Engineering

Q.No. 1

$\sin\pi/16\sin3\pi/16\sin5\pi/16\sin7\pi/16$ =

(A)

$\sqrt{2}/16$

(B)

1/8

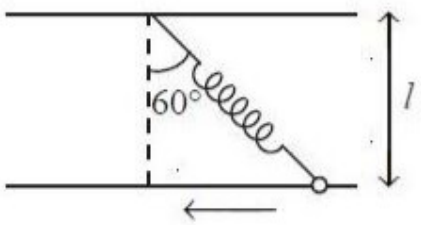
(C)

1/16

(D)

$\sqrt{2}/32$

Q.No. 2 A spring has a natural length l with one end fixed to the ceiling. The other end is fitted with a smooth ling which can slide on a horizontal rod fixed at distance I below the ceiling. Initially the spring makes an angle of 60° with the venical when system is released from rest. Find the angle of the spring with the vertical when the velocity of the ring reaches half of the maximum velocity which the ring can attain during the motion



(A) 30°

(B) $\cos^{-1}\left(\frac{2}{2+\sqrt{3}}\right)$

(C) $\cos^{-1}\left(\frac{\sqrt{3}-1}{2}\right)$

(D) 45°

Q.No. 3

What is the nature of the graph between momentum of a body and its kinetic energy?

(A)

Straight line

(B)

Parabola

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(C)

Circle

(D)

Ellipse

Q.No. 4

If

$$\int_a^b x^3 dx = 0 \text{ and } \int_a^b x^2 dx = \frac{2}{3}$$

then

(A)

a = -1 & b = 1

(B)

a = 1 & b = -1

(C)

a = 2 & b = -2

(D)

a = -2 & b = 2

Q.No. 5 A car starts from rest and moves with a constant acceleration of 5 m/s^2 for 10 seconds before the driver applies the brake. It then decelerates for 5 seconds before coming to rest. The average speed of the car over the entire journey of the car is

(A) 23 m/s

(B) 30 m/s

(C) 33 m/s

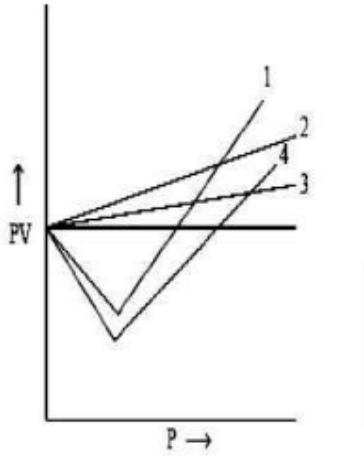
(D) 25 m/s

Q.No. 6

The figure represents PV vs P relation for CO, CH_4, H_2 and He gases under identical conditions. Which curve, shown in the figure, represents He gas?

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(A)

1

(B)

2

(C)

3

(D)

4

Q.No. 7 Assertion (A) : $\bar{a}, \bar{b}, \bar{c}, \bar{d}$ are position vectors of 4 points such that $2\bar{a} - 3\bar{b} + 7\bar{c} - 6\bar{d} = \bar{0}$
$\Rightarrow \bar{a}, \bar{b}, \bar{c}, \bar{d}$ are coplanar.
Reason (R): Vector equation of the plane passing through three points whose position vectors are $\bar{a}, \bar{b}, \bar{c}$ is $\bar{r} = (1 - x - y)\bar{a} + x\bar{b} + y\bar{c}$ Which of the following is true?

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

(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(C) (A) is true, but (R) is false

(D) (A) is false. but (R) is true

Q.No. 8 Bag A contains 6 Green and 8 Red balls and bag B contains 9 Green and 5 Red balls. A card is drawn at random from a well shuffled pack of 52 playing cards, If it is a spade. two balls are drawn at random from bag A. otherwise two balls are drawn at random from bag B. If the two balls drawn are found to be of the same colour, then the probability that they are drawn from bag A is

(A) 43/181

(B) 1/4

(C) 48/131

(D) 43/138

Q.No. 9

Give the correct characteristic colours of the products (P, Q, R, S) formed in the following reactions.

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A) $NO + NO_2 \xrightarrow{< 250\ K} P$

B) $2NO_2 \longleftrightarrow Q$

C) $Pb(NO_3)_2 \xrightarrow{673K} R + PbO$

D) $HNO_3 + P_4O_{10} \longrightarrow S + 4HPO_3$

(A)

P	Q	R	S
Blue	Colourless	Brown	Colourless

(B)

P	Q	R	S
Colourless	Blue	Colourless	Brown

(C)

P	Q	R	S
Colourless	Colourless	Blue	Brown

(D)

P	Q	R	S
Brown	Blue	Colourless	Colourless

Q.No. 10 Consider the following reaction in a 1 L closed vessel. $N_2 + 3H_2 \rightleftharpoons 2NH_3$ If all the species: N_2, H_2 and NH_3 are in 1 mole in the beginning of the reaction and equilibrium is attained after unreacted N_2 is 0.7 moles. What is the value of equilibrium constant.

(A) 3600.00

(B) 3657.14

(C) 2657.14

(D) 1828.57

Q.No. 11 Phosphorous reacts with SO_2Cl_2 to form PCI_5 and X. At 723K, HCl gas reacts with O_2 in the presence of $CuCl_2$, to form water and Y. Y reacts with X in water to form two acids A and B. 'What are A and B respectively?

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(A) H_2SO_4. HCI

(B) $H_2SO_4.HNO_3$

(C) HCl, HNO_3

(D) H_2SO_4, H_3PO_4

Q.No. 12 $\int \frac{x^5 dx}{(x^2+x+1)(x^6+1)(x^4-x^3+x-1)} =$

(A) $\log_e \left| \frac{x^6-1}{x^6+1} \right| + c$

(B) $\frac{1}{12}\log_e \left| \frac{x^6-1}{|x^6+1|} \right| + c$

(C) $\frac{1}{12}\log_e \left| \frac{x^4+1}{x^4-1} \right| + c$

(D) $\log_e \left| \frac{x^8+4}{x^6-1} \right| + c$

Q.No. 13

Newton’s law of cooling holds good provided the temperature difference between body and surrounding is .....

(A)

very large

(B)

large

(C)

small

(D)

very small

Q.No. 14

If (6,—k) and (3, 2) are conjugate points with respect to circle $x^2 + y^2 + 6x + 4y + 12 = 0$. then ‘k’ equals

(A)

-7/4

(B)

7/4

(C)

4/7

(D)

-4/7

Q.No. 15 In Young's double slit experiment, if the slit separation is twice the wavelength of light used. then the maximum number of interference maxima is

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(A) 0

(B) 3

(C) 5

(D) 7

Q.No. 16

A uniform disc of radius ‘a’ and mass ‘m’ is rotating freely with an angular speed of ‘ω' in a horizontal plane about a smooth fixed vertical axis passing through its centre. A particle, also of mass ‘m’ is suddenly attached to the rim of the disc and starts to rotate with it. The new angular speed of this system is

(A)

ω / 3

(B)

ω / 6

(C)

ω / 2

(D)

ω / 5

Q.No. 17

The flow rate of water from a tap of diameter 1.25 cm is 3 litres per minute. If coefficient of viscosity of water is 10^{-3}Pa.s, the nature of flow is _____

(A)

Unsteady

(B)

Turbulent

(C)

Streamlined

(D)

Laminar

Q.No. 18 Which of the following correctly represents Copper sulphate pentahydrate?

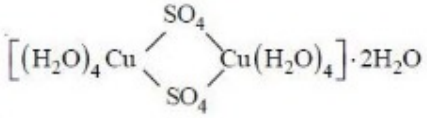
(A) $[Cu(SO_4)(H_2O)_3]2H_2O$

(B) $[Cu(SO_4)(H_2O)_5]$

(C) $[Cu(H_2O)_4]SO_4.H_2O$

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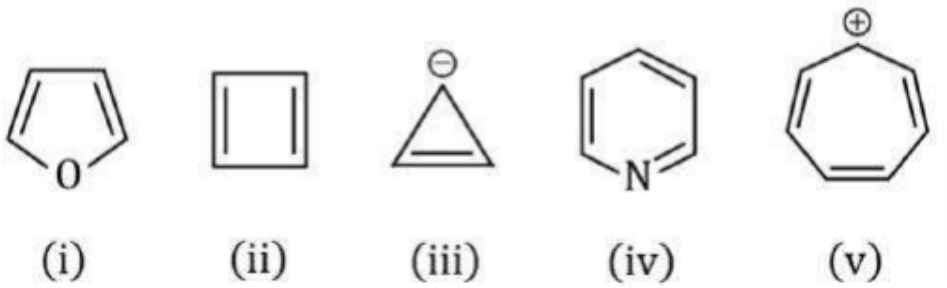
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(D)

Q.No. 19

Which of the following compounds are aromatic?



