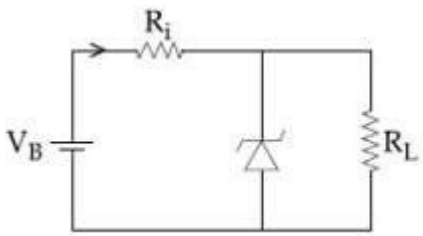
BITSAT 2023

Sample Paper

BITSAT 2023

Physics

Q.1 The Figure represents a voltage regulator circuit using of the Zener diode is 6V and $R_L = 4K\Omega$. The resistance circuit is $R_i = 1K\Omega$. If the battery voltage V_B varies from $8V$ to $16V$, What are the minimum and maximum values of the current respective



Option 1:
$0.5mA; 6mA$

Option 2:
$1mA; 8.5mA$

Option 3:
$0.5mA; 8.5mA$

Option 4:
$1.5mA; 8.5mA$

Correct Answer:
$0.5mA; 8.5mA$

Solution:
$Given V_B = 8V$

$$i_L = \frac{6 \times 10^{-3}}{4} = 1.5 \times 10^{-3} A \text{ and } i_R = \frac{(8-6) \times 10^{-3}}{1} = 2 \times 10^{-3} A$$

$$\therefore i_{Zener\ diode} = i_R - i_L = 0.5 \times 10^{-3} A$$

$When\ V_B = 16V$

$$i_L = 1.5 \times 10^{-3} A \text{ and } i_R = \frac{(16-6) \times 10^{-3}}{1} = 10 \times 10^{-3} A$$

$$\therefore i_{Zener\ diode} = i_R - i_L = 8.5 \times 10^{-3} A$$

Q. 2 10 gm of ice cubes at 0 C are released in a tumbler (wat
Assuming that negligible heat is taken from the surrour
tumbler becomes nearly

Option 1:
31 C

Option 2:
22 C

Option 3:
19 C

Option 4:
15 C

Correct Answer:
22 C

Solution:

As we have learned

Water Equivalent -

w = mc gm

- wherein

Cwater = 1

Heat gained = heat lost

heat gained = m)L + ms (– 0

$= 10 \times 80 + 10 \times 1 \times \theta$

Heat lost by wat)er = 55 (40-

$\Rightarrow 800 + 10\theta = 2200 - 550 \ or \ 650 = 1400$

$\theta = 22\,C$

Q. 3 If the magnetic dipole moment of an atom of the diamag material, and ferromagnetic materials respectively

Option 1:
$\mu_d \neq 0 \ and \ \mu_f \neq 0$

Option 2:
$\mu_p = 0 \ and \ \mu_f \neq 0$

Option 3:
$\mu_d = 0 \ and \ \mu_p \neq 0$

Option 4:
$\mu_d \neq 0 \ and \ \mu_p = 0$

Correct Answer:
$\mu_d = 0 \ and \ \mu_p \neq 0$

Solution:
As we learned

Magnetic Permeability -

It is the degree or extent to which a material is μ It is

-

Properties of substances

Q. 4 Distance of the centre of mass of a solid uniform cone of its base is *R* and its height is h then *z0* is equal to :

Option 1:
$\frac{h^2}{4R}$

Option 2:
$\frac{3h}{4}$

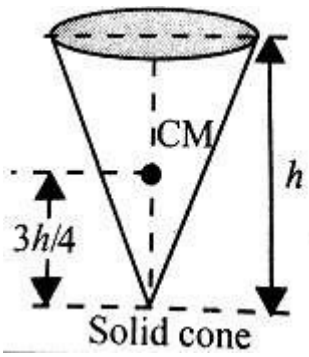
Option 3:
$\frac{5h}{8}$

Option 4:
$\frac{3h^2}{8R}$

Correct Answer:
$\frac{3h}{4}$

Solution:
As we learnt in

Centre of Mass of a solid c fornoem - tlhie taitp d oifs ttahnec ec one. $\frac{3h}{4}$



Q. 5 Two plates are *2 cm* apart, a potential difference of *10 volt* is applied between them, the electric field between the plates is

Option 1:
$20\ \ N/C$

Option 2:
$500\ \ N/C$

Option 3:
$5\ \ N/C$

Option 4:
$250\ N/C$

Correct Answer:
$500\ N/C$

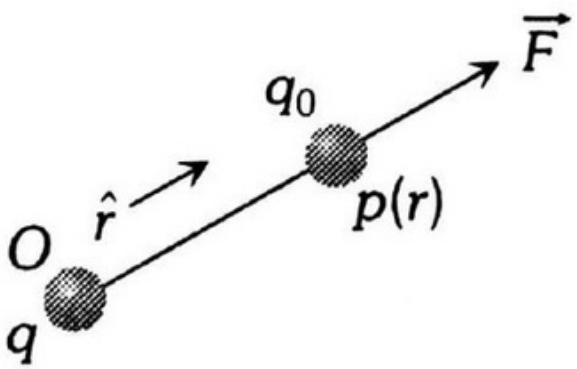
Solution:

As we learned

Electric Field Intensity -

$$\vec{E} = \frac{\vec{F}}{q_0} = \frac{kQ}{r^2}$$

- wherein



$$E = \frac{V}{d} = \frac{10}{2 \times 10^{-2}} = 500\ N/C$$

Q. 6 An electric field $\vec{E} = \left(25\,\hat{i} + 30\,\hat{j}\right) NC^{-1}$ exists in a region of space. If the origin is taken to be zero then the potential at x=2

Option 1:
-130 J

Option 2:
-120 J

Option 3:
-140 J

Option 4:
-110 J

Correct Answer:
-110 J

Solution:
As we learnt in

In space -

$$E_x = \frac{-dv}{dx} \quad E_y = \frac{-dv}{dy} \quad , E_z = \frac{-dv}{dz}$$

-

$$dv = -\vec{E}.\vec{dr} \Rightarrow \int dV = -\int \vec{E}.\vec{dr}$$

$$\vec{dr} = dx\hat{i} + dy\hat{j} + dz\hat{k}$$

$$\vec{E} = (25\hat{i} + 30\hat{j})Nc^{-1}$$

$$\int dV = -\int (25\hat{i} + 30\hat{j})(dx\hat{i} + dy\hat{j})$$

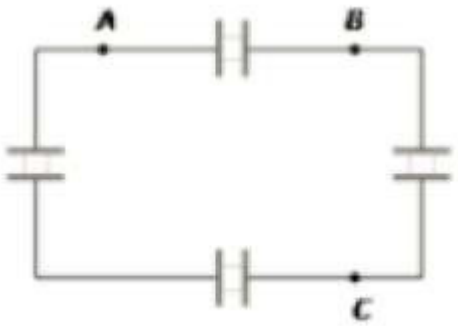
$$\int_0^V dV = \int_0^2 25dx + \int_0^2 30dy$$

$$V - 0 = 25[x]_0^2 + 30[y]_0^2$$

$$V = -[25 \times 2 + 30 \times 2] \Rightarrow V = -110\text{J / C}$$

V = -110 J / C

Q. 7 Four capacitors of each of capacity 3μF are connected as
ratio of equivalent capacitance between A and B and be



Option 1:
4 : 3

Option 2:
3 : 4

Option 3:
2 : 3

Option 4:
3 : 2

Correct Answer:
3 : 4

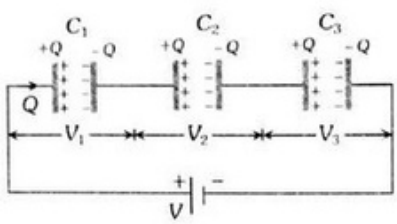
Solution:

As we learnt in

Series Grouping -

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots$$

- wherein

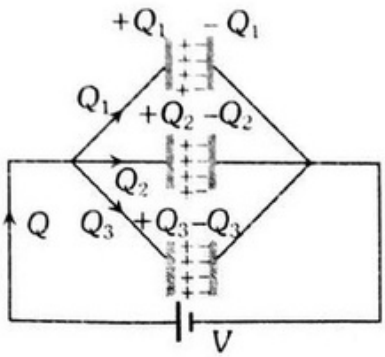


and

Parallel Grouping -

$$C_{eq} = C_1 + C_2 + \cdots$$

- wherein



Between A and B, 3 capacitors are in series and they are in p

$$C_1 = \frac{C \times 3C}{C + 3C} = \frac{3C}{4}$$

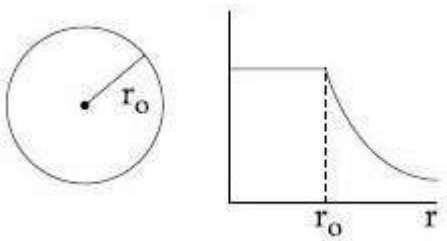
Between A and C:

Two capacitors are in series and in turn they are parallel.

$$C_2 = \frac{2C \times 2C}{2C + 2C} = C$$

Ratio $= \frac{3}{4}$

Q. 8 The given graph shows variation (with distance r from c



Option 1:
potential of a uniformly charged spherical shell

Option 2:
Electric field of a uniformly charged spherical shell

Option 3:
Electric eld of a uniformly charged sphere

Option 4:
Potential of a uniformly charged sphere

Correct Answer:
potential of a uniformly charged spherical shell

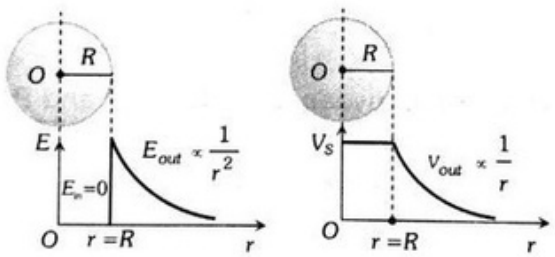
Solution:

Inside the sphere (P lies inside the sphere) -

$E_{in} = 0$

$V_{in} = constant$

- wherein



The potential of uniformly charged spherical shell.

Q. 9 A rod, of length L at room temperature and uniform are metal having coe cient $\alpha/^{\circ}C$. i nIte aisr oexbpsearnvseiod copressive force F, is applied on each of its ends, preve rod, when its temperat. uYroeu rnigs'ess mboyd ulus, Y , for this me $\Delta T R$

Option 1:
$\frac{F}{A\alpha\Delta T}$

Option 2:
$\frac{F}{A\alpha(\Delta T - 273)}$

Option 3:

$$\frac{F}{2A\alpha\Delta T}$$

Option 4:

$$\frac{2F}{A\alpha\Delta T}$$

Correct Answer:

$$\frac{F}{A\alpha\Delta T}$$

Solution:

Elongation -

$$\Delta l = \frac{FL}{AY}$$

- wherein

$$\Delta l = Elongation$$

$$y = \frac{\frac{F}{A}}{\frac{\Delta L}{L}}$$

$$\Rightarrow \frac{\Delta L}{L} = \frac{\frac{F}{A}}{y}$$

Coe cient of linear expansion

$$\alpha = \frac{\Delta L}{L\Delta T}$$

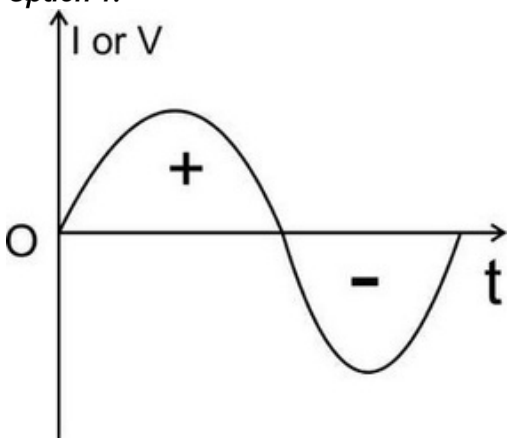
$$\frac{\Delta L}{L} = \alpha\Delta T$$

So we get

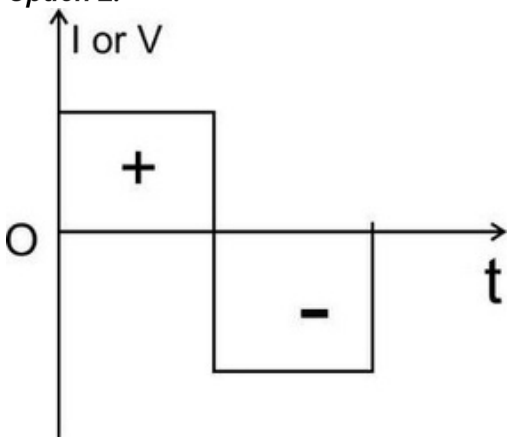
$$y = \frac{F}{A\alpha\Delta T}$$

Q. 10 The form factor for which of these were is $\frac{\pi}{2\sqrt{2}}$

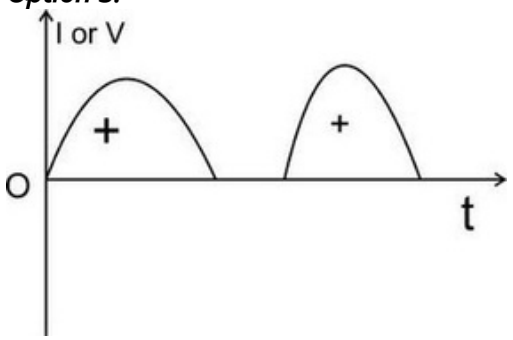
Option 1:



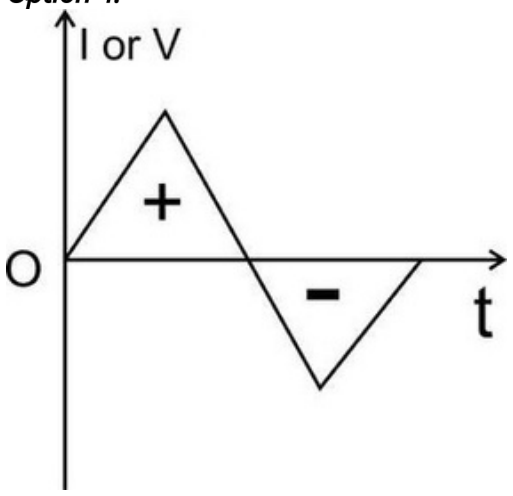
Option 2:



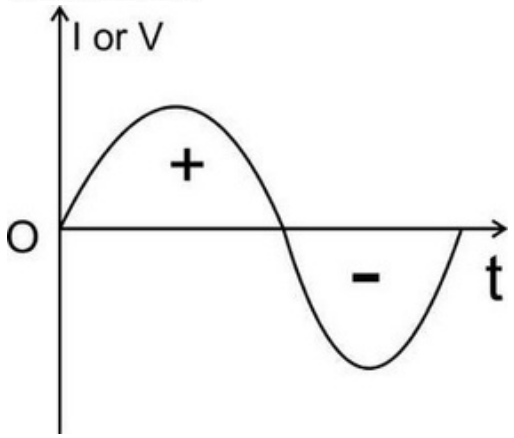
Option 3:



Option 4:



Correct Answer:



Solution:

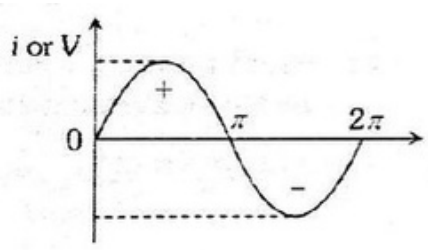
As we learnt

Wave Form (Sinusoidal) -

R.M.S. Value = $\frac{i_0}{\sqrt{2}}$

average value = $\frac{2i_0}{\pi}$

- wherein



form factor, $R_f = \frac{rms\ value}{average\ value}$

For sinusoidal wave

R.M.S. Value = $\frac{i_0}{\sqrt{2}}$

average value = $\frac{2i_0}{\pi}$

$$R_f = \frac{\frac{i_0}{\sqrt{2}}}{\frac{2i_0}{\pi}} \Rightarrow R_f = \frac{\pi}{2\sqrt{2}}$$

Q. 11 An electron moving with its speed 5×10^6 parallel to the electric intensity $1 \times 10^3 V/C$. The field is responsible for the retardation of the electrons. Now evaluate the distance traveled by the electron before it comes to instantaneous rest. (mass of electron $= 9 \times 10^{-31} kg$ and charge $= 1.6 \times 10^{-19} C$)

Option 1:
7 m

Option 2:
0.7 mm

Option 3:
7 cm

Option 4:
0.7 cm

Correct Answer:
7 cm

Solution:
As we have learnt,

when Charged Particle at rest in uniform field -

Force and acceleration

$$F = QE$$

$$a = \frac{QE}{m}$$

- wherein

m - mass

Q - charge

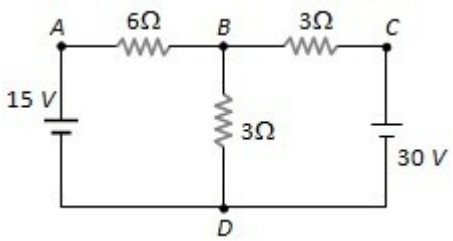
E - Electric field strength.

Electric force $qE = ma \Rightarrow a = \dfrac{QE}{m} \therefore a = \dfrac{1.6 \times 10^{-19} \times 1 \times 10^{3}}{9 \times 10^{-31}} = \dfrac{1.6}{9} \times 10^{15}$

$u = 5 \times 10^{6}$ and $v = 0 \therefore$ from $v^2 = u^2 - 2as \Rightarrow s = \dfrac{u^2}{2a}$

$\therefore Distance\ s = \dfrac{(5 \times 10^{6})^2 \times 9}{2 \times 1.6 \times 10^{15}} = 7cm(approx)$

Q. 12 In the circuit shown in gure, nd the current through t



Option 1:
5 A

Option 2:
0 A

Option 3:
3 A

Option 4:
4 A

Correct Answer:
5 A

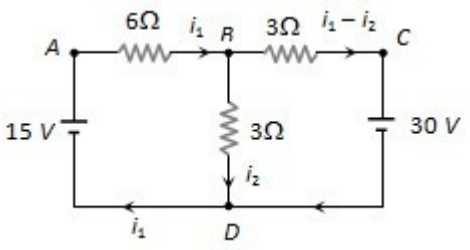
Solution:
As we have learnt,

Kirchho 's Law -

$\sum q = 0$

-

The current in the circuit are assumed as shown in the g.



