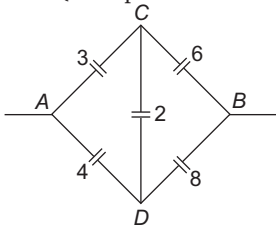


MET 2012 Memory Based Question Paper PDF

Physics

- Oxygen is 16 times heavier than hydrogen. Equal volumes of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is
 (a) $\sqrt{8}$ (b) $\sqrt{2/17}$
 (c) $\sqrt{1/8}$ (d) $\sqrt{32/17}$
- A man, standing between two cliffs, claps his hands and starts hearing a series of echoes at intervals of one second. If the speed of sound in air is 340 ms^{-1} , the distance between the cliffs is
 (a) 680 m (b) 1700 m
 (c) 340 m (d) 1620 m
- A beam of light of wavelength 600 nm from a source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringes on either side of the central bright fring is
 (a) 2.4 cm (b) 2.4 mm
 (c) 1.2 mm (d) 1.2 cm
- A thin plano-convex lens acts like a concave mirror of focal length 0.2 m when silvered from its plane surface. The refractive index of the material of the lens is 1.5. The radius of curvature of the convex surface of the lens will be
 (a) 0.1 m (b) 0.75 m
 (c) 0.4 m (d) 0.2 m
- A balloon is rising vertically up with a velocity of 29 ms^{-1} . A stone is dropped from it and it reaches the ground in 10 s. The height of the balloon when the stone was dropped from it is ($g = 9.8 \text{ ms}^{-1}$)
 (a) 400 m (b) 150 m
 (c) 100 m (d) 200 m
- In a Young's double slit experiment, the separation between the two slits is 0.9 mm and the fringes are observed one metre away. If it produces the second dark fringe at a distance of 1 mm from the central fringe, the wavelength of the monochromatic source of light used is
 (a) 450 nm (b) 400 nm
 (c) 500 nm (d) 600 nm
- A count rate meter shows a count of 240 per minute from a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half-life of the source is
 (a) 80 min (b) 120 min
 (c) 20 min (d) 30 min
- Two conductors of the same material have their diameters in the ratio 1 : 2 and their lengths in the ratio 2 : 1. If the temperature difference between their ends is the same, then the ratio of amounts of heat conducted per second through them will be
 (a) 4 : 1 (b) 1 : 4 (c) 8 : 1 (d) 1 : 8
- An ideal gas heat engine operates in a Carnot's cycle between 227°C and 127°C . It absorbs $6 \times 10^4 \text{ J}$ at high temperature. The amount of heat converted into work is
 (a) $1.6 \times 10^4 \text{ J}$ (b) $1.2 \times 10^4 \text{ J}$
 (c) $4.8 \times 10^4 \text{ J}$ (d) $3.5 \times 10^4 \text{ J}$
- Effective capacitance between A and B in the figure shown is (all capacitances are in μF)


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- (a) $\frac{3}{14} \mu\text{F}$ (b) $\frac{14}{3} \mu\text{F}$
 (c) $21 \mu\text{F}$ (d) $23 \mu\text{F}$
11. When the bob of a simple pendulum swings, the work done by tension in the string is
 (a) > 0 (b) < 0
 (c) zero (d) maximum
12. For a particle executing simple harmonic motion, the kinetic energy K is given by, $K = K_0 \cos^2 \omega t$. The maximum value of potential energy is
 (a) K_0 (b) zero
 (c) $K_0 / 2$ (d) not obtainable
13. A particle is moving along a circular path of radius 5 m with a uniform speed 5 ms^{-1} . What will be the average acceleration when the particle completes half revolution?
 (a) Zero (b) 10 ms^{-2}
 (c) $10 \pi \text{ ms}^{-2}$ (d) $\frac{10}{\pi} \text{ ms}^{-2}$
14. ECE of copper is $3.3 \times 10^{-7} \text{ kg/C}$. If 100 kWh energy is consumed at 33 V in a copper voltmeter, then mass of copper liberated is
 (a) 3.6 kg (b) 3.3 kg
 (c) 1 kg (d) 1 mg
15. In non-resonant circuit, what will be the nature of the circuit for frequencies higher than the resonant frequency?
 (a) Resistive (b) Capacitive
 (c) Inductive (d) None of these
16. A spot of light S rotates in a horizontal plane with a constant angular velocity of 0.1 rad/s . The spot of light P moves along the wall at a distance of 3 m from S . The velocity of spot P , where $\theta = 45^\circ$, is
 (a) 0.5 m/s (b) 0.6 m/s
 (c) 0.7 m/s (d) 0.8 m/s
17. A balloon contains 500 m^3 of He at 27°C and 1 atmospheric pressure. The volume of He at -3°C and 0.5 atmospheric pressure will be
 (a) 700 m^3 (b) 900 m^3
 (c) 1000 m^3 (d) 500 m^3
18. Which of the following is different from others?
 (a) Wavelength (b) Velocity
 (c) Frequency (d) Amplitude
19. The breaking force for a wire of diameter D of a material is F . The breaking force for a wire of the same material of radius D is
 (a) F (b) $2F$
 (c) $\frac{F}{4}$ (d) $4F$
20. If pressure of a gas contained in a closed vessel is increased by 0.4% when heated by 1°C , its initial temperature must be
 (a) 250 K (b) 250°C
 (c) 2500 K (d) 25°C
21. In an electromagnetic wave, the electric and magnetising fields are 100 V/m and 0.265 A/m . The maximum energy flow is
 (a) 26.5 W/m^2 (b) 36.5 W/m^2
 (c) 46.7 W/m^2 (d) 765 W/m^2
22. A bullet of mass 10 g is fired from a gun of mass 1 kg with recoil velocity of gun is 5 m/s . The muzzle velocity will be
 (a) 30 km/min (b) 60 km/min
 (c) 30 m/s (d) 500 m/s
23. Work done by air when it expands from 50 L to 150 L at a constant pressure of 2 atmosphere is
 (a) $2 \times 10^4 \text{ J}$ (b) $2 \times 100 \text{ J}$
 (c) $2 \times 10^{11} \text{ J}$ (d) $2 \times 10^{15} \text{ J}$
24. In an electron gun, the control grid is given a negative potential, relative to cathode in order to
 (a) accelerate the electrons
 (b) decrease KE of electrons
 (c) repel the electrons
 (d) decelerate the electrons
25. In an LCR circuit having $L = 8 \text{ H}$, $C = 0.5 \mu\text{F}$ and $R = 100 \Omega$ in series, the resonance frequency in rad/s is
 (a) 600 (b) 200
 (c) $250/\pi$ (d) 500
26. Power of a lens is -4 D and for second lens, power is $+2 \text{ D}$; the total power of the couple is
 (a) -2 D (b) 6 D
 (c) -6 D (d) -8 D
27. In which one of the following regions of the electromagnetic spectrum will the vibrational motion of molecules give rise to absorption?
 (a) Ultraviolet (b) Microwave
 (c) Infrared (d) Radio wave
28. During inelastic collision of two particles
 (a) $(KE)_{\text{final}} = (KE)_{\text{initial}}$
 (b) $(KE)_{\text{final}}$ must be greater than $(KE)_{\text{initial}}$
 (c) $(KE)_{\text{final}}$ must be less than $(KE)_{\text{initial}}$
 (d) $(KE)_{\text{final}}$ must be greater or less than $(KE)_{\text{initial}}$

