any candidate found using, or in possession of such unauthorized material, indulging in copying or impersonation, adopting unfair means ·is liable to be summarily disqualified and may be subjected to penal action.

5) After finishing the examination, hand over the complete question booklet and OMR Answer Sheet to the Room invigilator. DO NOT carry the question booklet or any part there of outside the examination room. Doing so, is a punishable offence.

6) The test is of objective type. This Question Booklet contains three parts, with a total of 180 questions and the Total time allotted is 3.00 hours.

Part I - Physics
Part II- Chemistry
Part III- Mathematics

7) Each objective type question is followed by four responses. Your task is to choose the correct/best response and mark your response by darkening the relevant CIRCLE with black Ball Point Pen on the OMR Answer Sheet and not on the Question Booklet.

8) All questions are COMPULSORY. There will be "No NEGATIVE MARKING".

·9) Completely darken the CIRCLE so that the number inside the CIRCLE is not visible. Darken ONLY ONE CIRCLE for each answer as shown in the example below. The CORRECT and the WRONG method of darkening the CIRCLE on the OMR sheet is given below.

CORRECT Method   WRONG Method

Ⓐ ● Ⓒ Ⓓ   Ⓐ Ⓑ̷ Ⓒ Ⓓ
                 Ⓐ ⊠ Ⓒ Ⓓ
                 Ⓐ ▬ Ⓒ Ⓓ

10) DO NOT make any stray marks anywhere on the OMR answer sheet. DO NOT fold or wrinkle the OMR answer sheet. Rough work MUST NOT be done on the answer sheet. Use your test booklet for this purpose.

11) Incase you notice any questions missing in the question booklet, kindly bring it to the attention of the Invigilator.

1. The dimensions of magnetic flux is
   (a) $\left|ML^3T^{-2}A^{-1}\right|$ (b) $\left|ML^2T^{-2}A^{-1}\right|$
   (c) $\left|ML^2\right|$ (d) $\left|M^2L^2T^2\right|$

2. Which physical quantities have the same dimensions ?
   (a) Force and power   (b) Torque and energy
   (c) Torque and power   (d) Force and torque

3. If $\vec{a}\cdot\vec{b}=\left|\vec{a}\times\vec{b}\right|$, then the angle θ between $\vec{a}$ and $\vec{b}$ will be
   (a) 60^0 (b) 45^0
   (c) 75^0 (d) 90^0

4. Rectangular components of vectors $\vec{A}$ and $\vec{B}$ are
   (A_x, A_y, A_z) and (B_x, B_y, B_z) respectively.
   If $\vec{A}+\vec{B}=0$, then
   (a) $A_X=-B_X, A_Y=-B_Y, A_Z=-B_Z$
   (b) $A_X=B_X, A_Y=B_Y, A_Z=B_Z$
   (c) $A_X>B_X, A_Y>B_Y, A_Z>B_Z$
   (d) $A_X<B_X, A_Y<B_Y, A_Z<B_Z$

5. The displacement s of a body as a function of time t is given by $3s=9t+5t^2$ with the numerical constants in appropriate SI units. The acceleration of the body is given by the number
   (a) 5/3   (b) 14/3
   (c) 10/3   (d) 19/3

6. Two balls of masses 2 kg and 4 kg respectively are dropped simultaneously from the top of a 60 ft tall building. After a fall of 30ft each towards earth, their respective kinetic energies will be in the ratio of
   (a) $\sqrt{2}:1$ (b) 1:4
   (c) 1:2   (d) $1:\sqrt{2}$

7. According to Kepler's law, the orbital time period T of a satellite varies with its orbital radius R according to the relation:
   (a) $T^2\propto R^3$ (b) $T^3\propto R^2$
   (c) $R^2\propto(1/R^3)$ (d) $T^3\propto(1/R^2)$

8. A body moving in a circle covers equal distance in equal interval of time. Which quantity will remain constant in this condition ?
   (a) Speed   (b) Acceleration
   (c) Velocity   (d) None of the above

9. A body of mass 2 kg is rotating with angular speed 2π rad/s in a circular path of radius 1 m. The centripetal force on body will be
   (a) 16π (b) 8π
   (c) $16\pi^2$ (d) $8\pi^2$

10. Three blocks of masses 2 kg, 3 kg and 5 kg are connected to each other with light strings and are then placed on a frictionless surface as shown in the figure. The system is pulled by a force $F=10N$. The tension T_1 is :
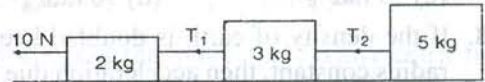
    (a) 1N   (b) 5N
    (c) 8N   (d) 10N

11. A car is moving along a straight horizontal road with a speed v_0. If the coefficient of friction between the tyres and the road is μ, then shortest distance in which the car can be stopped is
    (a) $\dfrac{v_0^2}{2\mu g}$ (b) $\dfrac{v_0}{\mu g}$
    (c) $\left(\dfrac{v_0}{\mu g}\right)^2$ (d) $\dfrac{v_0}{\mu}$

12. Two particles, each of mass 0.25kg, move towards each other with speed 3 m/s and 1 m/s respectively, collide and stick together. The final velocity of the system of two particles will be
    (a) 1 m/s   (b) 2 m/s
    (c) 4 m/s   (d) 3 m/s

13. A body moves a distance of 10 m under the action of force $F=10N$. If the work done is 25 J, the angle which the force makes with the direction of motion is :
    (a) 0^0 (b) 30^0
    (c) 60^0 (d) none of these

14. A solid sphere is given a kinetic energy E. What fraction of this kinetic energy is associated with rotation ?
    (a) 3/7   (b) 5/7
    (c) 1/2   (d) 2/7

