

JEE Main Exam

01 Sep 2021 (Evening, Shift-2)

Section : Physics Section A

- Q.1** The temperature of an ideal gas in 3-dimensions is 300 K. The corresponding de-Broglie wavelength of the electron approximately at 300 K, is :
[m_e = mass of electron = 9×10^{-31} kg
 h = Planck constant = 6.6×10^{-34} J s
 k_B = Boltzmann constant = 1.38×10^{-23} JK $^{-1}$]

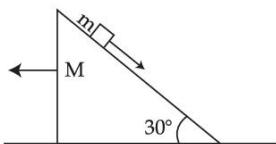
- Options**
1. 2.26 nm
 2. 3.25 nm
 3. 8.46 nm
 4. 6.26 nm

Question Type : MCQ
Question ID : 86435121520
Option 1 ID : 86435171141
Option 2 ID : 86435171142
Option 3 ID : 86435171144
Option 4 ID : 86435171143

- Q.2** A block of mass m slides on the wooden wedge, which in turn slides backward on the horizontal surface. The acceleration of the block with respect to the wedge is :

Given $m = 8 \text{ kg}$, $M = 16 \text{ kg}$

Assume all the surfaces shown in the figure to be frictionless.



Options

1. $\frac{3}{5} g$
2. $\frac{4}{3} g$
3. $\frac{6}{5} g$
4. $\frac{2}{3} g$

Question Type : MCQ

Question ID : 86435121532

Option 1 ID : 86435171191

Option 2 ID : 86435171189

Option 3 ID : 86435171192

Option 4 ID : 86435171190

- Q.3** The ranges and heights for two projectiles projected with the same initial velocity at angles 42° and 48° with the horizontal are R_1 , R_2 and H_1 , H_2 respectively. Choose the correct option :

Options

1. $R_1 = R_2$ and $H_1 = H_2$
2. $R_1 = R_2$ and $H_1 < H_2$
3. $R_1 > R_2$ and $H_1 = H_2$
4. $R_1 < R_2$ and $H_1 < H_2$

Question Type : MCQ

Question ID : 86435121531

Option 1 ID : 86435171188

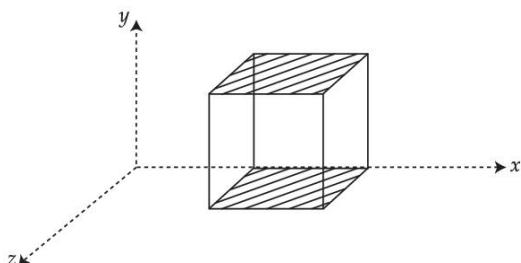
Option 2 ID : 86435171185

Option 3 ID : 86435171186

Option 4 ID : 86435171187

Q.4

A cube is placed inside an electric field, $\vec{E} = 150y^2 \hat{j}$. The side of the cube is 0.5 m and is placed in the field as shown in the given figure. The charge inside the cube is :



Options

1. $8.3 \times 10^{-11} \text{ C}$
2. $3.8 \times 10^{-11} \text{ C}$
3. $3.8 \times 10^{-12} \text{ C}$
4. $8.3 \times 10^{-12} \text{ C}$

Question Type : MCQ

Question ID : 86435121527

Option 1 ID : 86435171169

Option 2 ID : 86435171170

Option 3 ID : 86435171172

Option 4 ID : 86435171171

Q.5

Due to cold weather a 1 m water pipe of cross-sectional area 1 cm^2 is filled with ice at -10°C . Resistive heating is used to melt the ice. Current of 0.5 A is passed through $4 \text{ k}\Omega$ resistance. Assuming that all the heat produced is used for melting, what is the minimum time required ?

(Given latent heat of fusion for water/ice = $3.33 \times 10^5 \text{ J kg}^{-1}$,
specific heat of ice = $2 \times 10^3 \text{ J kg}^{-1}$ and
density of ice = 10^3 kg/m^3)

Options

1. 3.53 s
2. 0.353 s
3. 35.3 s
4. 70.6 s

Question Type : MCQ

Question ID : 86435121528

Option 1 ID : 86435171176

Option 2 ID : 86435171173

Option 3 ID : 86435171174

Option 4 ID : 86435171175

Q.6

A student determined Young's Modulus of elasticity using the formula $Y = \frac{MgL^3}{4bd^3\delta}$. The

value of g is taken to be 9.8 m/s^2 , without any significant error, his observation are as following.

Physical Quantity	Least count of the Equipment used for measurement	Observed Value
Mass (M)	1 g	2 kg
Length of bar (L)	1 mm	1 m
Breadth of bar (b)	0.1 mm	4 cm
Thickness of bar (d)	0.01 mm	0.4 cm
Depression (δ)	0.01 mm	5 mm

Then the fractional error in the measurement of Y is :

- Options**
1. 0.155
 2. 0.0083
 3. 0.083
 4. 0.0155

Question Type : MCQ

Question ID : 86435121538

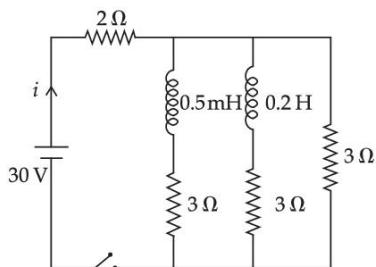
Option 1 ID : 86435171216

Option 2 ID : 86435171213

Option 3 ID : 86435171214

Option 4 ID : 86435171215

Q.7 For the given circuit the current i through the battery when the key is closed and the steady state has been reached is _____.



- Options**
1. 10 A
 2. 6 A
 3. 25 A
 4. 0 A

Question Type : MCQ

Question ID : 86435121524

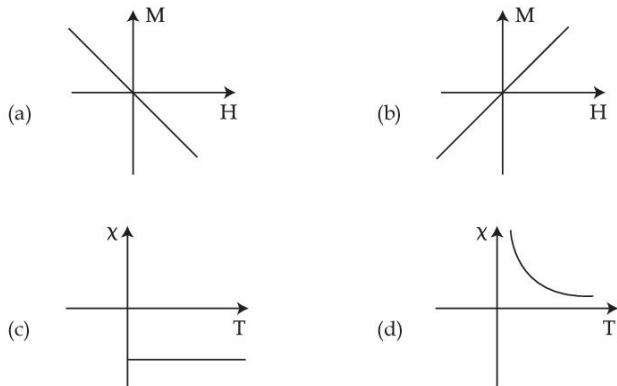
Option 1 ID : 86435171159

Option 2 ID : 86435171158

Option 3 ID : 86435171160

Option 4 ID : 86435171157

Q.8 Following plots show Magnetization (M) vs Magnetising field (H) and Magnetic susceptibility (χ) vs Temperature (T) graph :



Which of the following combination will be represented by a diamagnetic material ?