Applying KVL along the loop *ABDA*, we get

– 6*i*1 – 3 *i*2 + 15 = 0 or 2*i*1 + *i*2 = 5 …..(i)

Applying KVL along the loop *BCDB*, we get

– 3(*i*1 – *i*2) – 30 + 3*i*2 = 0 or – *i*1 + 2*i*2 = 10 …..(ii)

Solving equation (i) and (ii) for *i*2, we get *i*2 = 5 *A.*

Q. 13 When a ball is thrown up vertically with velocity vo it wishes to triple the maximum height then the ball shou

Option 1:
v o √ 3

Option 2:
3 v o

Option 3:
9 v o

Option 4:
(3 / 2) v o

Correct Answer:
v o √ 3

Solution:

As we learnt in

Potential Energy -

$$U_f - U_i = \int_{r_i}^{r_f} \vec{f} \cdot \vec{ds}$$

- wherein

$U_f - final\ potential\ energy$

$U_i - initial\ potential\ energy$

$f - force$

$ds - small\ displacement$

$r_i - initial\ position$

$r_f - final\ position$

At Maximum height V = 0

$v_0 = \sqrt{2gh} - - - (i)$

A t $h' = 3h$

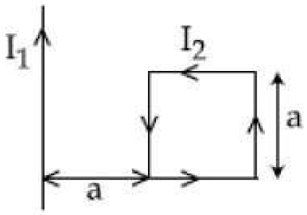
$u^2 = 2g(3h) = 6gh$

$u = \sqrt{6gh} - - - (ii)$

$\frac{v_0}{u} = \frac{\sqrt{2gh}}{\sqrt{6gh}}$

$=> u = \sqrt{3}v_0$

Q. 14 A rigid square l oaonpd o$'a'$cf a rsriydien g i sc ulrydI_2enngt on a horizontal sur long cur rceaI_1nrtr ying wire in the same plane as shown in gu due to the wire will be :



Option 1:

$Repulsive\ and\ equal\ to\ \frac{\mu_0 I_1 I_2}{2\pi}$

Option 2:

$Attractive\ and\ equal\ to \frac{\mu_0 I_1 I_2}{3\pi}$

Option 3:

$Repulsive\ and\ equal\ to \frac{\mu_0 I_1 I_2}{4\pi}$

Option 4:

$Zero$

Correct Answer:

$Repulsive\ and\ equal\ to \frac{\mu_0 I_1 I_2}{4\pi}$

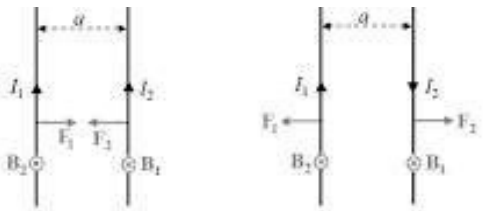
Solution:

Force between two parallel current carrying conductors -

$$F = \frac{\mu}{4\pi}\frac{2I_{1I_2}}{a}l$$

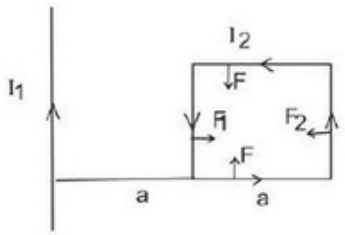
$$\frac{F}{l} = \frac{\mu o}{4\pi}\frac{2I_{1I_2}}{a}$$

- wherein



I1 and I2 current carrying two parallel wires

a-seperation between two wires



$$F_1 = \frac{\mu_0 I_1 I_2 a}{2\pi a} = \frac{\mu_0 I_1 I_2}{2\pi}$$

$$F_2 = \frac{\mu_0 I_1 I_2 a}{2\pi .2a} = \frac{\mu_0 I_1 I_2}{4\pi}$$

$$F_{Total} = F_1 - F_2$$

$$= \frac{\mu_0 I_1 I_2}{2\pi} - \frac{\mu_0 I_1 I_2}{4\pi}$$

$$= \frac{\mu_0 I_1 I_2}{4\pi}$$ to right Repulsive

Q. 15 A force of 10N acts on a body of mass 20kg for 10 sec

Option 1:
50 kgm/s

Option 2:
100 kgm/s

Option 3:
300 kgm/s

Option 4:
200 kgm/s

Correct Answer:
100 kgm/s

Solution:

As we learnt in

Linear Momentum -

Quantity of motion in a body

$$\vec{P} = M \times \vec{V}$$

M= Mass and V= velocity

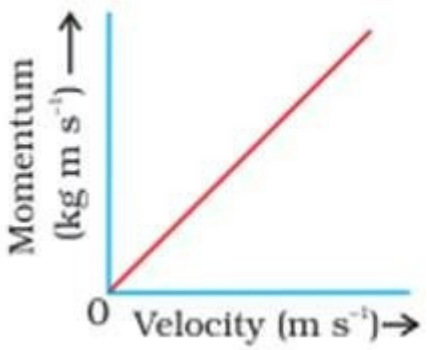
$\vec{P}$= Linear Momentum

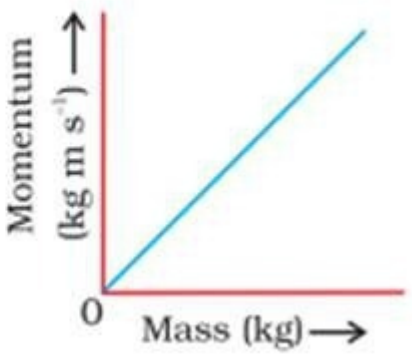
- wherein

* Vector Quantity

* Same as that of velocity

Unit- Kg m/sec (S.I)

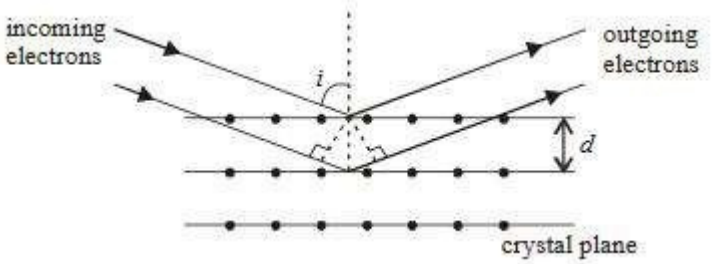




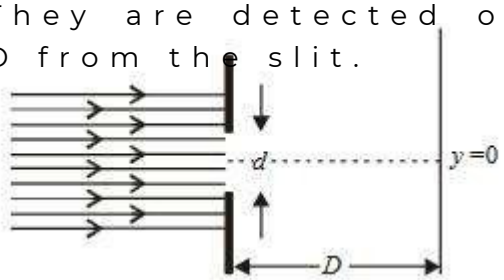
$\overrightarrow{\Delta P} = f.\Delta t \quad \Rightarrow \Delta P = 10 \times 10 = 100\ kgms^{-1}$

Q. 16 Question is based on the following paragraph.

Wave property of electrons implies that they will show
Germer demonstrated this by di racting electrons from
di raction from a crystal is obtained by requiring that e
planes of atoms in a crystal interfere constructively (se

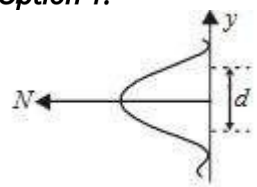


Question : In an experiment, electrons are made to pass through a narrow slit of width comparable to their de Broglie wavelength. They are detected on a screen at a distance D from the slit.

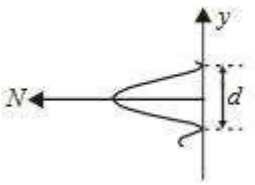


Which of the following graphs can be expected to repre
detected as a function of the detector position (= 0 co
slit)?

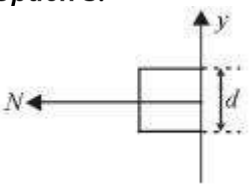
Option 1:



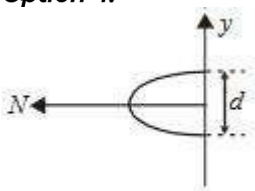
Option 2:



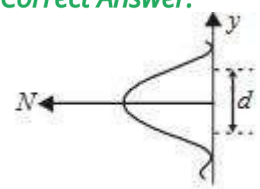
Option 3:



Option 4:



Correct Answer:



Solution:

As we learnt in

Davisson Germer Experiment -

A beam of electrons emitted by the electron gun is made to f
particular angle.

The scattered electron is received by the detector which can

The electron beams at the edges of the slit will de ect away f
slit. The electron beam along or near the central line will not
di raction pattern is wider than the slit width.

As number of electron decreases both side of central maximu

Correct graph is 1.

Q. 17 A solid sphere of radius r made of a soft material of bu liquid in a cylindrical container. A massless piston of a liquid, covering entire cross section of cylindrical cont surface of the piston to compress the liquid, the fracti sphere,

$\left(\frac{dr}{r}\right)$, is:

Option 1:
$\frac{mg}{Ka}$

Option 2:
$\frac{Ka}{mg}$

Option 3:
$\frac{Ka}{3mg}$

Option 4:
$\frac{mg}{3Ka}$

Correct Answer:
$\frac{mg}{3Ka}$

Solution:

As we learnt that

Bulk Modulus -

Ratio of normal stress to volumetric strain.

$$K = \frac{f/A}{-\Delta v/v} = \frac{-Fv}{A\Delta v}$$

$$K = \frac{-Pv}{\Delta v}$$

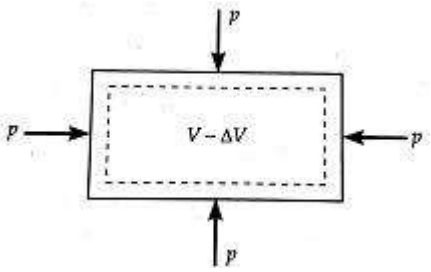
v = Original volume

ΔV = Change in volume

P = Increase in pressure

-ve(sign) shows dvoelcurmeaes e.

- wherein



$$\Delta P = \frac{mg}{a} \qquad V = \frac{4\pi}{3} r^3$$

$$K = -\frac{\Delta P}{(\frac{\Delta V}{V})} \qquad \therefore \frac{dV}{V} = 3.\frac{dr}{r}$$

$$K = \frac{-\Delta P}{3.(\frac{dr}{r})}$$

$$or \frac{dr}{r} = \frac{-mg}{3Ka}$$

Q. 18 A uniform disc of mass 2 kg is rotated about an axis per
radius of gyration is 50 cm, then the M.I. of disc about

Option 1:
0.25 $kg\ m^2$

Option 2:
0.5 $kg\ m^2$

Option 3:
2 $kg\ m^2$

Option 4:
1 $kg\ m^2$

Correct Answer:
0.5 $kg\ m^2$

Solution:

As we learnt in

Radius of gyration (K) -

Radius of Gyration of a body about an axis is the e ective dis
can be assumed to be concentrated so that moment of inertia

- wherein

$$I = MK^2$$

$$K = \sqrt{\frac{I}{M}}$$

use I = M K 2

$$= 2 \times 50 \times 50 = 5000\ kgcm^2$$

$$= 0.5\ kgm^2$$

Q. 19 What is the mechanical advantage of single xed pulley?

Option 1:
1

Option 2:
2

Option 3:
0.5

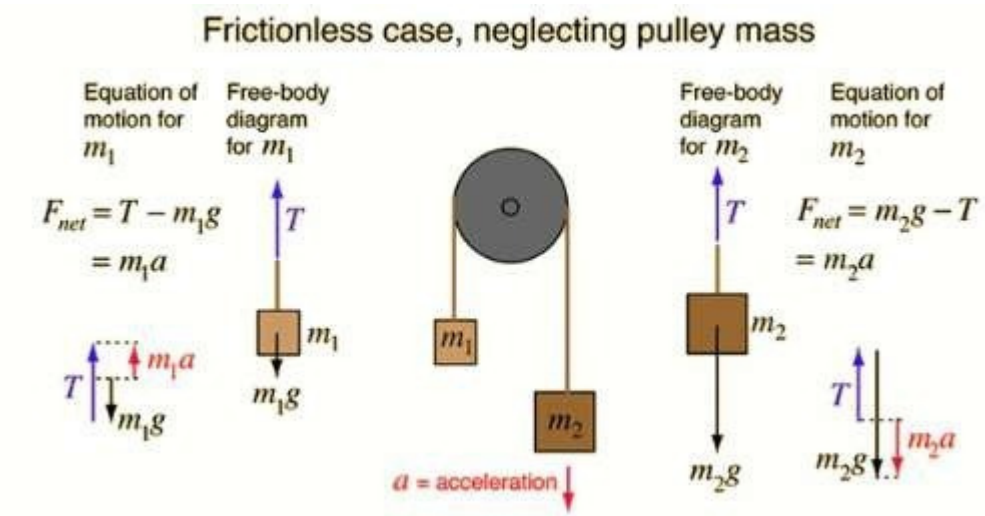
Option 4:
4

Correct Answer:
1

Solution:

As we learnt in

Motion of connected blocks over pulley -



Equation of motion for m_1

$$F_{net} = T - m_1 g = m_1 a$$

Equation of Motion for m_2

$$F_{net} = m_2 g - T = m_2 a$$

- wherein

$$a = \frac{[m_2 - m_1\,]g}{m_1 + m_2}$$

$$T = \frac{2m_1 m_2\, g}{m_1 + m_2}$$

Q. 20 A current of 2 mA was passed through an unknown resis
W. Dissipated power when an ideal power supply of 11 V

Option 1:
$11 \times 10^{-3}\ W$

Option 2:
$11 \times 10^{-5}\ W$

Option 3:
$11 \times 10^{5}\ W$

Option 4:
$11 \times 10^{-4}\ W$

Correct Answer:
$11 \times 10^{-5}\ W$

Solution:
$I = 2 \times 10^{-3}\text{A}, P = 4.4\text{W}$

$$P_{initial} = P = I^2 R \Rightarrow R = \frac{P}{I^2}$$

$$R = \frac{4.4}{4 \times 10^{-6}} = 1.1 \times 10^{6}\Omega$$

$$P_{final} = P' = \frac{V^2}{R} = \frac{11^2}{R} = 11 \times 10^{-5}\ W$$

Hence, (2) is the correct option.

Q. 21 Dispersive power for crown glass if $\mu_v = 1.523, \mu_r = 1.5145$

Option 1:
0.1639

Option 2:
0.1821

Option 3:
0.1764

Option 4:
0.2123

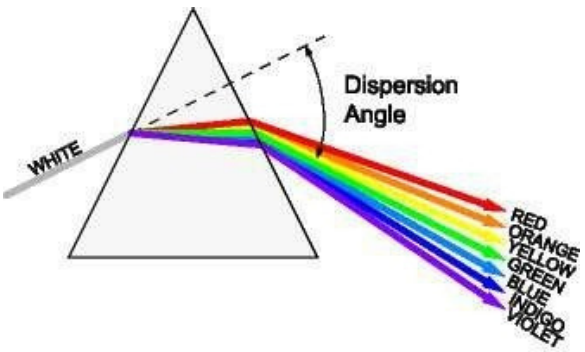
Correct Answer:
0.1639

Solution:

As we learn

Dispersive power (ω) -

$$\omega = \frac{\mu_v - \mu_r}{\mu_y - 1}$$



- wherein

μ_v = Refractive index of violet

μ_r = Refractive index of red

μ_y = Refractive index of yellow

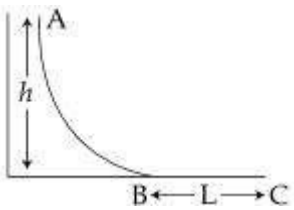
$$= \frac{\mu_v + \mu_r}{2}$$

$$w = \frac{\mu_v - \mu_r}{\mu_y - 1}$$

$$\mu_y = \frac{\mu_v + \mu_r}{2} = 1.5187$$

$$\therefore w = \frac{1.523 - 1.5145}{1.5187 - 1} = 0.1639$$

Q. 22 A small ball of mass m starts at a point A . with spee track AB as shown. The track BC has coe cient of frictio after travelling a distance L which is :



Option 1:
$$\frac{2h}{\mu} + \frac{v_0^2}{2\mu g}$$

Option 2:
$$\frac{h}{\mu} + \frac{v_0^2}{2\mu g}$$

Option 3:
$$\frac{h}{2\mu} + \frac{v_0^2}{\mu g}$$

Option 4:
$$\frac{h}{2\mu} + \frac{v_0^2}{2\mu g}$$

Correct Answer:
$$\frac{h}{\mu} + \frac{v_0^2}{2\mu g}$$

Solution:
Solution :

Given :
Initial speed $= v_0$
Initial height $= h$

Applying conservation of energy,

$$mgh + \frac{1}{2}\mathrm{mv}_0^2 = \frac{1}{2}\mathrm{mv}^2$$

$$v^2 = {v_0}^2 + 2gh$$

Now, if a be the decelaration produced because of friction
Using,
Newton's third equation of motion,

$$v^2 = u^2 + 2as$$

$$0 = \mathrm{v}_0^2 + 2\mathrm{gh} - 2\mathrm{aL}$$

$$\mathrm{L} = \frac{\mathrm{v}_0^2 + 2\mathrm{gh}}{2\mathrm{a}} \qquad -(1)$$

$$\text{Now, f} = \mu\mathrm{N}$$

$$\text{where, N} = \mathrm{mg}$$

$$f = \mu\mathrm{mg}$$

$$a = \mu g$$

Putting back this value in equation (1)

$$\mathrm{L} = \frac{{\mathrm{v}_0}^2 + 2\mathrm{gh}}{2\mu\mathrm{g}}$$

$$= \frac{\mathrm{h}}{\mu} + \frac{\mathrm{v}_0^2}{2\mu\mathrm{g}}$$

Q. 23 A moving coil galvanometer, having a resistance G, pro
cur I_g ows through it. This galvanometer can be conve
r $I_0(I_0 > I_g)$ by connecting a shu tnot irte sa$R_A$sdt a(niic)e i nto a voltme
e n t $V(V = GI_0)$ by connecting a ser iteos irte. sTh$R_V$setann, ce
0
t o
0
t o

