TSPH EduCare Private Limited

2023_JEE Actual Paper_1 Feb_2nd Shift

FULL SYLLABUS

Date : 1-2-2023

Marks : 300

**TSPH**

JEE • NEET • MHT-CET

PHYSICS

1) **Two objects A and B are placed at 15 cm and 25 cm from the pole in front of a concave mirror having radius of curvature 40 cm. The distance between images formed by the mirror is**

   a) 160 cm
   b) 40 cm
   c) 100 cm
   d) 60 cm

2) **For three low density gases A, B, C pressure versus temperature graphs are plotted while keeping them at constant volume, as shown in the figure.**
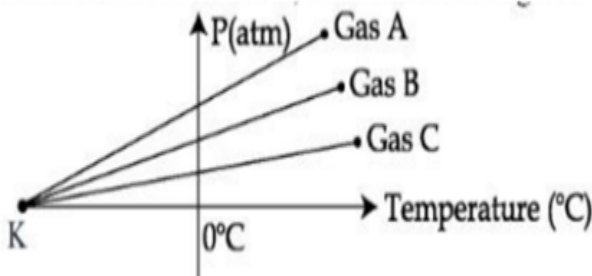

   The temperature corresponding to the point 'K' is

   a) $-100°C$
   b) $-40°C$
   c) $-273°C$
   d) $-373°C$

3) **For a body projected at an angle with the horizontal from the ground, choose the correct statement.**

   a) Gravitational potential energy is maximum at the highest point.

   b) The Kinetic Energy (K.E.) is zero at the highest point of projectile motion.

   c) The vertical component of momentum is maximum at the highest point,

   d) The horizontal component of velocity is zero at the highest point.

4) **As shown in the figure, a long straight conductor with semicircular arc of radius $\frac{\pi}{10}m$ is carrying current I = 3A. The magnitude of the magnetic field, at the center O of the arc is :**

   (The permeability of the vacuum = $4\pi \times 10^{-7}$ NA^{-2})

   a) 4μT
   b) 1μT
   c) 3μT
   d) 6μT
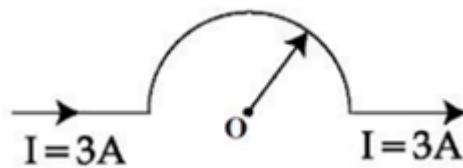
5) **The Young's modulus of a steel wire of length 6 m and cross-sectional area 3 mm^2, is 2 × 10^{11} N/m^2. The wire is suspended from its support on a given planet. A block of mass 4 kg is attached to the free end of the wire. The acceleration due to gravity on the planet is 1/4 of its value on the earth. The elongation of wire is (Take g on the earth = 10 m/s^2):**

   a) 1 mm
   b) 1 cm
   c) 0.1 mm
   d) 0.1 cm

6) **Choose the correct statement about Zener diode :**

   a) It works as a voltage regulator in forward bias and behaves like simple pn junction diode in reverse bias.

   b) It works as a voltage regulator in reverse bias and behaves like simple pn junction diode in forward bias.

   c) It works as a voltage regulator in both forward and reverse bias.

   d) It works as a voltage regulator only in forward bias.

7) **As shown in the figure a block of mass 10 kg lying on a horizontal surface is pulled by a force F acting at an angle 30°, with horizontal. For μ_S = 0.25. the block will just start to move for the value of F : [Given g= 10 ms^{-2}]**
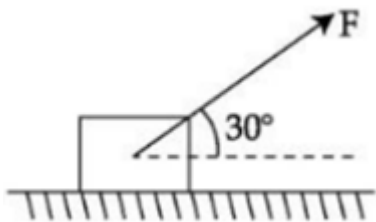
   a) 33.3N
   b) 20N
   c) 25.2N
   d) 35.7N

8) **A coil is placed in magnetic field such that plane of coil is perpendicular to the direction of magnetic field. The magnetic flux through a coil can be changed :**

   A. By changing the magnitude of the magnetic field within the coil.

   B. By changing the area of coil within the magnetic field.

   C. By changing the angle between the direction of magnetic field and the plane of the coil.

   D. By reversing the magnetic field direction abruptly without changing its magnitude.

   Choose the most appropriate answer from the options given below :

   a) A and C only
   b) A and B only
   c) A, B and D only
   d) A, B and C only

9) **Equivalent resistance between the adjacent corners of a regular n-sided polygon of uniform wire of resistance R would be :**

   a) $\frac{(n-1)R}{n}$
   b) $\frac{n^2 R}{n-1}$
   c) $\frac{(n-1)R}{(2n-1)}$
   d) $\frac{(n-1)R}{n^2}$

10) Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R.

    Assertion A : Two metallic spheres are charged to the same potential. One of them is hollow and another is solid, and both have the same radii. Solid sphere will have lower charge than the hollow one.

    Reason R : Capacitance of metallic spheres depend on the radii of spheres.

    In the light of the above statements, choose the correct answer from the options given below.

    a) Both A and R are true but R is not the correct explanation of A

    b) A is true but R is false

    c) A is false but R is true

    d) Both A and R are true and R is the correct explanation of A

11) **A Carnot engine operating between two reservoirs has efficiency 1/3. When the temperature of cold reservoir raised by x, its efficiency decreases to 1/6. The value of x. If the temperature of hot reservoir is 99°C, will be :**

    a) 33K
    b) 16.5K
    c) 62K
    d) 66K

12) Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : For measuring the potential difference across a resistance of 600 Ω. the voltmeter with resistance 1000 Ω will be preferred over voltmeter with resistance 4000 Ω.