Options

1. (b), (c)
2. (b), (d)
3. (a), (d)
4. (a), (c)

Question Type : MCQ

Question ID : 86435121529

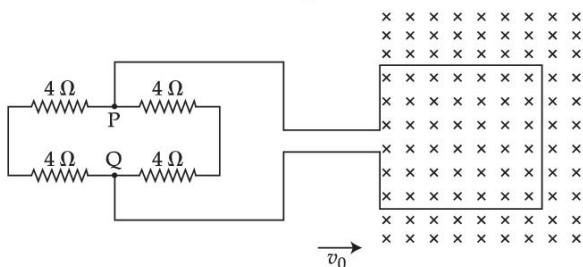
Option 1 ID : 86435171179

Option 2 ID : 86435171180

Option 3 ID : 86435171178

Option 4 ID : 86435171177

- Q.9** A square loop of side 20 cm and resistance 1 Ω is moved towards right with a constant speed v_0 . The right arm of the loop is in a uniform magnetic field of 5 T. The field is perpendicular to the plane of the loop and is going into it. The loop is connected to a network of resistors each of value 4 Ω . What should be the value of v_0 so that a steady current of 2 mA flows in the loop?



Options

1. 10^{-2} cm/s
2. 1 cm/s
3. 1 m/s
4. 10^2 m/s

Question Type : MCQ

Question ID : 86435121523

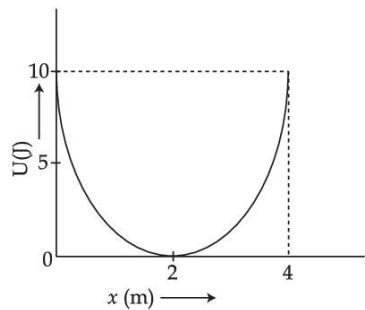
Option 1 ID : 86435171156

Option 2 ID : 86435171153

Option 3 ID : 86435171154

Option 4 ID : 86435171155

- Q.10** A mass of 5 kg is connected to a spring. The potential energy curve of the simple harmonic motion executed by the system is shown in the figure. A simple pendulum of length 4 m has the same period of oscillation as the spring system. What is the value of acceleration due to gravity on the planet where these experiments are performed?



Options

1. 4 m/s^2
2. 9.8 m/s^2
3. 5 m/s^2
4. 10 m/s^2

Question Type : MCQ

Question ID : 86435121536

Option 1 ID : 86435171208

Option 2 ID : 86435171205

Option 3 ID : 86435171207

Option 4 ID : 86435171206

Q.11 The half life period of a radioactive element x is same as the mean life time of another radioactive element y . Initially they have the same number of atoms. Then :

Options

1. x and y decay at the same rate always.
2. x -will decay faster than y .
3. y -will decay faster than x .
4. x and y have same decay rate initially and later on different decay rate.

Question Type : MCQ

Question ID : 86435121521

Option 1 ID : 86435171148

Option 2 ID : 86435171145

Option 3 ID : 86435171146

Option 4 ID : 86435171147

Q.12 A body of mass 'm' dropped from a height 'h' reaches the ground with a speed of $0.8 \sqrt{gh}$.

The value of workdone by the air-friction is :

Options

1. -0.68 mgh
2. mgh
3. 0.64 mgh
4. 1.64 mgh

Question Type : MCQ

Question ID : 86435121534

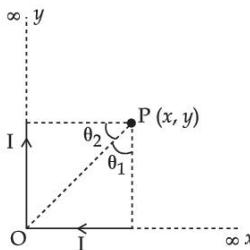
Option 1 ID : 86435171198

Option 2 ID : 86435171197

Option 3 ID : 86435171199

Option 4 ID : 86435171200

- Q.13** There are two infinitely long straight current carrying conductors and they are held at right angles to each other so that their common ends meet at the origin as shown in the figure given below. The ratio of current in both conductors is 1 : 1. The magnetic field at point P is _____.



Options

1. $\frac{\mu_0 I}{4\pi xy} \left[\sqrt{x^2 + y^2} - (x + y) \right]$
2. $\frac{\mu_0 I xy}{4\pi} \left[\sqrt{x^2 + y^2} - (x + y) \right]$
3. $\frac{\mu_0 I}{4\pi xy} \left[\sqrt{x^2 + y^2} + (x + y) \right]$
4. $\frac{\mu_0 I xy}{4\pi} \left[\sqrt{x^2 + y^2} + (x + y) \right]$

Question Type : MCQ

Question ID : 86435121530

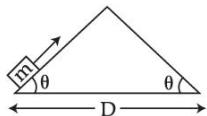
Option 1 ID : 86435171184

Option 2 ID : 86435171183

Option 3 ID : 86435171181

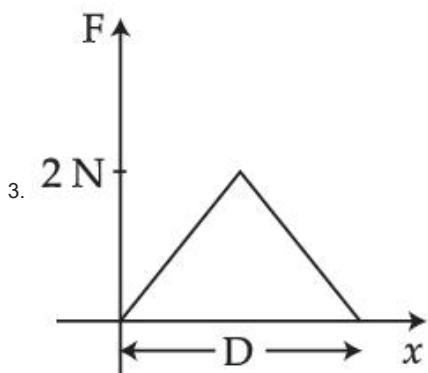
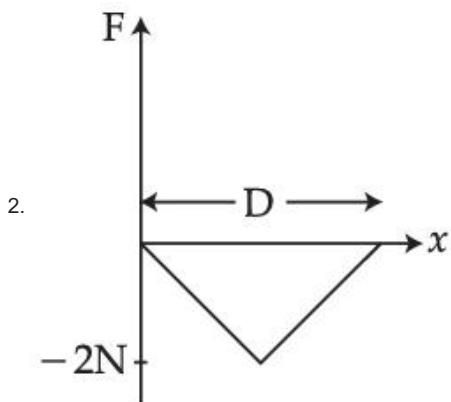
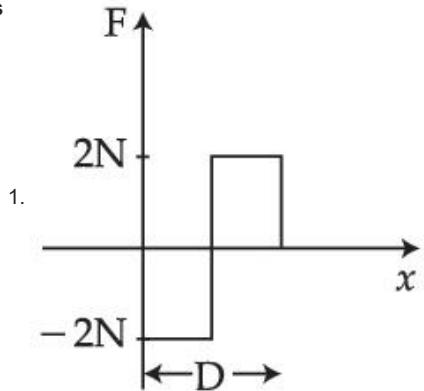
Option 4 ID : 86435171182

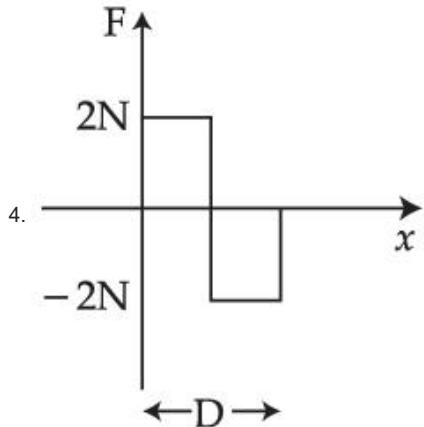
- Q.14** An object of mass 'm' is being moved with a constant velocity under the action of an applied force of 2N along a frictionless surface with following surface profile.