(A)

(i) (ii) & (iii) only

(B)

(ii) (iii) & (iv) only

(C)

(i) (iv) & (v) only

(D)

(iii) (iv) & (v) only

Q.No. 20

In an isosceles triangle ABC, the coordinates of vertices B and € of the base BC are (3 , 2) and (2,3) respectively, If the equation of the line AB is 3y = 2x, then the equation of the line AC is.....

(A)

2y = 3x

(B)

2y = x

(C)

x + y = 0

(D)

2x - y =0

Q.No. 21

Thermopile Bolometer is used to detect ..

(A)

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ultraviolet radiation

(B)

X-rays

(C)

gamma radiation

(D)

infrared radiation

Q.No. 22 The plane 3x+4y+6z+7 = 0 is rotated about the line $\bar{r} = (\bar{i} + 2\bar{j} - 3\bar{k}) + t(2\bar{i} - 3\bar{j} + \bar{k})$ until the plane passes through origin. The equation of the plane in the new position is

(A) x + y + z = 0

(B) 6x +3y -4z = 0

(C) 4x -5y -2z = 0

(D) x +2y +4z = 0

Q.No. 23

$HCLO_4$ is a stronger acid than 250, due to which of the following reasons?

(i) Oxidation state of Cl in $HClO_4$ is +7 and that of S in H_2SO_4, is +6

(ii) Cl is more electronegative than S

(iii) $HC1O_4$ is monobasic, whereas H_2SO_4 is dibasic

(iv) $Cl0_3$ part of $HClO_4$ can break O — H bond more easily to liberate a proton than SO_3 part in H_2S0_4

(A)

(i), (ii) & (iii) only

(B)

(i), (ii) & (iv) only

(C)

(i), (iii) & (iv) only

(D)

(ii), (iii) & (iv) only

Q.No. 24 The energy of an electron in an orbit of hydrogen like ion with an orbit radius of 59 pm in J is (ground state energy of electron in hydrogen atom is -18 x 10^{-18}J)

(A) -4.36 x 10^{-18}

(B) -1.09 x 10^{-17}

(C) -8.72 x 10^{-18}

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(D) -6.54×10^{-18}

Q.No. 25

A gas deviates most from ideal behavier when it is subjected to

(A)

low temperature & high pressure

(B)

high temperature & low pressure

(C)

high temperature & high pressure

(D)

low temperature & low pressure

Q.No. 26

The number of ways in which 'n' distinct objects can be put into two different boxes is

(A)

$^{n}P_{2}$

(B)

2n

(C)

$^{n}C_{2}$

(D)

n(n-1)(n-2)

Q.No. 27 Define $f(x) = \begin{cases} \dfrac{\sqrt{1+px}-\sqrt{1-px}}{x}, \text{if } -1 \le x < 0 \\ \dfrac{2x+1}{x-2}, \text{if } 0 \le x \le 1 \end{cases}$ If $\lim_{x\to 0} f(x)$ exists then p =

(A) -1

(B) -1/2

(C) 1/2

(D) 1

Q.No. 28

Which condition among the following holds true at the stage of half-completion for the reaction $A \rightleftharpoons B$?

(A)

$\Delta G^{\ominus} = 0$

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(B)

$\Delta G^{\ominus} > 0$

(C)

$\Delta G^{\ominus} < 0$

(D)

$\Delta G^{\ominus} = -RT \ln 2$

Q.No. 29

A Carnot engine having an efficiency 1/5 as a heat engine, is used as a refrigerator. If the work done on the system is 50 J, the amount of energy absorbed from the reservoir at lower temperature is.....

(A)

90J

(B)

99J

(C)

200J

(D)

1J

Q.No. 30

The fringe widths are found to be ω_1 and ω_2, respectively if a Young's double shit experiment 18 performed m medium of refractive index n_1 and n_2 respectively. The correct statement is:

(A)

$\omega_1 > \omega_2$ if $n_1 > n_2$

(B)

$\omega_1 > \omega_2$ if $n_1 < n_2$

(C)

$\omega_1 = \omega_2$ if $n_1 < n_2$

(D)

$\frac{\omega_1}{\omega_2} = \frac{n_1}{n_2}$

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Q.No. 31

$$\lim_{x \to (-3)} \left(\frac{\sin^{-1}(x+3)}{x^2+3x} \right) =$$

(A)

0

(B)

infinite

(C)

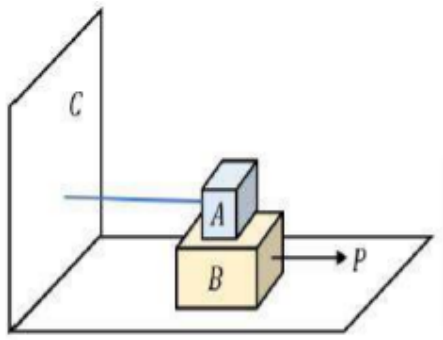
-3

(D)

-1/3

Q.No. 32

Block ‘A’ of mass 100 kg is kept above another block ‘B’ of mass 300 kg. ‘A’ is tied to the wall ‘C’ with a horizontal string. The coefficient of friction between ‘A’ and ‘B’ is 0.35 and that between ‘B” and the horizontal surface is 0.5. Find the horizontal force P, necessary to move the block ‘B’.



(A)

1150N

(B)

1250N

(C)

2350N

(D)

1420N

Q.No. 33

Which of the following statement is correct?

(A)

Electromagnetic force is short ranged

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(B)

Relative strength of gravitational force is higher than that of weak nuclear force

(C)

Range of the weak nuclear force is smaller than that of strong nuclear force

(D)

Relative strength of strong nuclear force may or may not be higher than that of electromagnetic force

Q.No. 34 A rocket is launched straight up from the surface of the earth. When its altitude is 1/3 of the radius of the earth. its fuel runs out and therefore it coasts. If the rocket has to escape from the gravitational pull of the earth, the minimum velocity with which it should coast is (Escape velocity on the surface of the earth is 11.2 kms^{-1})

(A) 11.2 kms^{-1}

(B) 10.7 kms^{-1}

(C) 9.7 kms^{-1}

(D) 8.7 kms^{-1}

Q.No. 35 If z=x + iy , x, y ∈ R and if the point P in the Argand plane represents 2, then the locus of P satisfying the condition $\text{Arg}(\frac{z-1}{z-3i}) = \frac{\pi}{2}$ is

(A) $\{z \in C / \left|z - \frac{1+3i}{2}\right| = \frac{\sqrt{10}}{2}\}$

(B) $\{z \in C / (3-i)z + (3+i)\bar{z} - 6 = 0\}$

(C) $\{z \in C / (3-i)z + (3+i)\bar{z} - 6 > 0, \left|z - \frac{1+3i}{2}\right| = \frac{\sqrt{10}}{2}\}$

(D) $\{z \in C / (3-i)z + (3+i)\bar{z} - 6 < 0, \left|z - \frac{1+3i}{2}\right| = \frac{\sqrt{10}}{2}\}$

Q.No. 36

If the density of a 5 M solution of KCl is 1.26 **g/ml**. then find the molality of the solution. (Molecular mass of KCl = 74.55 g mol)

(A)

0.74 m

(B) 1.26 m

(C)

7.45 m

(D)

3.38 m

Q.No. 37

Determine the value of ‘a’ in tan 70° — tan 20° = a.tan 50° ?

(A)

-4

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(B)

4

(C)

-2

(D)

2

Q.No. 38

In a meter bridge experiment, the balance point from left is 37.5 cm. The ratio of the right gap resistance to the left gap resistance is:

(A)

5/3

(B)

8/5

(C)

4/5

(D)

3/2

Q.No. 39

Let A and B be events with P(A) =1/3, P(B)=1/4 and P(AUB) =1/2, then which of the following statement is incorrect?

(A)

A and B are independent

(B)

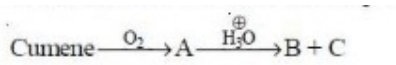
P(A/B) = 1/3

(C)

$P(A^C \cap B) = 1/3$

(D)

$P(A \cap B^C) = 1/4$

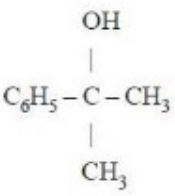


Q.No. 40 What are A, B and C in the following reactions?