29. Two gases are at absolute temperatures 300 K and 350 K respectively. The ratio of average kinetic energy of their molecules is
(a) 6 : 7 (b) 36 : 49
(c) 7 : 6 (d) 343 : 216
30. The current in a coil changes from 0 to 2 A in 0.05 s. If the induced emf is 80 V, the self-inductance of the coil is,
(a) 1 H (b) 0.5 H
(c) 1.5 H (d) 2 H
31. Equal volumes of monoatomic and diatomic gases at the same temperature are given equal quantities of heat. Then,
(a) the temperature of diatomic gas will be more
(b) the temperature of monoatomic gas will be more
(c) the temperature of both will be zero
(d) nothing can be said
32. A copper wire and a steel wire of the same diameter and length are joined end to end and a force is applied which stretches their combined length by 1 cm. Then, the two wires will have
(a) the same stress and strain
(b) the same stress but different strains
(c) the same strain but different stresses
(d) different stresses and strains
33. The length of the second's pendulum is decreased by 0.3 cm when it is shifted to Chennai from London. If the acceleration due to gravity at London is 981 cm/s^2 , the acceleration due to gravity at Chennai is
(a) 981 cm/s^2 (b) 978 cm/s^2
(c) 984 cm/s^2 (d) 975 cm/s^2
34. How does, the electric field (E) between the plates of a charged cylindrical capacitor vary with the distance r from the axis of the cylinder?
(a) $E \propto \frac{1}{r^2}$ (b) $E \propto \frac{1}{r}$
(c) $E \propto r^2$ (d) $E \propto r$
35. A thin bar magnet of length $2L$ is bent at the mid-point so that the angle between them is 60° . The new length of the magnet is
(a) $\sqrt{2} L$ (b) $\sqrt{3} L$
(c) $2 L$ (d) L
36. A capacitor is connected to a cell of emf E and some internal resistance r . The potential difference across the
(a) cell is E (b) cell is $< E$
(c) capacitor is $< E$ (d) capacitor is $> E$
37. The radius of the smallest electron orbit in hydrogen-like ion is $(0.51 \times 10^{-10} / 4) \text{ m}$, then it is
(a) hydrogen atom (b) He^+
(c) Li^{2+} (d) Be^{3+}
38. de-Broglie wavelength of a body of mass 1 kg moving with velocity of 2000 m/s is
(a) $3.32 \times 10^{-27} \text{ \AA}$ (b) $1.5 \times 10^7 \text{ \AA}$
(c) $0.55 \times 10^{-22} \text{ \AA}$ (d) None of these
39. A voltmeter of resistance 998Ω is connected across a cell of emf 2 V and internal resistance 2Ω . The potential difference across the voltmeter is
(a) 1.99 V (b) 3.5 V (c) 5 V (d) 6 V
40. If a person with a spring balance and a body hanging from it goes up and up in an aeroplane, then the reading of the weight of the body as indicated by the spring balance will
(a) goes on increasing
(b) goes on decreasing
(c) first increase and then decrease
(d) remains the same
41. A mass $3m$, initially at rest at the origin explodes into three fragments of equal mass. Two of the fragments have speed v each and move perpendicular to each other. The third fragment will move with a speed
(a) $\frac{v}{\sqrt{2}}$ (b) $\frac{v}{2}$ (c) v (d) $v\sqrt{2}$
42. A nucleus X initially at rest, undergoes alpha decay according to the equation
$${}_{92}\text{X}^A \rightarrow {}_Z\text{Y}^{228} + \alpha$$

Then, the value of A and Z are
(a) 94, 230 (b) 232, 90
(c) 190, 32 (d) 230, 94
43. The energy gap between the valence band and the conduction band for a material is 6 eV. The material is
(a) an insulator
(b) a metal
(c) an intrinsic semiconductor
(d) a superconductor
44. When the inputs of a two input logic gate are 0 and 0, the output is 1. When the inputs are 1 and 0 the output is 0. The logic gate is of the type
(a) AND (b) NAND
(c) NOR (d) OR

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45. If a transistor biased in the common-emitter mode, the emitter current is
 (a) much smaller than base current
 (b) much larger than base current
 (c) nearly equal to the base current
 (d) much smaller than the collector current
46. A sound has an intensity of $2 \times 10^{-8} \text{ W / m}^2$. Its intensity level in decibels is ($\log_{10} 2 = 0.3$)
 (a) 23 (b) 3
 (c) 43 (d) 4.3
47. A ray reflected successively from two plane mirrors inclined at a certain angle undergoes a deviation of 240° . Then, the number of images observable is
 (a) 3 (b) 5
 (c) 7 (d) 9
48. If 1 A of current is passed through CuSO_4 solution for 10 s, the number of copper atoms deposited at the cathode will be about
 (a) 1.6×10^{20} (b) 8×10^{19}
 (c) 3.1×10^{19} (d) 6.2×10^{19}
49. Two points A and B are situated at distance x and $2x$ respectively from the nearer pole of a magnet 2 cm long. The ratio of magnetic field at A and B is
 (a) 4 : 1 exactly (b) 4 : 1 approximately
 (c) 8 : 1 exactly (d) 8 : 1 approximately
50. Electromagnetic waves travel only through
 (a) material medium
 (b) vacuum
 (c) oscillating electric and magnetic fields
 (d) oscillating electric and magnetic fields whose directions are perpendicular to each other
51. The ratio of magnetic moments of two short magnets which give null deflection in tan B position at 12 cm and 18 cm from the centre of a deflection magnetometer is
 (a) 2 : 3 (b) 8 : 27
 (c) 27 : 8 (d) 4 : 9
52. A 220 V main supply is connected to a resistance of 100 k Ω . The effective current is
 (a) 2.2 mA (b) $2.2\sqrt{2}$ mA
 (c) $\frac{2.2}{\sqrt{2}}$ mA (d) None of these
53. Two bodies of different masses m_1 and m_2 have equal momenta. Their kinetic energies E_1 and E_2 are in the ratio
 (a) $\sqrt{m_1} : \sqrt{m_2}$ (b) $m_1 : m_2$
 (c) $m_2 : m_1$ (d) $m_1^2 : m_2^2$
54. When the light enters from air to glass, for which colour the angle of deviation is maximum?
 (a) Red (b) Yellow
 (c) Blue (d) Violet
55. Two waves are represented by $y_1 = A \sin(kx - \omega t)$ and $y_2 = A \cos(kx - \omega t)$. The amplitude of resultant wave is
 (a) 4A (b) 2A
 (c) $\sqrt{2}A$ (d) A
56. An atom of mass M which is in the state of rest emits a photon of wavelength λ . As a result, the atom will deflect with the kinetic energy equal to (h is Planck's constant)
 (a) $\frac{h^2}{M\lambda^2}$ (b) $\frac{1}{2} \frac{h^2}{M\lambda^2}$
 (c) $\frac{h}{M\lambda}$ (d) $\frac{1}{2} \frac{h}{M\lambda}$
57. If the angular momentum of any rotating body increases by 200%, then the increase in its kinetic energy is
 (a) 400% (b) 800%
 (c) 200% (d) 100%
58. A cylindrical tank has a hole of 1 cm² in its bottom. If the water is allowed to flow into the tank from a tube above it at the rate of 70 cm³/s, then the maximum height up to which water can rise in the tank is
 (a) 2.5 cm (b) 5 cm
 (c) 10 cm (d) 0.25 cm
59. X-rays and γ -rays of the same energies may be distinguished by
 (a) their velocity
 (b) their ionising power
 (c) their intensity
 (d) method of production
60. Which of the following materials is non-crystalline?
 (a) Copper (b) Sodium chloride
 (c) Wood (d) Diamond

