**Space for Rough Work**

**1.** The temperatures of two bodies differ by 1 °C. How much will they differ on Fahrenheit scale ?

(A) 1 °F

(B) 1.2 °F

(C) 2.4 °F

(D) 1.8 °F

**2.** Same quantity of ice is filled in each of the two identical metal containers P and Q having same size and shape but of different materials. In P ice melts completely in time $t_1$ whereas in Q the time taken is $t_2$. Then the ratio of conductivities of P and Q is

(A) $t_2 : t_1$

(B) $\sqrt{t_1} : \sqrt{t_2}$

(C) $t_1^2 : t_2^2$

(D) $t_2^2 : t_1^2$

**3.** From the measurement made on the Earth, it is known that the Sun has surface area of $6.1 \times 10^{18}$ m$^2$ and radiates energy at the rate of $3.9 \times 10^{26}$ W. Assuming that the emissivity of the Sun's surface is 1, the temperature of the Sun's surface is

(A) 2600 K

(B) 3600 K

(C) 4500 K

(D) 5800 K

**4.** In a diesel engine, the cylinder compresses air from approximately standard pressure and temperature to about one-sixteenth the original volume and a pressure of about 50 atm. The temperature of the compressed air is

(A) 225 K

(B) 853 K

(C) 970 K

(D) 1043 K

**5.** A charge q is placed at the centre of the line joining two equal charges Q. The system of the three charges will be in equilibrium if q is equal to

(A) –Q/2

(B) –Q/4

(C) Q/2

(D) Q/4

---

**Space for Rough Work**

6. One mole of helium gas, initially at STP ($p_1$ = 1 atm, $T_1$ = 0 °C), undergoes an isovolumetric process in which its pressure falls to half its initial value. The work done by the gas is

(A) 101 J
(B) 51 J
(C) 23 J
(D) 0 J

7. 100 Vernier scale divisions match with 99 main scale divisions of a slide calipers. If the value of each main scale division is 1 mm, then the Vernier constant is

(A) 1 mm
(B) 100 μm
(C) 10 μm
(D) 1 μm

8. The amount of moisture that must evaporate from a 5.0 kg body to reduce its temperature by 2 °C is 'm' g. The heat of vaporization for water at body temperature is about 580 cal/g. The specific heat capacity for the body is 0.83 cal/g. °C. The value of 'm' is

(A) 14.3 g
(B) 19.5 g
(C) 25.4 g
(D) 35.2 g

9. A sphere of 3 cm radius acts like a black body. It is in equilibrium with its surrounding and absorbs 30 kW of power radiated to it from surroundings. The temperature of the sphere is ($\sigma = 5.67 \times 10^{-8}$ W/m$^2$.K$^4$) approximately

(A) 5600 K
(B) 4600 K
(C) 3600 K
(D) 2600 K

10. A glass bulb of volume 400 cm$^3$ is connected to another bulb of volume 200 cm$^3$ by means of a tube of negligible volume. The bulbs contain dry air. They are both at a common temperature and pressure of 20 °C and 1.000 atm. The larger bulb is immersed in steam at 100 °C; the smaller, in melting ice at 0 °C. The final common pressure is

(A) 2.31 atm
(B) 1.13 atm
(C) 0.53 atm
(D) 0.04 atm

---

**Space for Rough Work**

**11.** At temperature 'T', the 'effective' speed of gaseous hydrogen molecules (molecular weight = 2) equal to that of oxygen molecules (molecular weight = 32) at 47 °C. The value of 'T' is

(A) 60 K
(B) 40 K
(C) 20 K
(D) 0 K

**12.** A drop of water of radius 0.01 m is falling through a medium whose density is 1.21 kg/$m^3$ and co-efficient of viscosity $\eta = 1.8 \times 10^{-5}$ Ns /$m^2$. Then the terminal velocity of the drop is

(A) $120.0 \times 10^{-2}$ m/s
(B) 0.012 m/s
(C) 1.2 m/s
(D) $1.2 \times 10^{-2}$ m/s

**13.** A wave along a string has the following equation ($x$ in metres and t in seconds):
$y = 0.02 \sin [30t - 4.0x]$ m. The speed of the wave is

(A) 4.0 m/s
(B) 30 m/s
(C) 7.5 m/s
(D) 10 m/s

**14.** How far should an object be from a concave spherical mirror of radius 36 cm to form a real image one-ninth its size ?