Option 1:

$$R_A R_V = G^2 \left(\frac{I_0 - I_g}{I_g}\right) \text{ a n d } \frac{R_A}{R_V} = \left(\frac{I_g}{(I_0 - I_g)}\right)^2$$

Option 2:

$$R_A R_V = G^2 \text{ a n d } \frac{R_A}{R_V} = \left(\frac{I_g}{I_0 - I_g}\right)^2$$

Option 3:

$$R_A R_V = G^2 \left(\frac{I_g}{I_0 - I_g}\right) \text{ and } \frac{R_A}{R_V} = \left(\frac{I_0 - I_g}{I_g}\right)^2$$

Option 4:

$$\frac{R_A}{R_V} = G^2 \text{ and } \frac{R_A}{R_V} = \frac{I_g}{(I_0 - I_g)}$$

Correct Answer:

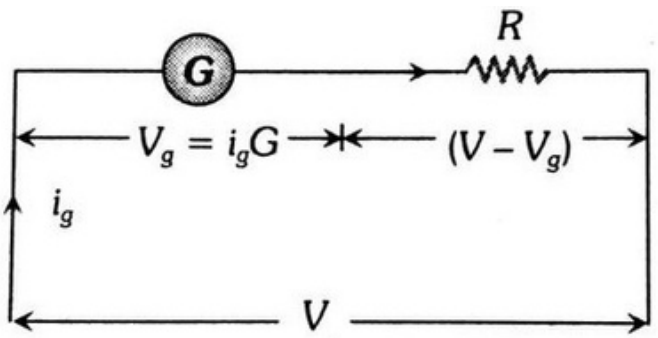
$$R_A R_V = G^2 \text{ and } \frac{R_A}{R_V} = \left(\frac{I_g}{I_0 - I_g}\right)^2$$

Solution:

Conversion of galvanometer into voltameter -

Connected a large resistance R

- wherein



$$(I_o - I_G)R_A = I_G G \qquad V_0 = I_G(G + R_A)$$

$$V_0 = I_0 G$$

$$R_A = \frac{I_G G}{I_o - I_G}$$

$$I_0 G = I_G(G + R_V)$$

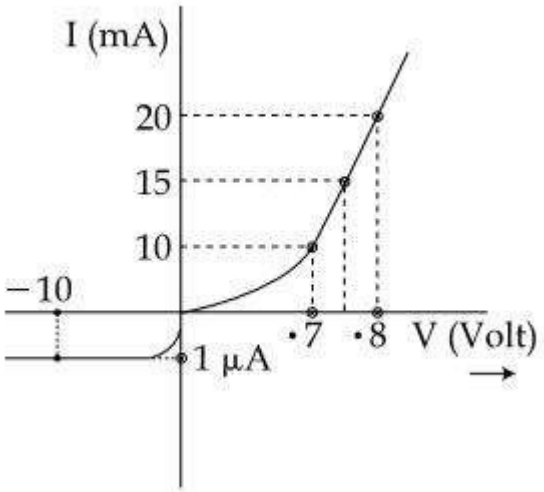
$$\frac{I_0 G}{I_G} - G = R_V$$

$$R_V = \frac{G(I_0 - I_G)}{I_G}$$

$$\frac{R_A}{R_V} = \frac{I_G G}{I_0 - I_G} \times \frac{I_G}{G(I_0 - I_G)} = \left(\frac{I_G}{I_0 - I_G}\right)^2$$

$$R_A R_V = \frac{I_G G}{I_0 - I_G} \times \frac{G(I_0 - I_G)}{I_G} = G^2$$

Q. 24 The V-I characteristic of a diode is shown in the gure. resistance is :



Option 1:
10

Option 2:
1−06

Option 3:
106

Option 4:
100

Correct Answer:
1−06

Solution:
.

Forward Resistance

$$R_F = \frac{\Delta V}{\Delta i} = \frac{0.1}{10 \times 10^{-3}} \Omega$$

Reverse bias Resistance $= \frac{\Delta V}{\Delta i} = \frac{10}{10^{-6}} = 10^7 \Omega$

Ratio of forward to reverse bias resistance $= \frac{10}{10^7} = 10^{-6}$

Correct option is 2.

Q. 25 The current voltage relation of diode is given by $I = e^{\frac{1000V}{T}} - 1$ relation of dio
where the applied voltage V is in volts and the tempera
makes an error me a Vs uwhilge measuring the current of 5 m
be the error in the value of current in mA ?

Option 1:
0.2 mA

Option 2:
0.02 mA

Option 3:
0.5 mA

Option 4:
0.05 mA

Correct Answer:
0.2 mA

Solution:
Given $5mA = \left(e^{\frac{1000V}{T}} - 1\right)$

or

$$e\frac{1000V}{T} = 6$$

Also $I = e^{\frac{1000V}{T}} - 1$

$$\frac{dI}{dV} = \left(\frac{1000}{T}\right).e^{\frac{1000V}{T}}$$

$$\Rightarrow dI = \left(e^{\frac{1000V}{T}}\right).\frac{1000}{T}dV$$

$$\Rightarrow dI = 6 \times \frac{1000}{300} \times 10^{-2}$$

= 0.2 mA

Q. 26 Work done by static friction on an object:

Option 1:
may be positive

Option 2:
must be negative

Option 3:
must be zero

Option 4:
none of these

Correct Answer:
may be positive

Solution:

Work done by the frictional force is negative -

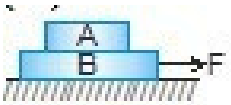
When the force is large enough to overcome the friction

Work done by the frictional force is positive -

When force is applied on a body, which is placed above anoth
force on the lower body may be positive

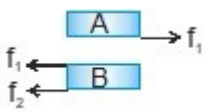
Work done by the frictional force is zero -

When force applied on a body is insu ent to over come the fri



Consider the blocks shown in the figure to be moving together due to friction between them.

The free body diagrams of both the blocks are shown below.



Work done by static friction on A is positive and on B is negative.

Q. 27 A green light is incident from the water to the air - wat
Select the correct statement.

Option 1:
The entire spectrum of visible light will come out of the wat

Option 2:
The spectrum of visible light whose frequency is less than th
medium.

Option 3:
The spectrum of visible light whose frequency is more than t
medium.

Option 4:
The entire spectrum of visible light will come out of the wat

Correct Answer:
The spectrum of visible light whose frequency is less than th
medium.

Solution:
As we learnt in

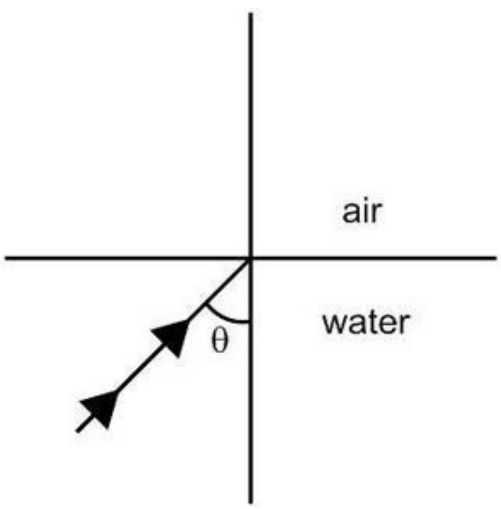
Critical angle -

$\sin c$ = Refractive index of rarer medium / Refractive index of d

- wherein

When angle of incidence of a travelling from a dence medium
angle, no refraction occurs.

A $sin\theta = \frac{1}{\mu}$



Aslo refractive index (μ) of the medium depends on the wavel wavelength. So will be move for lenser frequency of light.

Correct option is 3.

Q. 28 Match List I (Wavelength range of 22. electromagneti production of these waves) and select the correct optio lists.

List I		List II	
(a)	700 nm to 1 mm	(i)	Vibration of atoms and molecules.
(b)	1 nm to 400 nm	(ii)	Inner shell electrons in atoms moving from one energy level to a lower level.
(c)	$< 10^{-3}$ nm	(iii)	Radioactive decay of the nucleus.
(d)	1 mm to 0.1 m	(iv)	Magnetron valve.

Option 1:
(a) - (iv), (b) -(iii) ,(c) - (ii), (d) - (i)

Option 2:
(a) - (iii), (b) -(iv) ,(c) - (i), (d) - (ii)

Option 3:
(a) - (ii), (b) -(iii) ,(c) - (iv), (d) - (i)

Option 4:
(a) - (i), (b) -(ii) ,(c) - (iii), (d) - (iv)

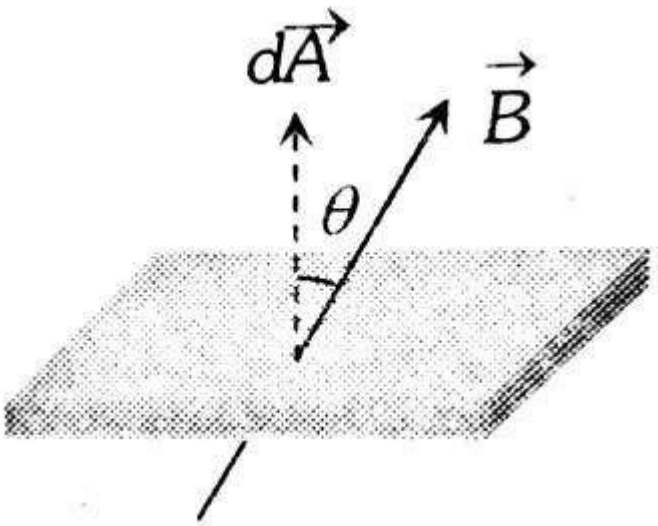
Correct Answer:
(a) - (i), (b) -(ii) ,(c) - (iii), (d) - (iv)

Solution:

Magnetic ux -

The total number of magnetic lines of force passing normally

- wherein



700nm to 1mm V vibistiabtlieo n of atoms and molecule

1nm to 400Innnme r shell electrons moving from one energy level

$< 10^{-3} nm$ (r radiatRiaodni)o active decay of nucleus

1mm to 1Mma gnetron valve.

Q. 29 One mole of an ideal gas when went through a thermody volume changed from p and V to 2P and 2V then its entr

Option 1:
$Cvlog_e2$

Option 2:
$Cplog_e2$

Option 3:
$(Cp+Cv)log_e2$

Option 4:
$(Cp-Cv)log_e2$

Correct Answer:
$(Cp+Cv)log_e2$

Solution:

As we have learned

Entropy change in terms of Pressure and Volume -

$$\Delta S = nc_v \ln\left(\frac{P_2}{P_1}\right) + n\,C_P \ln\left(\frac{V_2}{V_1}\right)$$

-

enrtopy change in term of P and V is

$$\Delta S = nc_v \ln\left(\frac{P_2}{P_1}\right) + n\,C_P \ln\left(\frac{V_2}{V_1}\right)$$

$$\Delta S = nc_v \ln\left(\frac{2P}{P_1}\right) + n\,C_P \ln\left(\frac{2V}{V_1}\right)$$

$$\Delta S = c_v log_e(2) + C_P log_e(2)$$

$$\Delta S = log_e(2) \times (C_v + C_P)$$

Q. 30 This question has statement 1 and statement 2 Of the fo
statements, choose the one that best describes the two

statement 1 : Davisson – germer experiment established

statement 2 : It electrons have wave nature, they can in

Option 1:
Statement 1 is false, Statement 2 is true

Option 2:
Statement 1 is true, Statement 2 is false

Option 3:
Statement 1 is true, Statement 2 is true and the correct expl

Option 4:
Statement 1 is true, Statement 2 is true, Statement 2 is not
for statement 1.

Correct Answer:
Statement 1 is true, Statement 2 is true and the correct expl

Solution:

Davisson-Germer experiment showed that electron beams can
atomic crystals. This shows the wave nature of electrons as w
di raction.

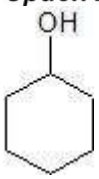
Correct option is

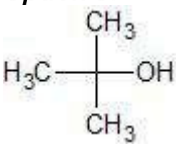
Any wave will show interterence and di eraction and interfere
during d ivisionand Germer experiment hence it establishes w

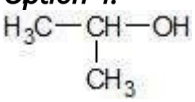
Chemistry

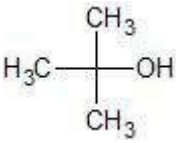
Q. 1 Which one of the following would not be oxidised upon

Option 1:
CH_3CH_2OH

Option 2:


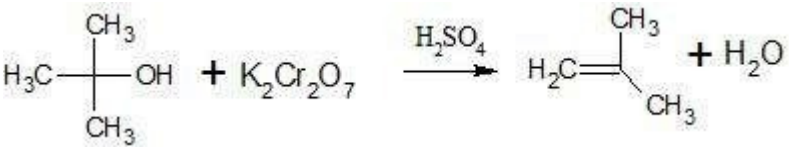
Option 3:


Option 4:


Correct Answer:


Solution:
As we learnt ,

Tertiary alcohols do not get oxidised in presence of H2SO4 and K2Cr2O7 it undergoes elimination reaction and alkenes are produced.



Therefore, option (3) is correct.

Q. 2 The Coagulation of colloidal particles of the sol can be

Option 1:
Heating

Option 2:
Adding oppositively charged sol

Option 3:
Adding Electrolyte

Option 4:
All of above

Correct Answer:
All of above

Solution:
By mixing two oppositely charged sols: Oppositely charged so
neutralise their charges and get partially or completely preci
sol) and arsenious sulphide (–ve sol) bring them in the precip
called mutual coagulation.

By boiling/heating: When a sol is boiled, the adsorbed layer i
the molecules of dispersion medium. This reduces the charge
settling down in the form of a precipitate.

By addition of electrolytes: When excess of an electrolyte is
The reason is that colloids interact with ions carrying charge
causes neutralisation leading to their coagulation. The ion re
particles is called the coagulating ion. A negative ion causes
vice versa.

So, all are correct.

Therefore, option number (4) is correct.

Q. 3 The tungsen lament for electric bulb is formed by

Option 1:
Graphite

Option 2:
Diamond

Option 3:
Fulle rene

Option 4:
C h a r c o a l

Correct Answer:
Diam ond

Solution:
A s w e h a v e l e a r n t ,

D i a m o n d i s u s e d f o r s h a r p e n i n g h a r d t o o l s , i n m a k i n g d i e s , j e
b u l b s .

Therefore, option (2) is correct.

Q. 4 Which of the following has highest metallic character?

Option 1:
P

Option 2:
A s

Option 3:
S b

Option 4:
B i

Correct Answer:
B i

Solution:
On moving down the group, the metallic character increases.

N i t r o g e n a n d p h o s p h o r u s a r e n o n - m e t a l s , A r s e n i c a n d a n t i m o r

Therefore, **option (4) is correct.**

Q. 5 An element has the con gurati o:n T o which block in the lo
of the periodic table, does this belong?

$1s^2, 2s^2, 2p^6, 3s^2, 3p^2$

Option 1:
s - b l o c k

Option 2:
p - b l o c k

Option 3:
d - b l o c k

Option 4:
f - b l o c k

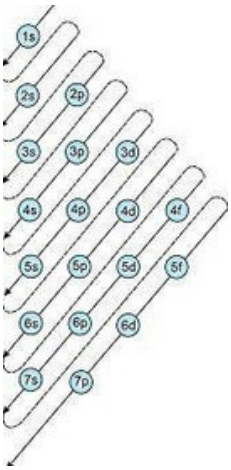
Correct Answer:
p - b l o c k

Solution:
A s w e l e a r n t i n

A u f b a u P r i n c i p l e -

In the ground state of the atoms, the orbitals are filled in order of their increasing energies.

- w h e r e i n



A c c o r d i n g t o A u f b a u ' s p r i n c i p l e , i n g r o u n d s t a t e o f a t o m s , t h i n c r e a s i n g e n e r g i e s . C l e a r l y , w i t h u n l l e d 3 p o r b i t a l s , t h e e l e o f e l e m e n t s .

Q. 6 W h i c h o f t h e f o l l o w i n g h a s h i g h e s t b o i l i n g p o i n t ?

Option 1:
ICl

Option 2:
BrCl

Option 3:
Br_2

Option 4:
Cl_2

Correct Answer:
ICl

Solution:

As we have learnt,

Interhalogen compounds have higher boiling point than Halog

Boiling Points depends on bond polarity and molecular mass
the greatest molecular mass along with the greatest bond pol

The correct order of boiling point is given as

$$ICl > BrCl > Br_2 > Cl_2$$

Hence, the correct answer is Option (1)

Q. 7 Which of the following do not impart any colour to flame?

Option 1:
Be

Option 2:
Al

Option 3:
Both a and b

Option 4:
Ca

Correct Answer:
Both a and b

Solution:

As we learn

Colour of ame due to be and al -

Both do not impart colour to ame

-

Be and Al both do not impart colour to flame.

Q. 8 Perhydrol is the name associated with

Option 1:
H_2O_2

Option 2:
D_2O

Option 3:
H_2O

Option 4:
HD

Correct Answer:
H_2O_2

Solution:
As we learnt in

Hydrogen Peraoxide -

Discoverd by J - L Thena

- wherein

H_2O_2

Perhydrol is a 30% weight by volume solution of hydrogen per

Q. 9 Which of the following hydride has the lowest boiling p

Option 1:
N H 3

Option 2:
P H 3

Option 3:
S b H 3

Option 4:
A s H 3

Correct Answer:
P H 3

Solution:
From PH3 to BiH3 the boiling points increase with the incre
in Van der Waal's forces with molecular mass. However, the
has a lower molecular mass than PH3 , due to the intermole
not present in PH3 and other hydrides in Group-15.

