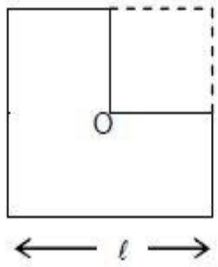
ALTUS KNOWLEDGE

Total: 75 Que.	IIT Full Length 3	Time: 180 Min.

Physics FL

1).

One quarter of the plate is cut from a square plate as shown in the figure. If 'M' is the mass of the plate and 'ℓ' is the length of each side, then the moment of inertia of the plate about an axis passing through 'O' and perpendicular to the plate is



(A) $M\ell^2 / 8$ (B) $3M\ell^2/4$

(C) $M\ell^2/3$ (D) $3M\ell^2$

(a) A **(b)** B **(c)** C **(d)** D

2).

A block is suspended by an ideal spring constant K. If the block is pulled down by constant force F and if maximum displacement of block from it's initial position of rest is z, then

(A) z = F/K (B) z = 2F/K

(C) work done by force F is equal to 2Fz.

(D) increase in potential energy of the spring is $\frac{1}{2}Kz^2$

(a) A **(b)** B **(c)** C **(d)** D

3).

A Carnot engine whose low temperature reservoir is at 7°C has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees should the temperature of the high temperature reservoir be increased

(a) 840K (b) 280 K (c) 560 K (d) 380K

(a) A **(b)** B **(c)** C **(d)** D

4).

A boat goes downstream for half an hour and then goes upstream for half an hour. The total distance travelled by the boat in the ground frame for this is 20 km. Ii is known that speed of the boat relative to the river for the whole trip was constant and greater than the speed of the river. The distance travelled by the boat in the frame of the river for this is

(A) zero
(B) 20 km
(C) 10 km
(D) can't be determined

(a) A **(b)** B **(c)** C **(d)** D

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5).

For a certain organ pipe open at both ends, the successive resonance frequencies are obtained at 510, 680 and 850 Hz. The velocity of sound in air is 340 m/s. The length of the pipe must be

(A) 2 m
(B) 0.5 m
(C) m
(D) 0.25 m

(a) A **(b)** B **(c)** C **(d)** D

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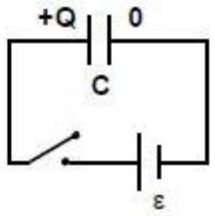
6).

The left plate of the capacitor shown in the figure above carries a charge +Q while the right plate is uncharged at t = 0. The total charge on the right plate after closing the switch will be



(A) $\frac{Q}{2} + C\varepsilon$
(B) $\frac{Q}{2} - C\varepsilon$
(C) $-\frac{Q}{2}$
(D) $-C\varepsilon$

(a) A **(b)** B **(c)** C **(d)** D

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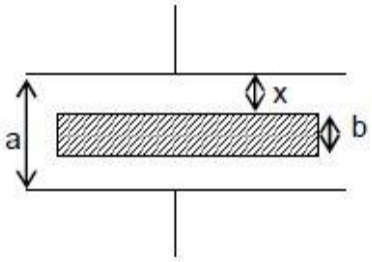
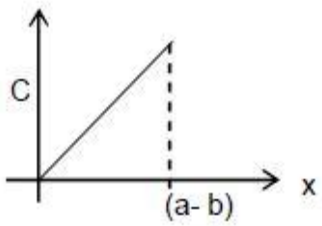
7).

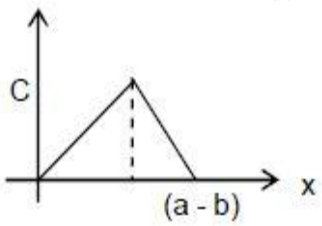
The distance between two parallel plates of a capacitor is a. A conductor of thickness b(b < a) is inserted between the plates as shown in the figure. The variation of effective capacitance between the surfaces of conductor and plate as a function of the distance (x) is best represented by



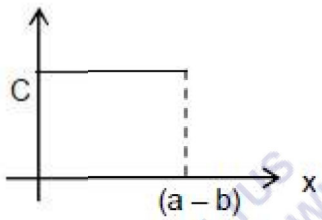
(A)



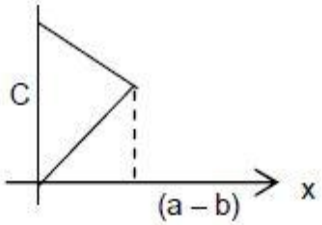
(B)



(C)



(D)



(a) A **(b)** B **(c)** C **(d)** D

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8).