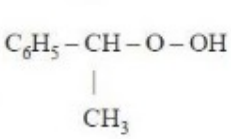
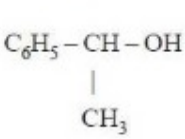
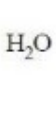
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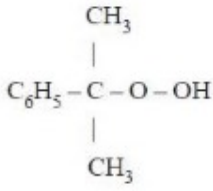
(A)

A	B	C
		

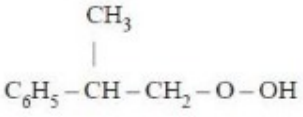
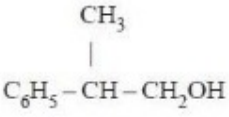
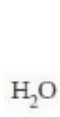
(B)

A	B	C
		

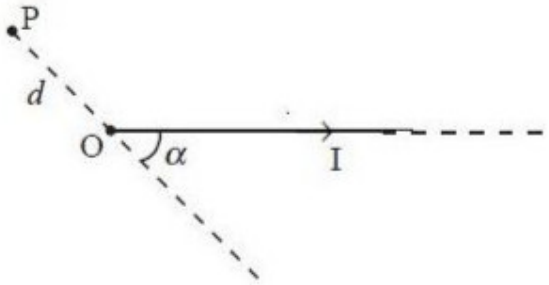
(C)

A	B	C
		

(D)

A	B	C
		

Q.No. 41 A steady current I flows through a wire with one end at O and the other end extending upto infinity as shown in the figure. The magnetic field at a point P, located at a distance 'd' from O is



(A) $\frac{\mu_o I}{4\pi d \cos\alpha}(1-\sin\alpha)$

(B) $\frac{\mu_o I}{2\pi d \cos\alpha}(1-\sin\alpha)$

(C) $\frac{\mu_o I}{4\pi d}$

(D) $\frac{\mu_o I}{4\pi d \sin\alpha}(1-\cos\alpha)$

Q.No. 42

If each element, of a determinant of third order with value A. is multiplied by 3, then the value of newly formed determinant is

(A)

3A

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(B)

9A

(C)

27A

(D)

-27A

Q.No. 43

The locus of the centers of the circles that are passing through the intersection of the circles $x^2+y^2 = 1$ and $x^2 +y^2-2x+y =0$ is

(A)

a line whose equation is x + 2y = 0

(B)

a circle

(C)

a parabola

(D)

a line whose equation is 2x - y = 0

Q.No. 44

$\sin^2 5° + \sin^2 10° + \sin^2 15° +.....+\sin^2 90° =$

(A)

8 1/2

(B)

9

(C)

9 1/2

(D)

4 1/2

Q.No. 45 A small object is thrown at an angle 45° to the horizontal with an initial velocity v_0. The velocity is averaged for first $\sqrt{2}$ s. and the magnitude of average velocity comes out to be same as that of initial velocity, i.e. $\left|\vec{v_0}\right|$. The magnitude $\left|\vec{v_0}\right|$ will be (Take $g = 10\mathrm{m/s^2}$)

(A) 3 m/s

(B) $3\sqrt{2}\mathrm{m/s}$

(C) 4 m/s

(D) 5 m/s

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Q.No. 46

If

$$\int \frac{2\cos x + 3\sin x}{4\cos x + 5\sin x}dx = \left(\frac{23}{41}\right) x + k\log|4\cos x + 5\sin x| + c$$

then k=.....

(A)

2/41

(B)

-2/41

(C)

3/41

(D)

-3/41

Q.No. 47

The value of the determinant

$$\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix}$$

is

(A)

a

(B)

b

(C)

0

(D)

a + b

Q.No. 48 Identify the correct statements from the following. [1] Sulphur sol is an example of a multimolecular colloid. [2] Tyndall effect is observed when the diameter of the dispersed particles is not much smaller than the wavelength of the light used. [3] The process of removing a dissolved substance from a colloidal solution by means of diffusion through a suitable membrane is called peptization. [4] Eosin. gelatin are examples of negatively charged sols.

(A) 1,2,3

(B) 1,2,4

(C) 1,3,4

(D) 2,3,4

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Q.No. 49 If $\cos\theta \neq 0$ and $\sec\theta - 1 = (\sqrt{2} - 1)\tan\theta$ then θ =

(A) $n\pi + \frac{\pi}{8}, n \in Z$

(B) $2n\pi + \frac{\pi}{4} (or) 2n\pi, n \in Z$

(C) $2n\pi + \frac{\pi}{8}, n \in Z$

(D) $2n\pi - \frac{\pi}{4} (or) 2n\pi, n \in Z$

Q.No. 50

A body of mass 3 kg is moving with a velocity of $8m.s^{-1}$ collides head on with another body of mass 1 kg, moving in the opposite direction with a velocity of $4m.s^{-1}$. After the collision, if the two bodies stick together and move, they move with a common velocity.....

(A)

$5ms^{-1}$

(B)

$7ms^{-1}$

(C)

$10ms^{-1}$

(D)

$14ms^{-1}$

Q.No. 51

The self-inductance of two coils of a transformer is 20 mH and 30 mH. What is the resistance between them?

(A)

0

(B)

1.5Ω

(C)

600Ω

(D)

Infinite

Q.No. 52 $\int \frac{x \cdot \log x}{(\sqrt{x^2-1})^3} dx =$

(A) $\sec^{-1} x + \frac{\log x}{\sqrt{x^2-1}} + c$

(B) $\sec^{-1} x - \frac{\log x}{\sqrt{x^2-1}} + c$

(C) $\frac{\log x}{\sqrt{x^2-1}} - \text{Sec}^{-1} x + c$

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(D) $-\frac{\log x}{\sqrt{x^2-1}} - \text{Sec}^{-1} x + c$

Q.No. 53

A real gas would be most likely to obey the ideal gas laws at

(A)

low temperature and low pressure

(B)

high temperature and low pressure

(C)

high temperature and high pressure

(D)

low temperature and high pressure

Q.No. 54

A magnetic field given by B(t) = (0.2 t - 0.05 t^2) T is directed perpendicular to the plane of a circular coil containing 25 turns of radius 1.8 cm and whose total resistance is 5 Ω. The power dissipation at 3 seconds is nearly

(A)

4μW

(B)

7μW

(C)

2.3μW

(D)

1.25μW

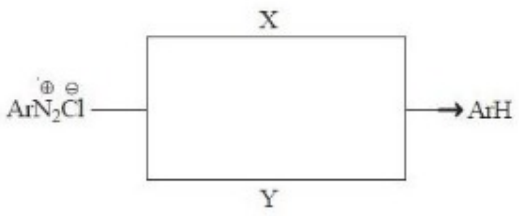
Q.No. 55 If $\tan\frac{\theta}{2} = \text{cosec}\,\theta - \sin\theta$ then $\tan^2\frac{\theta}{2} =$

(A) 2- √5

(B) -2+ √5

(C) 2+ √5

(D) √2 + 5



Q.No. 56 What are X and Y in the following reactions?

(A) X- CH_3CH_2OH Y-H_3PO_2, H_2O

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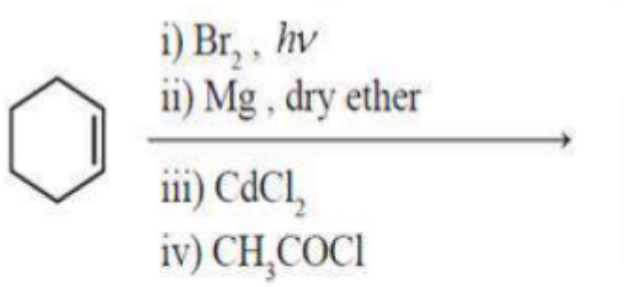
(B) X- CH_3MgX Y- H_3PO_3

(C) X- CH_3CHO Y- H_2O

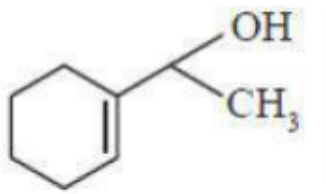
(D) X- $CH_2 = CH_2$ Y-$NaNO_2$/HCl

Q.No. 57

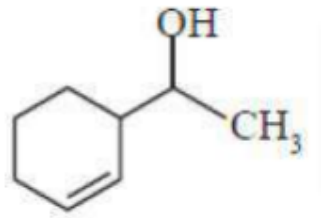
The major product formed in the following reaction scheme is



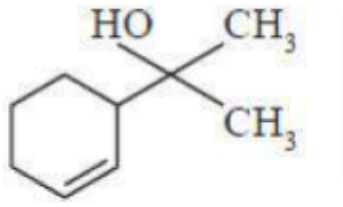
(A)



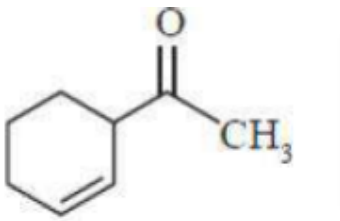
(B)



(C)



(D)



Q.No. 58 If $x^2 - 3ax + 14 = 0$ and $x^2 + 2ax - 16 = 0$ have a common root then $a^4 + a^2 =$

(A) 2

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(B) 90

(C) 6

(D) 20

Q.No. 59 Two sources A and B are producing notes of frequency 680 Hz. A listner moves from A to B with a constant velocity 'v'. If the speed of sound in air is 340 ms^{-1}, the value of 'v' so that he hears 10 beats per second is

(A) 2.0 ms^{-1}

(B) 2.5 ms^{-1}

(C) 3.0 ms^{-1}

(D) 3.5 ms^{-1}

Q.No. 60

If α, β and γ are the roots of the equation $x^3 - 3x^2 + x + 5 = 0$ then $y = \sum \alpha^2 + \alpha\beta\gamma$ satisfies the equation

(A)

$y^3 + y + 2 = 0$

(B)

$y^3 - y^2 - y - 2 = 0$

(C)

$y^3 + 3y^2 - y - 2 = 0$

(D)

$y^3 + 4y^2 + 5y + 20 = 0$

Q.No. 61

Find the value of "k", if the line joining the points (2 , k) and (3 , 7) is parallel to the line joining points (—2 , 1) and (3 , 0).