(A) 170 cm
(B) 180 cm
(C) 190 cm
(D) None

**15.** A wire 0.5 m long and with a mass per unit length of 0.0001 kg/m vibrates under a tension of 4 N. The fundamental frequency is

(A) 100 Hz
(B) 200 Hz
(C) 300 Hz
(D) 400 Hz

---

**Space for Rough Work**

**16.** If the speed of sound in air at 0 °C is 331 m/s, the speed of sound in air at 35 °C is
(A) 331.0 m/s
(B) 340.2 m/s
(C) 351.6 m/s
(D) 362.5 m/s

**17.** Current I flows through a conducting wire of radius a. The magnetic field (B) at a distance r from the centre of the wire (r > a and $\mu_0$ is the permeability of free space) is
(A) $\frac{2\mu_0 Ir}{\pi a^2}$
(B) $\frac{\mu_0 Ir}{2\pi a^2}$
(C) $\frac{\mu_0 I}{2\pi r}$
(D) $\frac{\mu_0 I}{\pi r^2}$

**18.** A concave lens forms the image of an object which is
(A) virtual, inverted and diminished
(B) virtual, upright and diminished
(C) virtual, inverted and enlarged
(D) virtual, upright and enlarged

**19.** A battery of 10 V and internal resistance 0.5 Ω is connected in parallel with a battery of 12 V and internal resistance 0.8 Ω. The terminals are connected by an external resistance of 20 Ω. The current flowing through the 20 Ω resistance is
(A) 0.75 A
(B) 1.74 A
(C) 0.53 A
(D) 1.21 A

**20.** Two coherent monochromatic light beams of intensity I and 4I are superimposed. The maximum and minimum possible intensities in the resulting beam are
(A) 5I and I
(B) 5I and 3I
(C) 9I and I
(D) 9I and 3I

---

**Space for Rough Work**

**21.** Complete the following nuclear equation ${}^{30}_{15}P \rightarrow {}^{30}_{14}Si + ?$

(A) ${}^{+1}_{0}e$

(B) ${}^{0}_{+1}e$

(C) ${}^{0}_{-1}e$

(D) None

**22.** The deviation produced by an equilateral prism, when a ray of light is incident on it, does not depend on

(A) angle of prism

(B) colour of light

(C) material of the prism

(D) size of the prism

**23.** A triode valve has an anode resistance 20,000 $\Omega$ and amplification factor 20. The mutual conductance is

(A) $10^{-2}$ mho

(B) $10^{-3}$ mho

(C) $10^{3}$ mho

(D) $10^{2}$ mho

**24.** A parallel-plate capacitor has plates of dimensions 2.0 cm by 3.0 cm separated by a 1.0 mm thickness of paper. The relative dielectric constant of paper is 3.7. Find its capacitance.

(A) 20 pF

(B) 20 nF

(C) 200 pF

(D) 20 micro F

---

**Space for Rough Work**

**25.** If a copper wire carries a current of 80.0 mA, how many electrons flow past a given cross-section of the wire in 10.0 min ?

(A) $0.3 \times 10^{20}$ electrons

(B) $3.0 \times 10^{16}$ electrons

(C) $9.0 \times 10^{18}$ electrons

(D) $3.0 \times 10^{20}$ electrons

**26.** A coil has resistance 20 Ω and inductance 0.35 H. Compute its impedance to an alternating current of 25 cycles/s.

(A) 50.5 Ω

(B) 48.5 Ω

(C) 58.5 Ω

(D) 68.5 Ω

**27.** What back emf is induced in a coil of self-inductance 0.008 H when the current in the coil is changing at the rate of 110 A/s ?

(A) 0.88V

(B) 0.78V

(C) 0.98V

(D) None

**28.** In an LCR circuit, capacitance is changed from C to 2C. For the resonant frequency to remain unchanged, the inductance should be changed from L to

(A) 4 L

(B) 2 L

(C) L/2

(D) L/4

**29.** In an a.c. circuit, the applied voltage $v = 100 \sin(100\, t)$ volts and the resulting current $i = 100 \sin(100\, t + \pi / 3)$ milli-amperes. The power dissipated in the circuit is

(A) $10^4$ W

(B) 10 W

(C) 2.5 W

(D) 5.0 W

**Space for Rough Work**

**30.** A nucleus with atomic number (Z) and mass number (A) undergoes alpha decay. Which of the following is true ?

(A) Z increases by 2 and A decreases by 4.

(B) Z decreases by 2 and A decreases by 4.

(C) Z increases by 1 and A does not change.

(D) Z decreases by 2 and A decreases by 2.

**31.** To generate energy, nuclear reactors use the principle of

(A) fusion

(B) fission

(C) alpha decay

(D) beta decay

**32.** The source of energy in the Sun is

(A) conversion of hydrogen into helium in nuclear fusion reaction.

(B) uranium fission.

(C) beta decay of uranium

(D) reaction of hydrogen with uranium.

**33.** Calculate the number density of free carriers in silver, assuming that each atom contributes one carrier. The density of silver is $10.5 \times 10^3 kg/m^3$ and the atomic weight is 107.8.

(A) $0.585 \times 10^{28}$ carriers/$m^3$

(B) $58.5 \times 10^{26}$ carriers/$m^3$

(C) $585.0 \times 10^{27}$ carriers/$m^3$

(D) $5.85 \times 10^{28}$ carriers/$m^3$

**34.** Sodium atoms emit a spectral line with a wavelength in the yellow, 589.6 nm. What is the difference in energy between the two energy levels involved in the emission of this spectral line ?