A block of mass 2 kg is attached to one end of a massless rod of length $\frac{1}{\pi}$ m . The rod is fixed to a horizontal plane at the other end such that the block and rod are free to revolve on a horizontal plane. The coefficient of friction between the block and surface is 0.1. Block is made to rotate with uniform speed by applying a constant external force in tangential direction on the block. The work done by external force when the rod rotates by 90^0 is

(A) 0

(B) 10 joule

(C) $\frac{\pi}{2}$ joule

(D) 1 joule

(a) A **(b)** B **(c)** C **(d)** D

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9).

A solid sphere of radius R, and dielectric constant 'k' has spherical cavity of radius R/4. A point charge q_1 is placed in the cavity. Another charge q_2 is placed outside the sphere at a distance of r from q. Then Coulombic force of interaction between them is found to be 'F_1'. When the same charges are separated by same distance in vacuum then the force of interaction between them is found to be F_2 then

(A) $F_1 = F_2/k$

(B) $F_2 = F_1/k$

(C) $F_1 . F_2 = \frac{1}{k}$

(D) $F_1 = F_2$

(a) A **(b)** B **(c)** C **(d)** D

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10).

A swimmer can swim in still water with a speed of $\sqrt{5}$ m/s. While crossing a river his average speed is 3 m/s. If he cross the river in the shortest possible time, what is the speed of flow of water?

(A) 2 m/s
(B) 4 m/s
(C) 6 m/s
(D) 8 m/s

(a) A **(b)** B **(c)** C **(d)** D

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11).

In the hydrogen atom spectrum λ_{3-1} and λ_{2-1} represent wavelengths emitted due to transition from second and first excited states to the ground state respectively. The value of $\frac{\lambda_{3-1}}{\lambda_{2-1}}$ is

(A) 27 / 32
(B) 32/27
(C) 4/9
(D) 9/4

(a) A **(b)** B **(c)** C **(d)** D

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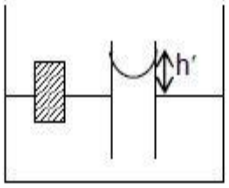
12).

In a capillary tube placed inside the liquid of density (ρ)in a container, the rise of liquid is h. When block of density 'σ' is placed on the liquid as shown in figure, liquid in the tube is h'. If $\sigma < \rho$ then



(A) h' = h
(B) h' < h
(C) h' > h
(D) insufficient data

(a) A **(b)** B **(c)** C **(d)** D

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13).

The power factor of a circuit in which a box having unknown electrical devices connected in series with a resistor of resistance 3Ω is 3/5. The reactance of the box is

(A) 5 Ω
(B) 5/3 Ω
(C) 4 Ω
(D) 4/3 Ω

(a) A **(b)** B **(c)** C **(d)** D

---

14).

Two points A and B are at distances of 'a' and 'b' respectively from an infinite conducting plate having charge density σ. The work done in moving charge Q from A to B is

(A) $\frac{Q\sigma}{\varepsilon_0}(b-a)$
(B) $\frac{\sigma}{(b-a)}Q$
(C) $\frac{Q\sigma}{(b-a)\varepsilon_0}$
(D) none of these

(a) A **(b)** B **(c)** C **(d)** D

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15).

A point charge of 0.1C is placed on the circumference of a non-conducting ring of radius 1m which is rotating with a constant angular acceleration of 1 rad/sec^2. If ring starts it's motion at t = 0 the magnetic field at the centre of the ring at t = 10 sec, is

(A) 10^{-6} T (B) 10^{-7} T

(C) 10^{-8} T (D) 10^{7} T

(a) A **(b)** B **(c)** C **(d)** D

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16).

The wavelength corresponding to maximum spectral radiancy of a black body A is λ_A = 5000 Å. Consider another black body B whose surface area is twice of that of A and total radiant energy emitted by B is 16 times that emitted by A. The wavelength corresponding to maximum spectrum radiancy for B will be

(A) 5000 $(8)^{1/4}$ Å (B) 2500 Å

(C) 10, 000 Å (D) $\frac{5000}{(8)^{1/4}}$ Å

(a) A **(b)** B **(c)** C **(d)** D

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17).