15. A body moves with a constant velocity in a straight line parallel to x- axis. Angular momentum with respect to origin
    (a) increases   (b) decreases
    (c) is constant   (d) None of these

16. A skater on ice spins faster when she folds her arms. This is due to
    (a) increase in energy and increase in angular momentum
    (b) decrease in friction at the skate
    (c) constant angular momentum
    (d) increase in energy and decrease in angular momentum

17. A light wire is wound on a hollow cylinder of radius 40cm. Mass of the cylinder is 3 kg. Force of 30 N is applied on the wire. The angular acceleration of the cylinder is
    (a) 25 rad/s^2 (b) 30 rad/s^2
    (c) 35 rad/s^2 (d) 90 rad/s^2

18. If the density of earth is doubled keeping its radius constant, then acceleration due to gravity g would become :
    (a) 20 m/s^2 (b) 10 m/s^2
    (c) 5 m/s^2 (d) 2.5 m/s^2

19. A particle falls towards earth from infinity. Its velocity on reaching the earth would be:
    (a) infinity   (b) $\sqrt{2gR}$
    (c) $2\sqrt{gR}$ (d) zero

20. A body executes SHM of amplitude A. When the body is at a distance of $A/\sqrt{2}$ from its equilibrium possition, the correct relation between KE and PE will be
    (a) KE is equal to PE   (b) KE is 2 times of PE
    (c) KE is 3 times of PE (d) KE is half of PE

21. The time period T of a simple pendulum varies with its length l according to the relation
    (a) $T\alpha\sqrt{l}$ (b) $T\alpha l$
    (c) $T\alpha\dfrac{1}{\sqrt{l}}$ (d) $T\alpha\dfrac{1}{l}$

22. Four rods of a given material have dimensions as specified below. Which of them will undergo maximum elongation when subjected to a given force ?
    (a) $l = 1m, d = 2mm$ (b) $l = 1m, d = 1mm$
    (c) $l = 2m, d = 1mm$ (d) $l = 2m, d = 2mm$

23. Relation between surface tension T, surface area A and surface energy E is
    (a) $A = TE$ (b) $E = \dfrac{T}{A}$
    (c) $T = \dfrac{E}{A}$ (d) $A = AT$

24. An aeroplane gets its upward lift due to a phenomenon described by the :
    (a) Archimedes Principle
    (b) Bernoulli's principle
    (c) buoyancy principle
    (d) Pascal law

25. Average molecular momentum of an ideal gas depends upon its
    (a) temperature   (b) mass
    (c) volume   (d) None of these

26. A sample of an ideal gas initially at temperature T is heated to temperature 3T. As a result its r.m.s. velocity will change by a factor of
    (a) $\sqrt{3}$ (b) 3
    (c) $\dfrac{1}{\sqrt{3}}$ (d) $\dfrac{1}{3}$

27. A gas is taken from state A to state B, first through path I and then again through path II. The change in internal energy of the gas as result of these two processes is ΔU_1 and ΔU_2 respectively. Then:

    (a) $\Delta U_1 > \Delta U_2$ (b) $\Delta U_1 < \Delta U_2$
    (c) $\Delta U_1 = \Delta U_2$ (d) $\Delta U_1 = \Delta U_2 = 0$

28. The efficiency of a Carnot engine is 0.6. It rejects 20 J of heat to the sink. The work done by the engine is :
    (a) 20 J   (b) 30J
    (c) 33.3 J   (d) 50J

29. In which thermodynamic process, volume of the system remains same ?
    (a) Isobaric   (b) Isothermal
    (c) Adiabatic   (d) Isochoric

30. A black body is heated to temperature 1000 K. Stefan's constant is
    $$\sigma = 5.67 \times 10^{-8}\ W/(m^2 k^4)$$
    Energy radiated per unit area per unit time by the body is

(a) $8.5 \, W/m^2$ (b) $10.6 \, W/m^2$

(c) $5.67 \, W/m^2$ (d) $4.5 \, W/m^2$

31. Heat current is maximum in which of the following rods ? (All rods are of uniform and identical cross section)

(a) | Cu | (b) | Steel | Cu |

(c) | Cu | Steel | (d) | Steel |

32. A sound source is moving towards a stationary observer. The apparent frequency of the sound is 1.5 times the actual frequency. If velocity of sound is 330 m/s, the velocity of source will be

(a) 110 m/s   (b) 220 m/s

(c) 150 m/s   (d) 60 m/s

33. A sound wave given by $y = A_0 \sin(\omega t - kx)$ is reflected from a solid wall with 64% of its amplitude. Then, equation of the reflected wave is

(a) $\dfrac{64}{100} A_0 \sin(\omega t + kx)$

(b) $\dfrac{70}{100} A_0 \sin(\omega t + kx)$

(c) $64 A_0 \sin(\omega t + kx)$

(d) None of the above

34. The equation of a wave is $y = 3\cos \pi (50t - x)$. The wavelength of the wave is :

(a) 3 units   (b) 2 units

(c) 50 units   (d) 47 units

35. In a Young's double slit experiment, the separation between the two slits is halved and distance between the plane of slit and the screen is doubled. Fringe width of the interference pattern is

(a) 4 times   (b) 8 times

(c) $\dfrac{1}{2}$ times   (d) $\dfrac{1}{4}$ times

36. A white light is passed through a prism. Which colour shows minimum deviation ?

(a) red   (b) violet

(c) yellow   (d) green

37. Light travelling from a transparent medium to air undergoes total internal reflection at an angle of incidence of 45^0. Then refractive index of the medium may be:

(a) 1.51   (b) 1.31

(c) 1.12   (d) 1.41

38. An object is placed at a distance 10cm from a convex mirror of focal length 20 cm. Image distance is

(a) $\dfrac{20}{3} cm$ (b) $\dfrac{3}{20} cm$

(c) 4 cm   (d) 4.5 cm

39. A convex lens of focal length f = 16cm produces a real image of magnification m=2. Distance of the object from the lens is

(a) 12 cm   (b) 16 cm

(c) 8 cm   (d) 48 cm

40. The equivalent capacitance between points A and B as shown in figure is :

(a) $6\mu F$ (b) $5\mu F$

(c) $2\mu F$ (d) $\dfrac{3}{2}\mu F$

41. As shown in the figure, there is an electric field along the direction of +ve X- axis. Which of the following pair of points are equipotential ?
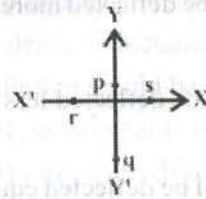
(a) ps   (b) pq

(c) rs   (d) rq

42. A charged particle of mass 0.003g is held stationary in space by placing it in an electric field directed vertically downward. If the magnitude of the electric field 6×10^4 N/C, then the value of charge is :

(a) $5\times10^{-4} C$ (b) $5\times10^{-10} C$

(c) $-18\times10^{-6} C$ (d) $-5\times10^{-9} C$

43. Three bulbs of power $B_1 = 40 \, W$, $B_2 = 60 \, W$ and $B_3 = 100W$ are connected to a 220 V power supply in parallel. What is the decreasing order of their brightness ?

(a) $B_1 > B_2 > B_3$ (b) $B_2 > B_3 > B_1$

(c) $B_3 > B_1 > B_2$ (d) $B_3 > B_2 > B_1$

44. In the given current distribution, what is the value of I ?

(a) 3 A   (b) 8 A

(c) 2 A   (d) 5 A
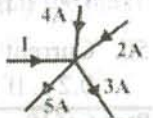
45. ECE of metals A and B are 7.2×10^{-4} g and 1.2×10^{-4} g respectively. A current deposits 14.4 g of metal A during a time interval. Amount of metal B that will be deposited by the same current during the same time is :

(a) 1.2 g   (b) 16 g

(c) 2.4 g   (d) 1.8 g

46. In the given figure an electron enters into a uniform magnetic field $\vec{B}$ pointing vertically into the plane of the paper. It deflects in the direction

(a) positive X- direction
(b) negative X- direction
(c) positive Y- direction
(d) negative Y- direction
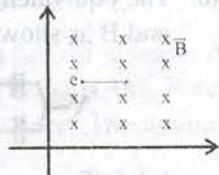
47. A mixed beam of He^+ and O^{2+} ions enters a region of uniform magnetic field at right angles to the field. The kinetic energy of all ions is the same. Mass of He^+ =4 amu and mass of O^{2+} = 16 amu. Then

(a) He^+ ions will be deflected more than those of O^{2+}

(b) He^+ ions will be deflected less than those of O^{2+}

(c) all the ions will be deflected equally

(d) no ions will be deflected

48. If the vertical component of earth magnetic field at some point is 0.5 oersted and dip angle is 60^0, then the magnitude of earth's magnetic field at that point is

(a) 1 oersted   (b) $\dfrac{\sqrt{3}}{2}$ oersted

(c) 2 oersted   (d) $\dfrac{1}{\sqrt{3}}$ oersted

49. In the figure shown, the magnetic field induction $\vec{B}$ at the point 'O' will have a magnitude of

(a) $\dfrac{\mu_0 i}{2\pi r}$ (b) $\left(\dfrac{\mu_0}{4\pi}\right)\left(\dfrac{i}{r}\right)(\pi + 2)$

(c) $\left(\dfrac{\mu_0}{4\pi}\right)\left(\dfrac{i}{r}\right)(\pi + 1)$ (d) $\left(\dfrac{\mu_0}{4\pi}\right)\dfrac{i}{r}(\pi - 2)$

50. Current in a coil changes from 5 A to 10 A in 0.2 s. If the self inductance of the coil is 10 H,

then the induced emf in the coil is

(a) 112 V   (b) 250 V
(c) 125 V   (d) 230 V

51. A step up transformer has turn ratio of 1:25. The current through secondary is 2A. The current through primary is

(a) 25 A   (b) 100 A
(c) 50 A   (d) 20 A

52. An AC series circuit has resistance 3Ω, inductive reactance 10Ω and capacity reactance 14Ω. The impedance of the circuit will be

(a) 1Ω (b) 10Ω
(c) 5Ω (d) 15Ω

53. In a hydrogen atom, the electron jumps from from 4th orbit to 2nd orbit. If the Rydbeng instant $R = 10^7 m^{-1}$, then the frequency of radiation is

(a) 5.62×10^{14} Hz   (b) 10^{14} Hz
(c) 5.62×10^{12} Hz   (d) 10^{12} Hz

54. A radioactive nucleus $_{92}X^{235}$ undergoes two radioactive decay processes and becomes the nucleus $_{91}Y^{231}$. The emitted particles and the correct sequence of their emission is

(a) 1 β particle and then 1 γ ray photon
(b) 1 α particle and then 1 γ ray photon
(c) 1 β particle and then 1 α particle
(d) 1 α particle and then 1 β particle

55. The megnetic field near a current carrying conductor is given by :

(a) Coulomb's law   (b) Lenz's law
(c) Biot-Savart's law   (d) Kirchhoff's law

56. In a transistor configuration β para meter is:

(a) I_b / I_c (b) I_c / I_b
(c) I_c / I_e (d) I_e / I_c

57. The dominant contribution to current comes from holes in case of :

(a) metal
(b) intrinsic semiconductors
(c) p- type extrinsic semiconductors
(d) n- type extrinsic semiconductors