Chemistry

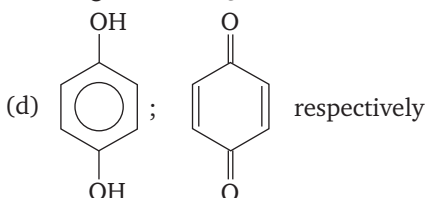
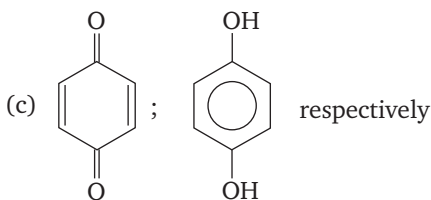
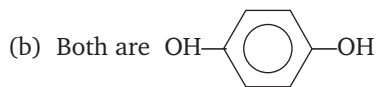
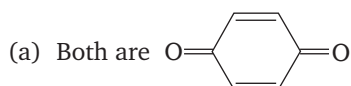
- The vapour density of N_2O_4 at a certain temperature is 30. What is the percentage dissociation of N_2O_4 at this temperature?
(a) 46% (b) 53%
(c) 75% (d) 92%
- Four different colloids have the following gold number, which one has the most effective action?
(a) 5 (b) 10
(c) 15 (d) 13
- In which of the following case, increase in concentration of ion cause increase in E_{cell} ?
(a) $Pt(H_2) | H^+(aq)$
(b) $Pt | \text{Quinhydrone} | H^+(aq)$
(c) $Ag | Ag^+(aq)$
(d) $Ag, AgCl | Cl^-(aq)$
- The relative lowering of vapour pressure of an aqueous solution containing a non volatile solute is 0.0125. The molality of the solution is
(a) 0.70 (b) 0.30
(c) 0.125 (d) 0.07
- Which of the following is known as Glauber's salt?
(a) $Na_2S_2O_3 \cdot 5H_2O$ (b) $Na_2SO_4 \cdot 10H_2O$
(c) $Na_2CO_3 \cdot 10H_2O$ (d) $Na(NH_4)HPO_4$
- $PhCHClBr \xrightarrow{tBuO^-}$ Carbene
In the above reaction which of the following will be most probable?
(a) $\cdot CHBr$ (b) $\cdot CHCl$
(c) $\cdot CPhBr$ (d) $\cdot CPhCl$
- Which of the following alcohol is unable to turn orange colour of chromic acid to green?
(a) 1° alcohol (b) 2° alcohol
(c) 3° alcohol (d) Allyl alcohol
- Which of the following test is performed by carbohydrates?
(a) Biuret test (b) Nitroprusside test
(c) Ninhydrin test (d) Molisch's test
- Which of the following is not used as propellant?
(a) Hydrazine (b) UDMH
(c) MMH (d) Phenyl hydrazine
- Which of the following species have the same number of electrons in its outermost as well as penultimate shell?
(a) Cl^- (b) O^{2-}
(c) Na^+ (d) Mg^{2+}
- Which of the following is the formula of Sorel's cement?
(a) $KCl \cdot MgCl_2 \cdot 6H_2O$
(b) $MgCl_2 \cdot 5MgO \cdot xH_2O$
(c) $CaSO_4 \cdot 2H_2O$
(d) $MgCO_3 \cdot CaCO_3$
- $S_{(rhombic)} + O_2(g) \longrightarrow SO_2(g),$
 $\Delta H = -297.5 \text{ kJ}$
 $S_{(monoclinic)} + O_2(g) \longrightarrow SO_2(g),$
 $\Delta H = -300 \text{ kJ}$
The data can predict that
(a) rhombic sulphur is yellow in colour
(b) monoclinic sulphur has metallic lusture
(c) monoclinic sulphur is more stable
(d) $\Delta H_{transition}$ of S_R to S_M is endothermic
- Which of the following is a measurement of water pollution?
(a) PSC (b) PCB
(c) BOD (d) COD
- The half-life period of a first order process is 1.6 min. It will be 90% complete in
(a) 5.3 min (b) 10.6 min
(c) 43.3 min (d) 99.7 min
- Which of the following is tetrabasic acid?
(a) Orthophosphorus acid
(b) Orthophosphoric acid
(c) Metaphosphoric acid
(d) Pyrophosphoric acid
- Which of the following order for bond angles is correct?
(a) $BF_3 < NF_3 < PF_3 < ClF_3$
(b) $BF_3 < NF_3 < PF_3 > ClF_3$
(c) $ClF_3 < PF_3 < NF_3 < BF_3$
(d) $BF_3 \approx NF_3 < PF_3 < ClF_3$
- The triad of the nuclei that is isotonic, is
(a) ${}_6C^{14}, {}_7N^{14}, {}_9F^{19}$ (b) ${}_6C^{14}, {}_7N^{15}, {}_9F^{17}$
(c) ${}_6C^{14}, {}_7N^{14}, {}_9F^{17}$ (d) ${}_6C^{12}, {}_7N^{14}, {}_9F^{19}$
- The oxidation number of cobalt in $K[Co(CO)_4]$ is
(a) -1 (b) -3 (c) +1 (d) +3
- Out of Cu, Ag, Fe and Zn, the metal which can displace all others from their salt solution, is
(a) Zn (b) Cu
(c) Ag (d) Fe

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20. Which of the following has magic number of neutrons?
 (a) ${}_{13}\text{Al}^{27}$ (b) ${}_{26}\text{Fe}^{56}$
 (c) ${}_{83}\text{Bi}^{209}$ (d) ${}_{92}\text{U}^{238}$
21. If K_a of $\text{HCN} = 4 \times 10^{-10}$, then the pH of 2.5×10^{-1} molar HCN(aq) is
 (a) 1 (b) 2.5
 (c) 4 (d) 5
22. A coffee cup calorimeter initially contains 125 g of water at a temperature of 24.2°C . After adding of 10.5 g of KBr , the temperature becomes 21.1°C . The heat of solution is
 (a) 40 J/g (b) 117 J/g
 (c) 167.7 J/g (d) 420.05 J/g
23. What product is formed when cyclohexanone is oxidised?
 (a) $\text{HOOC} \cdot (\text{CH}_2)_4 \cdot \text{COOH}$
 (b) $\text{CH}_3\text{CH}_2\text{COOH}$
 (c) $\text{CH}_3(\text{CH}_2)_4 \cdot \text{COOH}$
 (d) None of the above
24. The reaction