Reason R : Voltmeter with higher resistance will draw smaller current than voltmeter with lower resistance.

In the light of the above statements, choose the most appropriate answer from the options given below.

a) A is correct but R is not correct

b) A is not correct but R is correct

c) Both A and R are correct and R is the correct explanation of A

d) Both A and R are correct but R is not the correct explanation of A

13) **Figures (a), (b), (c) and (d) show variation of force with time**
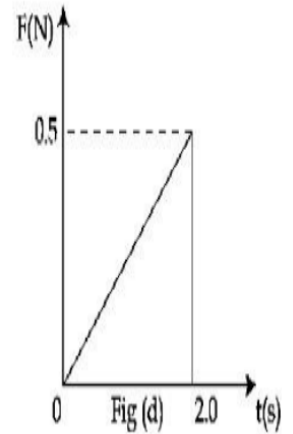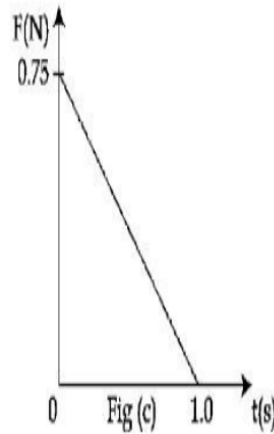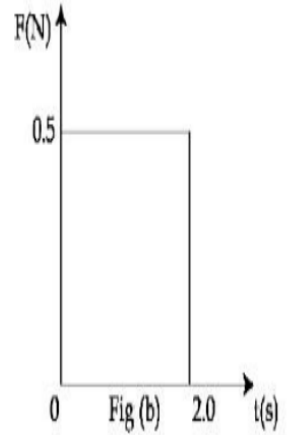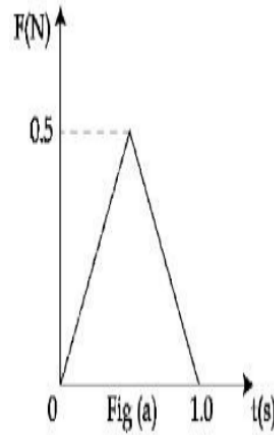
The impulse is highest in figure.

a) Fig. (b) b) Fig. (a)
c) Fig. (c) d) Fig. (d)

14) **The threshold frequency of a metal is f_0. When the light of frequency $2f_0$ is incident on the metal plate, the maximum velocity of photoelectrons is v_1. When the frequency of incident radiation is increased to $5f_0$, the maximum velocity of photoelectrons emitted is v_2. The ratio of v_1 to v_2 is**

a) $\frac{v_1}{v_2} = \frac{1}{4}$ b) $\frac{v_1}{v_2} = \frac{1}{2}$

c) $\frac{v_1}{v_2} = \frac{1}{8}$ d) $\frac{v_1}{v_2} = \frac{1}{16}$

15) **If the velocity of light c, universal gravitational constant G and Planck's constant h are chosen as fundamental quantities. The dimensions of mass in the new system is :**

a) $\left[h^{-\frac{1}{2}} c^{\frac{1}{2}} G^{\frac{1}{2}}\right]$

b) $\left[h^{\frac{1}{2}} c^{-\frac{1}{2}} G^{1}\right]$

c) $\left[h^{\frac{1}{2}} c^{\frac{1}{2}} G^{-\frac{1}{2}}\right]$

d) $[h^1 c^1 G^{-1}]$

16) **Choose the correct length (L) versus square of time period (T^2) graph for a simple pendulum executing simple harmonic motion.**
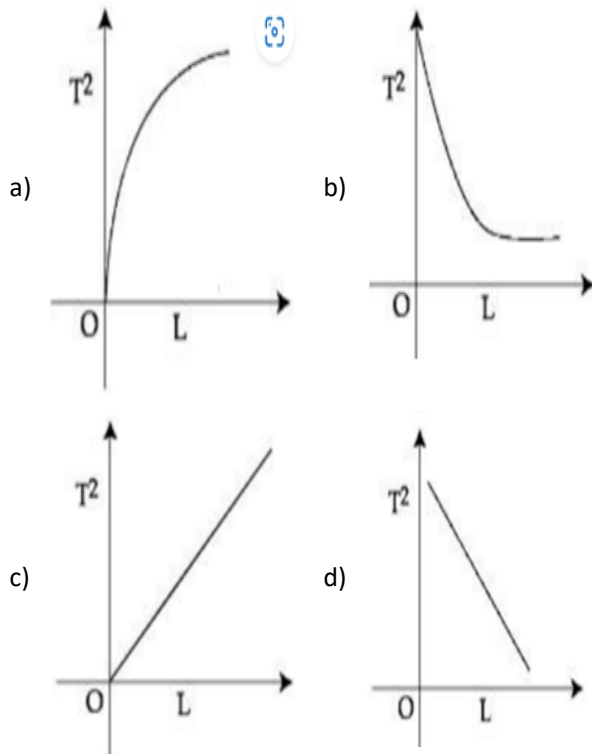
17) **The ratio of average electric energy density and total average energy density of electromagnetic wave is**

a) 2

b) 1/2

c) 3

d) 1

18) **The escape velocities of two planets A and B are in the ratio 1 : 2. If the ratio of their radii respectively is 1 : 3. then the ratio of acceleration due to gravity of planet A to the acceleration of gravity of planet B will be :**

a) 4/3

b) 3/2

c) 3/4

d) 2/3

19) **In an amplitude modulation, a modulating signal having amplitude of X V is superimposed with a carrier signal of amplitude Y V in first case. Then, in second ease, the same modulating signal is superimposed with different carrier signal of amplitude 2Y V. The ratio of modulation index ill the two cases respectively will be :**

a) 1 : 1

b) 1 : 2

c) 4 : 1

d) 2 : 1

20) **An electron of a hydrogen like atom, having Z = 4, jumps from 4th energy state to 2nd energy state. The energy released in this process, will be : (Given Rch = 13.6 eV)**