Tube A has both ends open while tube B has one end closed, otherwise they are identical. The ratio of fundamental frequency of tube A and B is

(a) 1 : 2 (b) 1 : 4

(c) 2 : 1 (d) 4 : 1.

(a) A **(b)** B **(c)** C **(d)** D

---

18).

The angle of incidence at which reflected light in totally polarized for reflection from air to glass (refractive index n), is

(a) $\sin^{-1}(n)$ (b) $\sin^{-1}(1/n)$

(c) $\tan^{-1}(1/n)$ (d) $\tan^{-1}(n)$.

(a) A **(b)** B **(c)** C **(d)** D

---

19).

What is the maximum acceleration of the particle doing the SHM $y = 2\sin\left[\frac{\pi t}{2} + \phi\right]$ where y is in cm?

(a) $\frac{\pi}{2}\text{cm/s}^2$ (b) $\frac{\pi^2}{2}\text{cm/s}^2$

(c) $\frac{\pi}{4}\text{cm/s}^2$ (d) $\frac{\pi}{4}\text{cm/s}^2$

(a) A **(b)** B **(c)** C **(d)** D

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20). If I_0 is the intensity of the principal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled?

(a) I_0 (b) $I_0/2$ (c) $2I_0$ (d) $4I_0$

(a) A **(b)** B **(c)** C **(d)** D

---

21). A particle starts from rest and moves with an acceleration of $a = \{2 + |t - 2|\}$ m/s^2, the velocity of the particle at t = 4 sec is

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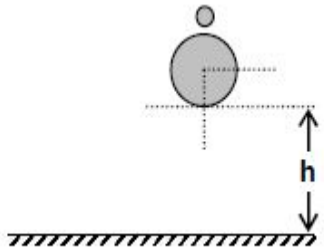
22). A small sphere and a big sphere are released from rest with a very small gap from height h as shown in the figure. The mass of bigger sphere is very large as compared to mass of smaller sphere the height from the point of collision of smaller sphere with the bigger sphere to which the smaller sphere will rise if all the collisions are elastic



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23). At what height above the earth's surface the acceleration due to gravity will be 1/9 th of its value at the earth's surface? Radius of earth is 6400 km.

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24). During an adiabatic process, the density of a gas is found to be proportional to cube of temperature. The degree of freedom of gas molecule is

25). An alternating voltage $E = 200\sqrt{2}\sin(100t)$ is connected to a 1 microfarad capacitor through an ac ammeter. The reading of the ammeter will be

Chemistry FL

26).

A compound is composed of two elements A and B, element A constitute f.c.c. lattice, while B occupy all the tetrahedral voids, in this way another simple cubic is constituted by element B, inside the fcc unit cell of element A. If all the points/particles along any one edge of inner cube of every unit cell, are missing then what is the new empirical formula of the compound

(A) A_4B_6 (B) A_2B_8
(C) A_2B_3 (D) AB_4

(a) A **(b)** B **(c)** C **(d)** D

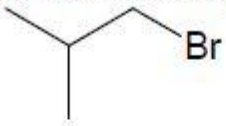
27).

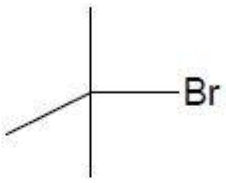
The ratio of time periods taken by electron in 1^{st} and 3^{rd} orbits of He^+ ion, for each revolution is.....

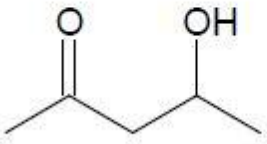
(A) 1 : 9 (B) 1 : 27
(C) 8 : 27 (D) 8 : 9

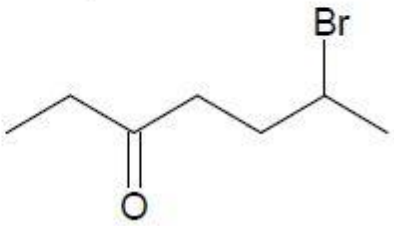
(a) A **(b)** B **(c)** C **(d)** D

28). Which of the following will undergo $E1_{cB}$.?

