

PHYSICS

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- 1) The dimension of K in the equation $W = \frac{1}{2} kx^2$ is
 a) $[M^1L^0T^{-2}]$ b) $[M^0L^1T^{-1}]$
 c) $[M^1L^1T^{-2}]$ d) $[M^1L^0T^{-1}]$
- 2) The unit of Stefan's constant is
 a) $Wm^{-2}K^{-1}$ b) WmK^{-4}
 c) $Wm^{-2}K^{-4}$ d) $Nm^{-2}K^{-4}$
- 3) The dimension of $\frac{a}{b}$ in the equation $p = \frac{a-t^2}{bx}$
 where p is pressure, x is distance and t is time is
 a) $[LT^{-3}]$ b) $[ML^3T^{-1}]$
 c) $[M^2LT^{-3}]$ d) $[MT^{-2}]$
- 4) A projectile is fired from level ground at an angle θ above the horizontal. The elevation angle ϕ of the highest point as seen from the launch point is related to θ by the relation
 a) $\tan \phi = 1/4 \tan \theta$
 b) $\tan \phi = \tan \theta$
 c) $\tan \phi = 1/2 \tan \theta$
 d) $\tan \phi = 2 \tan \theta$
- 5) A body dropped from top of a tower fall through 60 m during the last two seconds of its fall. The height of tower is : ($g = 10 \text{ m/s}^2$)
 a) 95 m b) 60 m
 c) 80 m d) 90 m
- 6) A wire of length L and radius r is fixed at one end and force F applied to the other end produces and extension l. The extension produced in another wire of the same material of length 2L and radius 2 r by a force 2 F, is
 a) l b) 2l
 c) 4l d) l/2
- 7) The phase difference between the instantaneous velocity and acceleration of a particle executing simple harmonic motion is
 a) 0.5π b) π
 c) 0.707π d) Zero
- 8) An ideal Carnot engine whose efficiency is 40% receives heat at 500 K. If the efficiency is to be 50% the intake temperature for this same exhaust temperature is :
 a) 600 K b) 800 K
 c) 900 K d) 1000 K
- 9) A steel ball of mass 5g is thrown downward with velocity 10 m/s from height 19.5 m. It penetrates sand by 50 cm. The change in mechanical energy will be : ($g = 10\text{m/s}^2$)
 a) 1 J b) 1.25 J
 c) 1.5 J d) 1.75 J
- 10) A 30 g bullet initially travelling at 120 m/s penetrates 12 cm into wooden block. The average resistance exerted by the wooden block is :
 a) 1800 N b) 2000 N
 c) 2200 N d) 2850 N
- 11) One solid sphere A and another hollow sphere B are of the same mass and same outer radii. Their moment of inertia about their diameters are respectively I_A and I_B such that
 a) $I_A = I_B$ b) $I_A > I_B$
 c) $I_A < I_B$ d) $\frac{I_A}{I_B} = \frac{d_A}{d_B}$
- 12) The maximum and minimum tensions in the string whirling in a circle of radius 2.5 m are in the ratio 5:3 then its velocity is
 a) $\sqrt{98} \text{ m/s}$ b) 7 m/s
 c) $\sqrt{490} \text{ m/s}$ d) $\sqrt{4.9} \text{ m/s}$
- 13) A particle is projected vertically upwards from the surface of earth (radius R_e) with a kinetic energy equal to half to the minimum speed value needed for it so escape. The height to which it rises above the surface of earth is
 a) $V = R$ b) $h = R$
 c) $u = h$ d) $u = v$

Space for Rough Work

- 14) When a ferromagnetic material is heated to temperature above its Curie point, the material
- is permanently magnetized
 - remains ferromagnetic
 - behaves like a diamagnetic material
 - behaves like a paramagnetic material
- 15) A soap bubble in vacuum has a radius 3 cm and another soap bubble in vacuum has radius 4 cm. If two bubbles coalesce under isothermal condition, then the radius of the new bubble will be:
- 7 cm
 - 5 cm
 - 4.5 cm
 - 2.3 cm
- 16) At what speed, the velocity head of water is equal to pressure head of 40 cm of Hg?
- 10.3 m/s
 - 2.8 m/s
 - 5.6 m/s
 - 8.4 m/s
- 17) A rod of length 1.0 m is rotated in a plane perpendicular to a uniform magnetic field of induction 0.25 T with a frequency of 12 rev/s. The induced emf across the ends of the rod is
- 18.89 V
 - 3 V
 - 15 V
 - 9.42 V
- 18) The earth radiates in the infra-red region of the spectrum. The spectrum is correctly given by
- Rayleigh jeans law
 - Planck's law of radiation
 - Stefan's law of radiation
 - Wien's law
- 19) A container with insulating walls is divided into equal parts by a partition fitted with a valve. One part is filled with an ideal gas at a pressure P and temperature T, whereas the other part is completely evacuated. If the valve is suddenly opened, the pressure and temperature of the gas will be :
- P/2, T/2
 - P, T
 - P, T/2
 - P/2, T
- 20) A Carnot engine takes heat from a reservoir at 627°C and rejects heat to a sink at 27°C. Its efficiency will be:
- 3/5
 - 1/3
 - 2/3
 - 200/209
- 21) If the heat of 110 J is added to a gaseous system, whose internal energy is 40 J, then the amount of external work done is:
- 80 J
 - 70 J
 - 115 J
 - 140 J
- 22) If average velocity becomes 4 times then what will be the effect on rms velocity at that temperature?
- 1.4 times
 - 4 times
 - 2 times
 - 1/4 times
- 23) The length of a simple pendulum is increased by 44%. What is the percentage increase in its time period?
- 10%
 - 20%
 - 40%
 - 44%
- 24) When a spring is stretched by 2 cm, it stores 100 J of energy. If it is stretched further by 2 cm, the stored energy will be increased by :
- 100 J
 - 200 J
 - 300 J
 - 400 J
- 25) The number of beats produced per second by two vibrations $x_1 = x_0 \sin 646 \pi t$ and $x_2 = x_0 \sin 652 \pi t$ is
- 2
 - 3
 - 4
 - 6
- 26) The magnitude of electric field \vec{E} in the annular region of a charged cylindrical capacitor
- is same throughout
 - is higher near the outer cylinder than near the inner cylinder
 - varies as $1/r$, where r is the distance from the axis
 - varies as $1/r^2$ where r is the distance from the axis