$$\text{CH}_3\text{CN} + 4\text{H} \xrightarrow{\text{Na/C}_2\text{H}_5\text{OH}} \text{CH}_3\text{CH}_2\text{NH}_2$$
 is known as
 (a) Hofmann's bromamide reaction
 (b) Mendius reaction
 (c) Perkin's reaction
 (d) Sabatier reaction
25. Action of Br_2 on cyclopentene gives
 (a) cyclopentyl bromide
 (b) 1,2-dibromo cyclopentane
 (c) cyclopentyl dibromide
 (d) no reaction
26. In a face-centred cubic arrangement of A and B atoms whose A atoms are at the corner of the unit cell and B atoms at the face-centre, one of A atom is missing from one corner in the unit cell. The simplest formula of the compound is
 (a) A_{24}B_7 (b) A_7B_{24}
 (c) A_7B_4 (d) AB_2
27. Beryllium shows diagonal relationship with
 (a) B (b) Mg
 (c) Al (d) Na
28. A compound has the molecular formula X_4O_6 . If 10 g of X_4O_6 has 5.72 g X, then calculate atomic mass of X.
 (a) 32 amu (b) 64 amu
 (c) 67 amu (d) 98 amu
29. Which of the following is Rinmann's green?
 (a) ZnO (b) $\text{ZnS} + \text{BaSO}_4$
 (c) $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ (d) $\text{ZnO} \cdot \text{CoO}$
30. For the valence electron in copper, the four quantum numbers are
 (a) $n = 4, l = 0, m = 0, s = \frac{1}{2}$
 (b) $n = 4, l = 0, m = +2, s = \frac{1}{2}$
 (c) $n = 4, l = 1, m = +2, s = \frac{1}{2}$
 (d) $n = 4, l = 1, m = 0, s = \frac{1}{2}$
31. Geometry of BF_3 is
 (a) trigonal planar (b) pentagonal
 (c) trihedral (d) tetrahedral
32. Which of the following will represent the normality of 10% (w/V) acetic acid?
 (a) 1.66 N (b) 16.6 N
 (c) 3.32 N (d) 33.2 N
33. The oxidation number of sulphur in $\text{H}_2\text{S}_2\text{O}_8$ is
 (a) +2 (b) +4
 (c) +6 (d) +7
34. Which of the following reaction requires catalyst?
 (a) $\text{S} + \text{O}_2 \longrightarrow \text{SO}_2$
 (b) $\text{C} + \text{O}_2 \longrightarrow \text{CO}_2$
 (c) $2\text{SO}_2 + \text{O}_2 \longrightarrow 2\text{SO}_3$
 (d) All of the above
35. $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) + 22 \text{ kcal}$
 The activation energy for the forward reaction is 50 kcal. What is the activation energy for the backward reaction?
 (a) 72 kcal (b) 28 kcal
 (c) -72 kcal (d) -28 kcal
36. Malonic acid and succinic acid are distinguished by
 (a) heating (b) NaHCO_3
 (c) both (a) and (b) (d) None of these
37. When chloroform is treated with chlorine in the presence of sunlight, it yields
 (a) urotropine (b) pyrene
 (c) chloropicrin (d) chloritone
38.
$$\text{A} \xleftarrow[\text{[O]}]{\text{CrO}_2\text{Cl}_2} \text{C}_6\text{H}_5\text{OH} \xrightarrow[\text{OH}^-, \text{(Elb's)}]{\text{K}_2\text{S}_2\text{O}_8} \text{[B]}$$

 Which of the following are A and B?



39. Which of the following will explain synthesis of RNA?

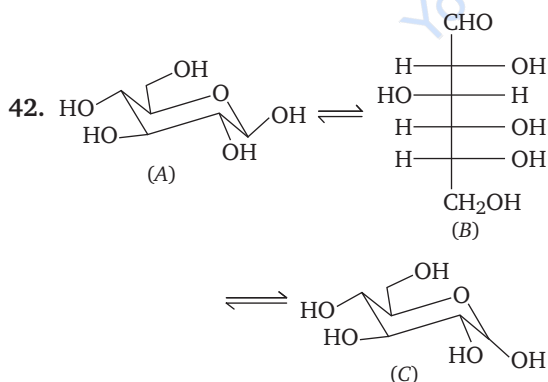
- (a) Translation (b) Coagulation
(c) Transcription (d) Replication

40. Which of the following is a narrow spectrum antibiotics?

- (a) Penicillin G (b) Dettol
(c) Aspirin (d) Analgin

41. When aniline reacts with oil of bitter almonds, condensation takes place and benzyl derivatives are formed. These are known as

- (a) Millon's base (b) Schiff's reagent
(c) Benedict reagent (d) Schiff's base



Which of the following is correct about (A), (B) and (C)?

- (a) A, B and C are anomers

- (b) A and C are anomers
(c) A, B and C are metamers
(d) None of the above

43. The IUPAC name of  is

- (a) bicyclo (2,1,0) pentane
(b) 1,2-cyclopropyl cyclobutane
(c) 1,2-methylene cyclobutane
(d) cyclopentane (4,3) annulene

44. In the conversion of ethanol into methanol which of the following reagents will be used?

- (a) $\text{K}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$ (b) $\text{NaOH} + \text{CaO}$
(c) $\text{Cl}_2 + \text{aq. KOH}$ (d) All of these

45. PDI for natural polymers is generally close to

- (a) zero (b) 1
(c) 10 (d) 100

46. Which of the following is diamagnetic?

- (a) H_2 (b) H_2^- (c) H_2^+ (d) He_2^+

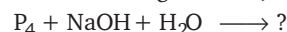
47. Which of the following is a property of non-metal?

- (a) Electronegativity
(b) Basic nature of oxide
(c) Reducing property
(d) Low ionisation potential

48. One mole of ice is converted into water at 273 K. The entropies of $\text{H}_2\text{O}(\text{s})$ and $\text{H}_2\text{O}(\text{l})$ are 38.20 and $60.01 \text{ J mol}^{-1} \text{ K}^{-1}$ respectively. The enthalpy change for the conversion is

- (a) 3 kJ mol^{-1} (b) 4 kJ mol^{-1}
(c) 5 kJ mol^{-1} (d) 6 kJ mol^{-1}

49. Complete the following reaction,



- (a) $\text{PH}_3 + \text{Na}_2\text{HPO}_2$ (b) $\text{PH}_3 + \text{NaH}_2\text{PO}_2$
(c) $\text{H}_3\text{PO}_4 + \text{NaO}$ (d) $\text{PH}_3 + \text{Na}_2\text{PO}_4$

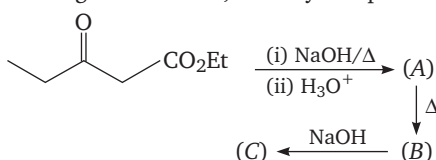
50. The elevation in boiling point would be highest for

- (a) 0.08 M BaCl_2 (b) 0.15 M KCl
(c) 0.10 M Glucose (d) 0.06 M $\text{Ca}(\text{NO}_3)_2$

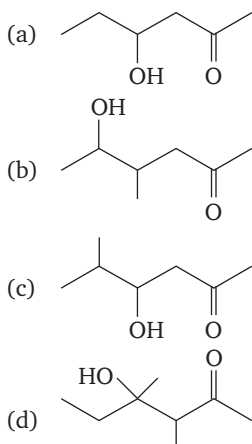
51. What is the magnetic moment of $[\text{FeF}_6]^{3-}$?

- (a) 2 BM (b) 5.9 BM
(c) 7 BM (d) 35 BM

52. In the given reaction, identify compound C?



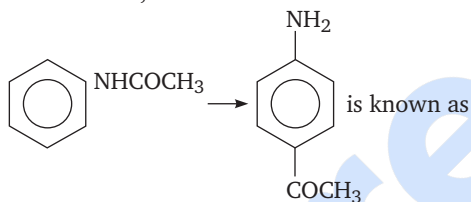
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53. The ratio of rate of diffusion of hydrogen and helium gas is

- (a) 1 : 1.4 (b) 1 : 1 (c) 1.4 : 1 (d) 1 : 2

54. The reaction,



- (a) substitution reaction
(b) addition reaction
(c) elimination reaction
(d) None of the above

55. Which of the following is responsible for hardness of water?

- (a) CaHCO_3 (b) CaCl_2
(c) Both (a) and (b) (d) None of these

56. Which of the following is differ in nature from others?

- (a) Vasopressin (b) Thyroid
(c) Oxytocin (d) Insulin

57. Indigo is an example of

- (a) vat dye (b) mordant dye
(c) azo dye (d) phthalein dye

58. Solder is an alloy of lead with

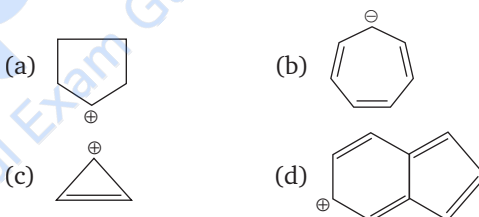
- (a) Cu (b) Fe
(c) Sn (d) Zn

59. An aqueous solution contains following ions :

Hg_2^{2+} , Hg^{2+} , Pb^{2+} and Cd^{2+} . On adding HCl, which of these will precipitate?