(A) 

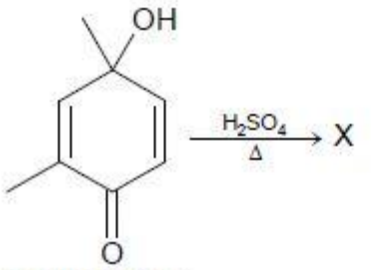
(B) 

(C) 

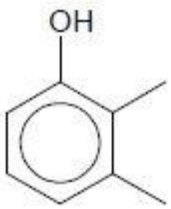
(D) 

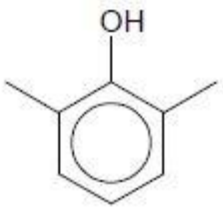
(a) A **(b)** B **(c)** C **(d)** D

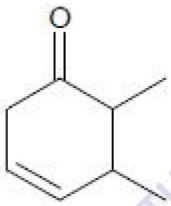
29).

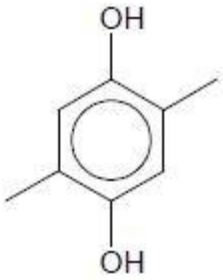


Product X is :

(A) 

(B) 

(C) 

(D) 

(a) A **(b)** B **(c)** C **(d)** D

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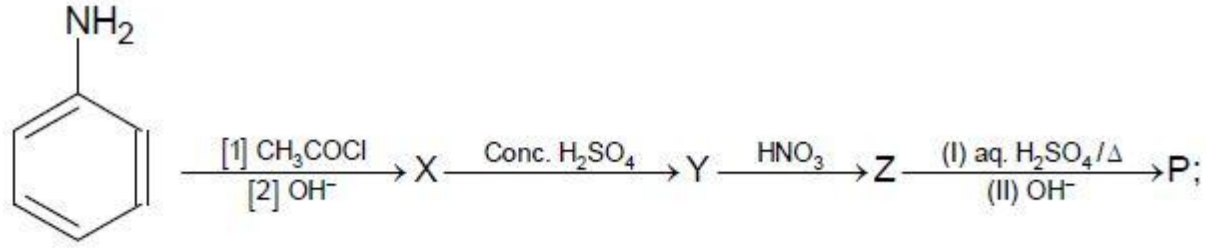
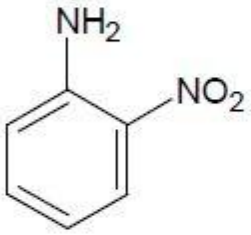
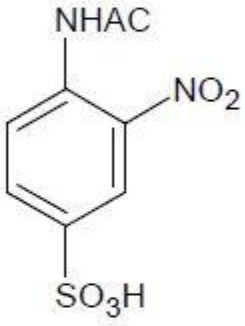
30).

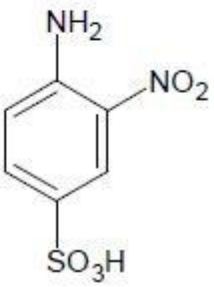


What is the product 'P' of the above reaction

(A) 

(B) 

(C) 

(D) 

(a) A **(b)** B **(c)** C **(d)** D

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31). Which of the following is tetrahedral and paramagnetic complex?

(A) $[NiCl_4]^{2-}$ (B) $[Ni(CN)_4]^{2-}$

(C) $[Cu(NH_3)_4]^{2+}$ (D) $[Ni(CO)_4]$

(a) A **(b)** B **(c)** C **(d)** D

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32). What is the solubility product of CaF_2 at room temperature, if $\overset{o}{\Lambda}_m(Ca^{2+}) = 1.04 \times 10^{-2}\ Sm^2/mol$

$\overset{o}{\Lambda}_m(F^-) = 4.8 \times 10^{-3}\ Sm^2/mol$

$\kappa_{CaF_2(Saturated\ Solution)} = 4.25 \times 10^{-3}\ S/m$ at room temperature.

$\kappa_{H_2O} = 2 \times 10^{-4} S/m$

(A) $4.05 \times 10^{-4}\ M^3$ (B) $2.025 \times 10^{-4}\ M^3$

(C) $3.32 \times 10^{-11}\ M^3$ (D) $4.05 \times 10^{10}\ M^3$

(a) A **(b)** B **(c)** C **(d)** D

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33). By which of the following methods, Cl_2 can be produced?

(A) By treating $KClO_3$ with iodine (I_2)

(B) By heating a mixture of NaBr and $NaBrO_3$ with HCl

(C) By treating $CaOCl_2$ and NaI mixture with HCl solution.