- 27) A charge Q is placed at each of the opposite corners of a square. A charge q is placed at each of the other two corners. If the net electrical force on Q is zero, then Q/q equals :
- a) -1 b) 1
 c) $-\frac{1}{\sqrt{2}}$ d) $-2\sqrt{2}$
- 28) The electric potential V (in volt) varies with x (in metre) according to the relation $V = (5 + 4x^2)$. The force experienced by a negative charge of 2×10^{-6} C located at $x = 0.5$ m is
- a) 2×10^{-6} N b) 4×10^{-6} N
 c) 6×10^{-6} N d) 8×10^{-6} N
- 29) The inductance of a coil is $L = 10$ H and resistance $R = 5\Omega$. If applied voltage of battery is 10 V and it switches off in 1 millisecond, find induced emf of inductor.
- a) 2×10^4 V b) 1.2×10^4 V
 c) 2×10^{-4} V d) None of these
- 30) A change of 8.0 mA in the emitter current brings a change of 7.9 mA in the collector current. The value of α and β are
- a) 0.99, 90 b) 0.96, 79
 c) 0.97, 99 d) 0.99, 79
- 31) A steady current I goes through a wire loop PQR having shape of a right angle triangle with $PQ = 3x$, $PR = 4x$ and $QR = 5x$. If the magnitude of the magnetic field at P due to this Loop is $k \left(\frac{\mu_0 I}{48\pi x} \right)$, find the value of k .
- a) 6 b) 9
 c) 5 d) 7
- 32) Curie temperature is the temperature above which
- a) a ferromagnetic material becomes paramagnetic
 b) a paramagnetic material becomes diamagnetic
 c) a ferromagnetic material becomes diamagnetic
 d) a paramagnetic material becomes ferromagnetic
- 33) A wire of length 2 m carrying a current of 1 A is bent to form a circle, the magnetic moment of the coil is
- a) $2\pi \text{ Am}^2$ b) $1/\pi \text{ Am}^2$
 c) $\pi \text{ Am}^2$ d) $2/\pi \text{ Am}^2$
- 34) Magnetic meridian is a:
- a) point b) horizontal plane
 c) vertical plane d) line along N-S
- 35) A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid air by a uniform horizontal magnetic field B . The magnitude of B (in tesla) is (assume that $g = 9.8 \text{ ms}^{-2}$)
- a) 2 b) 1.5
 c) 0.55 d) 0.65
- 36) A battery emf 10 V and internal resistance 3Ω is connected to a resistor. The current in the circuit is 0.5 A. The terminal voltage of the battery when the circuit is closed is
- a) 10 V b) 0 V
 c) 1.5 V d) 8.5 V
- 37) Which is different from others by units?
- a) Phase difference
 b) Mechanical equivalent
 c) Loudness of sound
 d) Poisson's ratio
- 38) In an ammeter 10% of main current is passing through the galvanometer. If the resistance of the galvanometer is C , then the shunt resistance, in ohms is:
- a) $9C$ b) $C/9$
 c) $90C$ d) $C/90$
- 39) If λ_1 and λ_2 are the wavelengths of the first members of the Lyman and Paschen series respectively, then $\lambda_1 : \lambda_2$ is
- a) 1 : 3 b) 1 : 30
 c) 7 : 50 d) 7 : 108