(A) 2.6 eV

(B) 2.9 eV

(C) 2.1 eV

(D) None

---

**Space for Rough Work**

**35.** The speed v of a wave on a string depends on the tension F in the string and the mass per unit length m/L of the string. If it is known that [F] = [ML] $[T]^{-2}$, the values of the constants a and b in the following equation for the speed of a wave on a string are:
$v = (\text{constant})\ F^{\alpha}\ (m/L)^{b}$

(A) $\frac{1}{2}, \frac{1}{2}$

(B) $-\frac{1}{2}, \frac{1}{2}$

(C) $-\frac{1}{2}, -\frac{1}{2}$

(D) $\frac{1}{2}, -\frac{1}{2}$

**36.** A stone is dropped from the top of a tower. The height through which it falls in first 3 seconds of its motion equals the height through which it falls in the last second of its motion. To reach the ground, the stone takes time equal to ($g = 10\ m/s^2$)

(A) 4 s
(B) 5 s
(C) 6 s
(D) 7 s

**37.** A particle executes SHM with a period 6 s and amplitude of 3 cm. Its maximum speed in cm/s is

(A) $\frac{\pi}{2}$

(B) $\pi$
(C) $2\pi$
(D) $3\pi$

**38.** A body of mass m moves along X such that at time t its position is $x(t) = \alpha t^4 - \beta t^3 + \gamma t$, where $\alpha$, $\beta$, $\gamma$ are constants .The acceleration of the body is

(A) $24\alpha t^3 - 6\beta t$
(B) $12\alpha t^2 - 6\beta t$
(C) $6\alpha t^2 - 6\beta t$
(D) $6\alpha t^3 - 6\beta t$

---

**Space for Rough Work**

**39.** A 7 kg object is subjected to two forces, $F_1 = 20i + 30j$ N and $F_2 = 8i - 50j$ N. Find the acceleration of the object.

(A) $4i - \frac{20}{7}j$

(B) $8i - \frac{40}{7}j$

(C) $2i - \frac{10}{7}j$

(D) $4i - \frac{10}{7}j$

**40.** The motion of a particle in the XY plane is given by $x(t) = 25 + 6t^2\ m$; $y(t) = -50 - 20t + 8t^2\ m$. The magnitude of the initial velocity of the particle, $v_0$ is given by

(A) 30 m/s
(B) 40 m/s
(C) 50 m/s
(D) 20 m/s

**41.** Rain, pouring down at an angle α with the vertical, has a constant speed of 10 m/s. A woman runs against the rain with a speed of 8 m/s and sees that the rain makes an angle β with the vertical. The relation between α and β is given by

(A) $\tan\beta = \frac{8 + 10\sin\alpha}{10\cos\alpha}$

(B) $\tan\beta = \frac{10 + 8\sin\alpha}{8\cos\alpha}$

(C) $\tan\beta = \frac{8 + 10\sin\alpha}{8\cos\alpha}$

(D) $\tan\beta = \frac{8 + 10\cos\alpha}{10\sin\alpha}$

**42.** A car goes around a curve of radius 48 m. If the road is banked at angle of 15° with the horizontal, the maximum speed in kilometers per hour at which the car can travel if there is to be no tendency to skid even on very slippery pavement (tan 15° = 0.27 approximately) is

(A) 30.6 km/h
(B) 40.6 km/h
(C) 20.6 km/h
(D) None

---

**Space for Rough Work**

**43.** An electrical appliance is rated 1500 W, 250 V. This appliance is connected to 250 V supply mains. The current drawn by the appliance (assuming unity power factor) is

(A) 6 A

(B) 10 A

(C) 15 A

(D) 12 A

**44.** Two identical coins of mass 8 g are 50 cm apart on a tabletop. How many times larger is the weight of one coin than the gravitational attraction of the other coin for it ? ($G = 6.67 \times 10^{-11}$ $Nm^2/kg^2$, $g = 9.81$ $m/s^2$)

(A) $4.6 \times 10^{12}$

(B) $4.6 \times 10^{10}$

(C) $4.6 \times 10^{14}$

(D) None

**45.** A straight rod of length L extends from $x = a$ to $x = L + a$. Find the gravitational force it exerts on a point mass m at $x = 0$ if the mass per unit length of the rod is $\mu = A + Bx^2$.

(A) $F = GmA\left[\left(\frac{1}{a} - \frac{1}{a+L}\right) + BL\right]$

(B) $F = Gm\left[A\left(\frac{1}{a} - \frac{1}{a+L}\right)\right] + BL$

(C) $F = Gm\left[A\left(\frac{1}{a} - \frac{1}{a+L}\right) + BL\right]$

(D) None

**46.** A delivery boy wishes to launch a 2.0 kg package up an inclined plane with sufficient speed to reach the top of the inclined. The plane is 3.0 m long and is inclined at 20º. The coefficient of kinetic friction between the package and the plane is 0.40. What minimum initial kinetic energy must the boy supply to the package ?

(A) 52.2 J

(B) 42.2 J

(C) 62.2 J

(D) None

**47.** A cell of internal resistance r drives a current through an external resistance R. The power delivered by the cell to the external resistance is maximum when

(A) $R = r$

(B) $R >> r$

(C) $R << r$

(D) $R = 2r$

---

**Space for Rough Work**

**48.** A block falls from a table 0.6 m high. It lands on an ideal, mass-less, vertical spring with a force constant of 2.4 kN/m. The spring is initially 25 cm high, but it is compressed to a minimum height of 10 cm before the block is stopped. Find the mass of the block ($g = 9.81\ m/s^2$).