(D) By treating NaCl with H_2SO_4

(a) A **(b)** B **(c)** C **(d)** D

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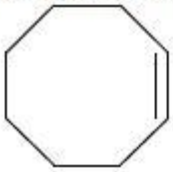
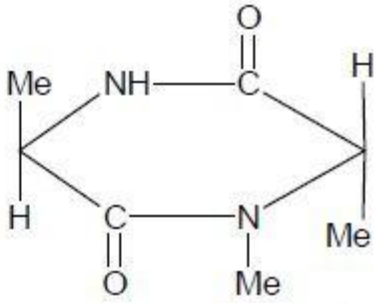
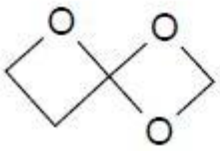
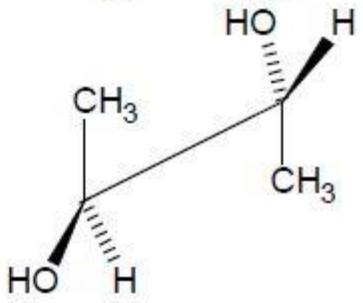
34). Which of the following is optically active?

(A) 

(B) 

(C) 

(D) 

(a) A **(b)** B **(c)** C **(d)** D

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35).

The rate of effusion of two gases 'a' and 'b' under identical condition of temperature and pressure are in the ratio of 2 : 1. What is the ratio of rms velocity of their molecules if T_a and T_b are in the ratio of 2 : 1?

(A) 2 : 1
(B) $\sqrt{2}:1$
(C) $2\sqrt{2}:1$
(D) $1:\sqrt{2}$

(a) A **(b)** B **(c)** C **(d)** D

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36).

A complex of iron and cyanide ions is 100% ionized at 1 molal. If its elevation in boiling point is 2.08°, then the complex is: (Given $K_b = 0.52^{\circ}C\ mol^{-1}\ kg$)

(A) $Fe_4[Fe(CN)_6]_3$
(B) $K_3[Fe(CN)_6]$
(C) $K_4[Fe(CN)_6]$
(D) $Fe_3[Fe(CN)_6]_2$

(a) A **(b)** B **(c)** C **(d)** D

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37).

Find the standard cell potential involving the cell reaction:

$In^{2+} + Cu^{+2} \longrightarrow In^{+3} + Cu^{+}$, at 298 K

Given: $E^0_{Cu^{+2}/Cu^{+}} = X_1V$, $E^0_{In^{+3}/In^{+}} = X_2V$ $E^{\circ}_{In^{+2}/In^{+}} = X_3V$

(A) $X_1 + X_3 - X_2$
(B) $(X_1 + X_3 - 2X_2)/3$
(C) $X_1 + X_3 - 2X_2$
(D) $X_1 + X_3 + 2X_2$

(a) A **(b)** B **(c)** C **(d)** D

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38).

An original salt solution in acidic medium did not give any precipitate on passing H_2S gas. Such a solution was boiled, reboiled after dilution 3 times. To such a solutions two drops of conc. HNO_3 were added, then heated and water was added. To this resulting solution, NH_4Cl was first added followed by excess of NH_4OH. Finally a green ppt. was obtained. Hence the cation may be:

(A) Al^{+3}
(B) Fe^{+2}
(C) Fe^{+3}
(D) Cr^{+3}

(a) A **(b)** B **(c)** C **(d)** D

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39).

$$H_3CCOOH \xrightarrow{Br_2/P} (Y) \xrightarrow[(ii)\ H_3O^+]{(i)\ KCN} (X)$$

Here (X) is:

(A) Glycollic acid
(B) α-hydroxypropionic acid
(C) succinic acid
(D) malonic acid

(a) A **(b)** B **(c)** C **(d)** D

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40).