- 40) A rectangular block is placed on a printed page lying on a horizontal surface. Find the minimum value of the refractive index of glass for which the letter on the page are not visible from any of the vertical faces of the block.
- a) 1.43 **b) 1.41**
 c) 1.42 d) 1.44
- 41) A telescope has an objective of focal length 50 cm and an eye piece of focal length 5 cm. The least distance of distinct vision is 25 cm. The telescope is focused for distinct vision on a scale 200 cm away from the objective. Calculate. The separation between the object and the eye-piece and the magnification produced
- a) 50.8 cm, -2 **b) 70.8 cm, -2**
 c) 50.8 cm, -1 d) 70.8 cm, -1
- 42) In an interference experiment, the spacing between successive maxima or minima is
- a) $\lambda d/D$ **b) $\lambda D/d$**
 c) dD/λ d) $\lambda d/4D$
- 43) Which of the following are not the transverse waves?
- a) Sound waves **b) Visible light waves**
 c) X-rays d) γ -rays
- 44) A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The Power of combination is
- a) -1.5D** b) -6.5 D
 c) +6.5 D d) 6.67 D
- 45) Maximum velocity of the photoelectrons emitted by a metal surface is $1.2 \times 10^6 \text{ ms}^{-1}$. Assuming the specific charge of the electron to be $1.8 \times 10^{11} \text{ C kg}^{-1}$, the value of the stopping potential in volt will be
- a) 2 b) 3
c) 4 d) 6
- 46) Two waves represented by the following equations are travelling in the same medium
- $$y_1 = 5 \sin 2\pi (75t - 25x)$$
- $$y_2 = 10 \sin 2\pi (150t - 50x)$$
- The intensity ratio I_1/I_2 of the two waves is:
- a) 1 : 2 **b) 1 : 4**
 c) 1 : 8 d) 1 : 16
- 47) The de-Broglie wavelength of a neutron at 927°C is λ . What will be its wavelength at 27°C ?
- a) $\lambda/2$** b) λ
 c) 2λ d) 4λ
- 48) ^{22}Ne nucleus, after absorbing energy, decays into two α -particles and an unknown nucleus. The unknown nucleus is:
- a) nitrogen **b) carbon**
 c) boron d) oxygen
- 49) The ratio of rms speed of O_2 to H_2 is
- a) 1/4** b) 4
 c) 2 d) 1/2
- 50) How many NAND gates are used in an OR gate?
- a) Four b) Two
c) Three d) Five

CHEMISTRY

5

- 51) In an experiment it showed that 10 mL of 0.05 M solution of chloride required 10 ml of 0.1 M solution of AgNO_3 , which of the following will be the formula of the chloride (X stands for the symbol of the element other than chlorine):
 a) X_2Cl b) X_2Cl_2
 c) XCl_2 d) XCl_4
- 52) 74.5 g of metallic chloride contain 35.5 g of chlorine, the equivalent weight of metal is
 a) 19.5 b) 35.5
 c) 39 d) 78.0
- 53) At 100°C and 1 atm, if the density of liquid water is 1.0 g cm^{-3} and that of water vapour is 0.0006 g cm^{-3} , then the volume occupied by the water molecules in 1 litre of steam at that temperature is
 a) 6 cm^3 b) 60 cm^3
 c) 0.6 cm^3 d) 0.06 cm^3
- 54) Equal weights of methane and oxygen are mixed in an empty container at 25°C . The fraction of the total pressure exerted by oxygen is
 a) $\frac{1}{3}$ b) $\frac{1}{2}$
 c) $\frac{2}{3}$ d) $\frac{1}{3} \times \frac{273}{298}$
- 55) Based on equation $E = -2.178 \times 10^{-18} \text{ J} \left(\frac{Z^2}{n^2} \right)$, certain conclusions are written. Which of them is not correct?
 a) Largest the value of n, the larger is the orbit radius
 b) Equation can be used to calculate the change in energy when the electron changes orbit.
 c) For $n = 1$, the electron has more negative energy than it does for $n = 6$ which mean that the electron is more loosely bound in the smallest allowed orbit.
 d) The negative sign in equation simply means that the energy or electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus
- 56) An isotone of coral $^{76}_{32}\text{Ge}$ is
 a) $^{77}_{32}\text{Ge}$ b) $^{77}_{33}\text{As}$
 c) $^{77}_{34}\text{Se}$ d) $^{78}_{36}\text{Sc}$
- 57) In $[\text{Ag}(\text{CN})_2]^{2-}$, the number of π bonds is
 a) 2 b) 3
 c) 4 d) 6
- 58) The species having pyramidal shape is :
 a) SO_3 b) BrF_3
 c) SiO_3^{2-} d) OSF_2
- 59) The molar heat capacity of water at constant pressure is $75 \text{ JK}^{-1} \text{ mol}^{-1}$. when 1 kJ of heat is supplied to 100 g of water, which is free to expand, the increase in temperature of water is
 a) 6.6 K b) 1.2 K
 c) 2.4 K d) 4.8 K
- 60) At 27°C one mole of an ideal gas is compressed isothermally and reversible from a pressure of 2 atm to 10 atm. The value of ΔE and q are ($R = 2 \text{ cal}$)
 a) 0, -965.84 cal
 b) -965.84 cal , -865.58 cal
 c) $+865.58 \text{ cal}$, -865.58 cal
 d) $+965.84 \text{ cal}$, $+865.58 \text{ cal}$
- 61) A 5% solution of can sugar (mol. wt. = 342) is isotonic with 1% solution of a substance X. The molecular weight of X is
 a) 34.2 b) 171.2
 c) 68.4 d) 136.8
- 62) The freezing point of equimolar aqueous solution will be highest for :
 a) $\text{C}_6\text{H}_5\text{NH}_3\text{Cl}$ (aniline hydrochloride)
 b) $\text{Ca}(\text{NO}_3)_2$
 c) $\text{La}(\text{NO}_3)_3$
 d) $\text{C}_6\text{H}_{12}\text{O}_6$ (glucose)

63) The values of K_{p1} and K_{p2} for the reactions



are in the ratio 9 : 1. If degree of dissociation of X and A be equal, then total pressure at equilibrium (1) and (2) are in the ratio :

a) 3 : 1 b) 1 : 9

c) 36 : 1 d) 1 : 1

64) The average concentration of SO_2 in the atmosphere over a city on a certain day is 10 ppm, when the average temperature is 298 K. Given that the solubility of SO_2 in water at 298 K is 1.3653 moles litre⁻¹ and the pK_a of H_2SO_3 is 1.92, estimate the pH of rain on that day.