Where R = Rydberg constant

c = Speed of light in vacuum h = Planck's constant

a) 13.6 eV

b) 40.8 eV

c) 10.5 eV

d) 3.4 eV

21) A square shaped coil of area 70 cm^2 having 600 turns rotates in a magnetic field of 0.4 wbm^{-2}, about an axis which is parallel to one of the side of the coil and perpendicular to the direction of field. If the coil completes 500 revolution in a minute, the instantaneous emf when the plane of the coil is inclined at 60 $^{\circ}$ with the field, will be _____ V. (Take π = 22/7)
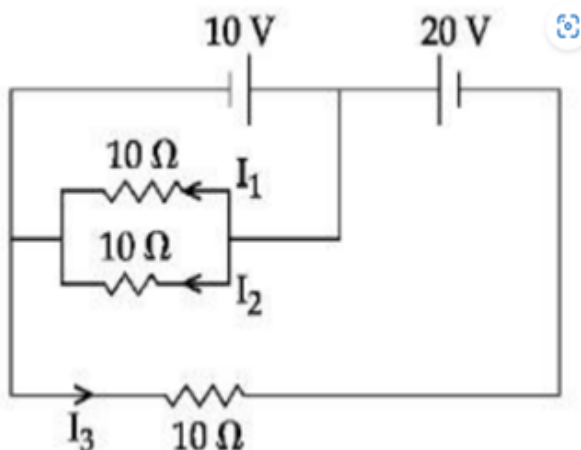
)

22) Nucleus A having Z = 17 and equal number of protons and neutrons has 1.2 MeV binding energy per nucleon.

Another nucleus B of Z = 12 has total 26 nucleons and 1.8 MeV binding energy per nucleons The difference of binding energy of B and A will be _____ MeV.

)

23) In the given circuit, the value of $\left|\frac{I_1+I_3}{I_2}\right|$ is _____

)

24) A force $F = (5 + 3y^2)$ acts on a particle in the y-direction, where F is in newton and y is in meter. The work done by the force during a displacement from y = 2m to y = 5m is _____ J.

)

25) A block is fastened to a horizontal spring. The block is pulled to a distance x = 10 cm from its equilibrium position (at x = 0) on a frictionless surface from rest. The energy of the block at x = 5 cm is 0,25 J. The spring constant of the spring is _____ Nm^{-1}

)

26) The surface of water in a water tank of cross section area 750 cm^2 on the top of a house is h m above the tap level. The speed of water coming out through the tap of cross section area 500 mm^2 is 30 cm/s. At that instant, $\frac{dh}{dt}$ is x × 10^{-3} m/s. The value of x will be _____

)

27) A cubical volume is bounded by the surfaces x = 0, x = a, y = 0, y = a, z = 0, z = a. The electric field in the region is given by $\vec{E} = E_0 x \hat{i}$. Where E_0 = 4 × 10^4 $NC^{-1}m^{-1}$. If a = 2 cm. the charge contained in the cubical volume is Q × 10^{-14}C. The value of Q is _____ . Take ϵ_0 = 9 × 10^{-12} C^2/Nm^2)

)

28) Moment of inertia of a disc of mass M and radius 'R' about any of its diameter is $\frac{MR^2}{4}$. The moment of inertia of this disc about an axis normal to the disc and passing through a point on its edge will be, $\frac{x}{2}MR^2$. The value of x is _____

)

29) For a train engine moving with speed of 20 ms^{-1}, the driver must apply brakes at a distance of 500 m before the station for the train to come to rest at the station. If the brakes were applied at half of this distance, the train engine would cross the station with speed $\sqrt{x}$ ms^{-1}. The value of x is _____ (Assuming same retardation is produced by brakes)

)

30) As shown in the figure, in Young's double slit experiment, a thin plate of thickness $t = 10\mu m$ and refractive index $\mu = 1.2$ is inserted infront of slit S_1. The experiment is conducted in air ($\mu = 1$) and uses a monochromatic light of wavelength). $= 500$ mn. Due to the insertion of the plate, central maxima is shifted by a distance of $x\beta_0$. β_0 is the fringe-width befor the insertion of the plate. The value of the x is