In order to distinguish between $C_2H_5NH_2$ and $C_6H_5NH_2$, which of the following reagents is useful

(A) Heinsberg reagent
(B) p-napthol
(C) Benzene diazonium chloride
(D) None of these

(a) A **(b)** B **(c)** C **(d)** D

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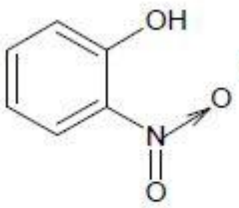
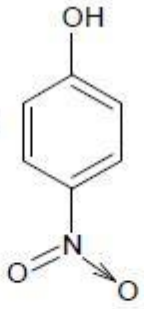
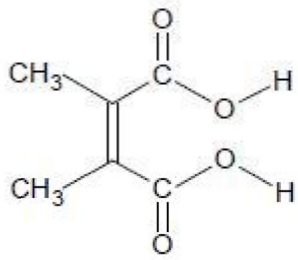
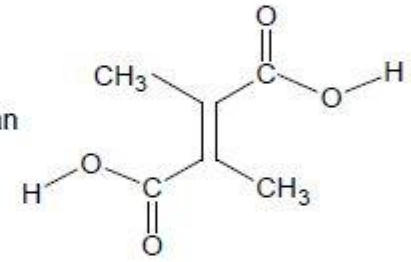
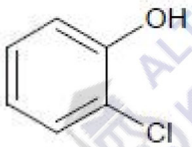
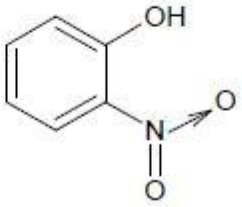
41). Which of the following statement is false ?

(A)  has lower boiling point than 

(B)  is less stable than 

(C)  has greater pKa than 

(D) H_3BO_3 in C_2H_5OH exists in the cage form due to intermolecular hydrogen bonding.

(a) A **(b)** B **(c)** C **(d)** D

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42). Acid catalyzed hydration of alkenes except ethene leads to the formation of

(a) primary alcohol
(b) secondary or tertiary alcohol
(c) mixture of primary and secondary alcohols
(d) mixture of secondary and tertiary alcohols

(a) A **(b)** B **(c)** C **(d)** D

---

43). Which of the following reactions will yield 2,2-dibromopropane?

(a) $CH_3 - CH = CH_2 + HBr \rightarrow$
(b) $CH_3 - C \equiv CH + 2HBr \rightarrow$
(c) $CH_3CH = CHBr + HBr \rightarrow$
(d) $CH \equiv CH + 2HBr \rightarrow$

(a) A **(b)** B **(c)** C **(d)** D

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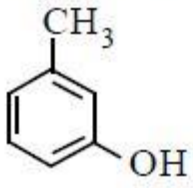
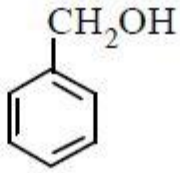
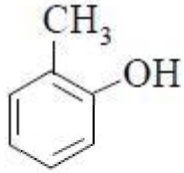
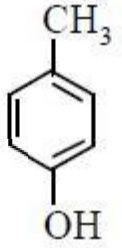
44). The structure of the compound that gives a tribromoderivative on treatment with bromine water is

(a) 

(b) 

(c) 

(d) 

(a) A **(b)** B **(c)** C **(d)** D

---

45). Fluorobenzene (C_6H_5F) can be synthesised in the laboratory

(a) by heating phenol with HF and KF

(b) from aniline by diazotization followed by heating the diazonium salt with HBF_4

(c) by direct fluorination of benzene with F_2 gas

(d) by reacting bromobenzene with NaF solution.

(a) A **(b)** B **(c)** C **(d)** D

---

46). In low temperature range fraction of heat supplied to an ideal diatomic gas system, at constant pressure, which bring change in its internal energy is approx.....?

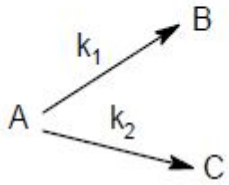
---

47). In a measurement of quantum efficiency of photo-synthesis in green plants, it was found that 10 quanta of red light of wavelength 6850 $\mathring{A}$ were needed to release one molecule of O_2. The average energy storage in this process is 112 kcal/mol O_2 evolved. What is the energy conversion efficiency in this experiment? Given 1 cal = 4.18 J, $N_A = 6 \times 10^{23}$, $h = 6.64 \times 10^{-34}$ JS.

---

48).

For first order parallel reaction k_1 and k_2 are 4 and 2 min^{-1} respectively at 300 K. If the activation energies for the formation of B and C are respectively 30,000 and 33,314 J/mol respectively. The Temperature at which B and C will be obtained in equimolar ratio is:



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49).

One mole of SO_3 was placed in a two litre vessel at a certain temperature. The following equilibrium was established in the vessel.

$$2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$$

The equilibrium mixture reacted with 0.2 mole $KMnO_4$ in acidic medium. Hence K_c is:

---

50).