a) 4.865 b) 7.875

c) 5.865 d) 6.865

65) Which of the following involves the redox reaction?

a) Reaction of H_2SO_4 with NaOH

b) Production of ozone from oxygen in the atmosphere by lightning.

c) Production of nitrogen oxide from nitrogen and oxygen in the atmosphere by lightning.

d) Evaporation of water

66) Oxidation states of X, Y, Z are +2, +5 and -2 respectively. Formula of compound formed by these will be

a) X_2YZ_6 b) XY_2Z_6

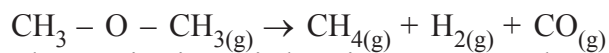
c) XY_5 d) X_3YZ_4

67) The rate constant k_1 and k_2 for two different reactions are $10^{16} \cdot e^{-2000/T}$ and $10^{15} \cdot e^{-1000/T}$, respectively. The temperature at which $k_1 = k_2$ is

a) 1000 k b) $\frac{2000}{2.303}$ K

c) 2000k d) $\frac{1000}{2.303}$ K

68) The gas phase decomposition of dimethyl ether follows first order kinetics.



The reaction is carried out in a constant volume

container at 500°C and has a half life of 14.5 minutes. Initially, only dimethyl ether is present of 0.40 atmosphere. What is the total pressure after 12 minutes? Assume ideal gas behavior.

a) 2.749 atm b) 0.749 atm

c) 3.449 atm d) 1.599 atm

69) The following data are for the following decomposition of ammonium nitrite in aqueous solution

Vol. of N_2 in cc	Time (min)
6.25	10
9.00	15
11.40	20
13.65	25
33.05	Infinity

The order of reaction is

a) zero

b) one

c) two

d) three

70) In langmuir's model of adsorption of a gas on a solid surface

a) the rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered

b) the adsorption at a single site on the surface may involve multiple molecules at the same time

c) the mass of gas striking a given area of surface is proportional to the pressure of the gas

d) the mass of gas striking a given area of surface is independent of the pressure of gas

71) The addition of 1% alcohol to chloroform acts as

a) auto-catalyst

b) bio-catalyst

c) positive-catalyst

d) negative-catalyst

72) The first ionization potentials of four consecutive elements, present in the second period of the periodic table is 8.3, 11.3, 14.4 and 13.6 eV respectively. Which of the following is the first ionization potential (in eV) of nitrogen?

a) 13.6

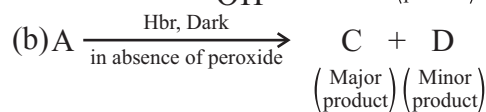
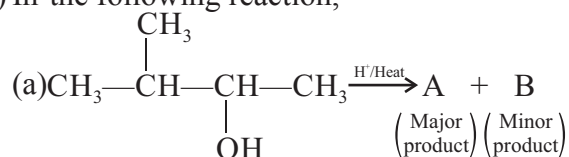
b) 11.2

c) 8.3

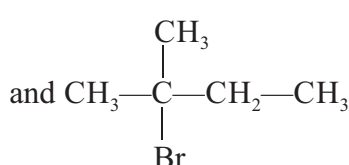
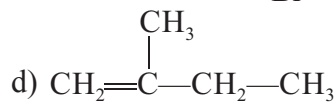
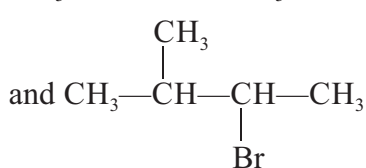
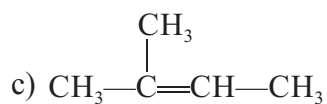
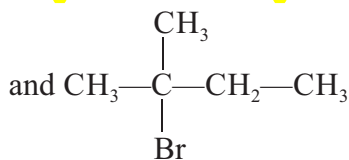
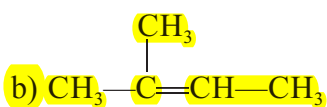
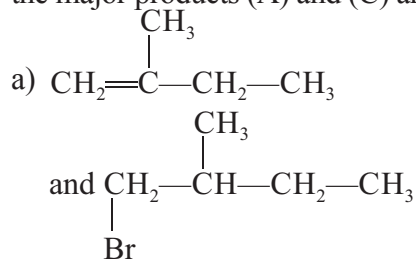
d) 14.5