- (a) Hg_2Cl_2 (b) PbCl_2
(c) Hg_2Cl_2 and PbCl_2 (d) HgCl_2 and PbCl_2

60. Which of the following molecules/species are aromatic in nature?



Mathematics

1. The sum of the series $1 + \frac{2^2}{2!} + \frac{3^2}{3!} + \frac{4^2}{4!} + \dots$ is

- (a) $2e$ (b) $3e$
(c) $2e - 1$ (d) None of these

2. If $f(x) = x^2 + 2bx + 2c^2$

and $g(x) = -x^2 - 2cx + b^2$

are such that $\min f(x) > \max g(x)$, then relation between b and c is

(a) no relation

(b) $0 < c < \frac{b}{2}$

(c) $|c| < \sqrt{2}|b|$

(d) $|c| > \sqrt{2}|b|$

3. If $\left| \frac{z_1}{z_2} \right| = 1$ and $\arg(z_1 z_2) = 0$, then

- (a) $z_1 = z_2$ (b) $|z_2|^2 = z_1 z_2$
(c) $z_1 z_2 = 1$ (d) None of these

4. If $\cos A = m \cos B$, and $\cot \frac{A+B}{2} = \lambda \tan \frac{B-A}{2}$, then λ is

- (a) $\frac{m}{m-1}$ (b) $\frac{m+1}{m}$
(c) $\frac{m+1}{m-1}$ (d) None of these

5. In a triangle, the angle are in AP and the lengths of the two larger sides are 10 and 9,

respectively, then the length of the third side can be

- (a) $5 \pm \sqrt{6}$ (b) 0.7
(c) $15 - \sqrt{6}$ (d) None of these

6. The complex number $z = x + iy$ which satisfy the equation $\left| \frac{z - 5i}{z + 5i} \right| = 1$, lie on

- (a) the x-axis
(b) the straight line $y = 5$
(c) a circle passing through the origin
(d) None of the above

7. If $x > 1$, $y > 1$, $z > 1$ are in GP, then $\frac{1}{1 + \ln x}$,

$\frac{1}{1 + \ln y}$, $\frac{1}{1 + \ln z}$ are in

- (a) AP (b) HP
(c) GP (d) None of these

8. If $\frac{e^x}{1-x} = B_0 + B_1x + B_2x^2 + \dots + B_nx^n + \dots$,

then $B_n - B_{n-1}$ equals

- (a) $\frac{1}{n!}$ (b) $\frac{1}{(n-1)!}$
(c) $\frac{1}{n!} - \frac{1}{(n-1)!}$ (d) 1

9. If $f(x) = \begin{cases} \frac{\sin [x]}{[x]}, & [x] \neq 0 \\ 0, & [x] = 0 \end{cases}$

where $[x]$ denotes the greatest integer less than or equal to x , then $\lim_{x \rightarrow 0} f(x)$ equals

- (a) 1 (b) 0
(c) -1 (d) None of these

10. If $y(t)$ is a solution of $(1+t) \frac{dy}{dt} - ty = 1$ and

$y(0) = -1$, then $y(1)$ equal to

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

11. The locus of the mid-points of the chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origin, is

- (a) $x + y = 2$ (b) $x^2 + y^2 = 1$
(c) $x^2 + y^2 = 2$ (d) $x + y = 1$

12. From a point A common tangents are drawn to the circle $x^2 + y^2 = a^2/2$ and parabola

$y^2 = 4ax$. The area of the quadrilateral formed by the common tangents to the chord of contact of the parabola is

- (a) $\frac{15a^3}{4}$ sq units (b) $\frac{15a^2}{4}$ sq units
(c) $\frac{7a^2}{4}$ sq units (d) $\frac{a^2}{4}$ sq unit

13. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$, then value of the

determinant $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 - \omega^2 & \omega^2 \\ 1 & \omega^2 & \omega \end{vmatrix}$ is

- (a) 3ω (b) $3\omega(\omega - 1)$
(c) $3\omega^2$ (d) $3\omega(1 - \omega)$

14. The harmonic mean of the root of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ is

- (a) 2 (b) 4
(c) 6 (d) 8

15. Domain of the function $\log |x^2 - 9|$ is

- (a) R (b) $R - [-3, 3]$
(c) $R - \{-3, 3\}$ (d) None of these

16. Let $f: R \rightarrow R$ be such that $f(1) = 3$ and $f'(1) = 6$.

Then, $\lim_{x \rightarrow 0} \left[\frac{f(1+x)}{f(1)} \right]^{1/x}$ equals

- (a) 1 (b) $e^{1/2}$
(c) e^2 (d) e^3

17. The value of $[a \ a + b \ a + b + c]$ is

- (a) $[a \ b \ c]^2$ (b) $[a \ b \ c]$
(c) $2[a \ b \ c]$ (d) $3[a \ b \ c]$

18. If $a = -i + 2j - k$, $b = i + j - 3k$ and $c = -4i - k$, then $a \times (b \times c) + (a \cdot b)c$

- (a) $5i + 5j - 15k$ (b) 0
(c) $12j + 4k$ (d) $-3i + 6j - 3k$

19. If $I(m, n) = \int_0^1 t^m (1+t)^n dt$, then the expression for $I(m, n)$ in terms of $I(m+1, n-1)$ is

- (a) $\frac{2^n}{m+1} - \frac{n}{m+1} I(m+1, n-1)$
(b) $\frac{n}{m+1} I(m+1, n-1)$
(c) $\frac{2^n}{m+1} + \frac{n}{m+1} I(m+1, n-1)$
(d) $\frac{m}{m+1} I(m+1, n-1)$