Therefore, Option(2) is correct

Q. 10 The bond order in NO is 2.5 while that in NO+ is 3. Wh
for these two species?

Option 1:
Bond length i sin greater than in NO^+ NO

Option 2:
Bond lengt ihs ingreater than in NO NO^+

Option 3:
Bond length i sin equal to that in NO^+ NO

Option 4:
Bond length is unpredictable.

Correct Answer:
Bond lengt ihs ingreater than in NO NO^+

Solution:
Bond order is defined as one half the difference between the n
and the antibonding orbitals.

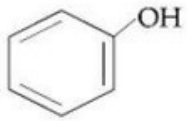
$$Bond\,Order = \frac{N_b - N_a}{2}$$

The higher the bond order, the shorter wisil lh abvei ntghe h bigohnedr lbeonngdt
than that of NO^+ has a shorter bond length.

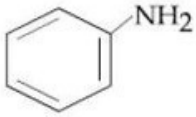
Q. 11 The organic compound that gives following qualitative a

Test	Inference
(a.) $Dil.HCl$	Insoluble
(b.) $NaOH\ solution$	soluble
(c.) $Br_2/water$	Decolourization

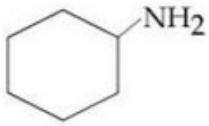
Option 1:



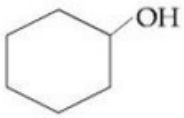
Option 2:



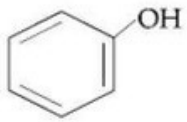
Option 3:



Option 4:



Correct Answer:



Solution:

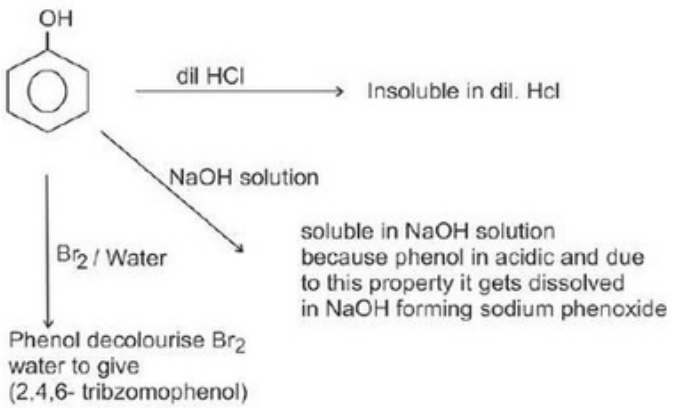
Physical properties of Phenol -

– Phenols are more acidic than alcohols

– They are less soluble in water but readily soluble in organi

– They liquify due to high hygroscopic nature.

-



Therefore, option (1) is correct.

Q. 12 Select the incorrect option regarding metallic solids

Option 1:
Positive ions are surrounded by sea of free electrons

Option 2:
These electrons are mobile

Option 3:
Covalent bonds are strong and directional

Option 4:
These are highly malleable and ductile

Correct Answer:
Covalent bonds are strong and directional

Solution:

As we learnt in

Metallic solids -

Metallic bond, i.e., attraction between positively charged me

- wherein

Ex. iron, copper, zinc, aluminium, sodium

In metallic solids positive ions are surrounded by free elecvt
are highly ductile and malleable. Covalent bonds are strong a
not in metallic solid.

Q. 13 Pt and Pd adsorb large volumes of hydrogen under spec
adsorbed is called?

Option 1:
Adsorbed Hydrogen

Option 2:
Reductive hydrogen

Option 3:
Occluded hydrogen

Option 4:
Atomic hydrogen

Correct Answer:
Occluded hydrogen

Solution:
Adsorption of any gas on the metal surface is also sometimes
adsorbed on a metal surface, then this hydrogen is known as

Hence, the correct answer is Option (3)

Q. 14 Consider the following table :

Gas	$a/(k\ Pa\ dm^6\ mol^{-1})$	$b/(\ dm^3\ mol^{-1})$
A	642.32	
B	155.21	
C	431.91	
D	155.21	

a and b are vanc odrreectr sWtataelsm econnt satbaonutst . tThhee g ase

Option 1:
Gas C will occupy more volume than gas A;
gas B will be more compressible than gas D

Option 2:
Gas C will occupy lesser volume than gas A;
gas B will be lesser compressible than gas D

Option 3:
Gas C will occupy more volume than gas A; gas B will be lesser compressible than gas D

Option 4:
Gas C will occupy lesser volume than gas A; gas B will be more compressible than gas D

Correct Answer:
Gas C will occupy more volume than gas A; gas B will be more compressible than gas D

Solution:

Vander Waal equation for real gas -

$$\left(p+\frac{an^2}{v}\right)(V-nb)=nRT$$

Vander Waal constant ‘a’ is the measure of the intermolecular attraction of a gas.

Vander Waal constant ‘b’ is a measure of the size of the molecule.

Greater the value of 'a' , greater is the force of attraction &

Greater the value of ' b ' , the higher will be the e ective vol

Gas A and C have same value of 'b' but di erent value of 'a' so force of attraction so molecules will be more closer hence oc

Gas B and D have same value of 'a' but di erent value of 'b' s compressible.

∴ Option (1) is correct.

Q. 15 The electrons identi ed by quantum numbers n and l :

(1) n = 4, l = 1 (2) n = 4, l = 0 (3) n = 3, l = 2 (

Can be placed in order of increasing energy as :

Option 1:
$(4)<(2)<(3)<(1)$

Option 2:

$(2) < (4) < (1) < (3)$

Option 3:

$(1) < (3) < (2) < (4)$

Option 4:

$(3) < (4) < (2) < (1)$

Correct Answer:

$(4) < (2) < (3) < (1)$

Solution:

As discussed in the concept

Principal Quantum Number (n) -

It is a positive integer with value of n = 1,2,3.....

-

and

Azimuthal Quantum Number(l) -

For a given value of n, l can have n values ranging from 0 to n – 1, that is, for a given value of n, the possible value of l are : l = 0, 1, 2, ...(n –1)

-

$(1)\ n = 4, l = 1 \Rightarrow 4p$

$(2)\ n = 4, l = 0 \Rightarrow 4s$

$(3)\ n = 3, l = 2 \Rightarrow 3d$

$(4)\ n = 3, l = 1 \Rightarrow 3p$

Increasing order of energy is

$3p < 4s < 3d < 4p$

$(4) < (2) < (3) < (1)$

Alternatively,

$For \quad (1)\ n + l = 5; n = 4$

$(2)\ n + l = 4; n = 4$

(3) $n+l=5; n=3$

(4) $n+l=4; n=3$

Lower $n+l$ means less energy and if for two subshells $n+l$ is same than lower n, lower will be the energy.

Thus correct order is (4) < (2) < (3) < (1)

Q. 16 Which of following is not an ambidentate ligand?

Option 1:
NO_2^-

Option 2:
CN^-

Option 3:
SCN^-

Option 4:
C O

Correct Answer:
C O

Solution:

As we learnt in

Types of Ligands on the basis of Connectivity -

(i) Unidentate - ligand is bound to metal ion through a single

e g $Cl^-, H_2O and NH_3$

(ii) Bidentate : when ligand can bind through two donor atom

e g $CH_2NH_2 - CH_2NH_2$

(iii) Polydentate - when ligand bind to two or more donor ato

(iv) Hexadentate - type of polydentate having six donor atoms

(v) Ambidentate- which can ligate through two di erent atoms

e g $M \leftarrow SCN$ & $M \leftarrow NCS$

- wherein

All ambidentate ligands are monodentate but all monodentate

Ambidentate Ligands can ligate through two di erent atoms a

Of all the given, CO is the only ligand which can donate only

Q. 17 The edge length of a face centred cubic cell of an ionic
the cation is 110 pm , the radius of the anion is :

Option 1:
144 pm

Option 2:
288 pm

Option 3:
398 pm

Option 4:
618 pm

Correct Answer:
144 pm

Solution:

As we learnt in

Centered unit cell -

In centered unit cell, constituent particles are present in pos
corners.

- wherein

Three types: face centered, body centered, end centered.

For fcc unit cell, 2 (radius of cation+ radius of anion) = edge

Therefore $(110+r_a) = \frac{508}{2} \Rightarrow r_a = 254 - 110 = 144pm$

Q. 18 Chlorine on reaction with hot and concentrated sodium

Option 1:
ClO_3^- and ClO_2^-

Option 2:
$Cl^-$and ClO_2^-

Option 3:
$Cl^-$and ClO^-

Option 4:
$Cl^-$and ClO_3^-

Correct Answer:
$Cl^-$and ClO_3^-

Solution:

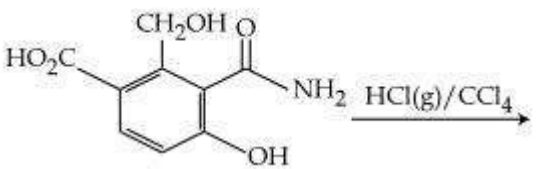
Reaction of chlorine with hot and concentrated NaOH

Cl2 gives disproportionation reaction on reaction with hot an and Chlorate ions

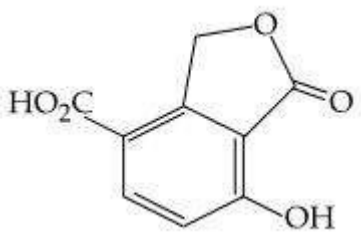
$$Cl_2 + NaOH \rightarrow NaCl + NaClO_3 + H_2O$$

Therefore, Option (4) is correct

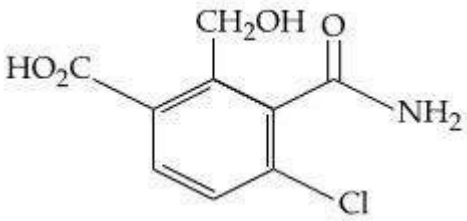
Q. 19 The major product expected from the following reactio



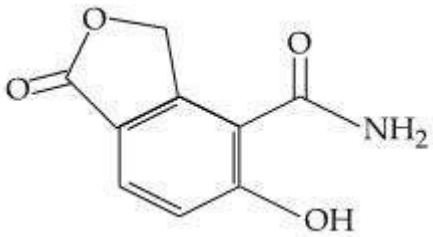
Option 1:



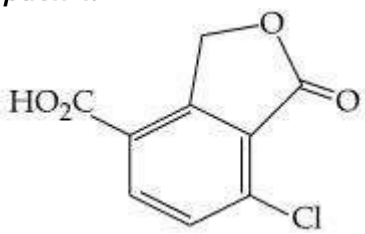
Option 2:



Option 3:



Option 4:



Q. 20 XeF_6 cannot be stored in glass because

Option 1:
it doesn't react

Option 2:
It reacts with SiO_2

Option 3:
It reacts with HCl

Option 4:
Both a and c

Correct Answer:
It reacts with SiO_2

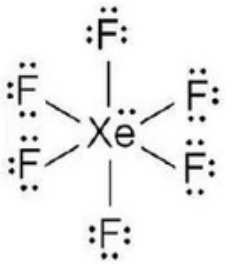
Solution:

As we learnt in

Structure of Xenon hexa uoride -

Distorted octahedral and hybridisation is Sp3d3

- wherein



XeF6 cannot be stored in glass because it reacts with the sili

$$2XeF_6 + SiO_2 \rightarrow 2XeOF_4 + SiF_4$$

$$2XeOF_4 + SiO_2 \rightarrow 2XeO_2F_2 + SiF_4$$

$$2XeO_2F_2 + SiO_2 \rightarrow 2XeO_3 + SiF_4$$

Q. 21 The standard reduction potential of four element are A=
D = -0.4202V

The element that displaces A from its compounds is

Option 1:
B

Option 2:
C

Option 3:
D

Option 4:
none of these

Correct Answer:
D

Solution:

As we have learned

Standard Electrode Potential -

If concentration of each species taking part in the electrode
carried out at 298 K, then the potential of each electrode is

-

A is displaced from D because $E^0 = -0.420$ D was an

Q. 22 18 g of glucose $(C_6H_{12}O_6)$ is added to 178.2 g of water. The vapour this aqueous solu itsion at $100^\circ C$

Option 1:
759.00 torr

Option 2:
7.60 torr

Option 3:
76.00 torr

Option 4:
752.40 torr.

Correct Answer:
752.40 torr.

Solution:

As we learnt in

Expression of relative lowering of vapour pressure -

$$\frac{\Delta P}{P^0} = x_{solute}$$

$$x_{solute} = \frac{n_{solute}}{n_{solute} + n_{solvent}}$$

ΔP is lowering of v.p.

$P^0 \rightarrow$ vapour pressure of pure solvent

$x_{solute} \rightarrow$ mole fraction of non volatile solute

$$\frac{p_A^0 - p_s}{p_A^0} = \chi_B$$

Mole fraction of glucose $(\chi_B) = \frac{18/180}{\frac{18}{180} + \frac{178.2}{18}} = \frac{1}{100}$

$p_A^0 =$ Vapour pressure of pure water at 100oc = 760 torr

$$\frac{760 - p_s}{760} = \frac{1}{100}$$

ps = Vapour pressure of solution = 752.4 torr.

Correct option is 4.

Q. 23 Oxidation Number iosf S in H_2SO_5

Option 1:
+ 6

Option 2:
+ 8

Option 3:
+ 4

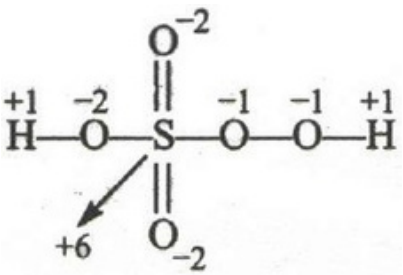
Option 4:
+ 2

Correct Answer:
+ 6

Solution:

As we have learnt,

The structure of Peroxomonosulphuric acid is given below:



From the structuwree coan H_2SO_5 say S has +6 oxidation state.

Theref ooptirone (,1) is correct.

Q. 24 Which of the following is (are) primary standard?

Option 1:
$Na_2C_2O_4$

Option 2:
$F_2Cr_2O_7$

Option 3:
KIO_3

Option 4:
All of these

Correct Answer:
All of these

Solution:
As we learnt

Primary Standard -

Primary standard is a substance of known high purity which n
solvent to give a primary standard solution. It is a reference
concentration of another known chemical.

- wherein

$NaC_2O_4(Sodium\ Oxalate)$; $K_2Cr_2O_7(Potassium\ Dichromate)$; $KIO_3(Potassium\ Iodate)$; $Oxalic\ acid$

All of the given chemicals are primary standard

Q. 25 Which of the following have least density -

Option 1:
C

Option 2:
Si

Option 3:
Ge

Option 4:
Sn

Correct Answer:
Correct Answer:
Si

Solution:
Fact based.

Order of density of the given elements is $Sn > Ge > C > Si$

Therefore, option (2) is correct.

Q. 26 Helium atom is two times heavier than a Hydrogen mole
energy of Helium is

Option 1:
Option 1:
Two times that of a hydrogen molecule

Option 2:
Option 2:
Same as that of a hydrogen molecule

Option 3:
Option 3:
Four times that of a hydrogen molecule

Option 4:
Option 4:
Half that of a hydrogen molecule

Correct Answer:
Correct Answer:
Same as that of a hydrogen molecule

Solution:
Average translational energy per molecule of any ideal gas is

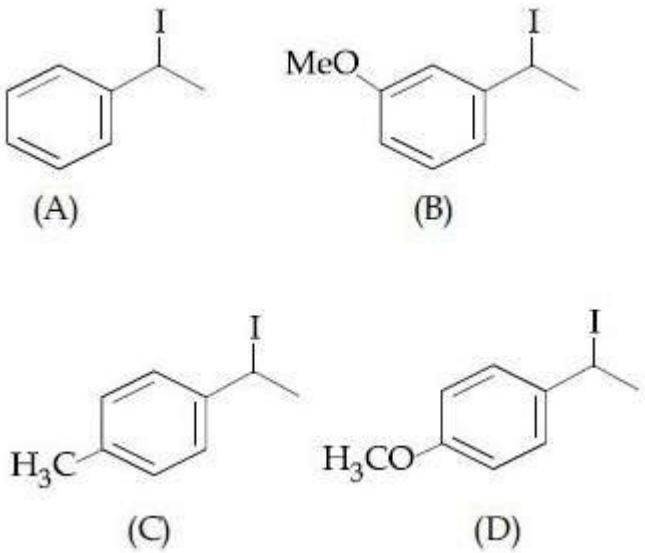
$$E = \frac{3kT}{2}$$

$$\frac{E_{He}}{E_{H_2}} = \frac{T_{He}}{T_{H_2}}$$

So energies will be same for He and H2 at same temperature.