The correct applied force vs distance graph will be :

Options





Question Type : MCQ
 Question ID : 86435121533
 Option 1 ID : 86435171194
 Option 2 ID : 86435171196
 Option 3 ID : 86435171195
 Option 4 ID : 86435171193
 Status : Not Answered
 Chosen Option : --

- Q.15** Electric field of a plane electromagnetic wave propagating through a non-magnetic medium is given by $E = 20\cos(2 \times 10^{10}t - 200x)$ V/m. The dielectric constant of the medium is equal to :

(Take $\mu_r = 1$)

Options 1. 2

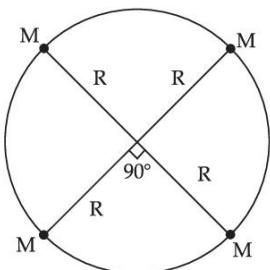
2. $\frac{1}{3}$

3. 9

4. 3

Question Type : MCQ
 Question ID : 86435121525
 Option 1 ID : 86435171164
 Option 2 ID : 86435171163
 Option 3 ID : 86435171162
 Option 4 ID : 86435171161
 Status : Not Answered
 Chosen Option : --

- Q.16** Four particles each of mass M , move along a circle of radius R under the action of their mutual gravitational attraction as shown in figure. The speed of each particle is :



Options

1. $\frac{1}{2} \sqrt{\frac{GM}{R}} (2\sqrt{2} + 1)$
2. $\frac{1}{2} \sqrt{\frac{GM}{R (2\sqrt{2} + 1)}}$
3. $\frac{1}{2} \sqrt{\frac{GM}{R}} (2\sqrt{2} - 1)$
4. $\sqrt{\frac{GM}{R}}$

Question Type : MCQ

Question ID : 86435121535

Option 1 ID : 86435171201

Option 2 ID : 86435171203

Option 3 ID : 86435171202

Option 4 ID : 86435171204

- Q.17** A glass tumbler having inner depth of 17.5 cm is kept on a table. A student starts pouring water ($\mu = 4/3$) into it while looking at the surface of water from the above. When he feels that the tumbler is half filled, he stops pouring water. Up to what height, the tumbler is actually filled ?

Options

1. 10 cm
2. 11.7 cm
3. 7.5 cm
4. 8.75 cm

Question Type : MCQ

Question ID : 86435121526

Option 1 ID : 86435171168

Option 2 ID : 86435171167

Option 3 ID : 86435171166

Option 4 ID : 86435171165

- Q.18** A capacitor is connected to a 20 V battery through a resistance of 10Ω . It is found that the potential difference across the capacitor rises to 2 V in $1 \mu\text{s}$. The capacitance of the capacitor is _____ μF .

$$\text{Given } \ln\left(\frac{10}{9}\right) = 0.105$$

- Options**
1. 0.95
 2. 9.52
 3. 1.85
 4. 0.105

Question Type : MCQ

Question ID : 86435121537

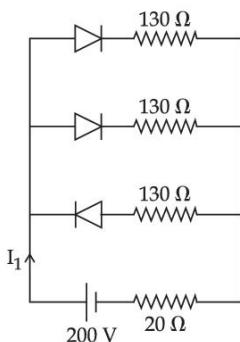
Option 1 ID : 86435171210

Option 2 ID : 86435171211

Option 3 ID : 86435171209

Option 4 ID : 86435171212

- Q.19** In the given figure, each diode has a forward bias resistance of 30Ω and infinite resistance in reverse bias. The current I_1 will be :



- Options**
1. 2 A
 2. 3.75 A
 3. 2.73 A
 4. 2.35 A

Question Type : MCQ

Question ID : 86435121522

Option 1 ID : 86435171149

Option 2 ID : 86435171152

Option 3 ID : 86435171151

Option 4 ID : 86435171150

Q.20 Two resistors $R_1 = (4 \pm 0.8) \Omega$ and $R_2 = (4 \pm 0.4) \Omega$ are connected in parallel. The equivalent resistance of their parallel combination will be :

Options

1. $(4 \pm 0.4) \Omega$
2. $(2 \pm 0.4) \Omega$
3. $(4 \pm 0.3) \Omega$
4. $(2 \pm 0.3) \Omega$

Question Type : MCQ

Question ID : 86435121539

Option 1 ID : 86435171217

Option 2 ID : 86435171219

Option 3 ID : 86435171220

Option 4 ID : 86435171218

Section : Physics Section B

Q.1 A 2 kg steel rod of length 0.6 m is clamped on a table vertically at its lower end and is free to rotate in vertical plane. The upper end is pushed so that the rod falls under gravity. Ignoring the friction due to clamping at its lower end, the speed of the free end of rod when it passes through its lowest position is _____ ms^{-1} .

(Take $g = 10 \text{ ms}^{-2}$)

Given --

Answer :

Question Type : SA

Question ID : 86435121549

Q.2 The average translational kinetic energy of N_2 gas molecules at _____ $^{\circ}\text{C}$ becomes equal to the K.E. of an electron accelerated from rest through a potential difference of 0.1 volt. (Given $k_B = 1.38 \times 10^{-23} \text{ J/K}$) (Fill the nearest integer).

Given --

Answer :

Question Type : SA

Question ID : 86435121547

Q.3 The width of one of the two slits in a Young's double slit experiment is three times the other slit. If the amplitude of the light coming from a slit is proportional to the slit-width, the ratio of minimum to maximum intensity in the interference pattern is $x : 4$ where x is _____.

Given --

Answer :

Question Type : SA

Question ID : 86435121542

- Q.4** Two satellites revolve around a planet in coplanar circular orbits in anticlockwise direction. Their period of revolutions are 1 hour and 8 hours respectively. The radius of the orbit of nearer satellite is 2×10^3 km. The angular speed of the farther satellite as observed from the nearer satellite at the instant when both the satellites are closest is $\frac{\pi}{x}$ rad h⁻¹ where x is _____.

Given --

Answer :

Question Type : **SA**
Question ID : **86435121544**

- Q.5** A steel rod with $y = 2.0 \times 10^{11}$ Nm⁻² and $\alpha = 10^{-5}$ °C⁻¹ of length 4 m and area of cross-section 10 cm² is heated from 0°C to 400°C without being allowed to extend. The tension produced in the rod is $x \times 10^5$ N where the value of x is _____.