20. The ΔPQR is inscribed in the circle $x^2 + y^2 = 25$. If Q and R have coordinates $(3, 4)$ and $(-4, 3)$, respectively. Then, $\angle QPR$ is equal to
- (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$
 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$
21. The equation of directrix of the parabola $y^2 + 4y + 4x + 2 = 0$ is
- (a) $x = -1$ (b) $x = 1$
 (c) $x = -\frac{3}{2}$ (d) $x = \frac{3}{2}$
22. If $a > 2b > 0$, then positive value of m for which $y = mx - b\sqrt{1 + m^2}$ is a common tangent to $x^2 + y^2 = b^2$ and $(x - a)^2 + y^2 = b^2$ is
- (a) $\frac{2b}{\sqrt{a^2 - 4b^2}}$ (b) $\frac{\sqrt{a^2 - 4b^2}}{2b}$
 (c) $\frac{2b}{a - 2b}$ (d) $\frac{b}{a - 2b}$
23. If $\alpha \in \left[0, \frac{\pi}{2}\right)$, then $\sqrt{x^2 + x} + \frac{\tan^2 \alpha}{\sqrt{x^2 + x}}$ is always greater than or equal to
- (a) $2 \tan \alpha$ (b) 1
 (c) 2 (d) $\sec^2 \alpha$
24. If an edge of a cube measure 2 m with a possible error of 0.5 cm. Find the corresponding error in the calculated volume of the cube
- (a) 0.6 m^3 (b) 0.06 m^3
 (c) 0.006 m^3 (d) 0.0006 m^3
25. Let f be twice differentiable function satisfying $f(1) = 1$, $f(2) = 4$, $f(3) = 9$, then
- (a) $f''(x) = 2, \forall x \in \mathbb{R}$
 (b) $f'(x) = 5 = f''(x)$. For some $x \in (1, 3)$
 (c) there exists atleast one $x \in (1, 3)$ such that $f''(x) = 2$
 (d) None of the above
26. The order of the differential equation whose general solution is given by
- $$y = (C_1 + C_2) \cos(x + C_3) - C_4 e^x + C_5$$
- where, C_1, C_2, C_3, C_4, C_5 are arbitrary constants, is
- (a) 5 (b) 4
 (c) 3 (d) 2
27. Evaluate $\int (\sqrt{\tan x} + \sqrt{\cot x}) dx$
- (a) $\sqrt{2} \tan^{-1} (\sqrt{\tan x} - \sqrt{\cot x}) + C$
 (b) $\frac{2}{\sqrt{2}} \tan^{-1} x + C$
 (c) $\sqrt{2} \tan^{-1} \left(\frac{\sqrt{\tan x} - \sqrt{\cot x}}{\sqrt{2}} \right) + C$
 (d) None of the above
28. In an election, number of candidates exceeds the number to be elected by 2. A man can vote in 56 ways. Then, the number of candidates is
- (a) 5 (b) 6
 (c) 7 (d) 8
29. The curve described parametrically by $x = t^2 + t + 1$, $y = t^2 - t + 1$ represents
- (a) a pair of straight lines
 (b) an ellipse
 (c) a parabola
 (d) a hyperbola
30. Tangent is drawn to ellipse $\frac{x^2}{27} + \frac{y^2}{1} = 1$ at $(3\sqrt{3} \cos \theta, \sin \theta)$, where $\left(\theta \in \left(0, \frac{\pi}{2}\right)\right)$. Then, the value of θ such that the sum of intercept on axes made by this tangent is minimum, is
- (a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$
 (c) $\frac{\pi}{8}$ (d) $\frac{\pi}{4}$
31. Suppose a, b, c are in AP and a^2, b^2, c^2 are in GP. If $a < b < c$ and $a + b + c = \frac{3}{2}$, then the value of a is
- (a) $\frac{1}{2\sqrt{2}}$ (b) $\frac{1}{2\sqrt{3}}$
 (c) $\frac{1}{2} - \frac{1}{\sqrt{3}}$ (d) $\frac{1}{2} - \frac{1}{\sqrt{2}}$
32. The function $f(x) = \frac{\ln(1 + ax) - \ln(1 - bx)}{x}$ is not defined at $x = 0$. The value which should be assigned to f at $x = 0$ so that it is continuous at $x = 0$, is
- (a) $a - b$ (b) $a + b$
 (c) $\ln a + \ln b$ (d) None of these
33. Domain of definition of function $f(x) = \sqrt{\sin^{-1}(2x) + \frac{\pi}{6}}$ for real-valued of x , is

- (a) $\left[-\frac{1}{4}, \frac{1}{2}\right]$ (b) $\left[-\frac{1}{2}, \frac{1}{2}\right]$
 (c) $\left[-\frac{1}{2}, \frac{1}{9}\right]$ (d) $[0, \pi]$
34. If $x \, dy = y(dx + y \, dy)$, $y(1) = 1$ and $y(x) > 0$. Then, $y(-3)$ is equal to
 (a) 3 (b) 2
 (c) 1 (d) 0
35. Evaluate $\int \frac{(x-1)e^x}{(x+1)^3} \, dx$
 (a) 0
 (b) $\frac{(x+1)^2}{e^x} + C$
 (c) $\frac{e^x}{(x+1)^2} + C$
 (d) $\frac{e^x}{(x-1)^2} + (x+1)^2 + C$
36. If $a = \log_2 3$, $b = \log_2 5$, $c = \log_7 2$, then $\log_{140} 63$ in terms of a, b, c is
 (a) $\frac{2ac+1}{2a+abc+1}$ (b) $\frac{2ac+1}{2a+c+a}$
 (c) $\frac{2ac+1}{2c+ab+a}$ (d) None of these
37. Local maximum value of the function $\frac{\log_e x}{x}$ is
 (a) 1 (b) e
 (c) $\frac{1}{e}$ (d) None of these
38. A + iB form of $\frac{(\cos x + i \sin x)(\cos y + i \sin y)}{(\cot u + i)(1 + i \tan v)}$ is
 (a) $\sin u \cos v [\cos(x+y-u-v) + i \sin(x+y-u-v)]$
 (b) $\sin u \cos v [\cos(x+y+u+v) + i \sin(x+y+u+v)]$
 (c) $\sin u \cos v [\cos(x+y+u+v) - i \sin(x+y+u+v)]$
 (d) None of the above
39. In the set $\mathbb{Q}^+$ of all positive rational numbers, the operation $*$ is defined by the formula $a * b = \frac{ab}{6}$. Then, the inverse of 9 with respect to $*$ is
 (a) 4 (b) 3
 (c) $\frac{1}{9}$ (d) $\frac{1}{3}$
40. If $\alpha + \beta + \gamma = \pi$, then the value of $\sin^2 \alpha + \sin^2 \beta - \sin^2 \gamma$ is equal to
 (a) $2 \sin \alpha$ (b) $2 \sin \alpha \cos \beta \sin \gamma$
 (c) $2 \sin \alpha \sin \beta \cos \gamma$ (d) $2 \sin \alpha \sin \beta \sin \gamma$
41. If in a $\triangle ABC$

$$\frac{2 \cos A}{a} + \frac{\cos B}{b} + \frac{2 \cos C}{c} = \frac{a}{bc} + \frac{b}{ac},$$
 then $b^2 + c^2$ is equal to
 (a) a^2 (b) ac
 (c) bc (d) None of these
42. In any $\triangle ABC$, the least value of $\left(\frac{\sin^2 A + \sin A + 1}{\sin A}\right)$ is
 (a) 3 (b) $\sqrt{3}$
 (c) 9 (d) None of these
43. Let λ and α be real

$$\begin{aligned} \lambda x + \sin \alpha \cdot y + \cos \alpha \cdot z &= 0, \\ x + \cos \alpha \cdot y + \sin \alpha \cdot z &= 0, \\ -x + \sin \alpha \cdot y - \cos \alpha \cdot z &= 0 \end{aligned}$$
 has a non-trivial solution. If $\lambda = 1$, then all the values of α is equals
 (a) $n\pi + \frac{\pi}{2}$ (b) $n\pi + \frac{\pi}{4}, n\pi$
 (c) $n\pi \pm \frac{\pi}{2}$ (d) $n\pi + \frac{\pi}{4}, \frac{\pi}{4}$
44. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then
 (a) $a < 2$ (b) $2 \leq a \leq 3$
 (c) $3 < a \leq 4$ (d) $a > 4$
45. If z_1 and z_2 are two complex numbers such that $|z_1| = |z_2| + |z_1 - z_2|$, then
 (a) $\operatorname{Im}\left(\frac{z_1}{z_2}\right) = 0$ (b) $\operatorname{Re}\left(\frac{z_1}{z_2}\right) = 0$
 (c) $\operatorname{Re}\left(\frac{z_1}{z_2}\right) = \operatorname{Im}\left(\frac{z_1}{z_2}\right)$ (d) None of these
46. The number of five digits numbers that can be formed without any restriction is
 (a) 990000 (b) 10000
 (c) 90000 (d) None of these
47. The middle term in the expansion of $\left(x^2 + \frac{1}{x^2} + 2\right)^n$ is
 (a) $\frac{n}{[(n/2)!]^2}$