58. Which is not an electromagnetic wave

(a) radio wave   (b) β -ray
(c) X -rays   (d) γ-rays

59. A monochromatic light of wave length 5890 Å in vacuum enters a glass slab of refractive index 1.5. Its wavelength in the glass will be
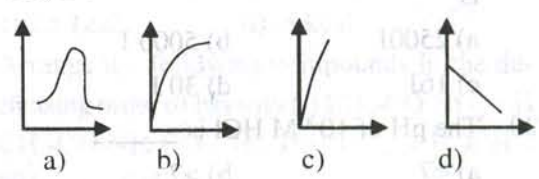
(a) 9372 Å   (b) 7932 Å
(c) 7548 Å   (d) 3927 Å

60. The restmass of a particle is m_0. It moves with a uniform speed of 0.6c and acquires a relativistic mass m. The ratio m / m_0 is

(a) 5/4   (b) 4/5
(c) 5/3   (d) 3/5

Part - II - Chemistry

1. Which of the following can act as reducing agent as well as oxidizing agent:
   a) HNO_3
   b) HNO_2
   c) F_2
   d) None.

2. 5ml of N HCl, 20ml of N/2 H_2SO_4 and 30ml of N/3 HNO_3 are mixed together and volume made to one litre. The normality of the resulting solution is
   a) N/5
   b) N/10
   C) N/20
   d) N/40.

3. Which of the following set of quantum numbers is not possible for a 4p electron?
   a) n = 4, l = 1, m = 0, s = + ½
   b) n = 4, l = 1, m = 0, s = - ½
   c) n = 4, l = 1, m = - 2, s = + ½
   d) n = 4, l = 1, m = +1, s = + ½.

4. The ratio of energy of photon of wave length 3000Å and 6000 Å is
   a) ½
   b) 1/3
   c) 2
   d) 1/6

5. The radius of 3rd orbit of Li^{2+} in Å is
   a) 0.53×3^2 Å
   b) $0.53/3^2$ Å
   c) 0.53×3 Å
   d) $0.53/3$ Å

6. The boiling point of p-nitrophenol is higher than that of O-nitrophenol because
   a) intramolecular H-bonding exists in p-nitrophenol,
   b) intermolecular H-bonding exists in p-nitrophenol,
   c) p-nitrophenol has a higher mol. wt.,
   d) intermolecular H-bonding exists in O-nitrophenol

7. The dipole moment of HBr is 78×10^{-18}esu cm and interatomic spacing is 1.41 A^0. The percentage ionic character of HBr is
   a) 7.5
   b) 11.5
   c) 15
   d) 27

8. The bond lengths in the species O_2, O_2^+ and O_2^- are in the order
   a) $O_2^+ > O_2 > O_2^-$
   b) $O_2^+ > O_2 > O_2$
   c) $O_2 > O_2^+ > O_2^-$
   d) $O_2 > O_2 > O_2^+$

9. A radioactive isotope decays at such a rate that after 96 minutes, only $1/8^{th}$ of the original amount remains. The half-life of this nuclide is
   a) 12 min
   b) 24 min
   c) 32 min
   d) 48 min

10. Which of the following plots represents correctly variation of equivalent conductance (Λ) with dilution for a strong electrolyte?

11. Equivalent conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 ohm^{-1} cm^2 respectively. The equivalent conductance of CH_3COOH at infinite dilution would be :
    a) 101.38 ohm^{-1}cm^2
    b) 253.62 ohm^{-1}cm^2,
    c) 390.71 ohm^{-1}cm^2
    d) 678.90 ohm^{-1}cm^2

12. Heating of iron pyrites in air to remove sulphur is called
    a) smelting
    b) calcination
    c) cupellation
    d) Roasting

13. German silver is an alloy of
    a) Ag and Cu
    b) Cu, Sn, Ag
    c) Cu, Zn, Ni
    d) Cu, Ni, Fe and Mn

14. The rate of diffusion of H_2 is about
    a) ¼ of O_2
    b) 4 times that of O_2
    c) 16 times of O2
    d) 1/6 time of O_2

15. At what temperature the r.m.s. velocity of ethane gas is same as that of methane at 27°C?
    a) 56.25K
    b) 300K
    c) 562K
    d) 600K

16. Solid AB has a rock salt type structure. If the radius of the cation is 200pm, what is the maximum possible radius of the anion?
    a) 483 pm
    b) 273 pm
    c) 888 pm
    d) 573 pm

17. The specific heat of a metal is 0.16. Its approximate atomic weight would be

    a) 16　　　　　　b) 64

    c) 40　　　　　　d) 32

18. No. of molecules in 1000 cc of water is close to

    a) 6.023×10^{23}　　b) $1.8 \times 6.023 \times 10^{23}$

    c) $18/22.4 \times 10^{23}$　d) $55.5 \times 6.023 \times 10^{23}$

19. One mole of a gas is expanded from 100 ml to 250 ml at temperature 55°C under a constant pressure of 2 atm. The work done by the gas is

    a) 2500J　　　　b) 5000 J

    c) 16J　　　　　d) 30 J

20. The pH of 10^{-8} M HCl is _____

    a) <7　　　　　b) >7

    c) 7　　　　　　d) 8

21. The pH of mixture of 50 ml 0.1M H_2SO_4 and 100 ml 0.2M HNO_3 is

    a) 0.699　　　　b) 0.750

    c) 3　　　　　　d) 3

22. The oxidation of SO_2 by O_2 to SO_3 is an exothermic reaction. The yield of SO_3 will be maximum if

    a) temperature is increases and pressure is kept constant,

    b) temperature is reduced and pressure is increased,

    c) Both temperature and pressure are increased,

    d) Both temperature and pressure are reduced

23. An one litre vessel initially contains 2.0, 0.5 and 0.0 moles of N_2, H_2 and NH_3 respectively. The system after attaining equilibrium has 0.2 mole of NH_3. The number of moles of H_2 in the vessel under equilibrium is