Hence, the correct answer is Option (2)

Q. 27 Increasing r arteea cotfi on in the following compounds is :



Option 1:
(A) < (B) < (C) < (D)

Option 2:
(B) < (A) < (C) < (D)

Option 3:
(B) < (A) < (D) < (C)

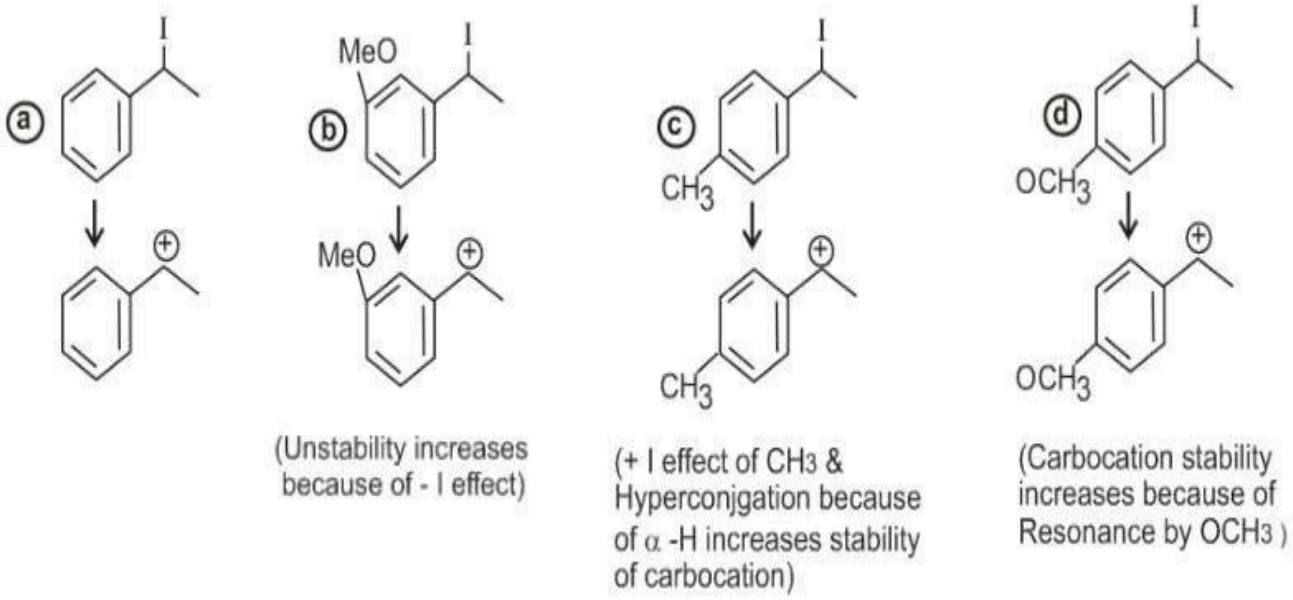
Option 4:
(A) < (B) < (D) < (C)

Correct Answer:
(B) < (A) < (C) < (D)

Solution:

As we have learnt,

Rate of S_N1 is directly proportional to stability of rst formed ca



∴ increasing rate of S_N1 reaction : (B) < (A) < (C) < (D)

Therefore, option (2) is correct.

Q. 28 Shape of s orbital is:

Option 1:
Spherical

Option 2:
Dumb bell

Option 3:
Cylindrical

Option 4:
Elliptical

Correct Answer:
Spherical

Solution:

As we learnt

Shape of s orbital -

spherical

-

s– orbital (l =0) have no directional dependence and are spherically symmetrical.

Therefore, **Option(1) is correct**

Q. 29 Which one of the following aqueous solutions will exhib

Option 1:
$0.01M\ Na_2SO_4$

Option 2:
$0.01M\ KNO_3$

Option 3:
$0.015M\ Urea$

Option 4:
$0.015M\ glucose$

Correct Answer:
$0.01M\ Na_2SO_4$

Solution:

Elevation in Boiling point $\propto i \times m$

For Na2SO4 , i = 3 , will be highest among these given aqueo

So, In 0.01 M Na2 SvOa4lu teh ew ill be 0.03 which is the highest in th $i \times m$

The correct option is 1.

Q. 30 Which of the following ligand is bidentate?

Option 1:
$C_2O_4^{2-}$

Option 2:
$CH_3C\epsilon N$

Option 3:
Br^-

Option 4:
CH_3NH_2

Correct Answer:
$C_2O_4^{2-}$

Solution:

As we learnt in

Types of Ligands on the basis of Connectivity -

(i) Unidentate - ligand is bound to metal ion through a single

e g$Cl^-, H_2O and NH_3$

(ii) Bidentate : when ligand can bind through two donor atom

e g$CH_2NH_2 - CH_2NH_2$

(iii) Polydentate - when ligand bind to two or more donor ato

(iv) Hexadentate - type of polydentate having six donor atoms

(v) Ambidentate- which can ligate through two di erent atoms

e g$M \leftarrow SCN$ &$M \leftarrow NCS$

- wherein

All ambidentate ligands are monodentate but all monodentate

When Ligands can bind through 2 donor atoms they are calle
C2O- 4 ts that criteria.

Maths

Q. 1 The sum $\sum_{k=1}^{20}(1+2+3+.....+k)$ is

Option 1:
1540

Option 2:
1680

Option 3:
1260

Option 4:
1450

Correct Answer:
1540

Solution:
Sum of Common Series

Sum of the square of rst n-natural numbers

$$1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

Now,

$$\sum_{k=1}^{20} \frac{k(k+1)}{2} = \frac{1}{2}\left(\sum_{k=1}^{20} k^2 + \sum_{k=1}^{20} k\right)$$

$$= \frac{1}{2}\left(\frac{20(20+1)(2\times 20+1)}{6} + \frac{20(20+1)}{2}\right)$$

$$= \frac{1}{2}((70\times 41) + 210) = 1540$$

Q. 2 What is the symbol of OR disjunction?

Option 1:
U

Option 2:
∩

Option 3:
V

Option 4:
Both (a) and (c)

Correct Answer:
Both (a) and (c)

Solution:
As we have learned

Disjunction "OR" -

The symbol for "OR" disjunction is the symbol $\vee$

Q. 3 The plane $x+2y-z=4$ cuts the sphere $x^2+y^2+z^2-x+z-2=0$ in a circle of radius

Option 1:
1

Option 2:
3

Option 3:
$\sqrt{2}$

Option 4:
2

Correct Answer:
1

Solution:

Equation of Sphere -

Equation of the sphere is

$$(x-a)^2+(y-b)^2+(z-c)^2=r^2$$

NOTE:

If the centre of the sphere at origin the eq.uation of sphere is $x^2+y^2+z^2=r^2$

The equation of the sphere can also be written as $x^2+y^2+z^2-2(ax+by+cz)+d=0$, where $d=a^2+b^2+c^2-r^2$

-

Centre $\left(\frac{1}{2},0,-\frac{1}{2}\right)$ $r=\sqrt{\frac{5}{2}}$

Perpendicular distance from centre $=\frac{\left|\frac{1}{2}+\frac{1}{2}-4\right|}{\sqrt{6}}=\sqrt{\frac{3}{2}}$

$$Radius^2=\left(\sqrt{\frac{5}{2}}\right)^2-\left(\sqrt{\frac{3}{2}}\right)^2=1$$

Q. 4 Equation of curve such that length of t atinmgesn to rddrianwant ea to thet point, will be $\sqrt{2}$

Option 1:
$y = 2x + c$

Option 2:
$y = x + c$

Option 3:
$y = 3x + c$

Option 4:
$y = 4x + c$

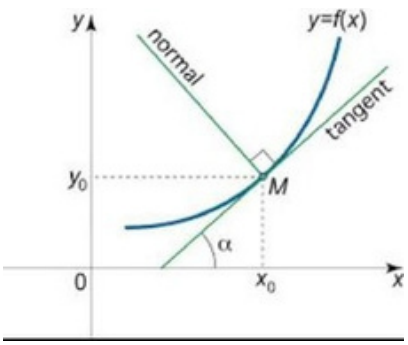
Correct Answer:
$y = x + c$

Solution:
AS we have learnt,

Length of Tangent -

Length $\left| y\sqrt{1 + \left(\frac{dx}{dy}\right)^2} \right|$

- wherein



$$\left| y\sqrt{1 + \left(\frac{dx}{dy}\right)^2} \right| = \sqrt{2}y$$

On squaring, we get

$$y^2\left(1+\left(\frac{dx}{dy}\right)^2\right)=2y^2 \Rightarrow \frac{\mathrm{d}x}{\mathrm{d}y}=1,-1$$

$$\Rightarrow y=x+c \text{ or } y=-x+c$$

Q. 5 In $\Delta ABC \cot\frac{A}{2}\cdot\cot\frac{B}{2}\cdot\cot\frac{C}{2}$ is equal to

Option 1:

$$\frac{\Delta}{r^2}$$

Option 2:

$$\frac{(a+b+c)^2}{abc}.2R$$

Option 3:

$$\frac{\Delta}{r}$$

Option 4:

$$\frac{\Delta}{Rr}$$

Correct Answer:

$$\frac{\Delta}{r^2}$$

Solution:

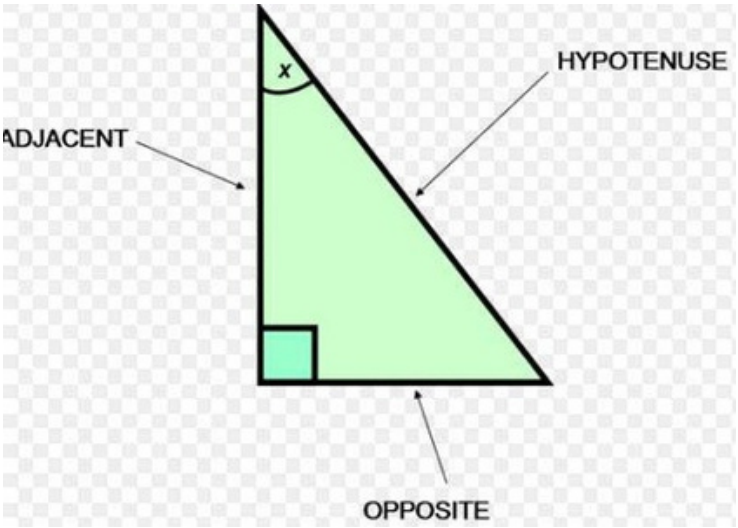
Trigonometric Ratios of Functions -

$$cosec\ \Theta=\frac{Hyp}{Opp}$$

$$\sec\Theta=\frac{Hyp}{Base}$$

$$\cot\Theta=\frac{Base}{Opp}$$

- wherein



$$\cot\frac{A}{2}\cdot\cot\frac{B}{2}\cdot\cot\frac{C}{2}$$

$$=\frac{s(s-a)}{\Delta}\cdot\frac{s(s-b)}{\Delta}\cdot\frac{s(s-c)}{\Delta}$$

$$=\frac{s^3(a+b+c)}{\Delta^3}=\frac{s^2\Delta^2}{\Delta^3}=\frac{s^2}{\Delta}$$

$$=\left(\frac{\Delta^2}{r^2}\right)\times\frac{1}{\Delta}=\frac{\Delta}{r^2}\qquad[\because s=\frac{\Delta}{r}]$$

$$\cot\frac{A}{2}\cdot\cot\frac{B}{2}\cdot\cot\frac{C}{2}=\frac{\Delta}{r^2}$$

Q. 6 $If A\cup B=P, A\cup C=Q, A\cap B=R, A\cap C=S, B\cup C=T, B\cap C=V.\ Then\ simplify\ A\cup(B\cap C)$

Option 1:
$R\cap S$

Option 2:
$T\cap V$

Option 3:
$P\cap Q$

Option 4:
$P\cup Q$

Correct Answer:
$P\cap Q$

Solution:
As we learnt

DISTRIBUTIVE PROPERTY -

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

-

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C) = P \cap Q$

Q. 7 The value of $\frac{1}{\cos 285^0} + \frac{1}{\sqrt{3}\sin 255^0}$, is

Option 1:
$\sqrt{3} - \sqrt{2}$

Option 2:
$2\sqrt{2}$

Option 3:
$\frac{4\sqrt{2}}{\sqrt{3}}$

Option 4:
$\frac{2\sqrt{2}}{3}$

Correct Answer:
$\frac{4\sqrt{2}}{\sqrt{3}}$

Solution:

$$\frac{1}{\cos 285^\circ} + \frac{1}{\sqrt{3}\sin 255^\circ}$$

$$= \frac{1}{\cos 75^\circ} + \frac{1}{\sqrt{3}\,(-\sin 75^\circ)} \quad \left[\because cos\ 285^\circ = +cos\ 75^\circ,\ sin\ 255^\circ = -sin\ 75^\circ\right]$$

$$= \frac{1}{sin 15^\circ} - \frac{1}{\sqrt{3}\ sin 75^\circ}$$

$$= \frac{2\sqrt{2}}{\sqrt{3}-1} - \frac{1(2\sqrt{2})}{\sqrt{3}(\sqrt{3}+1)}$$

$$= 2\sqrt{2}\left[\frac{1}{\sqrt{3}-1} - \frac{1}{\sqrt{3}(\sqrt{3}+1)}\right]$$

$$= \frac{2\sqrt{2}}{\sqrt{3}}\frac{[(\sqrt{3}+1)\sqrt{3}-(\sqrt{3}-1)]}{2} = \frac{4\sqrt{2}}{\sqrt{3}}$$

Q. 8 The general solution of the di erential eq uisation $y(x^2y + e^x)dx - e^x dy = 0$

Option 1:
$x^3y - 3e^x = cy$

Option 2:
$x^3y + 3e^x = 3cy$

Option 3:
$y^3x - 3e^y = cx$

Option 4:
$y^3x + 3e^y = cx$

Correct Answer:
$x^3y + 3e^x = 3cy$

Solution:

As we learnt in

Linear Di erential Equation -

$$\frac{dy}{dx} + Py = Q$$

- wherein

P, Q are functions of x alone.

$$y(x^2y + e^x)dx = e^x dy$$

$$\frac{1}{y^2}\frac{dy}{dx} - \frac{1}{y} = \frac{x^2}{e^x}$$

$$Let\ \frac{1}{y} = t$$

$$\therefore \frac{-1}{y^2}\frac{dy}{dx} = \frac{dt}{dx}$$

$$\therefore \frac{dt}{dx} + t = \frac{-x^2}{e^x}$$

$$\int 1.dx = x$$

$$I.F. = e^x$$

Solution is

$$t.e^x = \int \frac{-x^2}{e^x} \times e^x dx$$

$$= \frac{-x^3}{3} + C$$

$$\frac{1}{y}e^x = \frac{-x^3}{3} + C$$

$$\therefore 3e^x = -x^3y + 3cy$$

$$\therefore 3e^x + x^3y = 3cy$$

Q. 9 $\lim_{x\to 3} \frac{\sqrt{3x} - 3}{\sqrt{2x-4} - \sqrt{2}}$ is equal to

Option 1:
$\sqrt{3}$

Option 2:
$\frac{1}{\sqrt{2}}$

Option 3:
$\frac{\sqrt{3}}{2}$

Option 4:
$\frac{1}{2\sqrt{2}}$

Correct Answer:
$\frac{1}{\sqrt{2}}$

Solution:
Limit is of 0/0 form. We can rationalize the irrational powers

$$\lim_{x\to 3}\frac{\sqrt{3x}-3}{\sqrt{2x-4}-\sqrt{2}}$$

$$=\lim_{x\to 3}\frac{\sqrt{3x}-3}{\sqrt{2x-4}-\sqrt{2}}\times\frac{\sqrt{2x-4}+\sqrt{2}}{\sqrt{2x-4}+\sqrt{2}}\times\frac{\sqrt{3x}+3}{\sqrt{3x}+3}$$

$$=\lim_{x\to 3}\frac{3x-9}{2x-4-2}\times\frac{\sqrt{2x-4}+\sqrt{2}}{\sqrt{3x}+3}$$

$$=\lim_{x\to 3}\frac{3\left(x-3\right)}{2\left(x-3\right)}\times\frac{\sqrt{2x-4}+\sqrt{2}}{\sqrt{3x}+3}$$

$$=\frac{3}{2}\cdot\frac{\sqrt{2\times 3-4}+\sqrt{2}}{\sqrt{3\times 3}+3}$$

$$=\frac{3}{2}\times\frac{\sqrt{2}+\sqrt{2}}{6}$$

$$=\frac{2\sqrt{2}}{4}=\frac{\sqrt{2}}{2}=\frac{1}{\sqrt{2}}$$

Q. 10 Find the Range

$$p=\frac{2q+1}{q-5}$$

Option 1:
Option 1:
$p\neq 2$

Option 2:
Option 2:
$q\neq 5$

Option 3:
Option 3:
$p\neq 5$

Option 4:
Option 4:
None of these.

Correct Answer:
Correct Answer:
$p\neq 2$

Solution:

As we learnt in

Range -

The range of the relation R is the set of all second elements

- wherein

eg. R={(a,b),(c,d)}. Then Range is {b,d}

$$p = \frac{2q+1}{q-5}$$

$$pq - 5p = 2q + 1$$

$$(p-2)q = 5p + 1$$

$$q = \frac{5p+1}{p-2}$$

Here $p \neq 2$ is the range.