Given --

Answer :

Question Type : **SA**
Question ID : **86435121548**

- Q.6** A uniform heating wire of resistance 36 Ω is connected across a potential difference of 240 V. The wire is then cut into half and a potential difference of 240 V is applied across each half separately. The ratio of power dissipation in first case to the total power dissipation in the second case would be 1 : x , where x is _____.

Given --

Answer :

Question Type : **SA**
Question ID : **86435121541**

- Q.7** A carrier wave with amplitude of 250 V is amplitude modulated by a sinusoidal base band signal of amplitude 150 V. The ratio of minimum amplitude to maximum amplitude for the amplitude modulated wave is 50 : x , then value of x is _____.

Given --

Answer :

Question Type : **SA**
Question ID : **86435121543**

- Q.8** The temperature of 3.00 mol of an ideal diatomic gas is increased by 40.0°C without changing the pressure of the gas. The molecules in the gas rotate but do not oscillate. If the ratio of change in internal energy of the gas to the amount of workdone by the gas is $\frac{x}{10}$. Then the value of x (round off to the nearest integer) is _____.
(Given R = 8.31 J mol⁻¹ K⁻¹)

Given --

Answer :

Question Type : **SA**
Question ID : **86435121540**

- Q.9** When a body slides down from rest along a smooth inclined plane making an angle of 30° with the horizontal, it takes time T. When the same body slides down from the rest along a rough inclined plane making the same angle and through the same distance, it takes time αT , where α is a constant greater than 1. The co-efficient of friction between the body and

the rough plane is $\frac{1}{\sqrt{x}} \left(\frac{\alpha^2 - 1}{\alpha^2} \right)$ where $x = \text{_____}$.

Given --

Answer :

Question Type : **SA**

Question ID : **86435121545**

- Q.10** An engine is attached to a wagon through a shock absorber of length 1.5 m. The system with a total mass of 40,000 kg is moving with a speed of 72 kmh^{-1} when the brakes are applied to bring it to rest. In the process of the system being brought to rest, the spring of the shock absorber gets compressed by 1.0 m. If 90% of energy of the wagon is lost due to friction, the spring constant is $\text{_____} \times 10^5 \text{ N/m}$.

Given --

Answer :

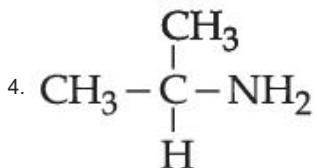
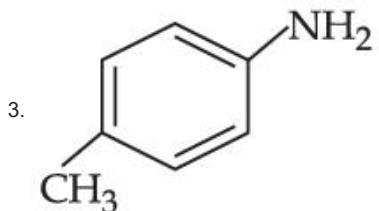
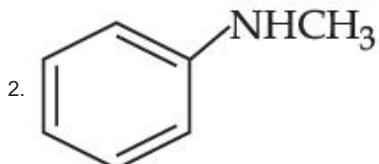
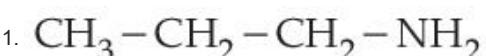
Question Type : **SA**

Question ID : **86435121546**

Section : Chemistry Section A

- Q.1** Which one of the following gives the most stable Diazonium salt ?

Options



Question Type : **MCQ**

Question ID : **86435121567**

Option 1 ID : **86435171301**

Option 2 ID : **86435171299**

Option 3 ID : **86435171302**

Option 4 ID : **86435171300**

Q.2 The potassium ferrocyanide solution gives a Prussian blue colour, when added to :

Options

1. CoCl_3
2. CoCl_2
3. FeCl_2
4. FeCl_3

Question Type : MCQ

Question ID : 86435121569

Option 1 ID : 86435171309

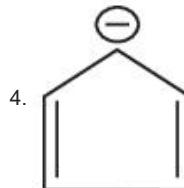
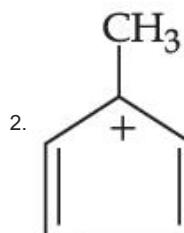
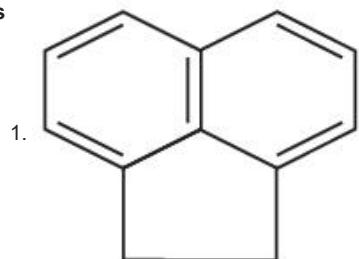
Option 2 ID : 86435171310

Option 3 ID : 86435171307

Option 4 ID : 86435171308

Q.3 Which one of the following compounds is aromatic in nature ?

Options



Question Type : MCQ

Question ID : 86435121562

Option 1 ID : 86435171280

Option 2 ID : 86435171279

Option 3 ID : 86435171282

Option 4 ID : 86435171281

Q.4 Monomer units of Dacron polymer are :

Options

1. glycerol and phthalic acid
2. ethylene glycol and phthalic acid
3. ethylene glycol and terephthalic acid
4. glycerol and terephthalic acid

Question Type : MCQ

Question ID : 86435121568

Option 1 ID : 86435171303

Option 2 ID : 86435171304

Option 3 ID : 86435171305

Option 4 ID : 86435171306

Q.5 Number of paramagnetic oxides among the following given oxides is _____.

Li_2O , CaO , Na_2O_2 , KO_2 , MgO and K_2O

Options

1. 1
2. 3
3. 0
4. 2

Question Type : MCQ

Question ID : 86435121555

Option 1 ID : 86435171253

Option 2 ID : 86435171251

Option 3 ID : 86435171254

Option 4 ID : 86435171252

Q.6 Experimentally reducing a functional group **cannot** be done by which one of the following reagents ?

Options

1. $\text{Zn}/\text{H}_2\text{O}$
2. $\text{Pt-C}/\text{H}_2$
3. $\text{Pd-C}/\text{H}_2$
4. Na/H_2

Question Type : MCQ

Question ID : 86435121560

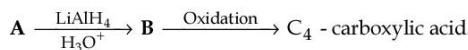
Option 1 ID : 86435171273

Option 2 ID : 86435171272

Option 3 ID : 86435171271

Option 4 ID : 86435171274

- Q.7** In the following sequence of reactions a compound A, (molecular formula C₆H₁₂O₂) with a straight chain structure gives a C₄ carboxylic acid. A is :



Options

1. $\text{CH}_3 - \text{CH}_2 - \overset{\text{OH}}{\underset{|}{\text{CH}}} - \text{CH}_2 - \text{O} - \text{CH} = \text{CH}_2$
2. $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{CH} = \text{CH} - \text{CH}_2 - \text{OH}$
3. $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{COO} - \text{CH}_2 - \text{CH}_3$
4. $\text{CH}_3 - \text{CH}_2 - \text{COO} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$

Question Type : MCQ

Question ID : 86435121564

Option 1 ID : 86435171287

Option 2 ID : 86435171288

Option 3 ID : 86435171289

Option 4 ID : 86435171290

- Q.8** Water sample is called cleanest on the basis of which one of the BOD values given below :

Options

1. 11 ppm
2. 15 ppm
3. 3 ppm
4. 21 ppm

Question Type : MCQ

Question ID : 86435121559

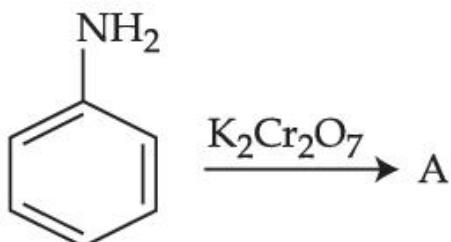
Option 1 ID : 86435171268

Option 2 ID : 86435171269

Option 3 ID : 86435171267

Option 4 ID : 86435171270

Q.9 Identify A in the following reaction.