The vapour pressure of pure water at 26°C is 25.21 torr. What is the vapour pressure of a solution which contains 20.0 glucose, $C_6H_{12}O_6$, in 70 g water?

Mathematics FL

51).

Consider a circle, $x^2 + y^2 = 1$ and point $P(1, \sqrt{3})$ ·PAB is a secant drawn from P intersecting circle in A and B (distinct) then range of |PA| + |PB| is

(A) $[2, 2\sqrt{3}]$ (B) $(2\sqrt{3}, 4]$

(C) (0, 4] (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

52).

The total number of 1 word, 2 word, 3 word sentences that can be formed using the letters of the word SAMSUNG is

(A) 8! (B) 18 × 7!

(C) 11 × 7! (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

53).

Consider a line $z(i - 1) + \bar{z}(i + 1) = 0$ in the argand plane and a point $z_1 = 2 + 3i$ then the reflection of z_1 in the given line is

(A) 2 – 3i (B) –2 + 3i

(C) 3 + 2i (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

54).

Let, $t_r = r!$ and $S_n = \sum_{r=1}^{n} r!$ then $\frac{S_n}{24} = a + \frac{\lambda}{24}$; $a, \lambda \in N$ where λ is

(A) 7
(B) 23
(C) 9
(D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

55).

The area between the curve $y^2(a + x) = (a - x)^3$ and its vertical asymptote is

(A) $\frac{\pi}{2}a^2$
(B) $2\pi a^2$
(C) $3\pi a^2$
(D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

56).

If the tangent to the curve $y = 1 - x^2$ at $x = \alpha (0 < \alpha < 1)$ meets the axes at P and Q. Also α varies, the minimum value of the area of the triangle OPQ is k times the area bounded by the axes and the part of the curve for which $0 < x < 1$, then k is

(A) $\frac{\sqrt{3}}{2}$
(B) $\frac{2}{\sqrt{3}}$
(C) $\frac{1}{2}$
(D) $\frac{3}{2}$

(a) A **(b)** B **(c)** C **(d)** D

---

57).

Consider a parabola $y^2 = \alpha x$ and a point $\left(-\frac{\alpha}{4}, 0\right)$ then midpoint of centres of the circles touching the tangents from given point and its chord of contact is

(A) $\frac{\alpha}{2}$
(B) $\frac{\alpha}{4}$
(C) $\frac{3\alpha}{2}$
(D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

58).

Consider the curves $C_1: x^2 + y^2 = 1$ and $C_2 : \frac{x^2}{\sin^2\theta} + \frac{y^2}{\cos^2\theta} = 1$. If a common tangent $y = mx + c$ is drawn to C_1, C_2 then $\left(\frac{\pi}{4} < \theta < \frac{\pi}{2}\right)$

(A) $m \in \phi$ (B) $c = 1$

(C) $m = \frac{1}{\sqrt{2}}$ (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

59).

Consider a parabola $x^2 = 4y$ and a hyperbola $xy = 1$. A tangent is drawn to parabola meets the hyperbola in A and B then locus of midpoint of AB is

(A) straight line (B) parabola

(C) ellipse (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

60).

If $f'(x^2 - 4x + 3) > 0$, $\forall x \in (2, 3)$; then f(sin x) is increasing on

(A) $\bigcup_{n\in I}\left(2n\pi, (4n+1)\frac{\pi}{2}\right)$ (B) $\bigcup_{n\in I}\left((4n-1)\frac{\pi}{2}, 2n\pi\right)$

(C) R (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

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61).

Coordinates of the point on the straight line $x + y = 4$, which is nearest to the parabola $y^2 = 4(x - 10)$ is

(A) $\left(\frac{17}{2}, -\frac{9}{2}\right)$ (B) (2, 2)

(C) $\left(\frac{3}{2}, \frac{5}{2}\right)$ (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

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62).

If $\bar{a}$, $\bar{b}$, $\bar{c}$ be three vectors of magnitude $\sqrt{3}$, 1, 2 such that $\bar{a}\times\left(\bar{a}\times\bar{c}\right)+3\bar{b}=0$, if θ is the angle between $\bar{a}$ and $\bar{c}$, then $\cos^2\theta$ is equal to

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{4}$ (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

63).