(b) $-\frac{(2n)!}{[(n/2)!]^2}$

(c) $\frac{1 \cdot 3 \cdot 5 \dots (2n+1)}{n!} 2^n$

(d) $\frac{(2n)!}{(n!)^2}$

48. The value of $\sin(22^\circ 30')$ is

(a) $\sqrt{\frac{\sqrt{2}+1}{2\sqrt{2}}}$

(b) $\sqrt{\sqrt{2}-1}$

(c) $\sqrt{\frac{\sqrt{2}-1}{2\sqrt{2}}}$

(d) None of these

49. If $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$, then the value of $\sqrt{\frac{1-\sin \theta}{1+\sin \theta}}$ is equal to

(a) $-\sec \theta + \tan \theta$

(b) $\sec \theta + \tan \theta$

(c) $\sec \theta - \tan \theta$

(d) None of these

50. If $\int \frac{2^x}{\sqrt{1-4^x}} dx = k \sin^{-1}(2^x) + C$, then k is equal to

(a) $\log 2$

(b) $\frac{1}{2} \log 2$

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

(d) $\frac{1}{\log 2}$

51. The area of the region bounded by $y = -1$, $y = 2$, $x = y^3$ and $x = 0$ is

(a) $\frac{17}{4}$ sq units

(b) $\frac{1}{4}$ sq unit

(c) 4 sq units

(d) None of these

52. The mid-point of the line joining the common points of the line $2x - 3y + 8 = 0$ and $y^2 = 8x$ is

(a) (3, 2)

(b) (5, 6)

(c) (4, -1)

(d) (2, -3)

53. The value of $\cos^2 48^\circ - \sin^2 12^\circ$ is

(a) $\frac{\sqrt{5}+1}{8}$

(b) $\frac{\sqrt{5}-1}{8}$

(c) $\frac{\sqrt{5}+1}{16}$

(d) None of these

54. The number of solutions of $\sin^2 \theta + 3 \cos \theta = 3$ in $[-\pi, \pi]$, is

(a) 4

(b) 2

(c) 0

(d) None of these

55. The height of the chimney when it is found that on walking towards it 50 m in the horizontal line through its base, the angle of elevation of its top changes from 30° to 60° , is

(a) $25\sqrt{3}$ m

(b) 25 m

(c) $25\sqrt{4}$ m

(d) $\frac{25}{\sqrt{3}}$ m

56. If $\lim_{x \rightarrow \infty} \left(\frac{x^3+1}{x^2+1} - (ax+b) \right) = 2$, then

(a) $a = 1, b = 1$

(b) $a = 1, b = 2$

(c) $a = 1, b = -2$

(d) None of these

57. If $f(x) = \begin{cases} \frac{|x+2|}{\tan^{-1}(x+2)}, & x \neq -2 \\ 2, & x = -2 \end{cases}$, then $f(x)$ is

(a) continuous at $x = -2$

(b) not continuous at $x = -2$

(c) differentiable at $x = -2$

(d) continuous but not derivable at $x = -2$.

58. Let P be any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$. Then, the length of the segment of the tangent between the coordinate axes of length

(a) $3a$

(b) $4a$

(c) $5a$

(d) a

59. The motion of a particle along a straight line is described by the function $x = (2t - 3)^2$, where x is in metre and t is in second. Then, the velocity of the particle at origin is

(a) 0

(b) 1

(c) 2

(d) None of these

60. The value of $\cos \frac{2\pi}{7} + \cos \frac{4\pi}{7} + \cos \frac{6\pi}{7}$ is

(a) 1

(b) -1

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

(d) $-\frac{1}{2}$

61. The maximum value of $3 \cos \theta + 4 \sin \theta$ is

(a) -5

(b) 5

(c) 25

(d) None of these

62. Which of the following is not a statement?

(a) Every set is a finite set

(b) 8 is less than 6

(c) Where are you going

(d) The sum of interior angles of a triangle is 180°

63. The least positive remainder when $123 \times 125 \times 127$ is divided by 124 is
 (a) 4 (b) 120
 (c) 121 (d) 130
64. The vertex connectivity of any tree is
 (a) one (b) two
 (c) three (d) None of these
65. A five digit number divisible by 3 is to be formed using the digits 0, 1, 2, 3, 4 and 5, without repetition. The total number of ways this can be done, is
 (a) 216 (b) 240
 (c) 600 (d) 3125
66. Given positive integers $r > 1$, $n > 2$ and the coefficient of $(3r)$ th and $(r + 2)$ th terms in the binomial expansion of $(1 + x)^{2n}$ are equal, then
 (a) $n = 2r$ (b) $n = 2r + 1$
 (c) $n = 3r$ (d) None of these
67. The number of solutions of $\log_4 (x - 1) = \log_2 (x - 3)$ is
 (a) 3 (b) 1
 (c) 2 (d) 0
68. The value of $\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \cos^2 t \, dt}{x \sin x}$ is
 (a) 2 (b) 1
 (c) 0 (d) None of these
69. The value of $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x} + \sqrt{x}} \, dx$ is
 (a) 1 (b) $1/2$
 (c) 2 (d) None of these
70. The solution of differential equation $(e^x + 1)y \, dy = (y + 1)e^x \, dx$ is
 (a) $(e^x + 1)(y + 1) = Ce^y$
 (b) $(e^x + 1)|(y + 1)| = Ce^{-y}$
 (c) $(e^x + 1)(y + 1) = \pm Ce^y$
 (d) None of the above
71. The equation of the circle passing through (1, 1) and the points of intersection of $x^2 + y^2 + 13x - 3y = 0$ and $11x + \frac{1}{2}y + \frac{25}{2} = 0$ is
 (a) $4x^2 + 4y^2 - 30x - 10y = 25$
 (b) $4x^2 + 4y^2 - 30x - 13y - 25 = 0$
 (c) $4x^2 + 4y^2 - 17x - 10y + 25 = 0$
 (d) None of the above
72. The equation of the common tangent to the curves $y^2 = 8x$ and $xy = -1$ is
 (a) $3y = 9x + 2$
 (b) $y = 2x + 1$
 (c) $2y = x + 8$
 (d) $y = x + 2$
73. If k be the perimeter of the ΔABC , then $b \cos^2 \frac{C}{2} + c \cos^2 \frac{B}{2}$ is equal to
 (a) k (b) $2k$
 (c) $\frac{k}{2}$ (d) None of these
74. Let $f(x)$ be a positive function. Let $I_1 = \int_{1-k}^k xf\{x(1-x)\} \, dx$, $I_2 = \int_{1-k}^k f\{x(1-x)\} \, dx$, where $2k - 1 > 0$, then $\frac{I_1}{I_2}$ is
 (a) 2 (b) k
 (c) $\frac{1}{2}$ (d) 1
75. If P is a variable point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, with AA' as major axis. Then, the maximum value of the area of the $\Delta APA'$ is
 (a) ab sq unit (b) $2ab$ sq unit
 (c) $\frac{ab}{2}$ sq unit (d) None of these
76. In a ΔABC , if $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$ and the side $a = 2$, then area of the triangle is
 (a) 1 sq unit (b) 2 sq units
 (c) $\frac{\sqrt{3}}{2}$ sq units (d) $\sqrt{3}$ sq units
77. The area bounded by the curves $y = |x| - 1$ and $y = -|x| + 1$ is
 (a) 1 sq unit (b) 2 sq units
 (c) $2\sqrt{2}$ sq units (d) 4 sq units
78. The value of the expression $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ$ is equal to
 (a) 2 (b) $\frac{2 \sin 20^\circ}{\sin 40^\circ}$
 (c) 4 (d) $\frac{4 \sin 20^\circ}{\sin 40^\circ}$

79. If in a ΔPQR , $\sin P$, $\sin Q$, $\sin R$ are in AP, then
 (a) the altitudes are in AP
 (b) the altitudes are in HP
 (c) the medians are in GP
 (d) the medians are in AP
80. A man and a woman appears in an interview for two vacancies in the same post. The probability of man's selection is $\frac{1}{4}$ and that of the woman's

selection is $\frac{1}{3}$. What is the probability that none of them will be selected?