    a) 0.3　　　　　b) 0.4

    c) 0.2　　　　　d) 1.8

24. In which of the following cases, does the reaction go farthest to completion.

    a) $K = 10^2$　　　b) $K = 10^{-2}$

    c) $K = 10$　　　　d) $K = 1$

25. In a Chemical equilibrium, the rate constant of the backward reaction is 7.5×10^{-4} and the equilibrium constant is 1.5. So the rate constant of the forward reaction is

    a) 5×10^{-4}　　　b) 2×10^{-3}

    c) 1.125×10^{-3}　d) 9.0×10^{-4}

26. The solubility of $Mg_3(PO_4)_2$ is 's'mol/L. The solubility product is given by the relation

    a) s^5　　　　　b) $36s^5$

    c) $6s^5$　　　　d) $108s^5$.

27. The rates of reaction at different time is found as follows:

Time (in minute)	0	10	20	30
Rate(in mol $l^{-1}s^{-1}$)	2.80×10^{-2}	2.78×10^{-2}	2.81×10^{-2}	2.79×10^{-2}

    The order of reaction is:

    a) Zero　　　　b) one

    c) two　　　　　d) three

28. The temperature coefficient of most of the reactions lies between

    a) 1 and 3　　　b) 2 and 3

    c) 1 and 4　　　d) 2 and 4

29. The viscosity of a liquid is:

    a) Inversely proportional to temperature

    b) directly proportional

    c) not affected by temperature

    d) directly proportional to square of temperature

30. When a substance is dissolved in a solvent the vapour pressure of the solvent is decreased. This results in

    a) increase in the boiling point of the solution

    b) decrease in the boiling point of the solution

    c) the solution having a higher freezing point than the solvent

    d) the solution having a lower osmotic pressure than the solvent

31. The dielectric constants of H_2O and D_2O are

82 and 80.5 respectively. Therefore the solubility of NaCl in D_2O is _____ than in water

a) equal to   b) slightly lower

c) slightly higher   d) Very high

32. A mixture of carbon monoxide and hydrogen is known as

   a) Water gas

   b) Carbonated water gas

   c) Semi water gas

   d) Producer gas

33. An inorganic compound gives off O_2 when heated, turns an acid solution of KI violet, and reduces acidified $KMnO_4$

   a) SO_3 b) KNO_3

   c) H_2O_2 d) All

34. Sodium conducts electricity in liquid ammonia due to

   a) Ammonated electrons

   b) Hydrated electrons

   c) sodamide formation

   d) None of these

35. Reinmann's green is

   a) Cobalt Zincate

   b) Cobalt nitrate

   c) Sodium zincate

   d) Zinc acetate

36. Butter is

   a) Fat dispersed in milk

   b) Fat dispersed in water

   c) Water dispersed in fat

   d) Water dispersed in oil

37. The calculated molal depression constant of water at 0°C is   (The latent heat of fusion of ice at 0°C is 80 calories per gram)

   a) 1.86   b) 1.52

   c) 1.32   d) 1.72

38. The enthalpy change for the transition of liquid water to steam at 373 K is 373KJ mol^{-1}. The entropy change for the process is

   a) 111.9J mol^{-1}k^{-1} b) 37.3J mol^{-1}k^{-1}

   c) 1000 J mol^{-1} k^{-1} d) 74.6J mol

39. Optically active compound among the following is ?

a) 2-Ethylbutanol-1

b) n-butanol

c) 2,2, - Dimethylbutanol

d) 2-Methylbutanol-1

40. Which of the following is true for the following reaction? $H_2O_{(l)} \rightleftharpoons H_2O_{(g)}$ at 100°C and 1 atmosphere

   a) $\Delta S = 0$ b) $\Delta H = 0$

   c) $\Delta H = \Delta E$ d) $\Delta H = T \Delta S$

41. If combustion of 4 g of CH_4 liberates 2.5kcal of heat, the heat of combustion of CH_4 is:

   a) -20 kcal   b) 10kcal

   c) 2.5 kcal   d) -5 kcal

42. Arrange the following compounds in the decreasing order of basicity (i) CH_3-CO-NH_2, (ii) CH_3-CO-NH-CO-CH_3, (iii) CH_3-$(CH_3)CH$--NH_2, (iv) NH_3

   a) (iii) > (iv) > (i) > (ii)

   b) (iii) > (iv) > (ii) > (i)

   c) (ii) > (i) > (iii) > (iv)

   d) (iv) > (iii) > (i) > (ii)

43. Keto-enol tautomerism is observed in

   a) C_6H_5CHO

   b) C_6H_5-CO-CO-C_6H_5

   c) C_6H_5-CO-C_6H_5

   d) C_6H_5-CO-CH_2-CO-C_6H_5

44. 0.1M solution of which of the following substance is more acidic?

   a) NH_4Cl b) KCN

   c) $AlCl_3$ d) CH_3COONa

45. End product of the following sequence is:
   $CaO+C \xrightarrow{\text{Heat}} (A) \xrightarrow{H_2O} (B) \xrightarrow[\text{Hg}^{2+}]{H_2SO_4} (X)$

   a) ethanol

   b) ethanol

   c) ethyl hydrogen sulphate

   d) ethylene glycol

46. Which of the following cannot reduce Fehling's solution?

   a) formic acid

   b) acetic acid

   c) formaldehyde

   d) acetaldehyde

47. Acetamide is

   a) Acidic   b) Basic

   c) Amphoteric   d) none

48. Urotropine is obtained when,
    a) Urea reacts with formalin
    b) Urea reacts with ammonia
    c) Formaldehyde reacts with ammonia
    d) Acetone reacts with ammonia