(A)

37/5

(B)

34/5

(C)

36/5

(D)

35/5

Q.No. 62

Arrange N, S , O & F in order of decreasing electron gain enthalpy

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(A)

F > S > O > N

(B)

N > O> S > F

(C)

O > S > F > N

(D)

S > O > N > F

Q.No. 63

A silver wire of length 3 m and of cross-sectional area 6.14×10^{-6} m^2 carries a current of 6 A. Atomic weight and density of silver are 108 and 10500 $kg.m^{-3}$ respectively. A silver atom contributes one free electron for conduction. Avogadro number is 6.023×10^{23} / mole. Drift velocity of electrons in silver is, close to.....

(A)

$10^{-2}ms^{-1}$

(B)

$10^{-4}ms^{-1}$

(C)

$0.1ms^{-1}$

(D)

$1ms^{-1}$

Q.No. 64

An ideal monoatomic gas of volume V is adiabatically expanded to a volume 3V at 27^oC.. The final temperature in Kelvins is: (use $C_p/C_v = 5/3$)

(A)

144.2

(B)

170.3

(C)

50.4

(D)

100.4

Q.No. 65

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The area of the triangle formed by the line x + y = 4 and angular bisectors of the pair of lines $x^2 - y^2 + 2y - 1 = 0$ is..... sq.units

(A)

9

(B)

4.5

(C)

1.5

(D)

0.5

Q.No. 66 Limiting molar conductivity of Mg^{2+} and Cl^- ions in water is 106.0 and 76.3 S $cm^2 mol^{-1}$. The limiting molar conductivity of magnesium chloride (in $S cm^2\ mol^{-1}$) in water is

(A) 182.3

(B) 258.6

(C) 288.3

(D) 364.6

Q.No. 67

In an amplitude modulation with modulation index 0.5, the ratio of the amplitude of the carrier wave to that of the side band in the modulated wave is

(A)

4:1

(B)

1:4

(C)

1:2

(D)

2:1

Q.No. 68

Let u and v be two non zero vectors in R^3. Then $|u \times v|^2 + |u * v|^2$ is equal to

(A)

$|u|^2+|v|^2$

(B)

2|u||v|

(C)

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$|u|^2|v|^2$

(D)

$(|u|+|v|)^2$

Q.No. 69

If a point (a, a) falls between the lines $|x + y| = 4$. then

(A)

$|a| = 2$

(B)

$|a| = 3$

(C)

$|a| < 2$

(D)

$|a| < 3$

Q.No. 70

If the equation of motion of a projectile is given by $y = 12x - 3/4x^2$ and its horizontal component of velocity is $3m.s^{-1}$, then find its range. ($g = 10\ m.s^{-2}$)

(A)

12.4m

(B)

21.6m

(C)

30.6m

(D)

36.0m

Q.No. 71

Identify the reagents A and B in the following reaction:



(A)

A = HI / red P & B = $LiAlH_4$

(B)

A = Ni / Δ & B = $LiAlH_4$

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(C)

A = Pd / $BaSO_4$ & B = Zn / HCl

(D)

A = $LiAlH_4$ & B = HI / red P

Q.No. 72 Identify the correct catalyst and reaction conditions for the controlled oxidation of methane to (i) methanol (X), (ii) methanal (Y) and ethane to (iii) ethanoic acid (Z)

(A)

(X)	(Y)	(Z)
Mo_2O_3/Δ	$(CH_3COO)_2Mn/\Delta$	$Cu/523K/100\,atm$

(B)

(X)	(Y)	(Z)
$Cu/523K/100\,atm$	Mo_2O_3/Δ	$(CH_3COO)_2Mn/\Delta$

(X)	(Y)	(Z)
$(CH_3COO)_2Mn/\Delta$	$Cu/523K/100\,atm$	Mo_2O_3/Δ

(C)

(D)

(X)	(Y)	(Z)
Mo_2O_3/Δ	$Cu/523K/100$ atm	$(CH_3COO)_2Mn/\Delta$

Q.No. 73 $\int \frac{x-1}{(x+1)\sqrt{x^3+x^2+x}}dx =$

(A) $2\tan^{-1}\left(\sqrt{\frac{1+x+x^2}{x}}\right) + c$

(B) $\tan^{-1}\left(\sqrt{\frac{1+x+x^2}{x}}\right) + c$

(C) $\tan^{-1}\left(\sqrt{\frac{x}{1+x+x^2}}\right) + c$

(D) $\tan^{-1}\left(\sqrt{\frac{1+x^2}{x}}\right) + c$

Q.No. 74 A man who is running has half the kinetic energy of a boy of half his mass. The man speeds up by 1 ms^{-1} and then has the same kinetic energy as the boy. The initial speed of the boy is

(A) $\sqrt{2}+1$ ms^{-1}

(B) $2(\sqrt{2}+1)$ ms^{-1}

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(C) $\sqrt{2}$ ms^{-1}

(D) 2 ms^{-1}

Q.No. 75

The boiling point of water at 1 atm is 100 °C. Which among the following is true for vaporization of water at 75 °C?

(A)

$\Delta G^0_{vap} > 0$

(B)

$\Delta H^0_{vap} < 0$

(C)

$K_{vap} = 1$

(D)

$\Delta S_{vap} < 0$

Q.No. 76 If the position vectors of the vertices of a Δ ABC are $\overline{OA} = 3\bar{i} + \bar{j} + 2\bar{k} \cdot \overrightarrow{OB} = \bar{i} + 2\bar{j} + 3\bar{k}$ and $\overline{OC} = 2\bar{i} + 3\bar{j} + \bar{k}$ then the length of the altitude of Δ ABC drawn from A is

(A) $\sqrt{\frac{3}{2}}$

(B) $\frac{3}{\sqrt{2}}$

(C) $\frac{\sqrt{3}}{2}$

(D) 3/2

Q.No. 77

If

$$\int \frac{2x+3}{x(x+1)(x+2)(x+3)+1}dx = \frac{-1}{ax^2+bx+c} + a$$

then the value of a+b+c =.....

(A)

3

(B)

4

(C)

5

(D)

6

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Q.No. 78 A regular hexagon of side 10 cm has a charge 5 μC at each of its vertices. The potential at the centre of the hexagon.

(A) 0 V

(B) 18 x 10^5

(C) 12.7 x 10^6

(D) 1.08 x 10^5

Q.No. 79

For a reaction

NO_2+ CO = CO_2+ NO the possible elementary steps (below 500K) are

$$\text{Step 1: } NO_2 + NO_2 \xrightarrow{slow} NO + NO_3$$

$$\text{Step 2: } NO_3 + CO \xrightarrow{Fast} CO_2 + NO_2$$

its rate expression will be

(A)

rate = K[NO_2][CO]

(B)

rate = K[CO_2]|[NO]

(C)

rate = K(NO_2]^2

(D)

rate = K[NO][NO_3]

Q.No. 80

The larger of cos(log θ) and log(cos θ) if $e^{-\pi/2}$< θ < π /2is

(A)

cos(log θ)

(B)

log (cosθ)

(C)

None of function is larger

(D)

One of the two function is undefined on domain even to compare

Q.No. 81

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Two bolts, two nuts and three needles are in a box. Two parts are chosen at random from the box, What is the probability that one is a bolt and one is a needle?