Q. 11 Find the smallest positive root of the $\sqrt{\cos(\sin x)} = \sqrt{\sin x}$

Option 1:
$\frac{\pi}{4} - \frac{1}{2}$

Option 2:
$\frac{\pi}{4} + \frac{1}{2}$

Option 3:
$\frac{\pi}{2} - \frac{1}{2}$

Option 4:
None of these

Correct Answer:
Correct Answer:
$\frac{\pi}{4} + \frac{1}{2}$

Solution:
Simultaneous Trigonometric Equations -

Simultaneous Trigonometric Equations

We can divide the problems related to Simultaneous Trigonom

1. If two equations satis es simultaneously having only one unk

2. If two equations satis es simultaneously having two unknow

-

$$\sqrt{\cos(1-x)} = \sqrt{\sin x}$$
$\cos(1-x) \geq 0 \;\; and \;\; \sin x \geq 0$
$\cos(1-x) = \sin x$
$\sin(\frac{\pi}{2} - (1-x)) = \sin x$
$\frac{\pi}{2} - 1 + x = n\pi + (-1)^n x$
$at \;\; n = 1$
$2x = \frac{\pi}{2} + 1$
$x = \frac{\pi}{4} + \frac{1}{2}$
For this value of x $both \;\; satisfies \;\; \cos(1-x) \geq 0 \;\; and \;\; \sin x \geq 0$

Q. 12 The area bounded by th aen cdu rve sb etween the ordinates $y = \cos x$ and $y = \sin x$ $x = 0 \; and \; x = \frac{3\pi}{2} \; is$

Option 1:
$4\sqrt{2} - 2$

Option 2:
$4\sqrt{2} + 2$

Option 3:
$4\sqrt{2} - 1$

Option 4:
$4\sqrt{2} + 1$

Correct Answer:
$4\sqrt{2} - 2$

Solution:

As we learnt in

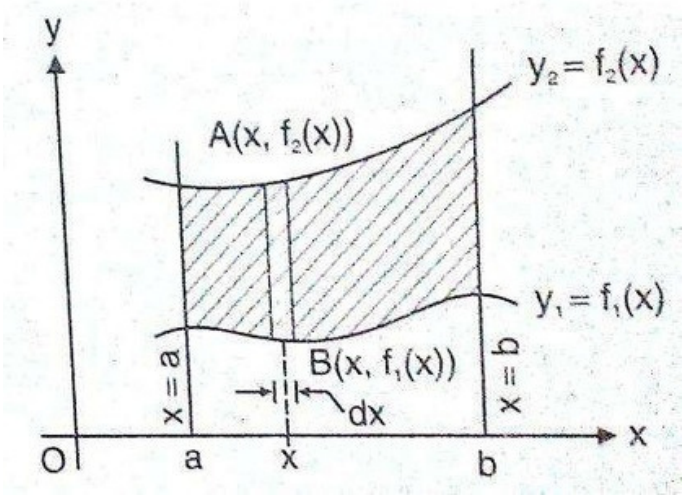
Area along x axis -

Let $y_1 = f_1(x) \; and \; y_2 = f_2(x)$ be two curve then area bounded between th

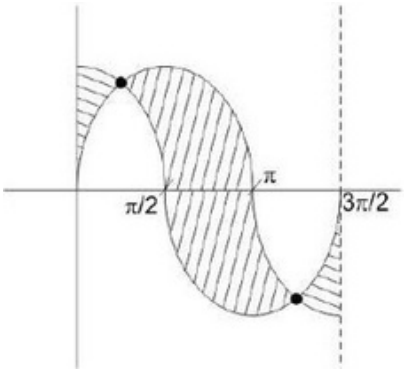
x = a and x = b is

$$\left| \int_a^b \Delta y \, dx \right| = \left| \int_a^b (y_2 - y_1) \, dx \right|$$

- wherein



Where $\Delta y = f_2(x) - f_1(x)$



$$Area = \int_0^{\frac{\pi}{4}} (\cos x - \sin x)dx + \int_{\frac{\pi}{4}}^{\frac{5\pi}{4}} (\sin x - \cos x)dx + \int_{\frac{5\pi}{4}}^{\frac{3\pi}{2}} (\cos x - \sin x)dx$$

$$= [\sin x + \cos x]_0^{\frac{\pi}{4}} + [-\cos - \sin x]_{\frac{\pi}{4}}^{\frac{5\pi}{4}} + [\sin x + \cos x]_{\frac{5\pi}{4}}^{\frac{3\pi}{2}}$$

$$= \sqrt{2}^{-1} + \left[\sqrt{2} + \sqrt{2}\right] + 1(-1) + \sqrt{2}$$

$$= 4\sqrt{2} - 2$$

Q. 13 I a^{th} term of a series is $(2a+1)2^{-a}$ then sum of its in nite term is

Option 1:
1 0

Option 2:
8

Option 3:
5

Option 4:
0

Correct Answer:
5

Solution:
As we learnt in

Sum of infinite terms of an AGP -

$$S_\infty = \frac{a}{1-r} + \frac{dr}{(1-r)^2}$$
$here\ |r| < 1$

- wherein

$a \rightarrow$ first term

$d \rightarrow$ common diff. of a AP

$r \rightarrow$ common ratio of a GP

$$S_\infty = \frac{3}{2} + \frac{5}{2^2} + \frac{7}{2^3} + ...\infty$$
$$\frac{S_\infty}{2} = \frac{3}{2^2} + \frac{5}{2^3} + ...\infty$$
$$\frac{S_\infty}{2} = \frac{3}{2} + \frac{1}{2} + \frac{1}{2^2} + ...\infty$$
$$\frac{S_\infty}{2} = \frac{3}{2} + 1$$
$$S_\infty = 5$$

Q. 14 Let $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{a} + \vec{b} = \hat{i} - \hat{j} - \hat{k}$, then $\vec{b}$ equals

Option 1:
$\hat{i} + 4\hat{j} - 2\hat{k}$

Option 2:
$-\hat{i} - 4\hat{j} - 2\hat{k}$

Option 3:
$\hat{i} - 4\hat{j} + 2\hat{k}$

Option 4:
$-\hat{i}-4\hat{j}+2\hat{k}$

Correct Answer:
$-\hat{i}-4\hat{j}-2\hat{k}$

Solution:
Giv en

$\vec{a}+\vec{b}=(\hat{i}-\hat{j}-\hat{k})$
Subtracting vector a from both sides
$\Rightarrow \vec{b}=(\hat{i}-\hat{j}-\hat{k})-\vec{a}$
$\Rightarrow \vec{b}=(\hat{i}-\hat{j}-\hat{k})-(2\hat{i}+3\hat{j}+\hat{k})$
$\Rightarrow \vec{b}=-\hat{i}-4\hat{j}-2\hat{k}$

Q. 15 If the fourth term in the Binomial exp ains sion oth en a $\left[\frac{2}{x}+x^{\log_8 x}\right]^6 \ (x>0)$ 20×8^7, value ios f :

Option 1:
8^3

Option 2:
8^2

Option 3:
8

Option 4:
8^{-2}

Correct Answer:
8^2

Solution:
G e n e r a l T e r m i n t h e e x p a n s i o n o f (x + a) n

$T_{r+1}={}^nC_r\cdot x^{n-r}\cdot a^r$

N o w ,

$\left[\frac{2}{x}+x^{\log_8 x}\right]^6$

$T_4=T_{3+1}=20\times 8^7$

$$\Rightarrow {}^{6}C_3 \left(\frac{2}{x}\right)^3 \left(x^{log_8 x}\right)^3 = 20 \times 8^7$$

$$\left(\frac{2}{x}\right)^3 \left(x^{log_8 x}\right)^3 = \left(2^3\right)^7$$

$$\left(\frac{2}{x}\right) \left(x^{log_8 x}\right) = (2)^7$$

$$\frac{x^{log_8 x}}{x} = 2^6 = 8^2$$

Take log both side with base 8

$$(log_8 x)^2 = 2 + log_8 x$$

$$log_8 x = 2 \; or \; -1$$

$$x = 8^2$$

Q. 16 The vector

$$\left(\hat{i} \times \vec{a}.\vec{b}\right)\hat{i} + \left(\hat{j} \times \vec{a}.\vec{b}\right)\hat{j} + \left(\hat{k} \times \vec{a}.\vec{b}\right)\hat{k} \text{ is equal to :}$$

Option 1:
$\vec{b} \times \vec{a}$

Option 2:
$\vec{A}$

Option 3:
$\vec{a} \times \vec{b}$

Option 4:
$\vec{B}$

Correct Answer:
$\vec{a} \times \vec{b}$

Solution:

$$(\hat{i} \times \vec{a} \cdot \vec{b})\hat{i} + (\hat{j} \times \vec{a} \cdot \vec{b})\hat{j} + (\hat{k} \times \vec{a} \cdot \vec{b})\hat{k}$$
$$= (\hat{i} \cdot \vec{a} \times \vec{b})\hat{i} + (\hat{j} \cdot \vec{a} \times \vec{b})\hat{j} + (\hat{k} \cdot \vec{a} \times \vec{b})\hat{k}$$
$$(\because \vec{a} \times \vec{b} \cdot \vec{c} = \vec{a} \cdot \vec{b} \times \vec{c})$$
$$= (\vec{a} \times \vec{b})\hat{i} + (\vec{a} \times \vec{b})\hat{j} + (\vec{a} \times \vec{b})\hat{k}$$
$$= \vec{a} \times \vec{b}$$

Q. 17 Which of the following inequalities is NOT ne?

Option 1:
Option 1:
$$\int_a^b x \sin x dx \leqslant \sqrt{\int_a^b x^2 dx \int_a^b sin^2 x dx}$$

Option 2:
Option 2:
$$\int_a^b \sin x dx \leq \sqrt{\int_a^b \sin^2 x dx}$$

Option 3:
Option 3:
$$\int_a^b x \cos x dx \leqslant \sqrt{x^3 \int_a^b cos^2 x dx}$$

Option 4:
Option 4:
$$\int_a^b \ln x \cdot e^x \leqslant \sqrt{\int_a^b \ln^2 x dx \times \int e^{2x} dx}$$

Correct Answer:
Correct Answer:
$$\int_a^b x \cos x dx \leqslant \sqrt{x^3 \int_a^b cos^2 x dx}$$

Solution:

As we learned

Schwarz - Bunyakovsky Inequality -

If $f^2(x)$ and $g^2(x)$ are integrable on $x \in [a, b]$

then

$$\left| \int_a^b f(x)\ g(x)\, dx \right| \leq \sqrt{\int_a^b f^2(x) dx \int_a^b g^2(x)\, dx}$$

-

(c) Violates the Cauchy Schwarz-Bunyakovsky Inequality

Q. 18 Let E and F be two independent events. The probability is $\frac{1}{12}$ and the probability that neither E nor F happens is $\frac{1}{2}$

Option 1:
$\frac{7}{12}$

Option 2:
$\frac{3}{2}$

Option 3:
$\frac{1}{3}$

Option 4:
$\frac{5}{12}$

Correct Answer:
$\frac{7}{12}$

Solution:
Let P(E) = x and P(F) = y

$$P(E \cap F) = P(E).P(F) = \frac{1}{12}$$

$$xy = \frac{1}{12}$$

and P (neither E nor F happens)

= P(E' ∩ F')

= P(E').P(F')

= (1 - P(E)).(1 - P(F))

= (1 - x)(1 - y)

Given that P (neither E nor F happens) = 1/2

So (1 - x)(1 - y) = 1/2

$$1 - (x + y) + xy = \frac{1}{2}$$

$$x + y = \frac{7}{12}$$

Q. 19 If A is an 3 x 3 non - singular matr-i1 xA s' u,c thh ethna Bt BA'A e' q=u aAl'sA

Option 1:
B^{-1}

Option 2:
(B - 1) '

Option 3:
I + B

Option 4:
I

Correct Answer:
I

Solution:

As we learnt in

Property of Transpose -

$$(AB)' = B'A'$$

- wherein

A' is the conjugate matrix of A

$$\Rightarrow AA^1 = A^1A$$

$$and\ \beta = A^{-1}A^1 \quad (given)$$

So that $BA = A^{-1}A^1A \quad [multiply\ by\ A]$

$$= A^{-1}AA^1$$

$$= IA^1$$

$$= A^1$$

Now $(BA)^1 = \left(A^1\right)^1 = A$

$$A^1B^1 = A$$

$$A^{-1}A^1B^1 = A^{-1}A = I \qquad [since\ A^{-1}A = I\ and\ multiply\ by\ A^{-1}]$$

$$\beta B^1 = I$$

Q. 20 If $A \subseteq B$ and $C \subseteq D$, also $A \times B = P; B \times C = Q\ A \times C = R; B \times D = S$. Then

Option 1:
$P \subseteq S$

Option 2:
$Q \subseteq S$

Option 3:
$R \subseteq S$

Option 4:
$P \subseteq S$

Correct Answer:
$R \subseteq S$

Solution:
As we have learnt,

Theorem of Cartesian Product -

$If A \subseteq B \ and \ C \subseteq D, then (AXC) \subseteq (BXD).$

-

If $A \subseteq B$ and $C \subseteq D$

then $A \times C \subseteq B \times D$

$\therefore R \subseteq S$

Q. 21 If $\sec^{-1} \sec(\pi/2 + \theta) = \quad where \ \ \theta \epsilon [-\pi/2, \pi/2] - \{0\}$

Then $-\theta = ?$

Option 1:
$-\pi/2$

Option 2:
$\pi/2$

Option 3:
π

Option 4:
0

Correct Answer:
$\pi/2$

Solution:
As we have learned

Important Results of Inverse Trigonometric Functions -

$\sec^{-1}(\sec\Theta) = \Theta$

- wherein

if $0 \leqslant \Theta < \frac{\pi}{2}$

or $\frac{\pi}{2} < \Theta \leqslant \pi$

Since $\sec^{-1}\sec\alpha = \alpha$

Thus $\pi/2 + \theta = \phi \Rightarrow \phi - \theta = \pi/2$

Q. 22 A plane passing through the points $(0,-1,0)$ and $(0,0,1)$ making an angle $\frac{\pi}{4}$ with the plane $y - z + 5 = 0$, also passes through the point

Option 1:
$\left(-\sqrt{2}, 1, -4\right)$

Option 2:
$\left(\sqrt{2}, -1, 4\right)$

Option 3:
$\left(-\sqrt{2}, -1, -4\right)$

Option 4:
$\left(\sqrt{2}, 1, 4\right)$

Correct Answer:
Correct Answer:
$\left(\sqrt{2}, 1, 4\right)$

Solution:
Let equation of the plane is $a(x-0)+b(y-1)+c(z-0)=0$

$\Rightarrow ax+by+cz+b=0$

As the given plane also passes through $(0,0,1)$

$c=-b$

$\therefore$ equation of plane is

$ax+by-bz+b=0$

Also given that the plane makes an angle $\frac{\pi}{4}$ with the plane $y-z+5=0$

$cos\frac{\pi}{4}=\frac{o+b+b}{\sqrt{a^2+b^2+b^2}\sqrt{2}}=\frac{1}{\sqrt{2}}$

$a=\pm\sqrt{2}b$

Now equation of the plane becomes

$\pm\sqrt{2}bx+by-bz+b=0$

$\Rightarrow \pm\sqrt{2}x+y-z+1=0$

$\left(\sqrt{2}, 1, 4\right)$ satisfies this equation

Q. 23 The cost of running a bus from A to B is $\left(av+\frac{b}{v}\right)$ Rs. per km, where v is the average speed of the bus. when the bus travels at 30 km/h, the cost comes to Rs. 65. Then the most economical speed (in km/h) of the bus is

Option 1:
45

Option 2:
50

Option 3:
60

Option 4:
40

Correct Answer:
60

Solution:

Let cost $\left(av + \frac{b}{v}\right)$

According to the question

$$30a + \frac{b}{30} = 75 \qquad \ldots(i)$$

$$40a + \frac{b}{40} = 65 \qquad \ldots(ii)$$

a = 1/2 and b = 1800

$$\text{Now, } C = av + \frac{b}{v}$$
$$\Rightarrow \frac{dC}{dv} = a - \frac{b}{v^2}$$
$$\frac{dC}{dv} = 0 \Rightarrow a - \frac{b}{v^2} = 0$$
$$\Rightarrow v = \sqrt{\frac{b}{a}} = \sqrt{3600}$$
$$\Rightarrow y = 60 \text{ kmph}$$

Q. 24 Find $\int \frac{dx}{x^2 - 4}$

Option 1:
$ln\frac{x+2}{x-2} + C$

Option 2:
$1/2ln\frac{x-2}{x+2} + C$

Option 3:
$\frac{1}{4}\ln|\frac{x-2}{x+2}| + C$

Option 4:
none of these

Correct Answer:
$\frac{1}{4}\ln|\frac{x-2}{x+2}| + C$

Solution:

As we have learned

Rule of integration by Partial fraction -

Linear and non-repeated:

$$\frac{P(x)}{Q(x)} = \frac{P(x)}{(x-\alpha_1)(x-\alpha_2)\cdots(x-\alpha_n)}$$

Let $\frac{P(x)}{Q(x)} = \frac{A}{(x-\alpha_1)} + \frac{B}{(x-\alpha_2)} \cdots$

Find a, b

By comparing $P(x)$

-

$$I = \int \frac{dx}{x^2-4} = \int \frac{dx}{(x-2)(x+2)}$$

$$= -\frac{\ln(|x+2|) - \ln(|x-2|)}{4} + C$$

$$= \frac{1}{4}\ln\left|\frac{x-2}{x+2}\right| + C$$

Q. 25

If $S = \left\{ x \in [0, 2\pi] : \begin{vmatrix} 0 & \cos x & -\sin x \\ \sin x & 0 & \cos x \\ \cos x & \sin x & 0 \end{vmatrix} = 0 \right\}$,

then $\sum_{x \in S} \tan\left(\frac{\pi}{3} + x\right)$ is equal to :

Option 1:

$4 + 2\sqrt{3}$

Option 2:

$-2 + \sqrt{3}$

Option 3:

$-2-\sqrt{3}$

Option 4:

$-4-2\sqrt{3}$

Correct Answer:

$-2-\sqrt{3}$

Solution:

As we learnt in

Cramer's rule for solving system of linear equations -

When $\Delta=0$ and $\Delta_1=\Delta_2=\Delta_3=0$,

then the system of equations has in nite solutions.