_____

)
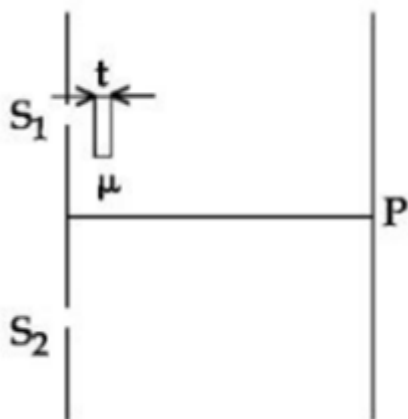
CHEMISTRY

31) **In figure, a straight line is given for Freundrich Adsorption (y = 3x + 2.505). The value of 1/n and log K are respectively.**
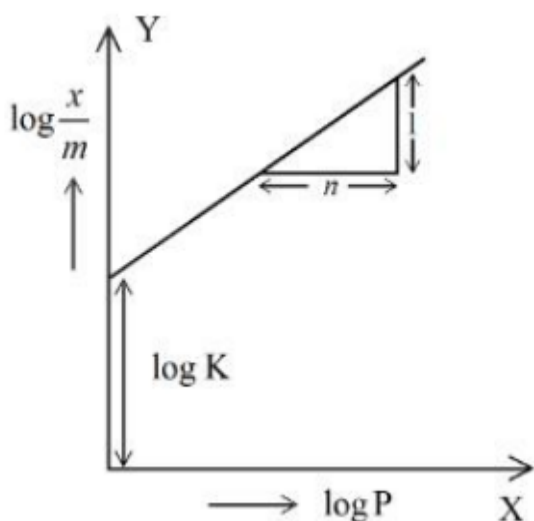
a) 3 and 2.505   b) 3 and 0.7033

c) 0.3 and log 2.505   d) 0.3 and 0.7033

32) **Which one of the following sets of ions represents a collection of isoelectronic species ?**

(Given: Atomic Number : F : 9, Cl : 17,Na = 11, Mg = 12, Al = 13, K= 19, Ca = 20; Sc = 21)

a) Ba^{2+}, Sr^{2+}, K^+, Ca^{2+}

b) K^+, Cl^-, Ca^{2+}, Sc^{3+}

c) Li^{3+}, Na^+, Mg^{2+}, Ca^{2+}

d) N^{3-}, O^{2-}, F^-, S^{2-}

33) **The structures of major products A, B and C in the following reaction are sequence.**
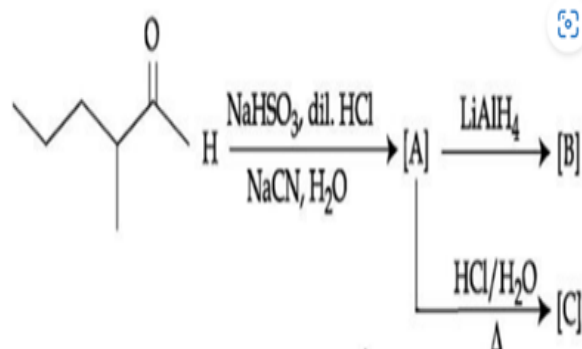
a)

b)

c)

d)

34) **In a reaction.**
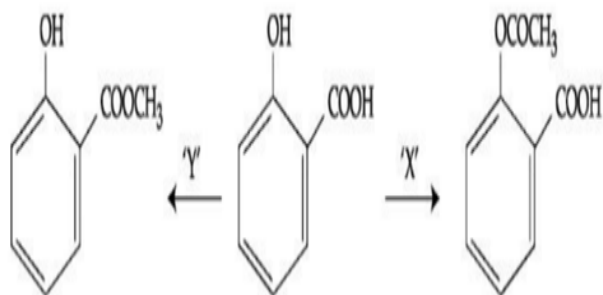
reagents 'X' and 'Y' respectively are :

a) CH_3OH/H^+, Δ and CH_3OH/H^+, Δ

b) $(CH_3CO)_2O/H^+$ and $(CH_3CO)_2O/H^+$

c) $(CH_3CO)_2O/H^+$ and CH_3OH/H^+, Δ

d) CH_3OH/H^+, Δ and $(CH_3CO)_2O/H^+$

35) Given below are two statements : one is labelled as Assertion (A) arid the other is labelled as Reason (R).

Assertion (A): Cu^{2+} in water is more stable than Cu^+.

Reason (R) : Enthalpy of hydration for Cu^{2+} is much less than that of Cu^+.

In the light of the above statements, choose the correct answer from the options given below :

a) (A) is not correct but (R) is correct

b) Both (A) and (R) are correct and (R) is the correct explanation of (A)

c) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

d) (A) is correct but (R) is not correct

36) **The industrial activity held least responsible for global warming is :**

a) steel manufacturing

b) manufacturing of cement

c) Industrial production of urea

d) Electricity generation in thermal power plants

37) **O — O bond length in H_2O_2 is $\underline{X}$ than the O–O bond length in F_2O_2**

The O — H bond length in H_2O_2 is $\underline{Y}$ than that of the O — F bond in F_2O_2.

Choose the correct option for X and Y from those given below :

a) X - shorter, Y - longer

b) X - longer, Y - shorter

c) X - shorter, Y - shorter

d) X - longer, Y - longer

38) **For electron gain enthalpies of the elements denoted as $\Delta_{eg}H$. the incorrect option is :**