(A)

2/21

(B)

4/21

(C)

6/21

(D)

12/21

Q.No. 82

A cyclist traversed half the distance of a linear track with a velocity 10 m/s. The Remaining part of the track was covered with a velocity $\vec{v_1}$, for half the time and a velocity $\vec{v_2}$, for the other half of the time. If $\vec{v_1}+\vec{v_2}=20m/s$, then the average velocity of the cyclist during the completion of the journey through the track is:

(A)

30 m/s

(B)

20 m/s

(C)

10 m/s

(D)

15 m/s

Q.No. 83 A car moving with a certain velocity, jumps from an inclined plane placed at one bank ofa river and reaches the other bank by attaining a maximum height of 0 m. If the same car. moving with the same velocity jumps from another inclined plane having different angle of inclination and reaches the same point on the other bank by attaining maximum height of 45 m, then the width of the river is

(A) 80 m

(B) 60 m

(C) 125 m

(D) 240 m

Q.No. 84 In a system, a particle A of mass m and charge -2q is moving in the nearest orbit around a very heavy particle B having charge +q, Assuming Bohr's model of the atom to be applicable to this system. the orbital angular velocity of the particle A is

(A) $\frac{2\pi m^2 q^2}{\epsilon_0 h^4}$

(B) $\frac{3\pi m^3 q^2}{\epsilon_0^3 h^2}$

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(C) $\frac{2\pi m q^4}{\epsilon_0^2 h^3}$

(D) $\frac{5\pi m^2 q^2}{\epsilon_0 h^4}$

Q.No. 85 In △ABC, ifa, 5, care in arithmetic progression, then cos A+ 2cos B+ cos C=

(A) 1

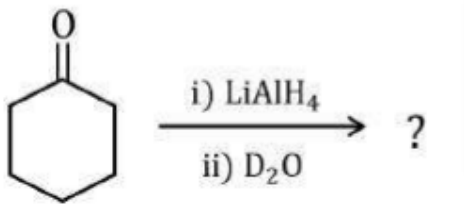
(B) 2

(C) 3/2

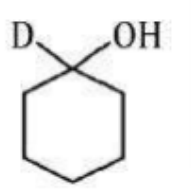
(D) √3+ 1

Q.No. 86

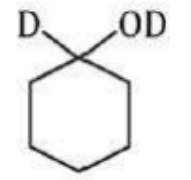
The major product of the following reaction is.....



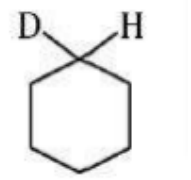
(A)



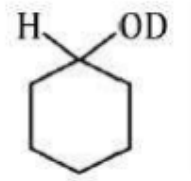
(B)



(C)



(D)



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Q.No. 87 An electric heater with constant heat supply rate is used to convert a certain amount of liquid ammonia to saturated vapour at high pressure. The heater takes 14 minutes to bring the liquid at 15°C to the boiling point of 50°C and 92 minutes to convert the liquid at the boiling point wholly to vapour. If the specific heat capacity of liquid ammonia is 4.9 kJ/kg K, the latent heat of vaporization of ammonia in kJ/kg is

(A) 557

(B) 981

(C) 1127

(D) 2250

Q.No. 88

Which condition among the following holds true at the stage of half-completion for the reaction $A \rightleftharpoons B$?

(A)

$\Delta G^{\ominus} = 0$

(B)

$\Delta G^{\ominus} > 0$

(C)

$\Delta G^{\ominus} < 0$

(D)

$\Delta G^{\ominus} = -RT \ln 2$

Q.No. 89

Let ABCDEF be a regular hexagon with the vertices A, B,C, D,E, F counter clockwise. If '0' is the center of ABCDEF, then the vector $\overrightarrow{AO}$ is to parallel/equal

(A)

$\overrightarrow{FE}$

(B)

$\overrightarrow{CD}$

(C)

$\overrightarrow{CB}$

(D)

$\overrightarrow{DE}$

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Q.No. 90 If x = a, y = b, z = c is the solution of the system of simultaneous linear equations x + y + z = 4, x - y + z = 2, x + 2y +2z = 1 then ab + bc + ca =

(A) 0

(B) - 25

(C) 1

(D) - 4

Q.No. 91 A pair of lines S = 0 together with the lines given by the equation $8x^2$ -14xy +$3y^2$ +10x +107 —25=0 form a parallelogram. If its diagonals intersect at the point (3, 2). then the equation S = 0 is

(A) $6x^2$ - 9xy + y^2 -25x + 30y + 25 = 0

(B) $8x^2$ - 14xy + $3y^2$ -25x + 30y + 50 = 0

(C) $8x^2$ - 14 xy+ $3y^2$ - 50x + 50y + 75 = 0

(D) $6x^2$ + 14xy - $3y^2$ - 30x +40y -75 = 0

Q.No. 92 28 g KOH is required to completely neutralise CO_2 produced on heating 60 g of impure $CaCO_3$. The percentage purity of $CaCO_3$ is approximately (molar masses of KOH and $CaCO_3$ are 56 and 100$gmol^{-1}$ respectively)

(A) 41.6

(B) 40

(C) 20.8

(D) 83.3

Q.No. 93 The abscissae of two points P, Q are the roots of the equation $2x^2$ +4x-7 = 0 and their ordinates are the roots of the equation $3x^2$-12x -1 = 0. Then the centre of the circle With PQ as a diameter is

(A) (-1, 2)

(B) (-2, 6)

(C) (1, -2)

(D) (2, -6)

Q.No. 94 A radioactive substance of half life 16 days is placed in a box. After n days only 20% of the substance is present, then the value of 'n' is

(A) 693

(B) 16

(C) 277.2

(D) 322

Q.No. 95

Let

$\vec{a}, \vec{b}, \vec{c}$

be unit vectors such that

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$$\vec{a} \cdot \vec{b} = 0 = \vec{a} \cdot \vec{c}$$

and the acute angle between

$$\vec{b}$$

and

$$\vec{e}$$

is

$$\frac{\pi}{3}$$

then

$$\left|\vec{a} \times \vec{b} - \vec{a} \times \vec{e}\right| =$$

(A)

1

(B)

1/2

(C)

3

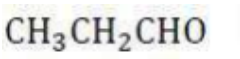
(D)

3/2

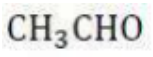
Q.No. 96

Nucleophilic addition reaction will be most favored in which among the following compounds?

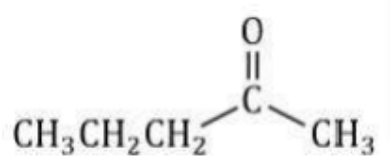
(A)



(B)



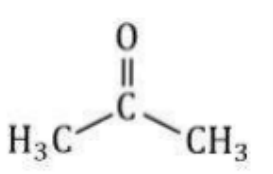
(C)



(D)

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Q.No. 97 The electronic configuration of Cr in $Cr(CO)_6$ as calculated using Crystal Field Theory is

(A) $t_{2g^4}\ e_g0$

(B) $t_{2g^3}\ e_g1$

(C) $t_{2g^6}\ e_g0$

(D) $t_{2g^4}\ e_g2$

Q.No. 98

When a light of wavelength 4900 A falls on a photosensitive metal, a negative 2 V potential is required to stop the emitted electrons. Then the work function of the material is nearly _..... Given charge on electron = 1.602×10^{-19} C and Planck's constant = 6.625×10^{-34}J.s

(A)

1.1eV

(B)

2.2eV

(C)

0.53eV

(D)

1eV

Q.No. 99

Gastric juice contains about 3.0 g of HCI per liter. If a person produces about 2.6 liters of gastric juice per day, find the number of antacid tablets required to neutralize all the HCl produced. Consider each antacid tablet contains 400 mg of Al(0H),. Given atomic masses: Al- 27,0 -16,H -1,C1- 355.

(A)

8

(B)

20

(C)

14

(D)

10

Q.No. 100

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A cylindrical tank is filled with water to a level of 3m. A hole is opened at a height of 52.5 cm from the bottom. The ratio of the area of the hole to that of the cross-sectional area of the tank is 0.1. The square of the speed with which water will be coming out from the orifice is _____($g = 10\ m/s^2$)

(A)

$50\ m^2/s^2$

(B)

$40\ m^2/s^2$

(C)

$51.5\ m^2/s^2$

(D)

$50.5\ m^2/s^2$

Q.No. 101 An object is placed 0.1 m in front of a convex lens of focal length 20 cm made of a material of refractive index 1.5. The surface of the lens away from the object is silvered. If the radius of curvature of the silvered surface is 22 cm, then the distance of the final image from the silvered surface is

(A) 10 cm

(B) 11 cm

(C) 12 cm

(D) 13 cm

Q.No. 102 A wire of length 40 cm and weighing 10 gm is attached to a spring at one end and to a fixed wall at the other end. The spring has a spring constant of 160 N/m and is stretched by 1 cm. If a wave pulse is produced on the suing near the wall, how much time will it take to reach the spring

(A) 0.05 s

(B) 0.02 s

(C) 0.3 s

(D) 0.4 s

Q.No. 103

Which of the following is the best container for a gas during adiabatic process?