- (a) $\frac{1}{2}$ (b) $\frac{1}{12}$
 (c) $\frac{1}{4}$ (d) None of these

English

Directions (Q. Nos. 1-5) *In the following questions, some of the sentences have errors and some have none. Find out which part of a sentence has an error. The letter of that part is your answer. If there is no error, your answer is (d) i.e., No error.*

- The whole country (a)/was suffering by (b)/a financial crisis. (c)/No error. (d)
- I do not know where could he have gone (a)/so early (b)/in the morning. (c)/No error. (d)
- I suggest that (a)/he goes (b)/to the doctor as soon as he returns from taking the examination. (c)/No error. (d)
- The introduction of tea and coffee (a)/and such other beverages (b)/have not been without some effect. (c)/No error. (d)
- Inspite of the roadblock (a)/the guards allowed us (b)/enter the restricted area to search for our friends (c)/No error. (d)

Directions (Q. Nos. 6-10) *In the following questions, out of the four alternatives, choose the one which best expresses the meaning of the given word.*

- Illicit**
 (a) immoral (b) illegal
 (c) ineligible (d) illegible
- Flair**
 (a) talent (b) tendency
 (c) bias (d) need
- Conservation**
 (a) preservation (b) respiration
 (c) correction (d) confusion
- Abysmal**
 (a) sickening (b) gloomy
 (c) sad (d) bottomless
- Salient**
 (a) valient (b) variant
 (c) prodent (d) prominent

Directions (11-15) *In the following questions, choose the word(s) opposite in meaning to the given word.*

- Suppress**
 (a) stir up (b) rouse
 (c) urge (d) incite
- Loosen**
 (a) fasten (b) accelerate
 (c) delay (d) paste
- Rebellion**
 (a) forgiveness (b) retribution
 (c) submission (d) domination
- Idiosyncrasy**
 (a) insanity (b) sanity
 (c) generality (d) singularity
- Sanguine**
 (a) diffident (b) hopeless
 (c) cynical (d) morose

Directions (Q. Nos. 16-20)

- (a) prioritise (b) picturise
 (c) hesitate (d) perforate
- (a) mendacious (b) obnoxious
 (c) pernicious (d) ferocious
- (a) pennetrate (b) irritate
 (c) hesitate (d) perforate
- (a) passageway (b) causeway
 (c) subway (d) straightway
- (a) rapport (b) support
 (c) repport (d) purport

Directions (Q. Nos. 21-25) *In the following questions, four alternatives are given for the Idio/Phrase printed in **bold** in the sentence. Choose the alternative which best expresses the meaning of the Idiom/Phrase.*

21. Don't worry about the silly row. It was just a **storm in a tea cup**.

- (a) important matter dealt with ease
 (b) hot tea being served
 (c) commotion over a trivial matter
 (d) confusion and chaos
22. The Rajput warriors **set their face against** the invader.
 (a) became enemies (b) turned away from
 (c) faced difficulty (d) opposed strongly
23. Syria is now **currying favour with** America.
 (a) pleasing
 (b) favouring
 (c) obliging
 (d) ingratiating itself with
24. Our principal is not a man **to mince matters**.
 (a) to confuse issues
 (b) to say something mildly
 (c) to mix everything together
 (d) to be very modest
25. We tend to **take for granted** the conveniences of modern life.
 (a) to consider (b) to admit
 (c) to accept readily (d) to care for

Directions (Q. Nos. 26-30) *In the following questions, out of the four alternatives, choose the one which can be substituted for the given words/sentence.*

26. Belief that God is in everything and that everything is God
 (a) Atheism (b) Pantheism
 (c) Scepticism (d) Animism
27. A picture of a person or a thing drawn in such a highly exaggerated manner as to cause laughter
 (a) Cartoon (b) Cacography
 (c) Cartography (d) Caricature
28. The state of being miserable be reft of all possessions
 (a) Dependant (b) Complacent
 (c) Destitute (d) Omnipresent
29. That which cannot be called back
 (a) Irresponsible (b) Irrevocable
 (c) Irredeemable (d) Incalculable
30. One who journeys from place to place
 (a) Quack (b) Cannibal
 (c) Itinerant (d) Courier

Directions (Q. Nos. 31-35) *In the following questions, a sentence has been given in Active Voice/Passive Voice. Out of the four alternatives suggested, select the one which best expresses the same sentence in Passive Voice/Active Voice.*

31. We have already done the exercise.
 (a) Already, the exercise has been done by us

- (b) The exercise has already been done by us
 (c) The exercise had been already done by us
 (d) The exercise is already done by us
32. The main skills we seek to develop include analysing, interpreting and evaluating ideas.
 (a) The main skills sought by us to develop include analysing, interpreting and evaluating ideas
 (b) The main skills that we are seeking to be developed include analysing, interpreting and evaluating ideas
 (c) The main skills sought to be developed by us include analysing, interpreting and evaluating ideas
 (d) The main skills include analysing, interpreting and evaluating ideas which are sought by us to develop
33. Who can question Gandhi's integrity?
 (a) By whom Gandhi's integrity can be questioned?
 (b) By whom can Gandhi's integrity be questioned?
 (c) Gandhi's integrity can be questioned by whom?
 (d) Who could have questioned Gandhi's integrity?
34. He presented me a bouquet on my birthday.
 (a) A bouquet is presented to me on my birthday by him
 (b) I was presented on my birthday a bouquet by him
 (c) I was presented a bouquet on my birthday by him
 (d) I will be presented a bouquet on my birthday by him
35. This surface feels smooth.
 (a) This surface is felt smooth
 (b) This surface is smooth when it is felt
 (c) This surface when felt is smooth
 (d) This surface is smooth as felt

Directions (Q. Nos. 36-40) *In the following questions, a part of the sentence is printed **bold**. Below are given alternatives to the **bold** part at (a), (b) and (c), which may improve the sentence. Choose the correct alternative. In case no improvement is needed, your answer is (d).*

36. In the desert, the sun is the master, all else **resigns** before its merciless rays.
 (a) collapses (b) falls
 (c) retires (d) No improvement

37. I intend to learn French next year.
(a) learning (b) learn
(c) have learnt (d) No improvement
38. The police needed him for armed robbery.
(a) liked (b) was after
(c) were looking to (d) No improvement
39. There is no more room for you in this compartment.
(a) no more seat (b) no more space
(c) no more accommodation (d) No improvement
40. It is easy to see why cities grew on the river banks
(a) along the river banks
(b) in the river banks
(c) upon the river banks
(d) No improvement