Options

- 1.
- 2.
- 3.
- 4.

Question Type : MCQ

Question ID : 86435121566

Option 1 ID : 86435171295

Option 2 ID : 86435171296

Option 3 ID : 86435171298

Option 4 ID : 86435171297

Q.10 Given below are two statements :

Statement I : The nucleophilic addition of sodium hydrogen sulphite to an aldehyde or a ketone involves proton transfer to form a stable ion.

Statement II : The nucleophilic addition of hydrogen cyanide to an aldehyde or a ketone yields amine as final product.

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

Options 1.

Both Statement I and Statement II are false.

2.

Both Statement I and Statement II are true.

3.

Statement I is false but Statement II is true.

4.

Statement I is true but Statement II is false.

Question Type : MCQ

Question ID : 86435121565

Option 1 ID : 86435171292

Option 2 ID : 86435171291

Option 3 ID : 86435171294

Option 4 ID : 86435171293

Q.11 Match List - I with List - II.

List - I

- | | |
|------------------------------------------------------------------------------|------------------------------|
| (a) Hydrolysis
(b) Reduction
(c) Oxidation
(d) Double Decomposition | (Colloid Preparation Method) |
|------------------------------------------------------------------------------|------------------------------|

List - II

(Chemical Reaction)

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| (i) $2\text{AuCl}_3 + 3\text{HCHO} + 3\text{H}_2\text{O} \rightarrow 2\text{Au}(\text{sol}) + 3\text{HCOOH} + 6\text{HCl}$
(ii) $\text{As}_2\text{O}_3 + 3\text{H}_2\text{S} \rightarrow \text{As}_2\text{S}_3(\text{sol}) + 3\text{H}_2\text{O}$
(iii) $\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 3\text{S}(\text{sol}) + 2\text{H}_2\text{O}$
(iv) $\text{FeCl}_3 + 3\text{H}_2\text{O} \rightarrow \text{Fe(OH)}_3(\text{sol}) + 3\text{HCl}$ | (Chemical Reaction) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|

Choose the **most appropriate** answer from the options given below :

Options

1. (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
2. (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
3. (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)
4. (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

Question Type : MCQ

Question ID : 86435121551

Option 1 ID : 86435171236

Option 2 ID : 86435171238

Option 3 ID : 86435171235

Option 4 ID : 86435171237

Q.12 The stereoisomers that are formed by electrophilic addition of bromine to *trans*-but-2-ene is/are :

Options 1. 2 identical mesomers

2. 2 enantiomers

3. 2 enantiomers and 2 mesomers

4. 1 racemic and 2 enantiomers

Question Type : MCQ

Question ID : 86435121561

Option 1 ID : 86435171275

Option 2 ID : 86435171276

Option 3 ID : 86435171278

Option 4 ID : 86435171277

Q.13 The oxide without nitrogen-nitrogen bond is :

Options 1. N_2O_4

2. N_2O

3. N_2O_5

4. N_2O_3

Question Type : MCQ

Question ID : 86435121556

Option 1 ID : 86435171257

Option 2 ID : 86435171255

Option 3 ID : 86435171258

Option 4 ID : 86435171256

Q.14 Calamine and Malachite, respectively, are the ores of :

Options 1. Copper and Iron

2. Zinc and Copper

3. Aluminium and Zinc

4. Nickel and Aluminium

Question Type : MCQ

Question ID : 86435121553

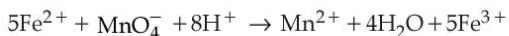
Option 1 ID : 86435171243

Option 2 ID : 86435171244

Option 3 ID : 86435171245

Option 4 ID : 86435171246

Q.15 In the given chemical reaction, colors of the Fe^{2+} and Fe^{3+} ions, are respectively :



Options

1. Yellow, Green
2. Yellow, Orange
3. Green, Orange
4. Green, Yellow

Question Type : MCQ

Question ID : 86435121557

Option 1 ID : 86435171262

Option 2 ID : 86435171259

Option 3 ID : 86435171261

Option 4 ID : 86435171260

Q.16 Identify the element for which electronic configuration in +3 oxidation state is $[\text{Ar}]3\text{d}^5$:

Options

1. Ru
2. Mn
3. Co
4. Fe

Question Type : MCQ

Question ID : 86435121552

Option 1 ID : 86435171241

Option 2 ID : 86435171239

Option 3 ID : 86435171242

Option 4 ID : 86435171240

Q.17 The Crystal Field Stabilization Energy (CFSE) and magnetic moment (spin-only) of an octahedral aqua complex of a metal ion (M^{Z+}) are $-0.8 \Delta_0$ and 3.87 BM, respectively.

Identify (M^{Z+}) :

Options

1. V^{3+}
2. Co^{2+}
3. Cr^{3+}
4. Mn^{4+}

Question Type : MCQ

Question ID : 86435121558

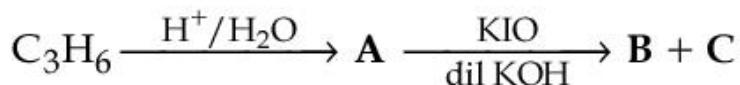
Option 1 ID : 86435171264

Option 2 ID : 86435171263

Option 3 ID : 86435171266

Option 4 ID : 86435171265

Q.18 In the following sequence of reactions,



The compounds **B** and **C** respectively are :