(A)

Glass vessel

(B)

Copper vessel

(C)

Wood vessel

(D)

Thermos flask

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Q.No. 104

A radio receiver antenna that is 4 m long is oriented along the direction the electromagnetic wave and it receives a signal of intensity 8 X 10^{-16} w.m^{-2}. The maximum instantaneous potential difference across the two ends of the antenna is

(A)

1.23 μW

(B)

3.1 μW

(C)

31 μW

(D)

7.76 μW

Q.No. 105 If $\lim_{x\to-\infty}\{\frac{x^3+1}{x^2+1}-(\alpha x+\beta)\}$ exists and equal to 2 then the ordered pair (α,β) of real numbers is

(A) (1, -1)

(B) (-2, 1)

(C) (-1, 1)

(D) (1, 2)

Q.No. 106

If the maximum kinetic energy of photoelectrons ejected from a metal surface when it is inradiated with a radiation of frequency 4 x10^{14} $s^{-1}$is 6.63 x 10^{-20} J, then the threshold frequency of the metal is

(A)

2 * 10^{14}

(B)

1x 10^{14}

(C)

3* 10^{14}

(D)

1 *10^{-14}

Q.No. 107 In the first order thermal decomposition of $C_2H_5I_{2(g)} \rightarrow C_2H_{4(g)} + HI_{(g)}$ the reactant in the beginning exerts a pressure of 2 bar in a closed vessel at 600 K. If the partial pressure of the reactant is 0.1 bar after 1000 minutes at the same temperature the rate constant in min^{-1} is (log 2 = 0.30)

(A) 6 x 10^{-4}

(B) 6 x 10^{3}

(C) 6 x 10^{-3}

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(D) 6×10^4

Q.No. 108

A particle executing simple harmonic motion has a maximum speed of 40 $m.s^{-1}$ and maximum acceleration of 60 $m.s^{-2}$. The period of oscillation is

(A)

$4\pi/3$ sec

(B)

$\pi/2$ sec

(C)

2π sec

(D)

$1/\pi$ sec

Q.No. 109

If

$$\int \frac{5\tan(x)}{\tan(x)-2}dx = x + a\log|\sin(x) - 2\cos(x)| + k$$

then a= .....

(A)

-1

(B)

-2

(C)

1

(D)

2

Q.No. 110

Assertion (A): The colour of radiation does not change on passing through different media.

Reason (R): The media do not absorb or emit colours.

(A)

Both A and R are true and R is a correct explanation for A

(B)

Both A and R are true but R is not a correct explanation for A

(C)

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A is true, R is false

(D)

A is false, R is true

Q.No. 111 $\cos^2 5^\circ - \cos^2 15^\circ - \sin^2 15^\circ + \sin^2 35^\circ + \cos 15^\circ \sin 15^\circ - \cos 5^\circ \sin 35^\circ =$

(A) 0

(B) 1

(C) 3/2

(D) 2

Q.No. 112

If the equation $2x^2$ + kxy — $6y^2$ + 3x+y+1=0, (k > 0) represents a pair of straight lines, then their point of intersection is

(A)

(5/8, 1/8)

(B)

(5/8, -1/8)

(C)

(-5/8, -1/8)

(D)

(-5/8, 1/8)

Q.No. 113

A cylinder of mass 12 kg is sliding on plane with an initial velocity 20 $m.s^{-1}$. If the coefficient of friction between the surface and the cylinder is 0.5, before stopping. the cylinder describes a distance of .....

(A)

40m

(B)

5m

(C)

20 m

(D)

10 m

Q.No. 114 When an inductor of inductance $\frac{6}{\pi}$H a capacitor of capacitance $\frac{50}{\pi}\mu$F and resistor of resistance R are connected in series with an ac supply of rms voltage 220 V and frequency 50 Hz, the rms current through the circuit is 440 mA. Match the inductive reactance (X_L). the capacitive reactance (X_c), the resistance (R) and the impedance

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(Z) of the circuit given in list- I with the corresponding values given in list-II.

List - I జాబితా-I		List - II జాబితా-II	
A)	X_L	I)	200 Ω
B)	X_C	II)	300 Ω
C)	R	III)	500 Ω
D)	Z	IV)	600 Ω

(A) A-IV, B-II, C-I, D-III

(B) A-IV, B-III, C-I, D-II

(C) A-IV, B-I, C-II, D-III

(D) A-I, B-IV, C-III, D-II

Q.No. 115

The equation of a line though the point (1,2) whose distance from the point (3,1) has the greatest value is

(A)

y=2x

(B)

y=x+1

(C)

x+2y=5

(D)

y=3x-1

Q.No. 116

In perfectly inelastic collisions. the relative velocity of the bodies:

(A)

before impact is zero

(B)

before impact is equal to that after impact

(C)

after impact is zero

(D)

is characterized by none of the above

Q.No. 117

2 aero planes [and II bond a target in succession, The probabilities of I and II scoring a hit correctly 1s 0.3 and 0.2 respectively, The second plane will bomb only if first misses the target. The probability that the target is hit by the

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2^{nd} plane is

(A)

0.06

(B)

0.14

(C)

0.32

(D)

0.7

Q.No. 118

The plane passing through the points (1,1,1).(1,-1,1) and (-7 ,-3,-5) is

(A)

Parallel to x-axis

(B)

Parallel to y-axis

(C)

Parallel to z-axis

(D)

3x-4z-1=0

Q.No. 119

A hydrogen atom emits a photon corresponding to an electron transition from n=5 to n= 1, If R is the Rydberg constant, then the wavelength of emitted photon is:

(A)

25/24R

(B)

24R/25

(C)

4/5R

(D)

5R/4

Q.No. 120

Minimum value of $5\tan^2\alpha + 9/\tan^2\alpha + 4\sec^2\alpha$ is

(A)

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24

(B)

22

(C)

32

(D)

28

Q.No. 121 A projectile is thrown in the upward direction making an angle of 60° with the horizontal with a velocity of 140 ms^{-1}. Then the time after which its makes 45° with the horizontal is (Acceleration due to gravity = 10 ms^{-2})

(A) 0.5124 s

(B) 51.24 s

(C) 5.124 s

(D) 512.4 s

Q.No. 122

A body of mass 0.15 kg moving with a velocity of 15 $m.s^{-1}$ comes to rest when it hits a spring that is fixed at another end. If the force constant of the spring is 1500 $N.m^{-1}$, the compression in the spring is.....

(A)

0.15m

(B)

0.1m

(C)

0.2m

(D)

0.5m

Q.No. 123

A particle slides down along an inclined plane AC. If the A plane is frictionless, kinetic energy of particle at 'C' is

(A)

mgy

(B)

mgx

(C)

mg (y/ Sin θ)

(D)

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mg (y/ Cos θ)

Q.No. 124 Collision takes place between two solid spheres denoted as I and 2. The initial velocities of the spheres are $u_1 = 3m/s$ and $u_2 = 1.5m/s$ and the final velocities are $v_1 = 2.5m/s$ and $v_2 = 3.5m/s$ The coefficient of restitution between the materials of the spheres is nearly

(A) 0.67

(B) 0.78

(C) 0.83

(D) 0.96

Q.No. 125

Let

$$\vec{a}, \vec{b}$$

and

$$\vec{e}$$

be the three vectors. If

$$|\vec{a}| = 1, |\vec{b}| = 17, |\vec{e}| = 8$$

and the angle between

$$\vec{a}$$

and $\vec{b}

is

\theta

and

\vec{a} \times(\vec{a} \times \vec{b})-\vec{c}=0

, then

\cos \theta+\operatorname{cosec} \theta=$$

(A)

409/136

(B)

309/136

(C)

419/126

(D)

409/126

Q.No. 126

$$\text{If A is a matrix } \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, \text{ then } A^n = \begin{bmatrix} 1 & 0 \\ n & 1 \end{bmatrix}, \forall n \in N$$

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(A)

not true for n=3

(B)

not true for n=2

(C)

true for n=3

(D)

not true for n=1

Q.No. 127 An earthquake generates both transverse (S) and longitudinal (p) waves in the earth with speeds 4.5 km^{-1} and 8.0 km s^{-1} respectively. A seismograph records that the first P-wave arrives 3.5 minutes earlier than the first S-wave. From the seismograph, the epicentre of the earthquake is located at a distance

(A) 1080 km

(B) 2468 km

(C) 2160 km

(D) 4320 km

Q.No. 128

A disc of mass 4 kg and radius 0.4 m is rotating with angular velocity 30 $rad.s^{-1}$. When two point-masses, each 0.25 kg, are attached on the periphery of the disc, at diametrically opposite points, its angular velocity becomes .....