a) $\Delta_{eg}H(I) < \Delta_{eg}H(At)$

b) $\Delta_{eg}H(Te) < \Delta_{eg}H(Po)$

c) $\Delta_{eg}H(Se) < \Delta_{eg}H(S)$

d) $\Delta_{eg}H(Cl) < \Delta_{eg}H(F)$

39) **All structures given below are of vitamin C. Most stable of them is :**
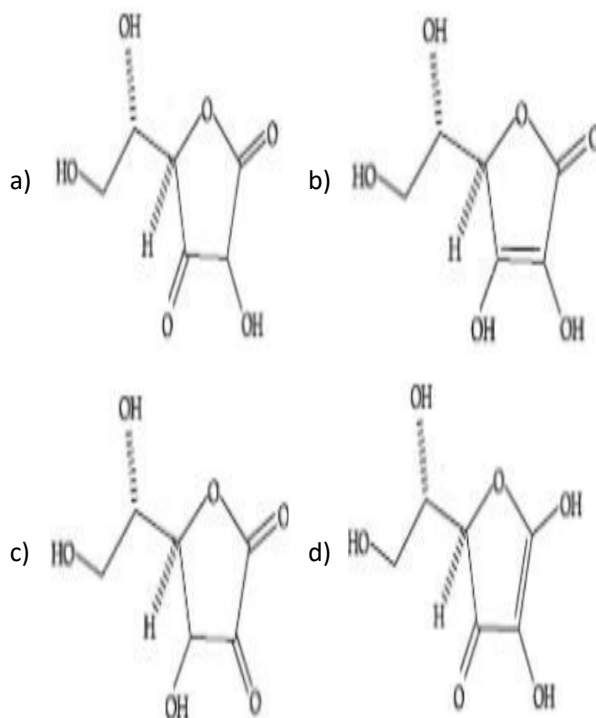
40) Given below are two statements ; one is labelled as Assertion (A) and the other is labelled as Reason (R)

Assertion (A): Gypsum is used for making fireproof wall boards.

Reason (R) : Gypsum is unstable at high temperatures. In the light of the above statements, choose the correct answer from the options given below :

a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

c) (A) is correct but (R) is not correct

d) (A) is not correct but (R) is correct

41) **The correct order of bond enthalpy (kJ mol^{-1})**

a) $Si - Si > C - C > Ge - Ge > Sn - Sn$

b) $C - C > Si - Si > Sn - Sn > Ge - Ge$

c) $Si - Si > C - C > Sn - Sn > Ge - Ge$

d) $C - C > Si - Si > Ge - Ge > Sn - Sn$

42) Given below are two statements :

Statement I: Sulplianilic acid gives esterification test for carboxyl group.

Statement II: Sulplianilic acid gives red colour in Lassigne's test for extra element detection.

In the light of the above statements, choose the most appropriate answer from the options given below :

a) Statement I is incorrect but Statement II is correct

b) Statement I is correct but Statement II is incorrect

c) Both Statement I and Statement II are incorrect

d) Both Statement I and Statement II are correct

43) Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): α-halocarboxylic acid on reaction with dil NH_3 gives good yield of α-amino carboxylic acid whereas the yield of amines is very low when prepared from alkyl halides.

Reason (R) : Amino acids exist in zwitter ion form in aqueous medium.

In the light of the above statements, choose the correct answer from the options given below :

a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

b) (A) is not correct but (R) is correct

c) (A) is correct but (R) is not correct

d) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

44) Given be Low are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): An aqueous solution of KOH when used for volumetric analysis, its concentration should be checked before the use.

Reason (R) : On aging KOH solution absorbs atmospheric CO_2.

In the light of the above statements, choose the correct answer from the options given below :

a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

b) (A) is correct but (R) is not correct

c) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

d) (A) is not correct but (R) is correct

45) The effect of addition of helium gas at constant volume to the following reaction in equilibrium state, is :

$$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$$

a) the equilibrium will shift in the forward direction and more of Cl_2 and PCl_3 gases will be produced.

b) the equilibrium will go backward due to suppression of dissociation of PCl_5.

c) addition of helium will not affect the equilibrium.

d) helium will deactivate PCl_5 and reaction will stop.

46) The graph which represents the following reaction is

$$(C_6H_5)_3C - Cl \xrightarrow[Pyridine]{OH} (C_6H_5)_3C - OH$$
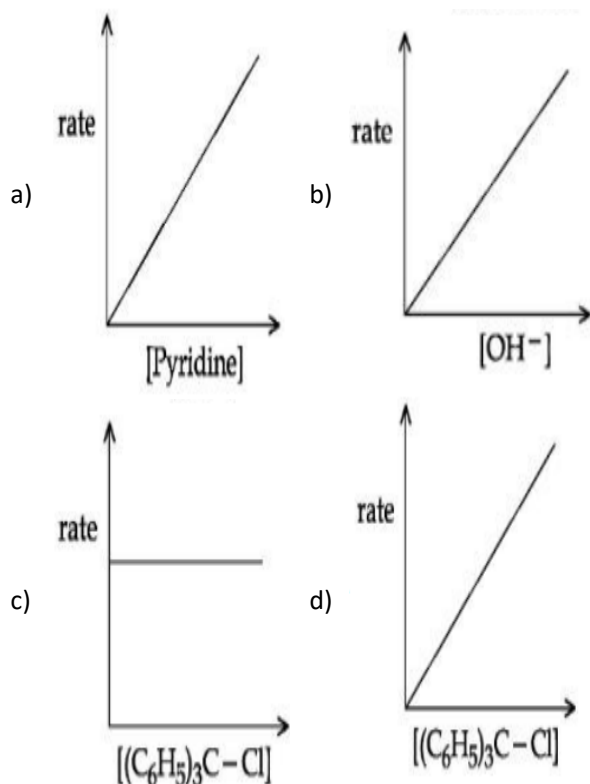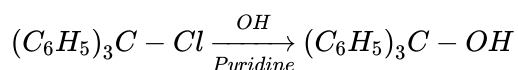
47) Which element is not present in Nessler's reagent ?