49. Optical activity is measured by
    a) Polarimeter   b) Refractometer
    c) Spectrograph   d) Tracer technique

50. *Teflon®* is a registered trademark and a *brand name* owned by DuPont, is a polymer
    a) PVC
    b) PMMA
    c) PTFE
    d) Vulcanized rubber

51. Amino acids are building blocks of
    a) Carbohydrates   b) vitamins
    c) Fats   d) Proteins

52. Stainless steel contains
    a) Fe+Cr + Ni   b) Fe+Ni+Cu
    c) Fe+Cr + Cu   d) Fe + Co + Ni

53. The lusture of metal is due to
    a) its high density
    b) Its high polishing
    c) its chemical inertness
    d) presence of free electrons

54. Variable valency is generally exhibited by
    a) Metallic elements
    b) non-metallic elements
    c) representative elements
    d) Transition elements

55. Which carbon is more electronegative?
    a) SP^3 hybridized carbon
    b) SP hybridized carbon
    c) SP^2 hybridised carbon
    d) the electron attracting power of C is always some irrespective of its hybrid state

56. Radioactive decay is a
    a) zero order reaction
    b) first order reaction
    c) second order reaction
    d) None

57. Cell reaction for the cell Zn | Zn^{2+} (1M) ||Cd^{2+}(1M)|Cd is
    a) Cd → Cd^{2+} + 2e$^-$
    b) Zn^{2+}→ Zn – 2e$^-$
    c) Cd + Zn^{2+}→zn + Cd^{2+}
    d) Zn + Cd^{2+}→ Zn^{2+}+ Cd

58. Which of the following is the most stable:
    a) CH$_3$CH$_2^-$ b) (CH$_3$)$_2$CH$^-$
    c) (CH$_3$)$_3$ C$^-$ d) C$_6$H$_5$CH$_2^-$

59. Which of the following alkene on ozonolysis followed by hydrolysis give CH$_3$CH$_2$CHO and CH$_3$COCH$_3$,
    a) CH$_3$ CH$_2$ C=C(CH$_3$)$_2$
    b) C$_2$H$_5$CH=CH C$_2$H$_5$
    c) C$_2$H$_5$CH=CHCH$_3$
    d) CH$_3$-C(CH$_3$)=CHCH$_3$

60. The coordination number and oxidation number of the element E in the complex [E(en)$_2$(C$_2$O$_4$)]NO$_2$ {where (en) is ethylene diamine} are respectively
    a) 4 and 3   b) 6 and 3
    c) 6 and 2   d) 4 and 2

1. If one person handshakes with the other only once and number of handshakes is 66, then number of persons will be
   (a) 10   (b) 33
   (c) 24   (d) 12

2. If $px^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines then value of p is
   (a) 3   (b) 2
   (c) 4   (d) 5

3. The eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, if its latus rectum is half of its minor axis is
   (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{\sqrt{5}}{3}$
   (c) 3/2   (d) 4/3

4. The arithmetic mean of first n odd natural numbers is
   (a) $2n$ (b) $n(n+1)$
   (c) n (d) $n/2$

5. A five digit number is formed by the digits 1, 2, 3, 4, 5, 6 & 8. The probability that the no. has even digits at both ends is
   (a) 2/7   (b) 3/7
   (c) 4/7   (d) 1/7

6. The co-ordinates of the incentre of the triangle having sides $3x - 4y = 0$, $5x + 12y = 0$ and $y - 15 = 0$ are
   (a) (1, 8)   (b) (-1, 8)
   (c) (1, -8)   (d) (1, 4)

7. $f(x) = \frac{dx}{(1 + x^2)^{3/2}}$ and $f(0) = 0$ then $f(1) =$
   (a) $1/\sqrt{2}$ (b) $1/\sqrt{3}$
   (c) 1   (d) 2

8. The value of $\lim_{x \to \alpha} \sqrt{x + \sqrt{x + \sqrt{x}}} - \sqrt{x}$ is
   (a) 0   (b) 2
   (c) 1   (d) 1/2

9. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$ then angle between is
   (a) $\pi/2$ (b) $\pi/3$
   (c) $\pi/6$ (d) $\pi/4$

10. The decimal equivalent of the binary number 11001 is
    (a) $(25)_{10}$ (b) $(34)_{10}$
    (c) $(21)_{10}$ (d) none of these

11. Distance between two parallel planes $4x + 2y + 4z + 5 = 0$ and $2x + y + 2z = 8$ is
    (a) 5/2   (b) 3/2
    (c) 7/2   (d) 4/3

12. If the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$, $\hat{i} + 2\hat{j} - \hat{k}$, $\hat{i} + 2\hat{j} - \hat{k}$ and $m\hat{i} - \hat{j} + 2\hat{k}$ are coplanar, then what is the value of m?
    (a) 3/5   (b) 8/5
    (c) 7/5   (d) 4/5

13. Find the value of $\left(\frac{-1}{2} + \frac{\sqrt{3}i}{2}\right)^{1000}$
    (a) ω (b) 1
    (c) ω^2 (d) 0

14. The aeram bounded by the curves $y^2 = 8x$ and $x^2 = 8y$ is .....
    (a) 64/3 sq. units   (b) 16/3 sq. units
    (c) 32/3 sq. units   (d) none of these.