(A)

24 $rad.s^{-1}$

(B)

27 $rad.s^{-1}$

(C)

21 $rad.s^{-1}$

(D)

10 $rad.s^{-1}$

Q.No. 129 Let M and m respectively denote the maximum and the minimum values of $[f(\theta)]^2$ where $f(\theta) = \sqrt{a^2\cos^2\theta + b^2\sin^2\theta} + \sqrt{a^2\sin^2\theta + b^2\cos^2\theta}$. Then M - m =

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

(B) $(a-b)^2$

(C) a^2b^2

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(D) $(a + b)^2$

Q.No. 130

A circular hoop of radius 50 cm and mass | kg rotating with an angular velocity «wo is placed on a rough horizontal surface. The initial velocity of the centre of the hoop is zero. Let 'v' be the velocity of the centre of the hoop when it ceases to slip. The ratio v/ w_o will be:

(A)

10 cm

(B)

15 cm

(C)

25 cm

(D)

12.5 cm

Q.No. 131

Vitamin-A is called

(A)

Ascorbic acid

(B)

Retinol

(C)

Calciferol

(D)

Tocopherol

Q.No. 132

Let u, v and w are non coplanar vectors, then the value of

$$\frac{(u + 2v - w) \cdot [(u - v) \times (u - v - w)]}{[u \quad v \quad w]}$$

is equal to

(A)

1

(B)

3

(C)

4

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(D)

2

Q.No. 133

If

$$\frac{x}{(1+x^2)(3-2x)} = \frac{Bx+C}{1+x^2} + \frac{A}{3-2x}$$

then 'C' is

(A)

2/3

(B)

1/13

(C)

-1/13

(D)

-2/13

Q.No. 134

The maximum area of a rectangle that can be formed with a fixed perimeter of 20 units is .....sq. units

(A)

30

(B)

25

(C)

20

(D)

15

Q.No. 135

In the electronic configuration of which of the given elements, 'Aufbau principle' or (n + l) rule is violated?

(A)

Mn

(B)

Ga

(C)

La

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(D)

Pu

Q.No. 136

The number of distinct positive integers can be formed using 0, 1, 2, 3 where each integer used at most once is equal to

(A)

84

(B)

64

(C)

48

(D)

36

Q.No. 137 For $A \neq 0, x < 0, \lim_{n \to \infty} \frac{\sin x - e^n}{1 + Ae^{nx}} =$

(A) 1/A

(B) sin x

(C) -1/A

(D) -sin x

Q.No. 138 Identify the set of acidic oxides.

(A) Na_2O, CaO, BaO

(B) ZnO, PbO, BeO

(C) CO, NO, N_2O

(D) Mn_2O_7, CrO_3, V_2O_5

Q.No. 139

Which of the following. in general. is a slow process?

(A)

Isothermal

(B)

Adiabatic

(C)

Isobaric

(D)

Isochoric

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Q.No. 140 If f: A→ B is an onto function such that $f(x) = \sqrt{|x| - x} + \frac{1}{\sqrt{|x|-x}}$ then A and B are respectively

(A) (-∞, ∞), (0,∞)

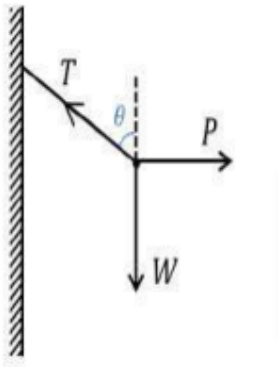
(B) (-∞, 0), (2,∞)

(C) (0,∞), (2,∞)

(D) (-∞, 0], (0,∞)

Q.No. 141

A small sphere is hung by a string fixed to a wall as shown in the figure. The sphere is pushed from the wall by a stick. The forces acting on the sphere are as shown. Then, identify the incorrect expression.



(A)

P=W tan θ

(B)

T=P+W=0

(C)

$T^2=P^2+W^2$

(D)

T=P+W

Q.No. 142 A 30 kg boy stands at the far edge of a floating plank whose near edge is against the shore of a river. The plank is 10 m long and weighs 10 kg. If the boy walks to the near edge of the plank, how far from the shore does the plank move

(A) 7 m

(B) 8 m

(C) 7.5 m

(D) 15 m

Q.No. 143

ΔW = 0 for the process _____

(A)

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Isobaric

(B)

Isochoric

(C)

Isothermal

(D)

Adiabatic

Q.No. 144

Define f:C + R by f(z) = |z| $\forall z \in C$. Then which of the following is false?

(A)

$f(-z)=f(z)\ \forall z \in C.$

(B)

$f(z)=f(z)\ \forall z \in C.$

(C)

$f(z^2)=(f(z))^2\ \forall z \in C.$

(D)

$f(z_1^2+z_2^2)=f(z_1^2)+f(z^2_2)\ \forall z_1 z_2 \in C.$

Q.No. 145 If a function f(x) defined by $f(x) = \begin{cases} ax + b, & x \leq -1 \\ 2x^2 + 2bx - \frac{a}{2}, & -1 < x < 1 \\ 7, & x \geq 1 \end{cases}$ is continuous on R then (a , b) =

(A) (-22 , -3)

(B) (22 , 3)

(C) (11 , -6)

(D) (-22 , -6)

Q.No. 146

50 g of copper is heated to increase its temperature by 10 °C. If the same quantity of heat is given to 10 g of water, the rise in temperature is (specific heat of Cu = 420 $J.kg^{-1}.°C^{-1}$ and specific heat of water is 4200 $J.kg^{-1}°C^{-1}$)

(A)

6°C

(B)

10°C

(C)

5°C

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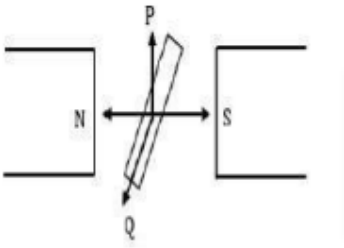
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(D)

15°C

Q.No. 147

Figure shows a straight wire placed between the pole pieces of a P magnet. Induced emf will be developed across the ends of the wire when it is moved towards



(A)

N

(B)

S

(C)

P

(D)

Q

Q.No. 148 If $y = \frac{(x+1)^2\sqrt{x-1}}{(x+4)^3e^x}$, then $\frac{dy}{dx} =$

(A) $\frac{(x+1)^3\sqrt{x-1}}{(x+4)^2e^x}[\frac{2}{x+1} + \frac{1}{2(x-1)} - \frac{3}{x+4} - 1]$

(B) $\frac{(x+1)^2\sqrt{x-1}}{(x+4)^3e^x}[\frac{2}{x+1} + \frac{1}{2(x-1)} + \frac{3}{x+4} - 1]$

(C) $\frac{(x+1)^2\sqrt{x-1}}{(x+4)^3e^x}[\frac{2}{x+1} + \frac{1}{2(x-1)} - \frac{3}{x+4} - 1]$

(D) $\frac{(x+1)\sqrt{x-1}}{(4+x)^2e^x}[\frac{2}{x+1} + \frac{1}{x-1} - \frac{3}{4+x} - 1]$

Q.No. 149 In

$$\triangle ABC \frac{1}{r^2} + \frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_1^2} =$$

(A)

$$\frac{a+b+c}{\Delta}$$

(B)

$$\frac{a^2+b^2+c^2}{\Delta^2}$$

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(C)

$$\frac{1}{2Rr}$$

(D) R

Q.No. 150 The non-biodegradable waste fonned in fertilizer industries is

(A) fly ash

(B) carbon monoxide

(C) gypsum

(D) lead

Q.No. 151

Speed of a sound in air.....

(A)

is independent of temperature

(B)

increases with pressure

(C)

increases with increase in humidity

(D)

decreases with increase in humidity

Q.No. 152 If the area of the region bounded by the curves $y= x^2$ and $x=y^2$ is & then the area of the region bounded by the curves $\frac{x+\sqrt{3}y}{2} = \left(\frac{\sqrt{3}x-y}{2}\right)^2$ and $\frac{\sqrt{3}x-y}{2} = \left(\frac{x+\sqrt{3}y}{2}\right)^2$ is

(A) $\frac{\sqrt{3}}{2}$k

(B) ½ k

(C) k

(D) $\left(\frac{\sqrt{3}+1}{2}\right)$ k

Q.No. 153

A wooden block floating in a bucket of water has $(4/5)^{th}$ of its volume submerged. When certain amount of an oil is poured in to the bucket, it is found that the block is just under the oil surface, with half of its volume under water and the other half in oil, The density of oil used, relative to that of water is.....