(A) 55.51 kg
(B) 5.51 kg
(C) 0.51 kg
(D) None

**49.** An engine pumps water continuously through a hose. If the speed with which the water passes through the hose nozzle is v, and if k is the mass per unit length of the water jet as it leaves the nozzle, what is the rate at which kinetic energy is being imparted to the water ?

(A) $\frac{1}{2}kv^2$
(B) $\frac{1}{2}kv^3$
(C) $\frac{1}{2}kv^4$
(D) None

**50.** n identical light bulbs, each designed to draw power P from a certain voltage supply are joined in series across that supply. The total power which they will draw, is

(A) nP
(B) P
(C) P/n
(D) $Pn^{-2}$

**51.** One mole of an ideal gas is at temperature T $^oK$. The $\gamma$ value of this gas is 5/3. Now the gas does 12R Joules of work adiabatically (R is the universal gas constant). Then the final temperature of the gas will be

(A) $(T - 8)\ ^oK$
(B) $(T + 4)\ ^oK$
(C) $(T - 4.4)\ ^oK$
(D) $(T - 6)\ ^oK$

**Space for Rough Work**

**52.** A light ladder is supported on a rough floor and leans against a smooth wall, touching the wall at height 'h' above the floor. A man climbs up the ladder until the base of the ladder is on the verge of slipping. The coefficient of static friction between the foot of the ladder and the floor is $\mu$. The horizontal distance moved by the man is

(A) $\mu^2 h$

(B) $\mu/h$

(C) $\mu h$

(D) $\mu^2 h^2$

**53.** A disk of 10 cm radius has a moment of inertia of 0.02 kg.m$^2$. A force of 15 N is applied tangentially to the periphery of the disk to give it an angular acceleration, $\alpha$ of magnitude

(A) 25 $\mu$/h rad/s$^2$

(B) 35 $\mu$/h rad/s$^2$

(C) 45 $\mu$/h rad/s$^2$

(D) 75 rad/s$^2$

**54.** A uniform hollow cylinder has a density $\rho$, a length 'L', an inner radius 'a', and an outer radius 'b'. Its moment of inertia about the axis of the cylinder is (Mass of the cylinder is 'M')

(A) $M(b^2 + a^2)$

(B) $2M(b^2 + a^2)$

(C) $\frac{M}{2}(b^2 + a^2)$

(D) $\frac{3M}{4}(b^2 + a^2)$

**55.** The two wires A and B of the same material have their lengths in the ratio 1 : 2 and their diameters in the ratio 2 : 1. If they are stretched with the same force, the ratio of the increase in the length of A to that of B will be

(A) 1 : 2

(B) 4 : 1

(C) 1 : 8

(D) 1 : 4

**Space for Rough Work**

**56.** The velocity of a particular mass 'm' is $\vec{v} = 5\hat{i} + 4\hat{j} + 6\hat{k}$ when at $\vec{r} = -2\hat{i} + 4\hat{j} + 6\hat{k}$. The angular momentum of the particle about the origin is

(A) $m\left(42\hat{i} - 28\hat{k}\right)$

(B) $m\left(42\hat{j} - 28\hat{k}\right)$

(C) $m\left(42\hat{i} + 28\hat{k}\right)$

(D) $m\left(42\hat{j} + 28\hat{k}\right)$

**57.** The increase in pressure required to decrease the volume of 200 L of water by 0.004% is (Bulk modulus of water is $2.1 \times 10^9$ N/m$^2$)

(A) $8.4 \times 10^4$ N/m$^2$

(B) $8.4 \times 10^3$ N/m$^2$

(C) $8.4 \times 10^5$ N/m$^2$

(D) $8.4 \times 10^6$ N/m$^2$

**58.** Water is flowing through a tube of radius 'r' with a speed 'v'. If this tube is joined to another tube of radius 'r/2', the speed of water in the second tube is

(A) 4v

(B) v/4

(C) v/2

(D) 2 v

**59.** The volume of an air bubble is doubled as it rises from the bottom of a lake to its surface. The atmospheric pressure is 75 cm of mercury and the ratio of the density of mercury to that of lake water is 40/3. The depth of the lake is

(A) 15 m

(B) 10 m

(C) 20 m

(D) 25 m

**60.** A hole of area 1 mm$^2$ opens in the pipe near the lower end of a large water storage tank, and a stream of water shoots from it. If the top of the water in the tank is 20 m above the point of the leak, the amount of water escapes in 1 s is