- 73) The electronic configuration of four elements are given below. Which elements does not belong to the same family as others?
 a) $[\text{Xe}]4f^{14} 5d^{10} 1s^2$ b) $[\text{Kr}]4d^{10} 5s^2$
 c) $[\text{Ne}]3s^2 3p^5$ d) $[\text{Ar}]3d^{10} 4s^2$
- 74) Sulfide ores are common for the metals
 a) Ag, Cu and Pb b) Ag, Mg and Pb
 c) Ag, Cu and Sn d) Al, Cu and Pb
- 75) "Electron" is an alloy of
 a) Mg and Zn b) Fe and Mg
 c) Ni and Zn d) Al and Zn
- 76) Which of the following is not correct regarding the electrolytic preparation of H_2O_2 ?
 a) lead is used as cathode
 b) 50% of H_2SO_4 is used
 c) hydrogen is liberated at anode
 d) sulphuric acid undergoes oxidation
- 77) Some statements about heavy water are given below:
 (a) Heavy water is used as a moderator in nuclear reactors
 (b) Heavy water is more associated than ordinary water
 (c) Heavy water is more effective solvent than ordinary water.
 Which of the above statement are correct?
 a) (a) and (c) b) (a) and (b)
 c) (a), (b) and (c) d) (b) and (c)
- 78) Aqueous solution of $\text{Na}_2\text{S}_2\text{O}_3$, on reaction with Cl_2 gives
 a) $\text{Na}_2\text{S}_4\text{O}_6$ b) NaHSO_4
 c) NaCl d) NaOH
- 79) Molecular formula of Glauber's salt is
 a) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ b) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 c) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ d) $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
- 80) The lead of the lead pencils melts at
 a) 2000°C b) 350°C
 c) 3170°C d) 75°C
- 81) Which of the following statements about anhydrous aluminium chloride is correct?
 a) It exists as a AlCl_3 molecules
 b) It is not easily hydrolysed
 c) It sublimes at 100°C under vacuum
 d) It is a strong Lewis base
- 82) The correct order of $E^\circ_{\text{M}^{2+}/\text{M}}$ value with negative sign for the four successive element Cr, Mn, Fe and Co is
 a) $\text{Mn} > \text{Cr} > \text{Fe} > \text{Co}$ b) $\text{Cr} > \text{Fe} > \text{Mn} > \text{Co}$
 c) $\text{Fe} > \text{Mn} > \text{Cr} > \text{Co}$ d) $\text{Cr} > \text{Mn} > \text{Fe} > \text{Co}$
- 83) The electronics configuration of gadolinium (atomic number 64) is
 a) $[\text{Xe}] 4f^8 5d^0 6s^2$ b) $[\text{Xe}] 4f^3 5d^5 6s^2$
 c) $[\text{Xe}] 4f^6 5d^2 6s^2$ d) $[\text{Xe}] 4f^7 5d^1 6s^2$
- 84) Which of the following is hexadentate ligand?
 a) ethylene diamine
 b) ethylene diamine tetra acetic acid
 c) 1,10-phenanthroline
 d) acetyl acetonato
- 85) The crystal field stabilization energy (CFSE) is highest for
 a) $[\text{CoF}_4]^{2-}$ b) $[\text{Co}(\text{NCS})_4]^{2-}$
 c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ d) $[\text{CoCl}_4]^{2-}$
- 86) Identify the wrong statement in the following
 a) chlorofluorocarbons are responsible for ozone layer depletion
 b) green house effect is responsible for global warming
 c) ozone layer does not permit infrared radiation from the sun to reach the earth
 d) acid rain the is mostly because of oxides of nitrogen and sulphur.
- 87) Which of the following statement is not true?
 a) pH of drinking water should be between 5.5-9.5
 b) concentration of DO below 6ppm is good for growth of fish.
 c) clean water would have a BOD value of less than 5 ppm
 d) oxides of sulphur, nitrogen and carbon are the most widespeard air pollutant.

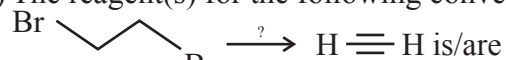
88) In the following reaction,



the major products (A) and (C) are respectively :



89) The reagent(s) for the following conversion



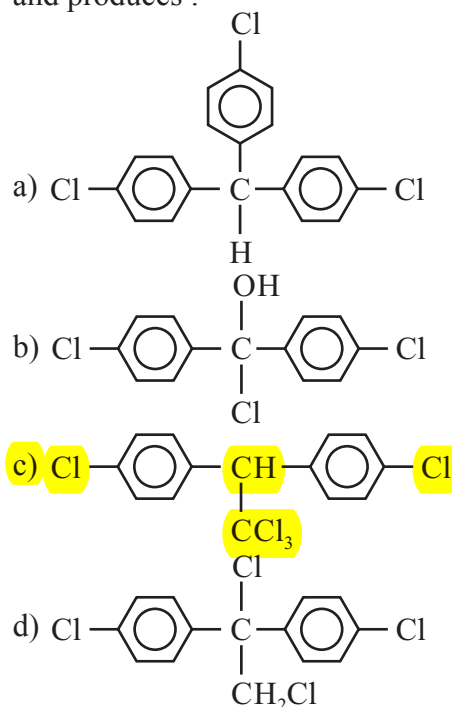
a) alcoholic KOH

b) alcoholic KOH followed by NaNH_2

c) aqueous KOH followed by NaNH_2

d) $\text{Zn}/\text{CH}_3\text{OH}$

90) Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces :



91) In the reaction p-chlorotoluene with KNH_2 in liq. NH_3 , the major product is :

a) o-toluidine

b) m-toluidine

c) p-toluidine

d) p-chloroaniline

92) Arrange the following in increasing order of their basic strength :

CH_3NH_2 (I), $(\text{CH}_3)_2\text{NH}$ (II), $(\text{CH}_3)_3\text{N}$ (III),

$\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$ (IV)

a) $\text{IV} < \text{III} < \text{II} < \text{I}$

b) $\text{IV} < \text{III} < \text{I} < \text{II}$

c) $\text{I} < \text{II} < \text{III} < \text{IV}$

d) $\text{IV} < \text{III} < \text{I} = \text{II}$

93) Dye can be used to distinguish

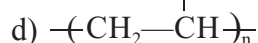
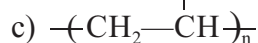
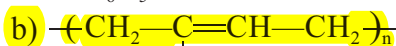
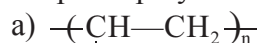
a) ethyl amine and acetamide

b) ethyl amine and aniline

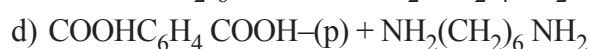
c) urea and acetamide

d) methyl amine and ethyl amine

94) Which of the following structure represent the neoprene polymer ?