Options

1. Cl_3COOK , CH_3I
2. CH_3I , HCOOK
3. Cl_3COOK , HCOOH
4. CHI_3 , CH_3COOK

Question Type : **MCQ**

Question ID : **86435121563**

Option 1 ID : **86435171285**

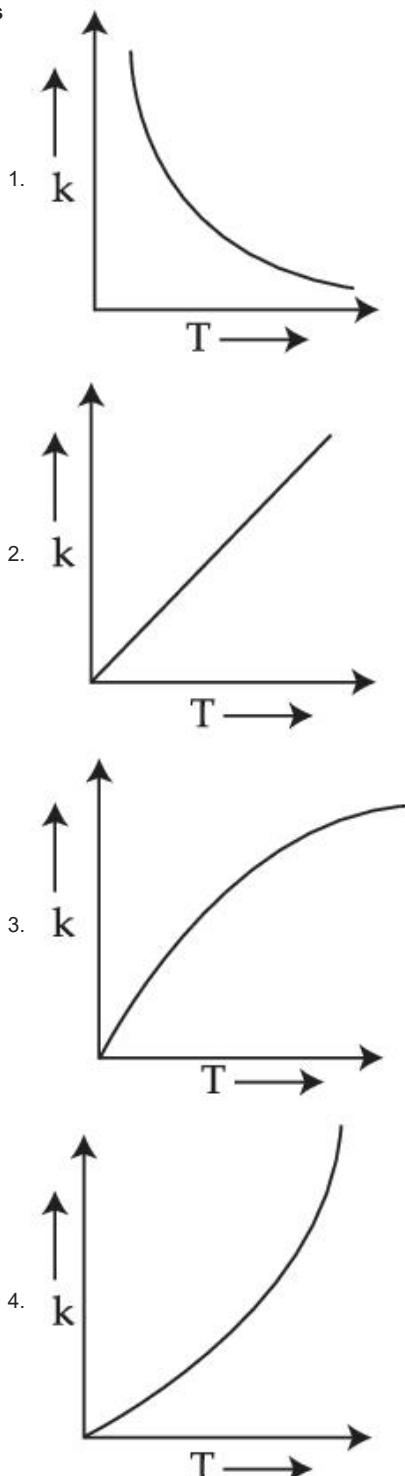
Option 2 ID : **86435171283**

Option 3 ID : **86435171286**

Option 4 ID : **86435171284**

Q.19 Which one of the following given graphs represents the variation of rate constant (k) with temperature (T) for an endothermic reaction?

Options



Question Type : MCQ

Question ID : 86435121550

Option 1 ID : 86435171234

Option 2 ID : 86435171233

Option 3 ID : 86435171231

Option 4 ID : 86435171232

Q.20 Hydrogen peroxide reacts with iodine in basic medium to give :

Options 1. IO^-

2. IO_3^-

3. I^-

4. IO_4^-

Question Type : MCQ

Question ID : 86435121554

Option 1 ID : 86435171249

Option 2 ID : 86435171247

Option 3 ID : 86435171248

Option 4 ID : 86435171250

Section : Chemistry Section B

Q.1 If the conductivity of mercury at 0°C is $1.07 \times 10^6 \text{ S m}^{-1}$ and the resistance of a cell containing mercury is 0.243Ω , then the cell constant of the cell is $x \times 10^4 \text{ m}^{-1}$. The value of x is _____. (Nearest integer)

Given --

Answer :

Question Type : SA

Question ID : 86435121577

Q.2 A 50 watt bulb emits monochromatic red light of wavelength of 795 nm. The number of photons emitted per second by the bulb is $x \times 10^{20}$. The value of x is _____. (Nearest integer)

[Given : $h = 6.63 \times 10^{-34} \text{ Js}$ and $c = 3.0 \times 10^8 \text{ ms}^{-1}$]

Given --

Answer :

Question Type : SA

Question ID : 86435121572

Q.3 If 80 g of copper sulphate $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is dissolved in deionised water to make 5 L of solution. The concentration of the copper sulphate solution is $x \times 10^{-3} \text{ mol L}^{-1}$. The value of x is _____. [Atomic masses Cu : 63.54 u, S : 32 u, O : 16 u, H : 1 u]

Given 0.116

Answer :

Question Type : SA

Question ID : 86435121575

Q.4 The sum of oxidation states of two silver ions in $[\text{Ag}(\text{NH}_3)_2]^+$ $[\text{Ag}(\text{CN})_2]^-$ complex is _____. Given 2

Given 2

Answer :

Question Type : SA

Question ID : 86435121578

- Q.5** For the reaction $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$, when $\Delta S = -176.0 \text{ J K}^{-1}$ and $\Delta H = -57.8 \text{ kJ mol}^{-1}$, the magnitude of ΔG at 298 K for the reaction is _____ kJ mol^{-1} . (Nearest integer)

Given --
Answer :

Question Type : **SA**
Question ID : **86435121574**

- Q.6** A peptide synthesized by the reactions of one molecule each of Glycine, Leucine, Aspartic acid and Histidine will have _____ peptide linkages.

Given 2
Answer :

Question Type : **SA**
Question ID : **86435121579**

- Q.7** The spin-only magnetic moment value of B_2^+ species is _____ $\times 10^{-2} \text{ BM}$. (Nearest integer)

[Given : $\sqrt{3} = 1.73$]

Given 2
Answer :

Question Type : **SA**
Question ID : **86435121573**

- Q.8** The number of atoms in 8 g of sodium is $x \times 10^{23}$. The value of x is _____. (Nearest integer)

[Given : $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$
Atomic mass of Na = 23.0 u]

Given 2
Answer :

Question Type : **SA**
Question ID : **86435121570**

- Q.9** An empty LPG cylinder weighs 14.8 kg. When full, it weighs 29.0 kg and shows a pressure of 3.47 atm. In the course of use at ambient temperature, the mass of the cylinder is reduced to 23.0 kg. The final pressure inside the cylinder is _____ atm. (Nearest integer)
(Assume LPG to be an ideal gas)

Given --
Answer :

Question Type : **SA**
Question ID : **86435121571**
Status : **Not Answered**

- Q.10** The molar solubility of $\text{Zn}(\text{OH})_2$ in 0.1 M NaOH solution is $x \times 10^{-18} \text{ M}$. The value of x is _____. (Nearest integer)
(Given : The solubility product of $\text{Zn}(\text{OH})_2$ is 2×10^{-20})

Given --
Answer :

Question Type : **SA**
Question ID : **86435121576**

Section : Mathematics Section A

Q.1 $\cos^{-1}(\cos(-5)) + \sin^{-1}(\sin(6)) - \tan^{-1}(\tan(12))$ is equal to :
(The inverse trigonometric functions take the principal values)

- Options
1. $3\pi + 1$
 2. $3\pi - 11$
 3. $4\pi - 11$
 4. $4\pi - 9$

Question Type : MCQ
 Question ID : 86435121599
 Option 1 ID : 86435171398
 Option 2 ID : 86435171399
 Option 3 ID : 86435171400
 Option 4 ID : 86435171397

Q.2 Let $S_n = 1 \cdot (n-1) + 2 \cdot (n-2) + 3 \cdot (n-3) + \dots + (n-1) \cdot 1$, $n \geq 4$.