(A) 87.5 cm$^3$/s

(B) 43.1 cm$^3$/s

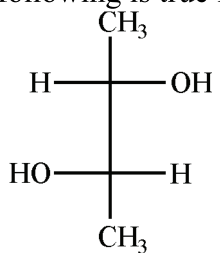
(C) 27.5 cm$^3$/s

(D) 19.8 cm$^3$/s

---

**Space for Rough Work**

**61.** Which of the following is true for the given molecule ?



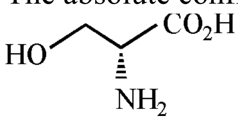
(A) Meso

(B) Achiral

(C) Prochiral

(D) Chiral

**62.** The absolute configuration for the given molecule is



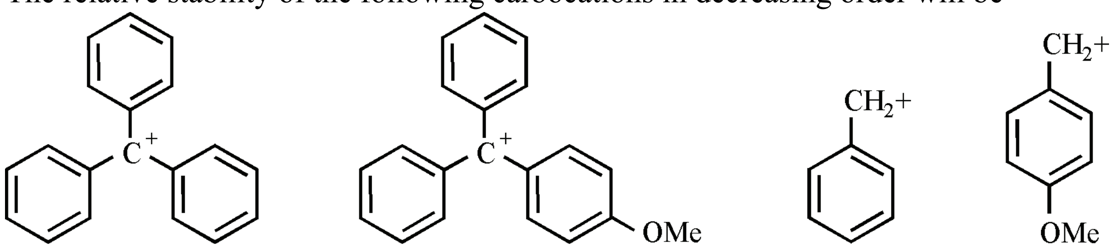
(A) (R)

(B) (S)

(C) Racemic

(D) None of the above

**63.** The relative stability of the following carbocations in decreasing order will be



Tr MMTr Bn PMB

(A) Tr > MMTr > Bn > PMB

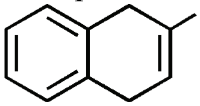
(B) MMTr > Tr > PMB > Bn

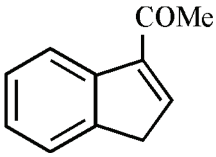
(C) MMTr > Tr > Bn > PMB

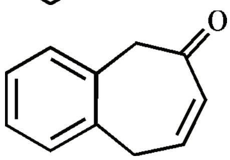
(D) PMB > Bn > MMTr > Tr

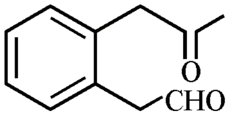
**Space for Rough Work**

**64.** Predict the product in the following reaction.

 $\xrightarrow[\text{2. NaOH/heat}]{\text{1. } O_3;Zn/H_2O}$ ?

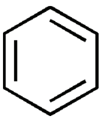
(A) 

(B) 

(C) 

(D) None of the above

**65.** What will be the product in the following reaction ?

 $\xrightarrow[\text{2. } NH_2NH_2\text{, KOH}]{\text{1. EtCOCl, } AlCl_3}$ Product

(A) Isopropyl benzene
(B) n-propyl benzene
(C) Ethyl benzene
(D) t-Butyl benzene

**66.** In a RNA molecule the sugar component is
(A) D-Xylose
(B) D-Ribose
(C) L-Ribose
(D) D-Glucose

**67.** Penicillin is used widely as
(A) Antihypertensive
(B) Analgesic
(C) Antibiotic
(D) Antiseptic

**Space for Rough Work**

68. The monomeric unit of Teflon consists of

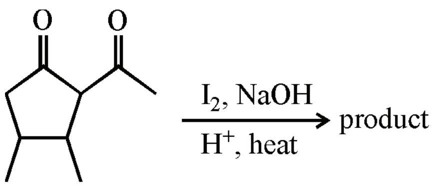
(A) Isoprene

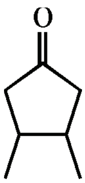
(B) 2-chloro-1, 3-butadiene (chloroprene)

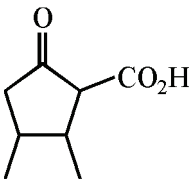
(C) Butadiene

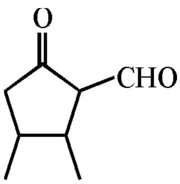
(D) Tetrafluoroethylene

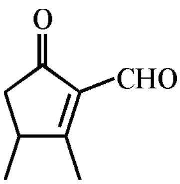
69. Final product in the following reaction sequence is ?




(A) 

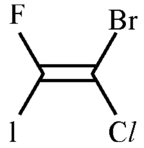
(B) 

(C) 

(D) 

**Space for Rough Work**

70. What would be the double bond geometry in the following compound ?



(A) Z

(B) E

(C) E, Z

(D) None of the above

71. Which thermodynamic law predicts spontaneity of a process ?

(A) There is no law which gives us idea about spontaneity

(B) The second law

(C) The first law

(D) The zeroth law

72. For the reaction: $2X + Y \rightleftharpoons 5Z$. If $K_{eq} = 4 \times 10^3$, what is the free energy change for the reaction at 25 °C (Note : $R = 8.314\ J\ K^{-1}\ mol^{-1}$)

(A) $-1.03 \times 10^4\ Jmol^{-1}$

(B) $+1.03 \times 10^4\ Jmol^{-1}$

(C) $-2.05 \times 10^4\ Jmol^{-1}$

(D) $+2.05 \times 10^4\ Jmol^{-1}$

73. For which of the following reactions would there be a 5.0 kJ work done on the system at room temperature (25 °C) (Given, R = 8.314 J/mol) ?