- wherein

$a_1x+b_1y+c_1z=d_1$

$a_2x+b_2y+c_2z=d_2$

$a_3x+b_3y+c_3z=d_3$

and

$$\Delta=\begin{vmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{vmatrix}$$

$\Delta_1,\Delta_2,\Delta_3$ are obtained by replaci nbgy colum nc Δ 1l,u2m,3n of (d_1,d_2,d_3)

$$\Rightarrow\begin{vmatrix}0 & \cos x & -\sin x\\ \sin x & 0 & \cos x\\ \cos x & \sin x & 0\end{vmatrix}=0$$

$\Rightarrow 0(0-\sin x\cos x)-\cos x(0-\ cos^2x)-\sin x(\sin^2 x)=0$

$\Rightarrow \sin^3 x-\cos^3 x=0$

$\Rightarrow (\sin x-\cos x)(1+\sin x\cos x)=0$

$\Rightarrow \because \sin x-\cos x=0$

$\Rightarrow \because \sin x-\cos x=0$

$\therefore \tan x=1$

$$\therefore x = \frac{\pi}{4} \ or \ \frac{5\pi}{4}$$

Now $\tan(\frac{\pi}{4} + x) = \frac{1 + \tan x}{1 - \tan x}$

Now Put $= \frac{\pi}{3}$

$$= \frac{1 + \tan\frac{\pi}{3}}{1 - \tan\frac{\pi}{3}}$$

$$= \frac{1 + \sqrt{3}}{1 - \sqrt{3}}$$

$$= \frac{(1+\sqrt{3})^2}{1 - \sqrt{3}} = \frac{1 + 3 + 2\sqrt{3}}{-2} = -2 - \sqrt{3}$$

$$\sum \tan(\frac{\pi}{3} + x) = -2 - \sqrt{3}$$

Q. 26 Let W denote the words in the English dictionary. Define the relation R by $R = \{(x, y) \in W \times W \mid \text{the word } x \text{ and } y \text{ have at least one letter in common}\}$. Then R is

Option 1:
not reflexive, symmetric and transitive

Option 2:
reflexive, symmetric and not transitive

Option 3:
reflexive, symmetric and transitive

Option 4:
reflexive, not symmetric and transitive.

Correct Answer:
reflexive, symmetric and not transitive

Solution:

As we learnt in

REFLEXIVE RELATION: A relation R in A is said to be reflexive,

SYMMETRIC RELATION: A relation R in A is said to be symmetric

TRANSITIVE RELATION: A relation R in A is said to be transitive

Now,

$R = \{(x, y) \ \in \omega \times \omega\}$

x, y having at least one letter in common

1. Re exive

For any pair of type (word 1, word 1), both are same, so they h
such pairs lie in the relation. So, the relation is re exive.

2. Symmetric

If $(word\,1, word\,2)$ lie in this relation, the nalisfo $(word\,2, word\,1)$ also lies in the relation, t
symmetric

If $(word\,1, word\,2)$ lies in R, then word 1 and word 2 have at least on

So, de nitely word 2 and word 1 have at least one letter in co
relation

So, if (word 1, word 2) lies in R, then (word 2, word 1) also lie

So, it is a symmetric relation

3. Transitive

If (word 1, word 2) lies in R, then they have at least one lette

If (word 2, word 3) lies in R, so these 2 words have at least or

But, this does not mean that (word 1, word 3) lies in R, as the
common. For example, (cat, bat), and (bat, blur) lie in R, but

So, it is not transitive.

Correct option is 2.

Q. 27 The set of all r efaolr vwah λ uicehs oefxactly two common tangents
circles $x^2 + y^2 - 4x - 4y + 6 = 0$ and $x^2 + y^2 - 10x - 10y + \lambda = 0$

Option 1:
(12, 3 2)

Option 2:
(18, 4 2)

Option 3:
(12, 2 4)

Option 4:
(18, 4 8)

Correct Answer:
(18, 4 2)

Solution:
As we learnt, when 2 circles intersect at 2 distinct points, then there are two common tangents, both of them being direct.

The condition for this is $|r_1 - r_2| < C_1C_2 < r_1 + r_2$

N o w ,

$S_1 : x^2 + y^2 - 4x - 4y + 6 = 0$

$r_1 = \sqrt{2^2 + 2^2 - 6} = \sqrt{2}$

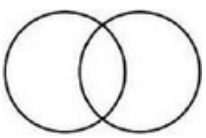
$C_1 : (2, 2)$

$S_2 : x^2 + y^2 - 10x - 10y + \lambda = 0$

$r_2 = \sqrt{5^2 + 5^2 - \lambda} = \sqrt{50 - \lambda}$

$C_2 : (5, 5)$

F o r t w o t a n g e n t s



$|r_1 - r_2| < C_1C_2 < r_1 + r_2$

$|\sqrt{50 - \lambda} - \sqrt{2}| < 3\sqrt{2} < \sqrt{2} + \sqrt{50 - \lambda}$

W e g e t $\sqrt{50 - \lambda} < 4\sqrt{2} \Rightarrow \lambda > 18 \; and \; \lambda \leq 50$

$\sqrt{50 - \lambda} > 2\sqrt{2} \Rightarrow \lambda < 42$

$\lambda \epsilon (18, 42)$

Q. 28 If $f(x) = 3|x|$. Then the range of f(x) is

Option 1:
$[0, \infty)$

Option 2:
$[3, \infty)$

Option 3:
R

Option 4:
$[1, \infty)$

Correct Answer:
$[0, \infty)$

Solution:
We can find range of |x| by simple manipulation
As $0 \leq |x| < \infty$
Multiplying all 3 sides by 3
$0 \leq 3|x| < \infty$

So, range is the same i.e. $[0, \infty)$

Q. 29 What is the union of set A = {1,2,3,4} with a set $B = \{x : x^2 - 5x + 6 = 0 \text{ or } x^2 - 5x + 4 = 0\}$

Option 1:
A

Option 2:
B

Option 3:
Both (1) and (2)

Option 4:
None of these

Correct Answer:
Correct Answer:
Both (1) and (2)

Solution:
As we learnt in

UNION OF SETS -

Let A and B be any two sets. The union of A and B is the set w
the elements of B, the common elements being taken only onc

And $A \cup A = A$

In this Question,

$$B = \{x : x^2 - 5x + 6 = 0 \; or \; x^2 - 5x + 4 = 0\}$$

$$x^2 - 5x + 6 = 0 \Rightarrow \; x = 2, 3$$

$$x^2 - 5x + 4 = 0 \Rightarrow \; x = 1, 4$$

$$\Rightarrow \; B = \{1, 2, 3, 4\}$$

Thus A = B

Thus $A \cup B = A = B$

Q. 30 If $A \times B = P; C \times D = Q, A \cap C = R, B \cap D = S$, then which of the follo
true ?

Option 1:
Option 1:
$P \cup Q = R \times S$

Option 2:
Option 2:
$P \cap Q = R \times S$

Option 3:
Option 3:
$P \times Q = R \cup S$

Option 4:
Option 4:
$P \times Q = R \cap S$

Correct Answer:
Correct Answer:
$P \cap Q = R \times S$

Solution:
As we have learnt,

Theorem of Cartesian Product -

$(AXB) \cap (CXD) = (A \cap C)X(B \cap D)$

-

$(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$
$P \cap Q = R \times S$

Q. 31 A circular wire of radius 3 cm is cut and bent so as to l
the angle subtended by the wire at the center of the ci

Option 1:
$\frac{\pi}{8}$

Option 2:
$\frac{\pi}{4}$

Option 3:
$\frac{\pi}{6}$

Option 4:
None of these

Correct Answer:
$\frac{\pi}{8}$

Solution:
Length of the circular wire = 2πr = 6π cm.

Angle subtended by the arc at the centre = $\frac{arc}{radius}$

$\Rightarrow \frac{6\pi}{48} = \frac{\pi}{8}$ radian

Q. 32 If the truth value of the st aitse fmaelsnet $p \wedge (\sim q) \vee r$ then the truth v
statements p, q, r are respectively :

Option 1:
F, T, T

Option 2:
T, F, F

Option 3:
T, T, F

Option 4:
T, F, T

Correct Answer:
T, T, F

Solution:

Tautology And Contradiction -

Tautology

A compound statetamutoelongyt ifs icta lilse adl ways true for all possible tru component statement.

For example, (p ⇒ q) ∨ (q ⇒ p)

Contradiction (fallacy)

A compound statemconetrnadtic tioins ciaf lilte di sa always false for all possible component statement.

For example, (p ⇒ q) ∨ (q ⇒ p)

Truth Table

p	q	$p \to q$	$q \to p$	$(p \to q) \vee (q \to p)$	$\sim ((p \to q) \vee (q \to p))$
T	T	T	T	T	F
T	F	F	T	T	F
F	T	T	F	T	F
F	F	T	T	T	F

-

$p \to (\sim q \vee r)$

$\sim p \vee (\sim q \vee r)$

$$\left.\begin{array}{ll} \sim p & \rightarrow F \\ \sim q & \rightarrow F \\ r & \rightarrow T \end{array}\right\} \Rightarrow \begin{array}{l} p \rightarrow T \\ q \rightarrow T \\ r \rightarrow F \end{array}$$

Q. 33 A variable circle passes thro uagnhd tthoeu claxhxeeids . p oTihnet locus of the other end of the diisameter through

Option 1:
$(y-p)^2=4qx$

Option 2:
$(x-q)^2=4py$

Option 3:
$(x-p)^2=4qy$

Option 4:
$(y-q)^2=4px$

Correct Answer:
$(x-p)^2=4qy$

Solution:

As we learnt in

Equation of a circle -

$$(x-h)^2+(y-k)^2=r^2$$

- wherein

Circle with centre (h,k) and radius r.

Circle touching x-axis and having radius r -

$$x^2+y^2\pm 2rx+2fy+f^2=0$$

- wherein

Where f is a variable parameter.

Let the other diametric end be P(h,k)

So centre is $\left(\frac{p+h}{2}, \frac{q+R}{2}\right)$

Radius $\sqrt{\left(\frac{h-p}{2}\right)^2+\left(\frac{k-q}{2}\right)^2}$

For circle touching x - axis, radius = $\left(\frac{q+k}{2}\right)$

So $\left(\frac{h-p}{2}\right)^2+\left(\frac{k-q}{2}\right)^2=\left(\frac{k+q}{2}\right)^2$

we get (h - p)2 = 4kg

i.e. (x - p)2 = 4qy. a parabola

Q. 34 If $f(x)=\log_e\left(\frac{1-x}{1+x}\right), |x|<1$, then $f\left(\frac{2x}{1+x^2}\right)$ is equal to:

Option 1:
$2f(x^2)$

Option 2:
$2f(x)$

Option 3:
$-2f(x)$

Option 4:
$(f(x))^2$

Correct Answer:
$2f(x)$

Solution:

$f(x)=\log_e\left(\frac{1-x}{1+x}\right), |x|<1,$

$f(\frac{2x}{1+x^2})=?$

$f\left(\frac{2x}{1+x^2}\right)=\log_e\left(\frac{1-\frac{2x}{1+x^2}}{1+\frac{2x}{1+x^2}}\right)$

$$= \log_e \left(\frac{\frac{1+x^2-2x}{1+x^2}}{\frac{1+x^2+2x}{1+x^2}} \right)$$

$$= \log_e \frac{x^2-2x+1}{x^2+2x+1} = \log_e \left(\frac{(1-x)^2}{(x+1)^2} \right)$$

$$= \log_e \left(\frac{1-x}{x+1} \right)^2$$

$$= 2\log_e \left(\frac{1-x}{x+1} \right), \ |x| < 1$$

$$= 2f(x)$$

Q. 35 If $A \times B = \{1, 3, 4\}$ and $A \times C = \{3, 4\}$ then $A \times (C - B) =$

Option 1:
{ 1 }

Option 2:
{ 3 , 4 }

Option 3:
{ 1 , 3 , 4 }

Option 4:
None of these.

Correct Answer:
None of these.

Solution:
As we have learnt,

Theorem of Cartesian Product -

A X (B - C) = (A X B) - (A X C)

-

A x (C - B) = (A x C) - (A x B)

= does not exist = ϕ

Q. 36 Solution of di rential equation is $\cos y\frac{\mathrm{d}y}{\mathrm{d}x}+(\sin y)x=x$

Option 1:
$e^{x^2/2}(\sin y-1)=c$

Option 2:
$e^{x}(\sin y-1)=c$

Option 3:
$e^{x^2}(\sin y-1)=c$

Option 4:
$e^{x^2}(\sin y+1)=c$

Correct Answer:
$e^{x^2/2}(\sin y-1)=c$

Solution:

As we have learned

Extended Form of linear Di erential Equation -

Sometimes, a di erential equation is not linear but it can be

-

Let it $\sin y=t\Rightarrow \cos y\frac{dy}{dx}=\frac{dt}{dx}$

equation reduces to

$\frac{dt}{dx}+(x)t=x$

which is again comparable with $\frac{dy}{dx}+Py=Q$

$I.F=e^{\int xdx}=e^{x^2/2}$

multiplying both sides with integrating factor , we get

$e^{x^2/2}\cdot\frac{dt}{dx}+te^{x^2/2}\cdot x=xe^{x^2/2}$

$\Rightarrow d/dx(e^{x^2/2}\cdot t)=xe^{x^2/2}$

$\Rightarrow \int d/dx(e^{x^2/2}\cdot t)-\int xe^{x^2/2}dx=C$

$$\Rightarrow e^{x^2/2} \cdot t - e^{x^2/2} = c$$

$$\Rightarrow e^{x^2/2} \cdot (t-1) = C \Rightarrow e^{x^2/2}(\sin y - 1) = C$$

Q. 37 If the tangent to the curve $y = x^3 + ax + b$ at the point $(1, -5)$ is perpendicular to the line $x + y + 4 = 0$, then which one of the following points lies

Option 1:
$(-2, 1)$

Option 2:
$(-2, 2)$

Option 3:
$(2, -1)$

Option 4:
$(2, -2)$

Correct Answer:
$(2, -2)$

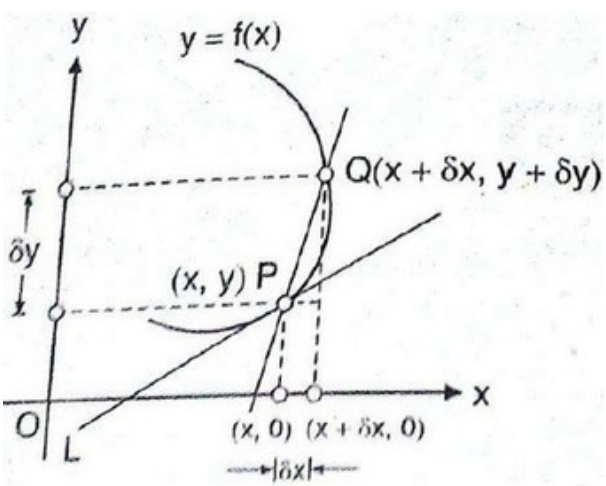
Solution:

Slope of the tangent -

Let y = f(x) is a curve then dy / dx = f'(x) and at a particular

$$M_T = \lim_{\delta x \to 0} \frac{(y + \delta y) - y}{(x + \delta x) - x} = \lim_{\delta x \to 0} \frac{\delta y}{\delta x}$$

- wherein



Equation of tangent -

Equation of tangent from other point on the curve.

$Let \;\; y = mx + c \; and \; (h,k)$ is the point where it passes t h trhoeurgehfo. Trhee n $K = mh + C$

$C = K - mh$

$y = mx + K - mh$

- wherein

Where m is slope of tangent.

given,

$y = x^3 + ax - b$

If passes via $(1,-5)$

$\Rightarrow -5 = 1 + a - b \Rightarrow a - b = -6 \ldots\ldots\ldots\ldots (1)$

Slope of the line $x + y + 4 = 0$ is

Slope of tier to the lines $x + y + 4 = 0 \quad -1$

$\frac{dy}{dx} = 3x^2 + a$

$\Rightarrow 3 + a = -1 \qquad\qquad x = 1 \qquad$ at

$\Rightarrow a = -4 \ldots\ldots\ldots\ldots (2)$

from (1) and (2)

$a = -4, b = +2$

equation of curve become

$y = x^3 - 4x - 2$

$(2,-2)$ satisfies the equation

Q. 38 Let $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ are four vectors then $\left[\vec{a}+\vec{b}\;\vec{c}\;\vec{d}\right] + \left[\vec{b}+\vec{c}\;\vec{a}\;\vec{d}\right] + \left[\vec{a}+\vec{c}\;\vec{b}\;\vec{d}\right]$ equals

Option 1:
- 1

Option 2:
0

Option 3:
1

Option 4:
2

Correct Answer:
0

Solution:
As we have learned

Properties of Scalar Triple Product -

$$\left[\left(\vec{a}+\vec{b}\right)\vec{c}\,\vec{d}\right]=\left[\vec{a}\,\vec{c}\,\vec{d}\right]+\left[\vec{b}\,\vec{c}\,\vec{d}\right]$$

- wherein

$\vec{a},\vec{b},\vec{c},\vec{d}$ are four vectors.

$$\left[\vec{a}+\vec{b}\;\vec{c}\,\vec{d}\right]+\left[\vec{b}+\vec{c}\;\vec{a}\,\vec{d}\right]+\left[\vec{a}+\vec{c}\;\vec{b}\,\vec{d}\right]$$

$$=\left[\vec{a}\;\vec{c}\,\vec{d}\right]+\left[\vec{b}\;\vec{c}\,\vec{d}\right]+\left[\vec{b}\;\vec{a}\,\vec{d}\right]+\left[\vec{c}\;\vec{a}\,\vec{d}\right]+\left[\vec{a}\;\vec{b}\,\vec{d}\right]+\left[\vec{c}\;\vec{b}\,\vec{d}\right]$$

$$=\left[\vec{a}\;\vec{c}\,\vec{d}\right]+\left[\vec{b}\;\vec{c}\,\vec{d}\right]+\left[\vec{b}\;\vec{a}\,\vec{d}\right]-\left[\vec{a}\;\vec{c}\,\vec{d}\right]-\left[\vec{b}\;\vec{a}\,\vec{d}\right]-\left[\vec{b}\;\vec{c}\,\vec{d}\right]=0$$

Q. 39 Which of the following integral has maxmum value?

Option 1:
$$\int_0^5 \ln x dx$$

Option 2:
$$\int_0^5 |\ln x| dx$$

Option 3:
both (a) and (b) are equal

Option 4:
$5\int_0^1 \ln x dx$

Correct Answer:
$\int_0^5 |\ln x| dx$

Solution:
As we have learnt,

Properties of Definite Integration -

If $f(x)$ is defined on (a, b) then $\left|\int_a^b f(x)dx\right| \leq \int_a^b |f(x)|\, dx$

-

Graph of |lnx| is always above the x-axis.