a) Iodine   b) Potassium

c) Mercury   d) Oxygen

48)

'X' is :

a)   b)   c)   d)
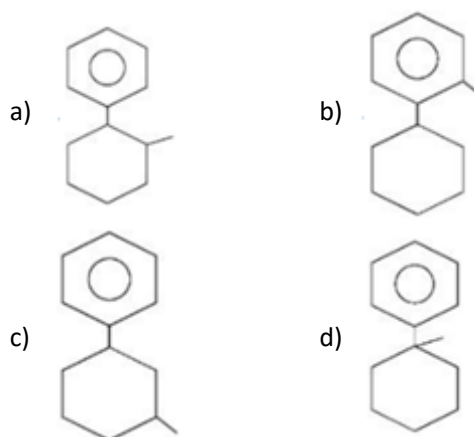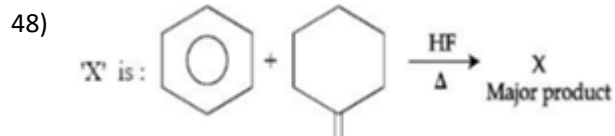
49) The starting material for convenient preparation of deuterated hydrogen peroxide (D_2O_2) in laboratory is :

a) 2-ethylanthraquinol   b) $K_2S_2O_8$

c) BaO   d) BaO_2

50) The complex cation which has two isomers is

a) $[Co(NH_3)_5Cl]^{2+}$ b) $[Co(NH_3)_5Cl]^{+}$

c) $[Co(NH_3)_5NO_2]^{2+}$ d) $[Co(H_2O)_6]^{3+}$

51) A metal M crystallizes into two lattices :- face centred cubic (fcc) and body centred cubic (bcc) with unit cell edge length of 2.0 and 2.5 A respectively. The ratio of densities of lattices fcc to bcc for the metal M is _____ .

)

52) A → B

The above reaction is of zero order. Half life of this reaction is 50 min. The time taken for the concentration of A to reduce to one-fourth of its initial value is _____ min.

)

53) The molality of a 10% (v/v) solution of di-bromine solution in CCl_4 (carbon tetrachloride) is 'x'. x = _____ $\times 10^{-2}$M. (Nearest integer) [Given : molar mass of Br_2 = 160 g mol^{-1}

atomic mass of C = 12 g mol^{-1}

atomic mass of Cl = 35.5 g mol^{-1}

density of dibromine = 3.2 g cm^{-3} density of CCl_4 = 1.6 g cm^{-3}]

)

54) 20% of acetic acid is dissociated when its 5 g is added to 500 mL of water. The depression in freezing point of such water is _____ x 10^{-3} °C.

(Atomic mass of C, H and O are 12, 1 and 16 a.m.u. respectively.)

[Given : Molal depression constant and density of water are 1.86 K kg mol^{-1} and 1 g cm^{-3} respectively.]

)

55) The spin only magnetic moment of $[Mn(H_2O)_6]^{2+}$ complexes is _____ B.M. (Nearest integer)

)

56) Among the following, the number of tranquilizer/s is/are _____

A. Chloroliazepoxide
B. Veronal

C. Valium
D. Salvarsan

)

57) Testosterone, which is a steroidal hormone, has the following structure.
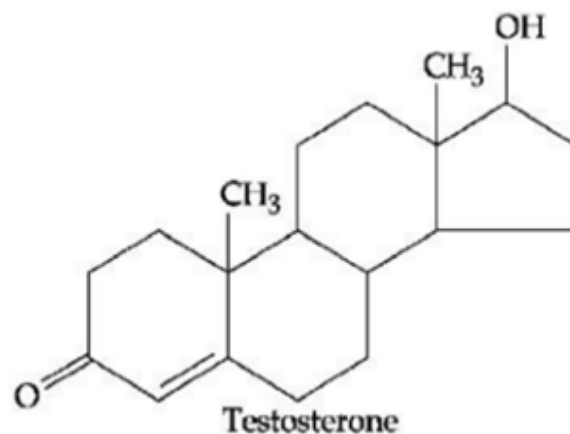
Testosterone

The total number of asymmetric carbon atoms in testosterone is _____

)

58) 0.3 g of ethane undergoes combustion at 27°C in a bomb calorimeter. The temperature of calorimeter system (including the water) is found to rise by 0.5°C, The heat evolved during

combustion of ethane at constant pressure is _____ kJ mol^{-1} .

(Nearest integer)

[Given : The heat capacity of the calorimeter system is 20 kJ K^{-1}, R = 8.3 JK^{-1} mol^{-1}.

Assume ideal gas behaviour.