95) Nylon 66 is a polyamide obtained by the reaction of



96) If two moles of glucose are oxidized in the body through respiration, the number of moles of ATP produced are

a) 19

b) 38

c) 57

d) 76

97) Glucose + tollen's reagent \rightarrow silver mirror the above process shows

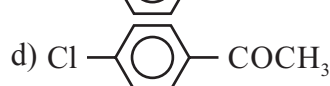
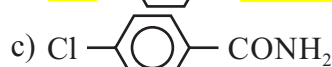
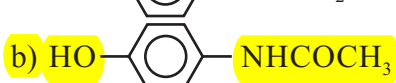
a) presence of -COOH group

b) presence of keto group

c) presence of -CHO group

d) presence of -CONH_2 group

98) The correct structure of drug paracetamol is



99) Which of the following is a local anaesthetic?

a) diazepam

b) procaine

c) chlorphenicol

d) penicillin-G

100) Which of the following represent soap?

a) $\text{C}_{17}\text{H}_{35}\text{COOK}$

b) $\text{C}_{17}\text{H}_{35}\text{COOH}$

c) $\text{C}_{15}\text{H}_{31}\text{COOH}$

d) $(\text{C}_{17}\text{H}_{35}\text{COO})_2\text{Ca}$

- 101) If n is a positive integer, then $(\sqrt{3}+1)^{2n} - (\sqrt{3}-1)^{2n}$ is
 a) an irrational number
 b) an odd positive integer
 c) an even positive integer
 d) a rational number other than positive integers
- 102) The domain of the function $f(x) = \frac{1}{\sqrt{|x|-x}}$ is
 a) $(0, \infty)$
 b) $(-\infty, 0)$
 c) $(-\infty, \infty) - \{0\}$
 d) $(-\infty, \infty)$
- 103) The number of integral values of k for which the equation $7 \cos x + 5 \sin x = 2k + 1$ has a solution is
 a) 4
 b) 8
 c) 10
 d) 12
- 104) If $\tan \alpha = \frac{m}{m+1}$ and $\tan \beta = \frac{1}{2m+1}$, find the possible values of $(\alpha + \beta)$
 a) $n\pi + \pi/2$
 b) $n\pi + \pi/3$
 c) $n\pi + 4/3$
 d) $n\pi + \pi/4$
- 105) For a positive integer n , let $f_n(\theta) = \left(\tan \frac{\theta}{2}\right) (1 + \sec \theta) (1 + \sec 2\theta) (1 + \sec 4\theta) \dots (1 + \sec 2^n \theta)$. Then
 a) $f_2\left(\frac{\pi}{16}\right) = 1$
 b) $f_3\left(\frac{\pi}{32}\right) = 1$
 c) $f_4\left(\frac{\pi}{64}\right) = 1$
 d) $f_5\left(\frac{\pi}{128}\right) = 1$
- 106) Least value of n for which $\left(\frac{1+i\sqrt{3}}{1-i\sqrt{3}}\right)^n$ is an integer, is :
 a) 1
 b) 2
 c) 3
 d) 4
- 107) The value of a for which the sum of the squares of the roots of the equation $x^2 - (a - 2)x - a - 1 = 0$ assume the least value is
 a) 2
 b) 3
 c) 0
 d) 1
- 108) If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then k lies in the interval
 a) $[4, 5]$
 b) $[-\infty, 4]$
 c) $[6, \infty]$
 d) $[5, 6]$
- 109) The sum to the infinity of the series $1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \frac{14}{3^4} + \dots$ is
 a) 3
 b) 4
 c) 6
 d) 2
- 110) The value of $2^{1/4} \cdot 4^{1/8} \cdot 8^{1/16} \dots \infty$ is
 a) 1
 b) 2
 c) $3/2$
 d) 4
- 111) The sum of all proper divisor of 9900 is :
 a) 29351
 b) 23951
 c) 33851
 d) none of these
- 112) If $\frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5}$, then
 a) $\tan^2 x = \frac{2}{3}$
 b) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{1}{125}$
 c) $\tan^2 x = \frac{1}{3}$
 d) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$
- 113) The range of the function $f(x) = {}^{7-x}P_{x-3}$ is
 a) $\{1, 2, 3\}$
 b) $\{1, 2, 3, 4, 5, 6\}$
 c) $\{1, 2, 3, 4\}$
 d) $\{1, 2, 3, 4, 5\}$
- 114) It is given that the events A and B are such that $P(A) = \frac{1}{4}, P(A|B) = \frac{1}{2}$ and $P(B|A) = \frac{2}{3}$. Then $P(B)$ is
 a) $\frac{1}{2}$
 b) $\frac{1}{6}$
 c) $\frac{1}{3}$
 d) $\frac{2}{3}$