(A) $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

(B) $CH_2O(g) + N_2(g) + 2O_2(g) \rightarrow N_2H_2(g) + CH_3OH(g)$

(C) $2H_2O(g) + O_2(g) \rightarrow 2H_2O_2(g)$

(D) $2H_2O_2(g) \rightarrow 2H_2O(g) + O_2(g)$

**Space for Rough Work**

74. Which is an extensive property ?

(A) Partial molal Gibbs free energy

(B) Boiling point elevation

(C) Gibbs free energy

(D) Freezing point depression

75. Which of the following statement(s) is (are) incorrect ?

I. Rates typically vary with time during a reaction.

II. Rate constants typically vary with time during a reaction.

III. Activation energies typically vary with time during a reaction.

(A) I only

(B) II only

(C) I and II

(D) II and III

76. Which of the following manipulations increase the solubility of calcium carbonate ($CaCO_3(s)$) in aqueous solution ?

I. Decrease temperature

II. Decrease pH

III. Add $Na_2CO_3$

(A) I only

(B) II only

(C) III only

(D) None of the above

77. $D + E \rightarrow F + 2G$, Rate = k[D][E], how will the initial rate change if the concentration of D is doubled and the concentration of E is tripled ?

(A) Two-fold increase

(B) Six-fold increase

(C) Three-fold increase

(D) Five-fold increase

---

**Space for Rough Work**

**78.** $dU = C_v dT$ is applicable only for

(A) any condensed phase

(B) any gas phase

(C) ideal gases

(D) van der Waals gas

**79.** The correct relation is

(A) $TdS = \delta q$

(B) $TdS = \delta q_{rev}$

(C) $dG = VdP - SdT$ (for open system)

(D) $\Delta S°(3) < \Delta S°(1) < \Delta S°(2)$

**80.** $t_{1/2}$ is independent of initial concentration of reactant for

(A) First order reaction

(B) Second order reaction

(C) Zero order reaction

(D) Third order reaction

**81.** A solution prepared at 25 °C by mixing 15mL of 1.0 M $H_2SO_4$ and 15mL of 2.0M KOH has a pH of

(A) 5

(B) 6

(C) 7

(D) 8

**82.** Consider the following reaction :

$2NO_2Cl(g) \rightleftharpoons 2NO_2(g) + Cl_2(g)$ has $K_c$= 8.90 mol $L^{-1}$at 350 °C, what is its $K_p$ at the same temperature ? (Assume ideal behaviour all gases)

(A) 256

(B) 350

(C) 455

(D) 520

**Space for Rough Work**

**83.** If the Ksp for the dissociation of nickel(II) hydroxide is $1.08 \times 10^{-16}$ at certain temperature, the concentration of nickel(II) ions in solution is

(A) $4.5 \times 10^{-6}$

(B) $3.0 \times 10^{-6}$

(C) $3.5 \times 10^{-6}$

(D) $6.3 \times 10^{-6}$

**84.** What is the value of the equilibrium constant for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI$ if the equilibrium mixture contains 0.092M $H_2$, 0.023M $I_2$, and 0.056 M HI ?

(A) 0.15

(B) 15

(C) 1.5

(D) 150

**85.** According to the balanced equation below, which of the following will favour the reverse reaction $CO_2(g) + H_2(g) \rightleftharpoons CO(g) + H_2O(l)$ ?

I. Decreasing the pressure

II. Adding CO to the reaction mixture

III. Removing $CO_2$ from the reaction mixture

(A) I only

(B) II only

(C) III only

(D) I, II, III

**86.** You can prepare 0.75 molal Na*Cl* by dissolving 15g Na*Cl* in what amount of water ?

(A) 0.34 kg

(B) 0.17 kg

(C) 0.4 kg

(D) 0.51 kg

**Space for Rough Work**

**87.** Which of the following will increase the rms speed of a molecule of gas, assuming that all other variables are kept constant ?

I. Increasing pressure

II. Increasing temperature

III. Decreasing molar mass

(A) I only

(B) I and II

(C) II and III

(D) I, II, III

**88.** In expanding from 3.00 to 6.00 litres at a constant pressure of 2.00 atmospheres, a gas absorbs 100.0 calories (24.14 calories = 1 liter atm). The change in energy $\Delta E$, for the gas is

(A) – 187.6 J

(B) –23.8 J

(C) – 142.9 J

(D) – 10.7 J

**89.** Which of the following would express the approximate density of carbon dioxide gas at 0 °C and 2.00 atm pressure (in grams per liter) ?

(A) 2 g/L

(B) 4 g/L

(C) 6 g/L

(D) 8 g/L

**90.** If the average velocity of a methane molecule, $CH_4$ (M.W. = 16), is $5.00 \times 10^4$ cm/sec at 0 °C, what is the average velocity of helium molecules at the same temperature and pressure conditions ?