The sum $\sum_{n=4}^{\infty} \left(\frac{2S_n}{n!} - \frac{1}{(n-2)!} \right)$ is equal to :

- Options
1. $\frac{e-2}{6}$
 2. $\frac{e-1}{3}$
 3. $\frac{e}{6}$
 4. $\frac{e}{3}$

Question Type : MCQ
 Question ID : 86435121585
 Option 1 ID : 86435171344
 Option 2 ID : 86435171343
 Option 3 ID : 86435171342
 Option 4 ID : 86435171341

Q.3 The number of pairs (a, b) of real numbers, such that whenever α is a root of the equation $x^2 + ax + b = 0$, $\alpha^2 - 2$ is also a root of this equation, is :

- Options
1. 6
 2. 8
 3. 4
 4. 2

Question Type : MCQ

Question ID : 86435121581

Option 1 ID : 86435171327

Option 2 ID : 86435171328

Option 3 ID : 86435171326

Option 4 ID : 86435171325

Q.4 The range of the function

$$f(x) = \log_{\sqrt{5}} \left(3 + \cos\left(\frac{3\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) - \cos\left(\frac{3\pi}{4} - x\right) \right)$$

- Options

1. $\left[\frac{1}{\sqrt{5}}, \sqrt{5} \right]$
2. $[0, 2]$
3. $(0, \sqrt{5})$
4. $[-2, 2]$

Question Type : MCQ

Question ID : 86435121580

Option 1 ID : 86435171322

Option 2 ID : 86435171323

Option 3 ID : 86435171321

Option 4 ID : 86435171324

Q.5

Let $f: \mathbf{R} \rightarrow \mathbf{R}$ be a continuous function. Then $\lim_{x \rightarrow \pi/4} \frac{\frac{\pi}{4} \int_2^{\sec^2 x} f(x) dx}{x^2 - \frac{\pi^2}{16}}$ is equal to :

Options

1. $f(2)$
2. $2f(\sqrt{2})$
3. $2f(2)$
4. $4f(2)$

Question Type : MCQ

Question ID : 86435121587

Option 1 ID : 86435171349

Option 2 ID : 86435171352

Option 3 ID : 86435171350

Option 4 ID : 86435171351

Q.6 If $y = y(x)$ is the solution curve of the differential equation

$x^2 dy + \left(y - \frac{1}{x}\right) dx = 0; x > 0$, and $y(1) = 1$, then $y\left(\frac{1}{2}\right)$ is equal to :

Options

1. $3 + e$
2. $3 - e$
3. $\frac{3}{2} - \frac{1}{\sqrt{e}}$
4. $3 + \frac{1}{\sqrt{e}}$

Question Type : MCQ

Question ID : 86435121590

Option 1 ID : 86435171361

Option 2 ID : 86435171362

Option 3 ID : 86435171363

Option 4 ID : 86435171364

Q.7

Consider the parabola with vertex $\left(\frac{1}{2}, \frac{3}{4}\right)$ and the directrix $y = \frac{1}{2}$. Let P be the point

where the parabola meets the line $x = -\frac{1}{2}$. If the normal to the parabola at P intersects the parabola again at the point Q, then $(PQ)^2$ is equal to :

Options

1. $\frac{25}{2}$

2. $\frac{75}{8}$

3. $\frac{125}{16}$

4. $\frac{15}{2}$

Question Type : MCQ

Question ID : 86435121591

Option 1 ID : 86435171366

Option 2 ID : 86435171367

Option 3 ID : 86435171365

Option 4 ID : 86435171368

Q.8 Consider the system of linear equations

$$-x + y + 2z = 0$$

$$3x - ay + 5z = 1$$

$$2x - 2y - az = 7$$

Let S_1 be the set of all $a \in \mathbb{R}$ for which the system is inconsistent and S_2 be the set of all $a \in \mathbb{R}$ for which the system has infinitely many solutions. If $n(S_1)$ and $n(S_2)$ denote the number of elements in S_1 and S_2 respectively, then

Options

1. $n(S_1) = 2, n(S_2) = 0$

2. $n(S_1) = 2, n(S_2) = 2$

3. $n(S_1) = 0, n(S_2) = 2$

4. $n(S_1) = 1, n(S_2) = 0$

Question Type : MCQ

Question ID : 86435121582

Option 1 ID : 86435171332

Option 2 ID : 86435171331

Option 3 ID : 86435171330

Option 4 ID : 86435171329

Q.9 The distance of line $3y - 2z - 1 = 0 = 3x - z + 4$ from the point $(2, -1, 6)$ is :

Options

1. $2\sqrt{5}$
2. $2\sqrt{6}$
3. $\sqrt{26}$
4. $4\sqrt{2}$

Question Type : MCQ

Question ID : 86435121594

Option 1 ID : 86435171380

Option 2 ID : 86435171378

Option 3 ID : 86435171379

Option 4 ID : 86435171377

Q.10

The area, enclosed by the curves $y = \sin x + \cos x$ and $y = |\cos x - \sin x|$ and the lines $x = 0$, $x = \frac{\pi}{2}$, is :

Options

1. $2\sqrt{2}(\sqrt{2} + 1)$
2. $2\sqrt{2}(\sqrt{2} - 1)$
3. $4(\sqrt{2} - 1)$
4. $2(\sqrt{2} + 1)$

Question Type : MCQ

Question ID : 86435121589

Option 1 ID : 86435171360

Option 2 ID : 86435171358

Option 3 ID : 86435171357

Option 4 ID : 86435171359

Q.11

If n is the number of solutions of the equation $2 \cos x \left(4 \sin\left(\frac{\pi}{4} + x\right) \sin\left(\frac{\pi}{4} - x\right) - 1 \right) = 1$,
 $x \in [0, \pi]$ and S is the sum of all these solutions, then the ordered pair (n, S) is :

Options

1. $(2, 8\pi/9)$
2. $(3, 13\pi/9)$
3. $(2, 2\pi/3)$
4. $(3, 5\pi/3)$

Question Type : MCQ

Question ID : 86435121598

Option 1 ID : 86435171396

Option 2 ID : 86435171394

Option 3 ID : 86435171393

Option 4 ID : 86435171395

Q.12 The function $f(x) = x^3 - 6x^2 + ax + b$ is such that $f(2) = f(4) = 0$. Consider two statements.

(S1) there exists $x_1, x_2 \in (2, 4)$, $x_1 < x_2$, such that $f'(x_1) = -1$ and $f'(x_2) = 0$.
(S2) there exists $x_3, x_4 \in (2, 4)$, $x_3 < x_4$, such that f is decreasing in $(2, x_4)$, increasing in $(x_4, 4)$ and $2f'(x_3) = \sqrt{3}f(x_4)$.