(A)

1/4

(B)

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3/5

(C)

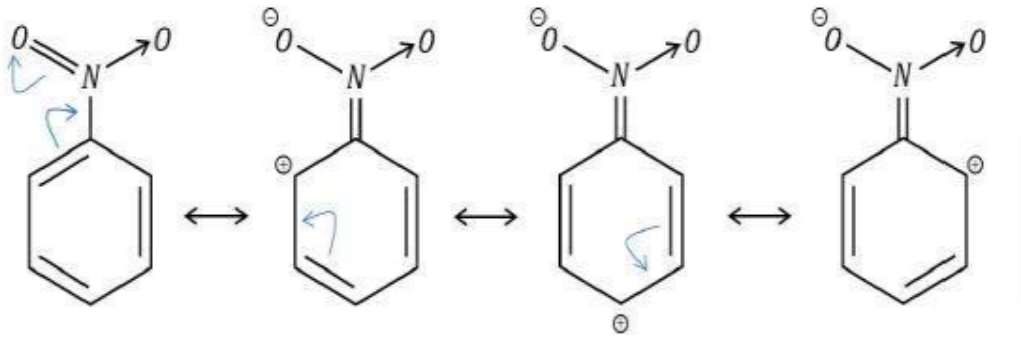
2/5

(D)

5/3

Q.No. 154

The electron transfer in the following conjugated system shows .....



(A)

—R effect

(B)

—I effect

(C)

+R effect

(D)

+I effect

Q.No. 155

The number of bridged CO ligands present in $Fe_2(CO)_9$ and $CO_2(CO)_8$ respectively, are

(A)

2,1

(B)

2,2

(C)

2,3

(D)

3,2

Q.No. 156 A rectangular loop of wire is placed in the XY plane with its side of length 3 cm parallel to the X-axis and the side of length 4 cm parallel to the Y-axis. It is moving in the positive X direction with the speed 10 cm/sec.

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A magnetic field exists in the space with its direction parallel to the Z - axis. The field decreases by $2 \times 10^{-3}\mathrm{T/cm}$ along the positive X - axis and increases in time by $2 \times 10^{-2}\mathrm{T/sec}$. The induced emf in the wire is

(A) $-4.8 \times 10^{-5}\mathrm{V}$

(B) $4.8 \times 10^{-5}\mathrm{V}$

(C) 0

(D) $3.6 \times 10^{-5}\mathrm{V}$

Q.No. 157

Which of the following pairs of reactions give H_2 gas as a product upon hydrolysis?

(A)

a) $Ba \xrightarrow{H_2O}$ products

b) $BaO_2 \xrightarrow{H_2O}$ products

(B)

a) $Ca \xrightarrow{H_2O}$ products

b) $CaH_2 \xrightarrow{H_2O}$ products

(C)

a) $K \xrightarrow{H_2O}$ products

b) $K_2O \xrightarrow{H_2O}$ products

(D)

a) $Na \xrightarrow{H_2O}$ products

b) $Na_2O_2 \xrightarrow{H_2O}$ products

Q.No. 158

Photo cells convert .....

(A)

light energy into mechanical energy

(B)

heat energy into electrical energy

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(C)

light energy into electrical energy

(D)

electrical energy into light energy

Q.No. 159

The equation of a curve passing through the point (0 , 1). given that the slope of the tangent to the curve at any point (x , y) is equal to the sum of the x-coordinate, and the product of x and y coordinates at that point, is

(A)

$$y = 1 - 2\,e^{(x^2/2)}$$

(B)

$$y = -1 + 2\,e^{(x^2/2)}$$

(C)

$$y = -1 - 2\,e^{(x^2/2)}$$

(D)

$$y = 1 + 2\,e^{(x^2/2)}$$

Q.No. 160

Identify the incorrect statement regarding crystals having Frenkel defect:

(A)

Frenkel defects are observed where the difference in sizes of cations and anions is large.

(B)

The density of crystals having Frenkel defect is less than that of a pure perfect crystal.

(C)

An ionic crystal having Frenkel defect may also contain Schottky detect.

(D)

Alkali halides don’t usually have Frenkel defect.

Answer Sheet

Q.No	Answer
Q.No. 1	(A)
Q.No. 2	(B)

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Q.No. 3	(B)
Q.No. 4	(A)
Q.No. 5	(D)
Q.No. 6	(C)
Q.No. 7	(A)
Q.No. 8	(A)
Q.No. 9	(A)
Q.No. 10	(B)
Q.No. 11	(A)
Q.No. 12	(B)
Q.No. 13	(C)
Q.No. 14	(B)
Q.No. 15	(C)
Q.No. 16	(A)
Q.No. 17	(B)
Q.No. 18	(C)
Q.No. 19	(C)
Q.No. 20	(A)
Q.No. 21	(D)
Q.No. 22	(A)
Q.No. 23	(B)
Q.No. 24	(C)
Q.No. 25	(A)
Q.No. 26	(B)
Q.No. 27	(B)
Q.No. 28	(A)
Q.No. 29	(C)
Q.No. 30	(B)
Q.No. 31	(D)
Q.No. 32	(C)
Q.No. 33	(C)
Q.No. 34	(C)
Q.No. 35	(C)
Q.No. 36	(D)
Q.No. 37	(D)
Q.No. 38	(A)
Q.No. 39	(C)
Q.No. 40	(C)
Q.No. 41	(D)
Q.No. 42	(C)
Q.No. 43	(A)

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Q.No. 44	(C)
Q.No. 45	(D)
Q.No. 46	(B)
Q.No. 47	(C)
Q.No. 48	(B)
Q.No. 49	(B)
Q.No. 50	(A)
Q.No. 51	(D)
Q.No. 52	(B)
Q.No. 53	(B)
Q.No. 54	(D)
Q.No. 55	(B)
Q.No. 56	(A)
Q.No. 57	(D)
Q.No. 58	(B)
Q.No. 59	(B)
Q.No. 60	(B)
Q.No. 61	(C)
Q.No. 62	(A)
Q.No. 63	(C)
Q.No. 64	(A)
Q.No. 65	(B)
Q.No. 66	(B)
Q.No. 67	(A)
Q.No. 68	(C)
Q.No. 69	(A)
Q.No. 70	(B)
Q.No. 71	(D)
Q.No. 72	(B)
Q.No. 73	(A)
Q.No. 74	(B)
Q.No. 75	(A)
Q.No. 76	(B)
Q.No. 77	(C)
Q.No. 78	(C)
Q.No. 79	(C)
Q.No. 80	(A)
Q.No. 81	(C)
Q.No. 82	(C)
Q.No. 83	(D)
Q.No. 84	(C)

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Q.No. 85	(B)
Q.No. 86	(D)
Q.No. 87	(C)
Q.No. 88	(A)
Q.No. 89	(A)
Q.No. 90	(B)
Q.No. 91	(C)
Q.No. 92	(A)
Q.No. 93	(A)
Q.No. 94	(D)
Q.No. 95	(A)
Q.No. 96	(B)
Q.No. 97	(C)
Q.No. 98	(C)
Q.No. 99	(C)
Q.No. 100	(A)
Q.No. 101	(B)
Q.No. 102	(A)
Q.No. 103	(D)
Q.No. 104	(B)
Q.No. 105	(D)
Q.No. 106	(C)
Q.No. 107	(C)
Q.No. 108	(A)
Q.No. 109	(D)
Q.No. 110	(C)
Q.No. 111	(A)
Q.No. 112	(C)
Q.No. 113	(A)
Q.No. 114	(C)
Q.No. 115	(A)
Q.No. 116	(C)
Q.No. 117	(C)
Q.No. 118	(B)
Q.No. 119	(A)
Q.No. 120	(B)
Q.No. 121	(C)
Q.No. 122	(A)
Q.No. 123	(A)
Q.No. 124	(A)
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Q.No. 126	(C)
Q.No. 127	(C)
Q.No. 128	(A)
Q.No. 129	(B)
Q.No. 130	(C)
Q.No. 131	(B)
Q.No. 132	(B)
Q.No. 133	(D)
Q.No. 134	(B)
Q.No. 135	(C)
Q.No. 136	(C)
Q.No. 137	(B)
Q.No. 138	(D)
Q.No. 139	(A)
Q.No. 140	(B)
Q.No. 141	(D)
Q.No. 142	(C)
Q.No. 143	(B)
Q.No. 144	(D)
Q.No. 145	(A)
Q.No. 146	(C)
Q.No. 147	(C)
Q.No. 148	(C)
Q.No. 149	(A)
Q.No. 150	(C)
Q.No. 151	(C)
Q.No. 152	(C)
Q.No. 153	(B)
Q.No. 154	(A)
Q.No. 155	(D)
Q.No. 156	(C)
Q.No. 157	(B)
Q.No. 158	(C)
Q.No. 159	(B)
Q.No. 160	(B)

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