(A) $2.5 \times 10^4$ cm/sec

(B) $5 \times 10^4$ cm/sec

(C) $1 \times 10^5$ cm/sec

(D) $2 \times 10^5$ cm/sec

**Space for Rough Work**

**91.** The species which contains maximum number of lone pairs of electrons on the central atoms is

(A) $ClO_3^-$

(B) $XeF_4$

(C) $I_3^-$

(D) $SF_4$

**92.** The number of unpaired electrons present in $Sc^{3+}$ and $Cr^{2+}$ are

(A) 0, 4

(B) 3, 1

(C) 4, 0

(D) 1, 3

**93.** The correct order of acid strength for $Al_2O_3$, $SO_3$, $P_2O_3$ and $SiO_2$ is

(A) $SO_3 < P_2O_3 < SiO_2 < Al_2O_3$

(B) $Al_2O_3 < SiO_2 < P_2O_3 < SO_3$

(C) $Al_2O_3 < SiO_2 < SO_3 < P_2O_3$

(D) $SO_3 < SiO_2 < P_2O_3 < Al_2O_3$

**94.** Which one of the following has a regular tetrahedral ($T_d$) structure ?

(A) $SF_4$

(B) $[Ni(CN)_4]^{2-}$

(C) $XeF_4$

(D) $[NiCl_4]^{2-}$

**95.** The positive Lassaigne test for nitrogen of any compound from sodium fusion is due to the formation of

(A) $Fe_4[Fe(CN)_6]_3$

(B) $Na_4[Fe(NCS)(CN)_5]$

(C) $Na_4[Fe(CN)_6]$

(D) $Na_4[Fe(NOS)(CN)_5]$

**Space for Rough Work**

**96.** The increasing order of oxidizing power of $VO_2^+$, $Cr_2O_7^{2-}$ and $MnO_4^-$ is

(A) $MnO_4^- < Cr_2O_7^{2-} < VO_2^+$

(B) $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$

(C) $Cr_2O_7^{2-} < MnO_4^- < VO_2^+$

(D) $VO_2^+ < MnO_4^- < Cr_2O_7^{2-}$

**97.** Separate hydrolysis of calcium cyanamide (CaNCN), calcium phosphide ($Ca_3P_2$) and calcium carbide ($CaC_2$) with water give calcium salts and

(A) $NH_2CONH_2$, $PH_3$ and $C_2H_2$

(B) $NH_3$, $PH_3$ and $C_2H_2$

(C) $NH_3$, $PH_3$ and $CH_4$

(D) $NH_3$, $PH_3$ and $C_2H_6$

**98.** Which one of the following does not liberate oxygen on reaction with $H_2O_2$ ?

(A) Acidified $KMnO_4$

(B) $PbO_2$

(C) Aqueous solution of KI

(D) Moist Silver Oxide

**99.** Reaction of silver nitrate with acetylene in presence of ammonia gives

(A) $AgC \equiv CAg$

(B) $Ag_2CO_3$

(C) $AgOCH_2CH_2OAg$

(D) $AgHCO_3$

**100.** On heating, ammonium cyanate gives

(A) $(NH_4)_2CO_3$

(B) $(NH_2)_2CO$

(C) $HCONH_2$

(D) $HCO_2NH_4$

---

**Space for Rough Work**

**101.** The nature of the following hydrides
NaH, HF and CrH are, respectively
(A) Molecular, Saline and Interstitial.
(B) Interstitial, Molecular and Saline.
(C) Saline, Molecular and Interstitial.
(D) Interstitial, Saline and Molecular.

**102.** An isobar of $^{14}C_6$ is
(A) $^{11}B_5$
(B) $^{15}N_7$
(C) $^{13}C_6$
(D) $^{14}N_7$

**103.** Two separate reactions of $Fe_2O_3$ and Ni with carbon monoxide give, respectively
(A) Fe and $Ni(CO)_4$
(B) $Fe(CO)_5$ and $Ni(CO)_4$
(C) $Fe(CO)_5$ and Ni
(D) Fe and Ni

**104.** Addition of excess potassium iodide to a solution of $HgCl_2$ gives a
(A) neutral mercuric iodide
(B) dianionic tetra-iodo complex
(C) monoanionic tri-iodo complex
(D) trianionic penta-iodo complex

**105.** AgC*l* reacts with solutions of aqueous sodium thiosulphate and potassium cyanide solutions to give
(A) $Na[Ag(S_2O_3)_2]$,$K[Ag(CN)_2]$
(B) $Na[Ag(S_2O_3)_2]$,$K_3[Ag(CN)_2]$
(C) $Na_3[Ag(S_2O_3)_2]$,$K[Ag(CN)_2]$
(D) $Na_3[Ag(S_2O_3)_2]$,$K_3[Ag(CN)_2]$