15. If is an imaginary cube root of unity, then $(1 - \omega + \omega^2)$ $(1 - \omega^2 + \omega^4)$ $(1 - \omega^4 + \omega^8)$ $(1 - \omega^8 + \omega^{16})$ is....
    (a) 4   (b) 8
    (c) 12   (d) 16

16. $\cos^2 \frac{\pi}{16} + \cos^2 \frac{3\pi}{16} + \cos^2 \frac{5\pi}{16} + \cos^2 \frac{7\pi}{16} = ..$
    (a) 0   (b) 1
    (c) 2   (d) 3

17. The equation of the ellipse whose foci are at $(\pm 2, 0)$ and eccentricity is $\frac{1}{2}$ is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ where
    (a) $a^2 = 16, b^2 = 12$ (b) $a^2 = 12, b^2 = 16$
    (c) $a^2 = 16, b^2 = 4$ (d) $a^2 = 4, b^2 = 16$

18. If $f(x) . f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$ and $f(4) = 65$, then $f(6)$ is
    (a) 215   (b) 217
    (c) 220   (d) none of these

19. $\displaystyle\int_{0}^{\pi/2} \frac{2\sqrt{\cos\theta}}{3(\sqrt{\sin\theta}+\sqrt{\cos\theta})}d\theta =$

    (a) $\pi/2$ (b) $\pi/6$

    (c) $\pi/3$ (d) $\pi/4$

20. If $y = \dfrac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}$, then dy/dx is

    (a) $\dfrac{1}{2}\cos^2\dfrac{x}{2}$ (b) $\dfrac{1}{2}\sin^2\dfrac{x}{2}$

    (c) $\dfrac{1}{2}\cos ec^2\dfrac{x}{2}$ (d) none of these

21. $\displaystyle\int_{1}^{3/2} [2x+1]\, dx =$

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

22. If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi$, then
    $x+y+z =$

    (a) xyz (b) $\dfrac{1}{(xyz)^2}$

    (c) $\dfrac{1}{xyz}$ (d) none of these

23. Co-ordinates of the foci of the ellipse
    $5x^2 + 9y^2 + 10x - 36y - 4 = 0$ are

    (a) (1, 2) and (3, 2)
    (b) (1, 2) and (-3, 2)
    (c) (-1, 2) and (-3, 2)
    (d) (1, -2) and (3, -2)

24. The degree of the differential equation

    $2\left(\dfrac{d^2y}{dx^2}\right) + 3\left(\dfrac{dy}{dx}\right)^2 + 4y^3 = x$ is

    (a) 2   (b) 3
    (c) 1   (d) none of these

25. Inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ is

    (a) $\begin{bmatrix} 2 & 3 \\ 1 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & +2 \\ -1 & -1 \end{bmatrix}$

    (c) $\begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$

26. The shortest distance between the lines
    $\dfrac{x-3}{1} = \dfrac{y-5}{2} = \dfrac{z-7}{1}$ and $\dfrac{x+1}{7} = \dfrac{y+1}{-6} = \dfrac{z+1}{1}$
    is ....

    (a) $\sqrt{25}$ (b) $2\sqrt{25}$

    (c) $\dfrac{46}{5\sqrt{5}}$ (d) $\dfrac{46}{5}$

27. The sum of series $1^2 - 2^2 + 3^2 - 4^2 + ... + 99^2 - 100^2 = ...$

    (a) -5050   (b) 5050
    (c) 11000   (d) -11000

28. Out of 200 students in a class, 120 passed in Physics, 140 in Mathematics, 40 failed in both subjects, how many students passed in both ?
    (a) 100   (b) 160
    (c) 180   (d) 240

29. In an exam of 9 papers, a candidate has to pass in more papers than the number of papers in which he fails in order to be successful. The number of ways in which he can be unsuccessful is .....
    (a) 112   (b) 256
    (c) 264   (d) 656

30. Value of $\sin 10° \cdot \sin 50° \cdot \sin 70°$ is.......
    (a) -1/4   (b) 1/8
    (c) 1/4   (d) -1/8

31. Points (5, 2, 4), (6, -1, 2) and (8, -7, k) are collinear if k is equal to
    (a) -2   (b) 1
    (c) -1   (d) 2

32. Let S be a set containing n elements and we select 2 subsets A and B of S at random then the probability that $A \cup B$ and $A \cap B = \phi$ is

    (a) 2^n (b) n^2

    (c) $1/n$ (d) $1/2^n$

33. $\begin{vmatrix} 1+\sin^2\theta & \sin^2\theta & \sin^2\theta \\ \cos^2\theta & 1+\cos^2\theta & \cos^2\theta \\ 4\sin 4\theta & 4\sin 4\theta & 1+4\sin 4\theta \end{vmatrix} = 0$ then $\sin 4\theta$
    equal to
    (a) 1/2   (b) 1
    (c) -1/2   (d) -2

34. Let the homogeneous system of linear equations
    $px + y + z = 0$, $x + qy + z = 0$, $x + y + rz = 0$
    where $(p, q, r \neq 1)$ have a non-zero solution then

    the value of $\dfrac{1}{1-p} + \dfrac{1}{1-q} + \dfrac{1}{1-r}$ is

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

35. $2x^2 - (p+1)x + (p-1) = 0$. If $\alpha - \beta = \alpha\beta$, then what is the value of p ?