Atomic mass of C and H are 12 and 1 g mol-1 respectively]

)

59) 1×10^{-5} MAgNO$_3$ is added to 1 L of saturated solution of AgBr. The conductivity of this solution at 298 K is _____ $\times 10^{-8}$ Sm^{-1}

[Given : $K_{SP}(AgBr)$ = 4.9 $\times 10^{-13}$ at 298 K

$\lambda^0_{Ag^+} = 6 \times 10^{-3} Sm^2 mol^{-1}$

$\lambda^0_{Br^-} = 8 \times 10^{-3} Sm^2 mol^{-1}$

$\lambda^0_{NO_3^-} = 7 \times 10^{-3} Sm^2 mol^{-1}$

)

60) Among following compounds, the number of those present in copper matte is _____

A. $CuCO_3$ B. Cu_2S

C. Cu_2O D. FeO

)

MATHEMATICS

61) **For the system of linear equations ax + y + z =1, x + αy + z = 1, x − y + αz =β, which one of the following statements is NOT correct ?**

a) $x + y + z = -\frac{3}{4}$ if α = 2 and β =1

b) It has infinitely many solutions if α = 2 and β = − 1

c) It has no solution if α = − 2 and β = 1

d) It has infinitely many solutions if α = 1 and β = 1

62) **Let $P(x_0, y_0)$ be the point on the hyperbola $3x^2 − 4y^2 = 36$, which is nearest to the line 3x + 2y = 1. Then $\sqrt{2}(y_0 − x_0)$ is equal to :**

a) 3   b) -3

c) 9   d) -9

63) **Let P(S) denote the power set of S = {1, 2, 3, … , 10}. Define the relations R_1 and R_2 on P(S) as AR_1B if $(A \cap B^c) \cup (B \cap A^c) = \phi$ and AR_2B if $A \cup B^c = B \cup A^c$, ∀A, B ∈ P(S). Then:**

a) only R_1 is an equivalence relation

b) only R_2 is an equivalence relation

c) both R_1 and R_2 are equivalence relations

d) both R_1 and R_2 are not equivalence relations

64) **If $y(x)$ x^x, x > 0, then y''(2) − 2y'(2) is equal to :**

a) $8 \log_e 2 - 2$

b) $4 \log_e 2 + 2$

c) $4(\log_e 2)^2 - 2$

d) $4(\log_e 2)^2 + 2$

65) **Which of the following statements is a tautology ?**

a) $p \vee (p \wedge q)$

b) $(p \wedge (p \rightarrow q)) \rightarrow \sim q$

c) $(p \wedge q) \rightarrow (\sim(p) \rightarrow q)$

d) $p \rightarrow (p \wedge (p \rightarrow q))$

66) **The sum $\sum_{n=1}^{\infty} \frac{2n^2+3n+4}{(2n!)}$ is equal to**

a) $\frac{13e}{4} + \frac{5}{4e}$ b) $\frac{11e}{2} + \frac{7}{2e}$

c) $\frac{13e}{4} + \frac{5}{4e} - 4$ d) $\frac{11e}{2} + \frac{7}{2e} - 4$

67) **Let $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k} \ and \ \vec{b} = \hat{i} + 3\hat{j} + 5\hat{k}$ be two vectors. Then which one of the following statements is TRUE ?**

a) Projection of $\vec{a}$ on $\vec{b}$ is $\frac{-17}{\sqrt{35}}$ and the direction of the projection vector is opposite to the direction of $\vec{b}$.

b) Projection of $\vec{a}$ on $\vec{b}$ is $\frac{17}{\sqrt{35}}$ and the direction of the projection vector is opposite to the direction of $\vec{b}$

c) Projection of $\vec{a}$ on $\vec{b}$ is $\frac{17}{\sqrt{35}}$ and the direction of the projection vector is same as of $\vec{b}$.

d) Projection of $\vec{a}$ on $\vec{b}$ is $\frac{-17}{\sqrt{35}}$ and the direction of the projection vector is same as of $\vec{b}$

68) **Let αx = exp($x^\beta y^\gamma$) be the solution of the differential equation $2x^2y \ dy − (1 − xy^2) \ dx = 0$, x > 0, $y(2) = \sqrt{\log_e 2}$. Then α + β − γ equals :**

a) 3   b) 1

c) -1   d) 0

69) **The sum of the absolute maximum and minimum values of the function**

$f(x) = |x^2 - 5x + 6| - 3x + 2$ **in the interval [−1, 3] is equal to :**

a) 13
b) 10
c) 12
d) 24

70) **Let f : R − {0, 1} → R be a function such that**
$f\left(x\right) + f\left(\frac{1}{1-x}\right) = 1 + x.$ **Then f(2) is equal to**

a) $\frac{7}{3}$
b) $\frac{9}{2}$
c) $\frac{7}{4}$
d) $\frac{9}{4}$

71) **Let 9 = x_1 < x_2 < ...< x_7 be in an A.P. with common difference d. If the standard deviation of x_1, x_2..., x_7 is 4 and the mean is $\bar{x},\ then\ \bar{x} + 6$ is equal to :**

a) 34
b) $2\left(9 + \frac{8}{\sqrt{7}}\right)$
c) $18\left(1 + \frac{1}{\sqrt{3}}\right)$
d) 25

72) **Let the plane P pass through the intersection of the planes 2x + 3y − z = 2 and x + 2y + 3z = 6, and be perpendicular to the plane 2x + y − z + 1 = 0 . If d is the distance of P from the point (− 7, 1, 1), then d^2 is equal to :**

a) $\frac{250}{83}$
b) $\frac{15}{53}$
c) $\frac{25}{83}$
d) $\frac{250}{82}$

73) **Two dice are thrown independently. Let A be the event that the number appeared on the 1st die is less than the dumber appeared on the 2nd die, B be the event that the number appeared on the 1st die is even and that on the second die is odd, and C be the event that the number appeared on the 1st die is odd and that on the 2nd is even. Then :**

a) B and C are independent

b) A and B are mutually exclusive

c) the number of favourable cases of the event (A ∪ B) ∩ C is 6

d) the number of favourable cases of the events A, B and C are 15, 6 and 6 respectively