**Space for Rough Work**

**106.** Which is an oxide ore ?

(A) Zincite

(B) Calamine

(C) Malachite

(D) Cryolite

**107.** In borax ($Na_2B_4O_7 \cdot 10H_2O$) the number of B-OH bonds present is

(A) five

(B) four

(C) three

(D) two

**108.** The net reaction during the discharge of nickel-cadmium battery is

(A) $2Ni(OH)_2 + Cd + H_2O \rightarrow 2Ni(OH)_2 + Cd(OH)_2$

(B) $2Ni_2O_3 + Cd + O_2 \rightarrow 2Ni(OH)_3 + Cd(OH)_2$

(C) $2Ni(OH)_3 + Cd \rightarrow CdO + 2Ni(OH)_2 + H_2O$

(D) $2Ni(OH)_2 + Cd + O_2 \rightarrow 2Ni(OH)_2 + CdO$

**109.** What is the number of valence electrons present in iodine monochloride (IC*l*) ?

(A) 12

(B) 14

(C) 16

(D) 18

**110.** Amongst the following :

$BF_3$, $SO_3$, $NO_3^-$, $CO_3^{2-}$, $NH_3$ and $SO_3^{2-}$

the species having trigonal pyramidal shapes are

(A) $NH_3$, $SO_3$

(B) $NO_3^-$, $CO_3^{2-}$

(C) $NH_3$, $SO_3^{2-}$

(D) $BF_3$, $SO_3^{2-}$

---

**Space for Rough Work**

**111.** The structural feature which distinguishes proline from other natural amino acids is :

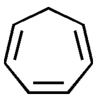
(A) It is optically inactive.

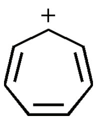
(B) It contains aromatic group.

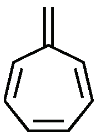
(C) It is a dicarboxylic acid.

(D) It is a secondary amine.

**112.** Which of the following is an aromatic species ?

(A) 

(B) 

(C) 

(D) None of the above

**113.** Aqueous solution of carbohydrate with 2 drops of alcoholic solution of $\alpha$-naphthol and $H_2SO_4$ gives a ring at the junction. The colour of the ring is

(A) Yellow

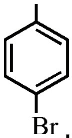
(B) Green

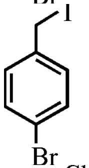
(C) Violet

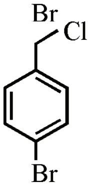
(D) Red

**Space for Rough Work**

**114.** Which of the following will give yellow ppt. on shaking with an aq. solution of NaOH followed by acidification with dil. $HNO_3$ and addition of $AgNO_3$ solution ?

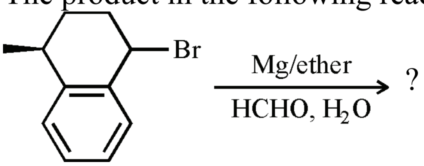
(A) 

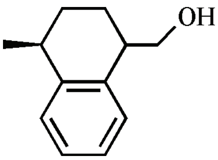
(B) 

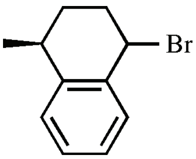
(C) 

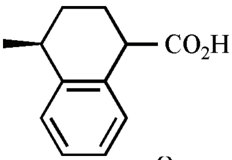
(D) None of the above

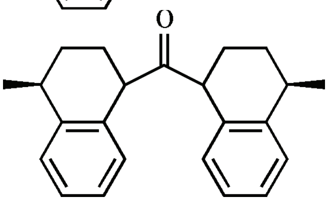
**115.** The product in the following reaction is



(A) 

(B) 

(C) 

(D) 

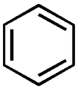
---

**Space for Rough Work**

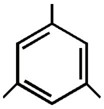
**116.** Identify the product in the following reaction :

$$C_2H_2 \xrightarrow{\text{Red hot Iron tube}} ?$$

(A) $H_2C = CH - CH = CH_2$

(B) 

(C) 

(D) 

**117.** Which of the following reaction will lead to enantiomeric molecules ?

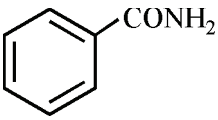
(A) $LiAlH_4$ reduction of acetone

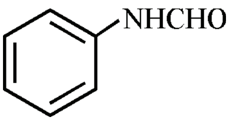
(B) $LiAlH_4$ reduction of benzophenone

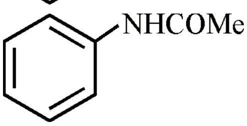
(C) $NaBH_4$ reduction of acetophenone

(D) $NaBH_4$ reduction of acetone

**118.** A compound A has molecular formula $C_7H_7NO$. On treatment with $Br_2$ and KOH, A gives an amine B which gives carbylamine test. B upon diazotization and coupling with phenol gives an azo dye. A is,

(A) 

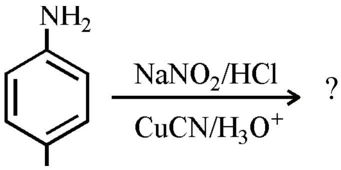

(B) 

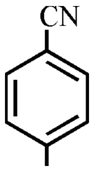

(C) 

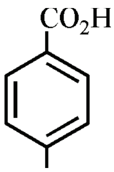

(D) None of the above

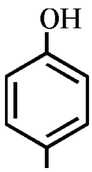
**Space for Rough Work**

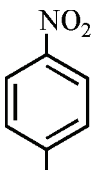
**119.** Identify the reaction product :




(A) 


(B) 


(C) 


(D) 


**120.** Which of the following $\alpha$-amino acids having a phenolic-OH group in its backbone ?

(A) Phenylalanine

(B) Histidine

(C) Tyrosine

(D) Glumatic acid

**Space for Rough Work**