- 115) The probability of India winning a test match against AVS is $1/2$ assuming independence from match to match. The probability that in a match series India's second win occurs at the third test is
 a) $1/8$ b) $1/4$
 c) $1/2$ d) $2/3$
- 116) If $A^2 - A + I = 0$ then the inverse of A is
 a) $I - A$ b) $A - I$
 c) A d) $A + I$
- 117) The value of the determinant

$$\begin{vmatrix} 1 & a & a^2 \\ \cos(n-1)x & \cos nx & \cos(n+1)x \\ \sin(n-1)x & \sin nx & \sin(n+1)x \end{vmatrix}$$
 is zero, if:
 a) $\sin x = 0$ b) $\cos x = 0$
 c) $a = 0$ d) $\cos x = \frac{1+a^2}{2a}$
- 118) If $\frac{\log a}{b-c} = \frac{\log b}{c-a} = \frac{\log c}{a-b}$ then $a^a b^b c^c$ is equal to
 a) -1 b) 1
 c) 2 d) none of these
- 119) The value of $\lim_{x \rightarrow \infty} \left(\frac{x+3}{x+1} \right)^{x+2}$
 a) 0 b) 1
 c) e^2 d) e^4
- 120) Let α, β be such that $\pi < \alpha - \beta < 3\pi$. If $\sin \alpha + \sin \beta = -\frac{21}{65}$ and $\cos \alpha + \cos \beta = -\frac{27}{65}$, then the value of $\cos \left(\frac{\alpha - \beta}{2} \right)$ is
 a) $-\frac{3}{\sqrt{130}}$ b) $\frac{3}{\sqrt{130}}$
 c) $\frac{6}{65}$ d) $-\frac{6}{65}$
- 121) The value of $\cot \left(\operatorname{cosec}^{-1} \frac{5}{3} + \tan^{-1} \frac{2}{3} \right)$ is
 a) $5/17$ b) $6/17$
 c) $3/17$ d) $4/17$
- 122) If in a triangle ABC, $\angle B = 60^\circ$, then :
 a) $(a-b)^2 = c^2 - ab$
 b) $(b-c)^2 = a^2 - bc$
 c) $(c-a)^2 = b^2 - ac$
 d) $a^2 - b^2 + c^2 = 2b^2 - ac$
- 123) The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minimum at
 a) $x = -2$ b) $x = 0$
 c) $x = 1$ d) $x = 2$
- 124) Suppose $f(x)$ is differentiable at $x = 1$ and $\lim_{h \rightarrow 0} \frac{1}{h} f(1+h) = 5$, then $f'(1)$ equals
 a) 6 b) 5
 c) 4 d) 3
- 125) If $f(x) = \left(\frac{1}{x} \right)^x$, then the maximum value of $f(x)$ is :
 a) e b) $(e)1/e$
 c) $\left(\frac{1}{e} \right)^e$ d) none of these
- 126) If $y = \sec^{-1} \left(\frac{x+1}{x-1} \right) + \sin^{-1} \left(\frac{x-1}{x+1} \right)$, $\frac{dy}{dx}$ is equal to :
 a) 1 b) $\frac{x-1}{x+1}$
 c) zero d) $\frac{x+1}{x-1}$
- 127) $\frac{d^2x}{dy^2}$ equals
 a) $\left(\frac{d^2y}{dx^2} \right)^{-1}$ b) $-\left(\frac{d^2y}{dx^2} \right)^{-1} \left(\frac{dy}{dx} \right)^{-3}$
 c) $\left(\frac{d^2y}{dx^2} \right) \left(\frac{dy}{dx} \right)^{-2}$ d) $-\left(\frac{d^2y}{dx^2} \right) \left(\frac{dy}{dx} \right)^{-3}$

128) Let $y = e^{x \sin x^3} + (\tan x)^x$. Find $\frac{dy}{dx}$.

a) $e^{x \sin x^3} [\sin x^3 + 3x^3 \cos x^3] +$

$(\tan x)^x \left[\frac{2x}{\sin 2x} + \log \tan x \right]$

b) $e^{x \cos x^3} [\sin x^3 + 3x^3 \cos x^3] +$

$(\tan x)^x \left[\frac{2x}{\sin 2x} + \log \tan x \right]$

c) $e^{x \cos x^3} [\sin x^3 + 3x^3 \cos x^3] +$

$(\tan x)^x \left[\frac{2x}{\sin 2x} + \log \cot x \right]$

d) $e^{x \sin x^3} [\cos x^3 + 3x^3 \sin x^3] +$

$(\tan x)^x \left[\frac{2x}{\sin 2x} + \log \cot x \right]$

129) $\lim_{n \rightarrow \infty} \frac{1+2^4+3^4+\dots+n^4}{n^5}$
 $-\lim_{n \rightarrow \infty} \frac{1+2^3+3^3+\dots+n^3}{n^5}$ is

- a) 1/30 b) 0
 c) 1/4 d) 1/5

130) $\int_0^{10x} |\sin x| dx$ is

- a) 20 b) 8
 c) 10 d) 18

131) $\int_{-\pi}^{\pi} \frac{2x(1+\sin x)}{1+\cos^2 x} dx$ is

- a) $\pi^2/4$ b) π^2
 c) 0 d) $\pi/2$

132) The difference between the greatest and least values of the function $\phi(x) = \int_0^x (t+1) dt$ on $[2, 3]$ is :

- a) 3 b) 2

- c) 7/2 d) 11/2

133) A point on the curve $x^2 + 2y^2 = 6$ whose distance from the line $x + y = 7$, is minimum.