So its enclosed the maximum area under the curve.

Q. 40 The volume of the largest possible right circular cylinder of radius $\sqrt{3}$ is :

Option 1:
$\frac{4}{3}\sqrt{3}\pi$

Option 2:
$\frac{8}{3}\sqrt{3}\pi$

Option 3:
4π

Option 4:
2π

Correct Answer:

Correct Answer:

4π

Solution:

As we have learned

Method for maxima or minima -

By second derivative method :

$Step\ 1.\ find\ values\ of\ x\ for\ \frac{dy}{dx} = 0$

$Step\ 2.\ \ x = x_{\circ}\ is\ a\ point\ of\ local\ maximum\ if\ f''(x) < 0\ and\ local\ minimum\ if\ f''(x) > 0$

- wherein

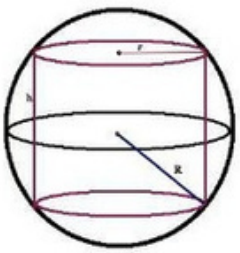
$Where\ y = f(x)$

$\frac{dy}{dx} = f'(x)$

vol. of cylinder $= \pi r^2 h$

$Now,\ \ R^2 = r^2 + \frac{h^2}{4}$

$\Rightarrow 3 = r^2 + \frac{h^2}{4}$



$\Rightarrow h^2 = 4(3 - r^2)$

$\Rightarrow r^2 = 3 - (h^2/4)$

$V = \pi h(3 - \frac{h^2}{4})$

$= 3\pi h - \frac{\pi}{4}h^3$

$\Rightarrow \frac{dv}{dh} = 3\pi - \frac{3\pi}{4}h^2$

$\Rightarrow h = 2$

$$\therefore volume = \pi \times 2 \times (3-1) = 4\pi$$

English

Q. 1 Find out the meaning of the phrasal verb

Break in

Option 1:
Enter like a thief

Option 2:
Ask one to do something

Option 3:
Interrupt

Option 4:
Trouble

Option 5:
Ask for a favour

Correct Answer:
Interrupt

Solution:
The verb means to interrupt

Q. 2 Read the paragraph and choose a suitable summary from the given options:

Journalism as a profession is gaining ground in these days. There is an explosion of information. We are living in a fast changing world with a fast flow of information. A large number of magazines and journals have come up. Today, we have a number of news agencies trading in news and there are more than two scores of associations of journalists in the country. There are regular courses in journalism run in various universities. Mass communication has already been introduced as a subject at post graduate level in many universities. The profession of journalism now attracts a lot of able and talented students.

Option 1:
Journalism has always been a rampantly growing force
Option 2:
Journalism as a calling is going through a period of considerable snowballing
Option 3:
Journalism is the best profession for students now a days.
Option 4:
Journalism is unbridled and thus, perilous
Option 5:
Journalism is defying the growth of all other professions
Correct Answer:
Journalism as a calling is going through a period of considerable snowballing
Correct Answer:

Solution:
The paragraph highlights the expansion and growth of journa
growth of all other professions" is the best choice.

Q. 3 Change the speech.

She said, "I am sorry, I did not write".

Option 1:
She apologized for I did not write.
Option 2:
She apologized she is sorry, she could not write.
Option 3:
She apologized and added that she was sorry, she had not wr

Option 4:
She apologized she is sorry, she did not write.

Option 5:
She apologized she is sorry, she has not written.

Correct Answer:
She apologized and added that she was sorry, she had not wr

Solution:
grammatically and idiomatically correct option is 4.

Q. 4 Find out the pair of words from the options which exhib by the question pair of words:

Lull: Break

Option 1:
Destitution: Penury

Option 2:
Paucity: A uence

Option 3:
A uent: Penurious

Option 4:
Misogamist: Brawn

Correct Answer:
Destitution: Penury

Solution:
Lull means a break. Similarly, destitution means penury.

Q. 5 Read the paragraph and choose a suitable summary from the given options: Does any innocent

human being deserve to be abused? The answer is no. So why should animals on factory farms have to go through this pain? They feel and hurt too, as they're living things. That's why people should focus on animal protection on factory farms because the treatment is cruel and immoral. First of all, animals suffer everywhere because of what people do to them. So hidden cameras are set up in all different factory farms all over to further prove the wrong that's happening.

Option 1:
Guiltless animals are subjected to inhumane behaviour by human beings and thus, they need to be resuscitated.

Option 2:
Animals are innocuous and thus, become the target of savagery at the hands of human beings.

Option 3:
Killing animals is inhumane and thus, must be discouraged.

Option 4:
Innocent animals are killed and it shows inhuman nature of

Option 5:
It is imperative to save animals to maintain the equilibrium of the eco system.

Correct Answer:
Animals are innocuous and thus, become the target of savagery at the hands of human beings.

Solution:
The author underlines that animals are innocent, brutalized a comprehensive choice is "Animals are innocuous and thus, be human beings"

Q. 6 Change the voice:

This is being done by him

Option 1:
This is being done by him

Option 2:
He is doing it

Option 3:
He will do it

Option 4:
He has been doing this

Option 5:
He has done it

Correct Answer:
He is doing it

Solution:
"He is doing it" appropriately changes the subject to object.

Q. 7 Change the speech.

Bala's mother, "Will you lock the door, Bala ?"

Option 1:
Bala's mother asked Bala if he would lock the door.

Option 2:
Bala's mother asked Bala if he can lock the door.

Option 3:
Bala’s mother said lock the door.

Option 4:
Bala's mother told Bala that he need not lock the door.

Option 5:
Bala's mother asked Bala if he had locked the door.

Correct Answer:
Bala's mother asked Bala if he would lock the door.

Solution:
Rest of the options change the meaning.

Q. 8 Find out the correct form of tense.

Employees who fought the adverse conditions narrated control after forty minutes.

Option 1:
was brought

Option 2:
has been brought

Option 3:
is brought

Option 4:
had been brought

Option 5:
can be brought

Correct Answer:
was brought

Solution:
The sentence is in past tense. Was brought thus, is idiomatic

Q. 9 Find out the odd one out among the following words:

Option 1:
Extortionate
Option 2:
Extravagant
Option 3:
Reasonable
Option 4:
Exorbitant
Option 5:
Dear
Correct Answer:
Reasonable

Correct Answer:

Solution:
Reasonable is the odd word. Where the others denote a high c
cheaper.

Q. 10 Find out the synonym for the given word:

Discuss

Option 1:
Sidestep
Option 2:
Enlist
Option 3:
Broach
Option 4:
ill-disposed

Option 4:

Option 5:
Loath

Correct Answer:
Broach

Solution:
Broach means to raise a topic for discussion.

Logical Reasoning

Q. 1 Choose the word which is least like the other words in t

Option 1:
3 7

Option 2:
4 5

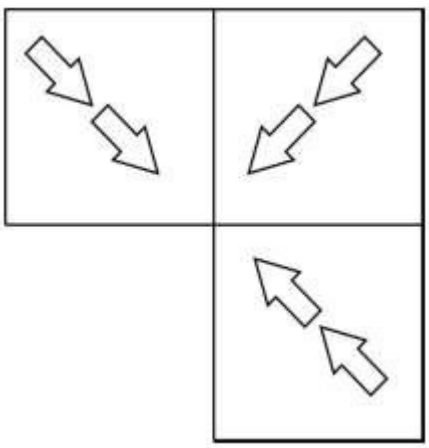
Option 3:
4 9

Option 4:
6 5

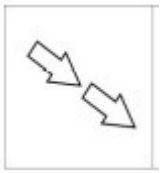
Correct Answer:
4 9

Solution:
49 is the only Perfect square number in the group

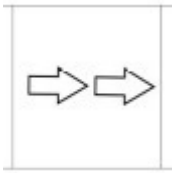
Q. 2



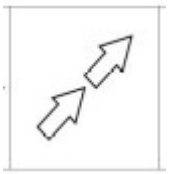
Option 1:



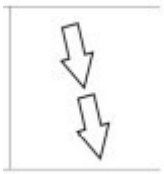
Option 2:



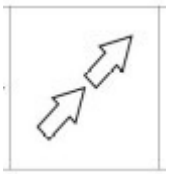
Option 3:



Option 4:



Correct Answer:

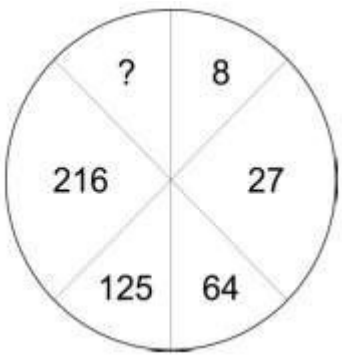


Solution:

The arrow heads pointed towards the center

Q. 3 Study the following table carefully to answer the quest

Character.



Option 1:
4

Option 2:
3 0 5

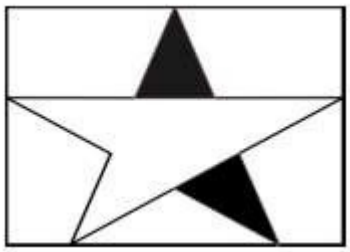
Option 3:
3 4 3

Option 4:
7 2 9

Correct Answer:
3 4 3

Solution:
Moving clockwise, the terms $2^3, 3^3, 4^3, 5^3, 6^3, 7^3$ are :

Q. 4 How the gure wiil look after 180 degree rotation



Option 1:

Option 2:

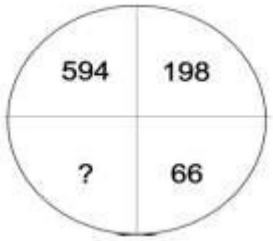
Option 3:

Option 4:

Correct Answer:

Solution:
After 180 degree the gure look like

Q. 5 Study the following table carefully to answer the quest
Character



Option 1:
11

Option 2:
12

Option 3:
22

Option 4:
33

Correct Answer:
22

Solution:
Moving clockwise we have : 594/3=198; 198/3=66;
66/3=22

Q. 6 In each question below is given a passage followed by
example each inference separately in the context of th
degree of truth or falsity.

Corel draw and photoshop are the old softwares used fo
Adobe illustrator and the In Design are the new ones, b
are mostly used in the industries. These are designing s
Digital Marketing. Digital Marketing is a technique use
facebook marketing, instagram and E-mail marketing et
approx 70 % of companies to generate lead for their bus
end of traditional marketing strategies. By the coming
scene of marketing is dramatically changed. In india on
internet.

70 % of companies used digital marketing technique to generate their business leads.

Option 1:
if the inference is "" de nitely true "" it directly follows fro

Option 2:
if the inference is "" probably true"" though not de nitely t

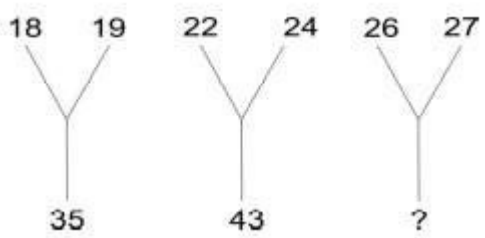
Option 3:
if you think the data is inadequate , from the facts given yo
likely to be true or false

Option 4:
if you think the inference is "" probably false "" though not
given

Correct Answer:
if the inference is "" probably true"" though not de nitely t

Solution:
The information is mention in the passage.

Q.7 Study the following table carefully to answer the quest
Character.



Option 1:
49

Option 2:
76

Option 3:
89

Option 4:
94

Correct Answer:
49

Solution:
we have : (18+19) -2 = 35;

(22+24) -3 = 43

so the answer is : (26+27) - 4 = 49

Q.8 Bird : Cage

Option 1:
Animals : Zoo

Option 2:
Thief : Prison

Option 3:
Antique : Museum

Option 4:
Crime : Punishment

Correct Answer:

Correct Answer:

Thief : Prison

Solution:

Second is the place where is the rst is made captive

Q. 9 Train : Track

Option 1:

Idea : Brain

Option 2:

Bullet : Barrel

Option 3:

Water : Boat

Option 4:

Fame : Television

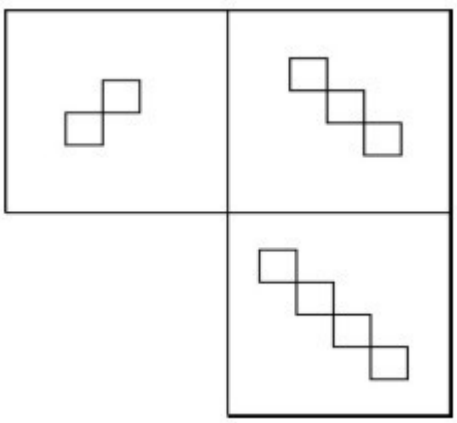
Correct Answer:

Bullet : Barrel

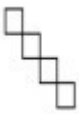
Solution:

A Train moves on tracks. Similarly , a bullet travels through t

Q. 10

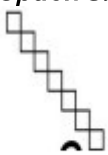


Option 1:

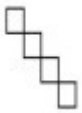


Option 2:

Option 3:



Option 4:



Correct Answer:

Solution:
The triangles are increasing by 1

Q. 11 In each question below is given a passage followed by example each inference separately in the context of th degree of truth or falsity.

Now, In India the strength of girls in the colleges are increasing because of the several movements led by the institutions. There is another movement which is increa members. Only 30% of females are doing job and they ar government has been opening so many courses to skill t There is a sharp increment in the ratio of new born girl after the campaign "beti bachao beti padhao" led by ou

In India sex ratio is good in comparison to other countries.

Option 1:
if the inference is "" probably true"" though not de nitely t

Option 2:
if the inference is "" de nitely true "" it directly follows fro

Option 3:
if you think the data is inadequate , from the facts given yo
likely to be true or false

Option 4:
if you think the inference is "" probably false "" though not
given

Correct Answer:
if you think the data is inadequate , from the facts given yo
likely to be true or false

Solution:
The details about the sex ratio of other countries is not discu

Q. 12 In each question below is given a passage followed by
example each inference separately in the context of th
degree of truth or falsity.

Corel draw and photoshop are the old softwares used fo
Adobe illustrator and the In Design are the new ones, b
are mostly used in the industries. These are designing s
Digital Marketing. Digital Marketing is a technique use
facebook marketing, instagram and E-mail marketing et
approx 70 % of companies to generate lead for their bus
end of traditional marketing strategies. By the coming
scene of marketing is dramatically changed. In india on
internet.

Internet has been used in india from year 2000.

Option 1:
if the inference is "" probably true"" though not de nitely t

Option 2:
if the inference is "" de nitely true "" it directly follows fro

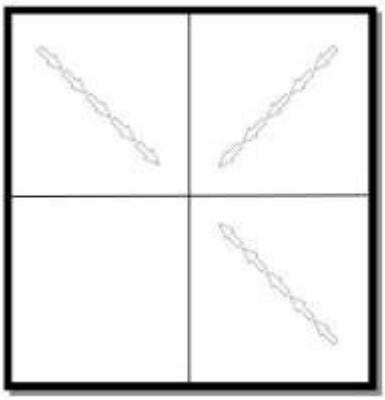
Option 3:
if you think the data is inadequate , from the facts given yo
likely to be true or false

Option 4:
if you think the inference is'de nitely false"" it contradicts

Correct Answer:
if you think the inference is'de nitely false"" it contradicts

Solution:
In the passage it is mention that internet in india starts from

Q. 13 Chart Logic (Insert the Missing Character)



Option 1:

Option 2:

Option 3:

Option 4:

Correct Answer:

Solution:
The arrow pointed towards the center

Q. 14 Find out which of the gure formed after combining the

Option 1:

Option 2:

Option 3:

Option 4:

Correct Answer:

Solution:
it is clear from the gure

Q. 15 Choose the word which is least like the other words in t

Option 1:
Calender

Option 2:
Yea r

Option 3:
Date

Option 4:
M o n t h

Correct Answer:
Calender

Solution:
A l l O t h e r s a r e p a r t s o f a C a l e n d e r

Q. 16 1 , 9 , 2 5 , 4 9 , ? , 1 2 1

Option 1:
6 4

Option 2:
8 1

Option 3:
9 1

Option 4:
1 0 0

Correct Answer:
8 1

Solution:
T h e g i v e n s e r i e s c o n s i s t s o f s q u a r e s o f c o n s e c u t i v e o d d n u m b
$1^2, 3^2, 5^2 \ldots$
S o , missing= 8th term = 9^2

Q. 17 2 , 3 , 8 , 2 7 , 1 1 2 , ?

Option 1:
2 2 6

Option 2:
3 3 9

Option 3:
4 5 2

Option 4:
565

Correct Answer:
565

Solution:
The Pattern is X1+1, X 2+ 2, X 3+ 3, X 4 + 4, ……
so missing term =112 x 5+ 5=565

Q. 18 Choose the word which is least like the other words in t

Option 1:
Curd

Option 2:
Butter

Option 3:
Oil

Option 4:
Cheese

Correct Answer:
Oil

Solution:
All except Oil are products obtained from milk.

Q. 19 Zinc is to Galvanisation as Nickel is to

Option 1:
Aircraft

Option 2:
Corrosion

Option 3:
Electroplating

Option 4:
Filament

Correct Answer:
Correct Answer:
Electroplating

Solution:
Second is the purpose of rst

Q.20 25 : 125 : : 36 : ?

Option 1:
Option 1:
180

Option 2:
Option 2:
206

Option 3:
Option 3:
216

Option 4:
Option 4:
318

Correct Answer:
Correct Answer:
216

Solution:
The relationship is $x^2 : x^3$