If the function $f : [2, \infty) \to [1, \infty)$ is defined by $f(x) = 3^{x(x-2)}$, then $f^{-1}(x)$ is

(A) $1 + \sqrt{1+\log_3 x}$ (B) $1 - \sqrt{1+\log_3 x}$

(C) $1 + \sqrt{1-\log_3 x}$ (D) does not exist

(a) A **(b)** B **(c)** C **(d)** D

---

64).

$\frac{1}{x} = \frac{2}{3!}\frac{e}{} + \frac{4}{5!}\frac{e}{} + \frac{6}{7!}\frac{e}{} + \ldots \infty$, then find $\int_0^x f(y)\log_y x \, dy$, $y > 1$

(A) $\frac{[f(e)]^2}{2}$ (B) $\frac{\left[f\left(\frac{1}{e}\right)\right]^2}{2}$

(C) $\frac{\left[f(e^2)\right]^2}{2}$ (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

65).

If lines $x = y = z$, $x = \frac{y}{2} = \frac{z}{3}$ and third line passing through (1, 1, 1) form a triangle of area $\sqrt{6}$ units then point of intersection of third line with second line will be

(A) (1, 2, 3) (B) (2, 4, 6)

(C) $\left(\frac{4}{3}, \frac{8}{3}, \frac{12}{3}\right)$ (D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

66).

Let f(x) = max{tan x, cot x}. Then number of roots of the equation $f(x) = \frac{1}{\sqrt{3}}$ in $(0, 2\pi)$ is

(A) 2
(B) 4
(C) 0
(D) infinite

(a) A **(b)** B **(c)** C **(d)** D

---

67).

If $f(x) = \int_0^4 e^{|t-x|}dt$ $(0 \le x \le 4)$, the maximum value of f(x) is

(A) $e^4 - 1$
(B) $2(e^2 - 1)$
(C) $e^2 - 1$
(D) none of these

(a) A **(b)** B **(c)** C **(d)** D

---

68).

The solution of the equation $\frac{d^2y}{dx^2} = e^{-2x}$

(a) $\frac{1}{4}e^{-2x}$
(b) $\frac{1}{4}e^{-2x} + cx + d$
(c) $\frac{1}{4}e^{-2x} + cx^2 + d$
(d) $\frac{1}{4}e^{-2x} + c + d.$

(a) A **(b)** B **(c)** C **(d)** D

---

69).

The centres of a set of circles, each of radius 3, lie on the circle $x^2 + y^2 = 25$. The locus of any point in the set is

(a) $4 \le x^2 + y^2 \le 64$
(b) $x^2 + y^2 \le 25$
(c) $x^2 + y^2 \ge 25$
(d) $3 \le x^2 + y^2 \le 9$

(a) A **(b)** B **(c)** C **(d)** D

---

70).

The two lines $x = ay + b$, $z = cy + d$ and $x = a'y + b'$, $z = c'y + d$ will be perpendicular, if and only if

(a) $aa' + bb' + cc' = 0$
(b) $(a + a')(b + b') + (c + c') = 0$
(c) $aa' + cc' + 1 = 0$
(d) $aa' + bb' + cc' + 1 = 0.$

(a) A **(b)** B **(c)** C **(d)** D

---

71).

Consider a curve $|z - i| = 2$ and a point $z_1 = 3 - i$, then the length of tangent made from the point (z_1) to the curve is

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72).

The sequence a_n is defined by $a_1 = \frac{1}{2}$, $a_{n+1} = a_n^2 + a_n$. Also, $S = \frac{1}{a_1 + 1} + \frac{1}{a_2 + 1} + ... + \frac{1}{a_{100} + 1}$

then [S] (where [.] denotes the greatest integer function) is

---

73).

If $\Delta(x) = \begin{vmatrix} e^x & \sin 2x & \tan x^2 \\ \ln(1+x) & \cos x & \sin x \\ \cos x^2 & e^x - 1 & \sin x^2 \end{vmatrix} = A + Bx + Cx^2 + ...$, then B is equal to

---

74).

$\int_{\pi}^{10\pi} |\sin x| dx$ is

---

75).

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 $(1, \vec{a}, \vec{a}^2)$, $(1, \vec{b}, \vec{b}^2)$ and $(1, \vec{c}, \vec{c}^2)$ are non-coplanar, then the product abc equals

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