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

134) The maximum value of the function

$f(x) = 2x^3 - 15x^2 + 36x - 48$ on the set $A = \{x | x^2 + 20 \leq 9x\}$ is

- a) 4 b) 7
 c) 5 d) 3

135) The solution of the differential equation

$(1+y^2) + (x - e^{\tan^{-1} y}) \frac{dy}{dx} = 0$, is

- a) $(x-2) = ce^{-2 \tan^{-1} y}$
 b) $2xe^{\tan^{-1} y} = e^{2 \tan^{-1} y} + c$
 c) $xe^{\tan^{-1} y} = \tan^{-1} y + c$
 d) $xe^{2 \tan^{-1} y} = e^{\tan^{-1} y} + c$

136) Differential coefficient of $\tan^{-1} \frac{2x}{1-x^2}$ with

respect to $\sin^{-1} \frac{2x}{1+x^2}$ will be :

- a) 1 b) -1
 c) -1/2 d) x

137) The equation of the straight line passing through the point (4, 3) and making intercepts on the coordinate axes whose sum is -1, is

a) $\frac{x}{2} + \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$

b) $\frac{x}{2} - \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$

c) $\frac{x}{2} + \frac{y}{3} = 1$ and $\frac{x}{-2} + \frac{y}{1} = 1$

d) $\frac{x}{2} - \frac{y}{3} = 1$ and $\frac{x}{-2} + \frac{y}{1} = 1$

138) The two circles $x^2 + y^2 = ax$ and $x^2 + y^2 = c^2$ ($c > 0$) touch each other if

- a) $|a| = c$ b) $a = 2c$

- c) $|a| = 2c$ d) $2|a| = c$
- 139) The greatest distance of the point P(10, 7) from the circle $x^2 + y^2 - 4x - 2y - 20 = 0$ is
 a) 10 unit b) 15 unit
 c) 5 unit d) None of these
- 140) If one of the lines of $my^2 + (1 - m^2)xy - mx^2 = 0$ is a bisector of the angle between the lines $xy = 0$, then m is
 a) $-1/2$ b) -2
 c) ± 1 d) 2
- 141) The equation of the directrix of the parabola $y^2 + 4y + 4x + 2 = 0$ is
 a) $x = -1$ b) $x = 1$
 c) $x = -3/2$ d) $x = 3/2$
- 142) The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and having its centre at (0, 3) is
 a) 4 unit b) 3 unit
 c) $\sqrt{12}$ unit d) $7/2$ unit
- 143) Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is
 a) a/b sq unit b) \sqrt{ab} sq unit
 c) ab sq unit d) $2ab$ sq unit
- 144) The equation of the chord joining two points (x_1, y_1) and (x_2, y_2) on the rectangular hyperbola $xy = c^2$ is
 a) $\frac{x}{x_1 + x_2} + \frac{y}{y_1 + y_2} = 1$
 b) $\frac{x}{x_1 - x_2} + \frac{y}{y_1 - y_2} = 1$
 c) $\frac{x}{y_1 + y_2} + \frac{y}{x_1 + x_2} = 1$
 d) $\frac{x}{y_1 - y_2} + \frac{y}{x_1 - x_2} = 1$
- 145) The equation of the normal to the hyperbola
- $\frac{x^2}{16} - \frac{y^2}{9} = 1$ at $(-4, 0)$ is :
 a) $y = 0$ b) $y = x$
 c) $x = 0$ d) $x = -y$
- 146) A line makes the same angle θ with each of the x and z axes. If the angle β , which it makes with y -axis, is such that $\sin^2 \beta = 3 \sin^2 \theta$, then $\cos^2 \theta$ equals
 a) $2/3$ b) $1/5$
 c) $3/5$ d) $2/5$
- 147) The shortest distance from the plane $12x + 4y + 3z = 327$ to the sphere $x^2 + y^2 + z^2 + 4x - 2y - 6z = 155$ is
 a) 26 b) $11\frac{4}{13}$
 c) 13 d) 39
- 148) Let $\vec{u} = \hat{i} + \hat{j}$, $\vec{v} = \hat{i} - \hat{j}$ and $\vec{w} = \hat{i} + 2\hat{j} + 3\hat{k}$. If \hat{n} is a unit vector such that $\vec{u} \cdot \hat{n} = 0$ and $\vec{v} \cdot \hat{n} = 0$, then $|\vec{w} \cdot \hat{n}|$ is equal to
 a) 0 b) 1
 c) 2 d) 3
- 149) If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and vectors $(1, a, a^2)$, $(1, b, b^2)$ and $(1, c, c^2)$ are non coplanar, then the product abc equals
 a) 2 b) -1
 c) 1 d) 0
- 150) The projection of the vector $\hat{i} - 2\hat{j} + \hat{k}$ on the vector $4\hat{i} - 4\hat{j} + 7\hat{k}$ is equal to
 a) $\frac{5\sqrt{6}}{10}$ b) $\frac{19}{9}$
 c) $\frac{9}{19}$ d) $\frac{\sqrt{6}}{19}$