    (a) 1   (b) 2

    (c) 3   (d) -2

36. Give the number of common tangents to circle $x^2 + y^2 + 2x + 8y - 23 = 0$ and $x^2 + y^2 + 4x - 10y + 9 = 0$.

    (a) 1   (b) 3

    (c) 2   (d) none of these

37. If $\dfrac{x}{\alpha} + \dfrac{y}{\beta} = 1$ touches the circle $x^2 + y^2 = a^2$, then point $(1/\alpha, 1/\beta)$ lies on a/an

    (a) straight line   (b) circle

    (c) parabola   (d) ellipse

38. Equation $\sqrt{(x-2)^2 + y^2} + \sqrt{(x+2)^2 + y^2} = 4$

    (a) Parabola   (b) ellipse

    (c) circle   (d) pair of straight lines

39. $\lim\limits_{y \to \infty} \left(\dfrac{y-3}{y+2}\right)^y$ is

    (a) $\dfrac{1}{e}$ (b) $\dfrac{1}{e^5}$

    (c) $\dfrac{2}{e}$ (d) e

40. The coefficient of $\dfrac{1}{x}$ in the expansion of $\left(\dfrac{1}{x}+1\right)^n (1+x)^n$ is

    (a) $^{2n}C_n$ (b) $^{2n}C_{n-1}$

    (c) $^{2n}C_1$ (d) $^nC_{n-1}$

41. $\displaystyle\int \dfrac{dx}{\sin x \cos x}$ · is

    (a) $\log|\sin x| + c$

    (b) $\log|\tan x| + c$

    (c) $\log|\cos x| + c$

    (d) None of these

42. If $p = \sin^2 x + \cos^4 x$. Then

    (a) $\dfrac{3}{4} \le p \le 1$ (b) $\dfrac{3}{16} \le p \le \dfrac{1}{4}$

    (c) $\dfrac{1}{4} \le p \le 1$ (d) None of these

43. A person puts three cards addressed to three different people in three envelopes with three different addresses without looking. What is the probability that the cards go into their respective envelopes ?

    (a) $\dfrac{2}{3}$ (b) $\dfrac{1}{6}$

    (c) $\dfrac{1}{5}$ (d) $\dfrac{2}{5}$

44. If $P = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix} \begin{bmatrix} -1 & -2 \\ -2 & 0 \\ 0 & -4 \end{bmatrix} \begin{bmatrix} -4 & -5 & -6 \\ 0 & 0 & 1 \end{bmatrix}$

    Then $P_{22} =$

    (a) 40   (b) -40

    (c) -20   (d) 20

45. If $f(x) = \sqrt{1 + \cos^2(x^2)}$, then $f'\left(\dfrac{\sqrt{\pi}}{2}\right)$

    (a) $\dfrac{\sqrt{\pi}}{6}$ (b) $-\sqrt{\dfrac{\pi}{6}}$

    (c) $\dfrac{1}{\sqrt{6}}$ (d) $\dfrac{\pi}{\sqrt{6}}$

46. $\displaystyle\sum_{K=0}^{10} {}^{20}C_K =$

    (a) $2^{19} + \dfrac{1}{2}\,{}^{20}c_{10}$ (b) 2^{19}

    (c) $^{20}c_{10}$ (d) None of these

47. If $f(x, y, z) =$ in $(x^3 + y^3 + z^3 - 3xyz)$, $\dfrac{\partial f}{\partial x} + \dfrac{\partial f}{\partial y} + \dfrac{\partial f}{\partial z} =$

    (a) 0   (b) $\dfrac{1}{x+y+z}$

    (c) $\dfrac{2}{(x+y+z)}$ (d) $\dfrac{3}{x+y+z}$

48. If $z = x\sqrt{y} + \dfrac{y}{x^{1/3}}$, then $\dfrac{\delta z}{\delta y} = ?$

    (a) 0   (b) $\dfrac{x}{2\sqrt{y}} + \dfrac{1}{x^{1/3}}$

    (c) 1   (d) -1

49. $|A| = 8$, total number of bijections defined on A is

    (a) 8!   (b) 7!
    (c) 6!   (d) 9!

50. Ram secures 100 marks in math then he will get a mobile. The converse is
    (a) If Ram get a mobile then he will not secures 100 marks
    (b) If Ram not get a mobile then he will secures100 marks
    (c) If Ram will get a mobile then he secures 100 marks in Math.
    (d) none of these

51. In how many ways 8 persons are to sit in a round table ?
    (a) 6!   (b) 3!
    (c) 7!   (d) 2!

52. In a non-leap year, the probability of having 53 Friday or Saturday is
    (a) 3/7   (b) 4/7
    (c) 2/7   (d) 1/7

53. $f(x) = x \sin(\pi / x)$ is continuous every where, then $f(0) =$
    (a) -1   (b) 1
    (c) 0   (d) all of these

54. Variance of the numbers 2, 4, 6, 8 is
    (a) 3   (b) 8
    (c) 4   (d) 5

55. Mode of 7, 6, 10, 7, 5, 9, 3, 7, 5 is
    (a) 6   (b) 3
    (c) 5   (d) 7

56. If $P(S) = 0.3$, $P(T) = 0.4$. S and T are independent events, then $P(S / T)$
    (a) 0.2   (b) 0.3
    (c) 0.12   (d) 0.4

57. Area of Δ with vertices $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$ is
    (a) 3/2 sq.units   (b) 1/2 sq.units
    (c) $\sqrt{3}/2$ sq. units   (d) 1 sq.units

58. Minimum value of $\begin{vmatrix} 0 & 0 & 1 \\ \sin x & \cos x & 0 \\ -\cos x & 1 + \tan x & 0 \end{vmatrix}$
    (a) 0   (b) 1
    (c) -1   (d) 2

59. $\displaystyle\lim_{n\to\infty} \dfrac{\sqrt{1} + \sqrt{2} + \sqrt{3} + ... + \sqrt{n}}{n\sqrt{n}} =$
    (a) 2/3   (b) 3/2
    (c) 3   (d) 1/2

60. In $a, \dfrac{1}{a+c} + \dfrac{1}{b+c} = \dfrac{3}{a+b+c}$ then $\angle ACB$ in degrees equals
    (a) 60^0 (b) 30^0
    (c) 45^0 (d) 90^0

Space for rough work