74) **Let**
$\overrightarrow{a} = 2\hat{i} - 7\hat{j} + 5\hat{k},\ \overrightarrow{b} = \hat{i} + \hat{k}\ and\ \overrightarrow{c} = \hat{i} +$ **be three given vectors. If $\overrightarrow{r}$ is a vector s**
$\overrightarrow{r} \times \overrightarrow{a} = \overrightarrow{c} \times \overrightarrow{a}\ and\ \overrightarrow{r}.\overrightarrow{b} = 0,\ then\ \left|\overrightarrow{r}\right|$ **to :**

a) $\frac{\sqrt{914}}{7}$
b) $\frac{11}{5}\sqrt{2}$
c) $\frac{11}{7}\sqrt{2}$
d) $\frac{11}{7}$

75) **The area of the region given by {(x, y) : xy ≤ 8, 1, ≤ y ≤ x^2} is**

a) $8\log_e 2 - \frac{11}{3}$
b) $16\log_e 2 - \frac{14}{3}$
c) $8\log_e 2 + \frac{7}{6}$
d) $16\log_e 2 + \frac{7}{3}$

76) **Let**
$\left\{x \in R : 0 < x < 1\ and\ 2\tan^{-1}\left(\frac{1-x}{1+x}\right) = \cos^{-1}\left(\cdot\right.\right.$

If n(S) denotes the number of elements in S t

a) n(S) = 2 and only one element in S is less $\frac{1}{2}$

b) n(S) = 0

c) n(S) = 1 and the element in S is less than $\frac{1}{2}$

d) $\frac{1}{2}$n(S) = 1 and the elements in S is more th

77) **If $A = \frac{1}{2}\begin{bmatrix} 1 & \sqrt{3} \\ -\sqrt{3} & 1 \end{bmatrix}$, then**

a) $A^{30} + A^{25} + A = I$
b) $A^{30} - A^{25} = 2I$
c) $A^{30} + A^{25} - A = I$
d) $A^{30} = A^{25}$

78) **The value of the integral $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \frac{x + \frac{\pi}{4}}{2 - \cos 2x} dx$ is**

a) $\frac{\pi^2}{12\sqrt{3}}$
b) $\frac{\pi^2}{6\sqrt{3}}$
c) $\frac{\pi^2}{6}$
d) $\frac{\pi^2}{3\sqrt{3}}$

79) **Let a, b be two real numbers such that ab < 0. If the complex number $\frac{1+ai}{b+i}$ is of unit modulus and a + ib lies on the circle |z − 1| = |2z|, then a possible value of $\frac{1+[a]}{4b}$, where [t] is greatest integer function, is :**

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

80) **The number of integral values of k, for which one root of the equation $2x^2 - 8x + k = 0$ lies in the interval (1, 2) and its other root lies in the interval (2, 3), is :**

a) 3

b) 1

c) 0

d) 2

81) The line x = 8 is the directrix of the ellipse $E : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with the corresponding focus (2, 0). If the tangent to E at the point P in the first quadrant passes through the point $(0, 4\sqrt{3})$ and intersects the x-axis at 0. then $(3PQ)^2$ is equal to _____
)

82) Let $\alpha x + \beta y + yz = 1$ be the equation of a plane passing through the point (3, − 2, 5) and perpendicular to the line joining the points (1,2, 3) and (− 2, 3, 5). Then the value of $\alpha\beta\gamma$ is equal to _____
)

83) Number of integral solutions to the equation x + y + z = 21 , where x ≥ 1, y ≥ 3, z ≥ 4, is equal to _____
)

84) The point of intersection C of the plane 8x + y + 2z = 0 and the line joining the points A(− 3, − 6, 1) and B(2, 4, − 3) divides the line segment AB internally in the ratio k : 1 If a. b, c (|a |, |b|, |c| are coprime) are the direction ratios of the perpendicular from the point C on the line $\frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3}$, then |a + b + c| is equal to _____
)

85) The total number of six digit numbers, formed using the digits 4, 5, 9 only and divisible by 6, is _____
)

86) If $\int \frac{5^{\cos x}\left(1+\cos x \cos 3x+\cos^2 x+\cos^3 x \cos 3x\right)dx}{1+5^{\cos x}} = \frac{k\pi}{16}$, then k is equal to _____
)

87) The sum of the common terms of the following three arithmetic progressions.

3,7,11,15……… 399,

2, 5, 8, 11,…….. 359 and

2,7,12, 17………. 197,

is equal to_____ .

)

88) If the term without x in the expansion of $\left(x^{\frac{2}{3}} + \frac{a}{x^3}\right)^{22}$ is 7315, then $|\alpha|$ is equal to _____

)

89) If the x-intercept of a focal chord of the parabola $y^2 = 8x + 4y + 4$ is 3, then the length of this chord is equal to _____ .

)

90) Let the sixth term in the binomial expansion of $\left(\sqrt{2^{\log_2(10-3^x)}} + \sqrt[5]{2^{(x-2)\log_2 3}}\right)^m$, in the increasing powers of $2^{(x-2)\log_2 3}$, be 21, If the binomial coefficients of the second, third and fourth terms in the expansion are respectively the first, third and fifth terms of an A.P.. then the sum of the squares of all possible values of x is _____ .

)