Then

Options

1. (S1) is true and (S2) is false
2. both (S1) and (S2) are false
3. both (S1) and (S2) are true
4. (S1) is false and (S2) is true

Question Type : MCQ

Question ID : 86435121586

Option 1 ID : 86435171345

Option 2 ID : 86435171347

Option 3 ID : 86435171348

Option 4 ID : 86435171346

Q.13

Let $J_{n,m} = \int_0^{\frac{1}{2}} \frac{x^n}{x^m - 1} dx$, $\forall n > m$ and $n, m \in \mathbb{N}$. Consider a matrix $A = [a_{ij}]_{3 \times 3}$ where

$$a_{ij} = \begin{cases} J_{6+i, 3} - J_{i+3, 3}, & i \leq j \\ 0, & i > j \end{cases}. \text{ Then } |\text{adj } A^{-1}| \text{ is :}$$

Options

1. $(15)^2 \times 2^{34}$
2. $(15)^2 \times 2^{42}$
3. $(105)^2 \times 2^{36}$
4. $(105)^2 \times 2^{38}$

Question Type : **MCQ**

Question ID : **86435121583**

Option 1 ID : **86435171335**

Option 2 ID : **86435171336**

Option 3 ID : **86435171334**

Option 4 ID : **86435171333**

Q.14 Let the acute angle bisector of the two planes $x - 2y - 2z + 1 = 0$ and $2x - 3y - 6z + 1 = 0$ be the plane P. Then which of the following points lies on P ?

Options

1. $(0, 2, -4)$
2. $(-2, 0, -\frac{1}{2})$
3. $(4, 0, -2)$
4. $(3, 1, -\frac{1}{2})$

Question Type : **MCQ**

Question ID : **86435121593**

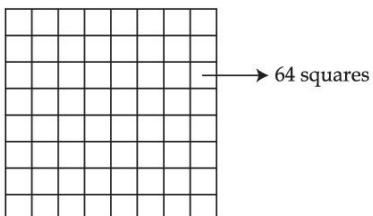
Option 1 ID : **86435171374**

Option 2 ID : **86435171376**

Option 3 ID : **86435171373**

Option 4 ID : **86435171375**

- Q.15** Two squares are chosen at random on a chessboard (see figure). The probability that they have a side in common is :



Options

1. $\frac{1}{9}$
2. $\frac{1}{7}$
3. $\frac{2}{7}$
4. $\frac{1}{18}$

Question Type : MCQ

Question ID : 86435121596

Option 1 ID : 86435171388

Option 2 ID : 86435171387

Option 3 ID : 86435171386

Option 4 ID : 86435171385

- Q.16** Which of the following is equivalent to the Boolean expression $p \wedge \sim q$?

Options

1. $\sim p \rightarrow \sim q$
2. $\sim(q \rightarrow p)$
3. $\sim(p \rightarrow q)$
4. $\sim(p \rightarrow \sim q)$

Question Type : MCQ

Question ID : 86435121592

Option 1 ID : 86435171369

Option 2 ID : 86435171371

Option 3 ID : 86435171372

Option 4 ID : 86435171370

Q.17

Let θ be the acute angle between the tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{1} = 1$ and the circle $x^2 + y^2 = 3$ at their point of intersection in the first quadrant. Then $\tan\theta$ is equal to :

Options

1. $\frac{5}{2\sqrt{3}}$
2. $\frac{4}{\sqrt{3}}$
3. $\frac{2}{\sqrt{3}}$
4. 2

Question Type : MCQ

Question ID : 86435121597

Option 1 ID : 86435171390

Option 2 ID : 86435171392

Option 3 ID : 86435171391

Option 4 ID : 86435171389

Q.18

The function $f(x)$, that satisfies the condition $f(x) = x + \int_0^{\frac{\pi}{2}} \sin x \cdot \cos y f(y) dy$, is :

Options

1. $x + \frac{\pi}{2} \sin x$
2. $x + (\pi + 2) \sin x$
3. $x + \frac{2}{3}(\pi - 2) \sin x$
4. $x + (\pi - 2) \sin x$

Question Type : MCQ

Question ID : 86435121588

Option 1 ID : 86435171353

Option 2 ID : 86435171354

Option 3 ID : 86435171356

Option 4 ID : 86435171355

Q.19 Let P_1, P_2, \dots, P_{15} be 15 points on a circle. The number of distinct triangles formed by points P_i, P_j, P_k such that $i+j+k \neq 15$, is :

Options 1. 455

2. 419

3. 12

4. 443

Question Type : MCQ

Question ID : 86435121584

Option 1 ID : 86435171339

Option 2 ID : 86435171340

Option 3 ID : 86435171337

Option 4 ID : 86435171338

Q.20

Let a_1, a_2, \dots, a_{21} be an AP such that $\sum_{n=1}^{20} \frac{1}{a_n a_{n+1}} = \frac{4}{9}$. If the sum of this AP is 189, then

$a_6 a_{16}$ is equal to :

Options 1. 57

2. 48

3. 36

4. 72

Question Type : MCQ

Question ID : 86435121595

Option 1 ID : 86435171381

Option 2 ID : 86435171383

Option 3 ID : 86435171384

Option 4 ID : 86435171382

Section : Mathematics Section B

Q.1 Let the points of intersections of the lines $x - y + 1 = 0$, $x - 2y + 3 = 0$ and $2x - 5y + 11 = 0$ are the mid points of the sides of a triangle ABC. Then the area of the triangle ABC is _____.

Given --

Answer :

Question Type : SA

Question ID : 86435121602

Q.2

Let $f(x)$ be a polynomial of degree 3 such that $f(k) = -\frac{2}{k}$ for $k = 2, 3, 4, 5$. Then the value of $52 - 10 f(10)$ is equal to _____.

Given 54

Answer :

Question Type : SA

Question ID : 86435121603

- Q.3** Let $[t]$ denote the greatest integer $\leq t$. The number of points where the function

$$f(x) = [x] |x^2 - 1| + \sin\left(\frac{\pi}{[x]+3}\right) - [x+1], x \in (-2, 2)$$

Given --

Answer :

Question Type : **SA**

Question ID : **86435121606**

- Q.4** All the arrangements, with or without meaning, of the word FARMER are written excluding any word that has two R appearing together. The arrangements are listed serially in the alphabetic order as in the English dictionary. Then the serial number of the word FARMER in this list is _____.

Given **29**

Answer :

Question Type : **SA**

Question ID : **86435121609**

- Q.5** A man starts walking from the point $P(-3, 4)$, touches the x -axis at R , and then turns to reach at the point $Q(0, 2)$. The man is walking at a constant speed. If the man reaches the point Q in the minimum time, then $50((PR)^2 + (RQ)^2)$ is equal to _____.

Given **650**

Answer :

Question Type : **SA**

Question ID : **86435121604**

- Q.6** Let $f(x) = x^6 + 2x^4 + x^3 + 2x + 3, x \in \mathbb{R}$. Then the natural number n for which

$$\lim_{x \rightarrow 1} \frac{x^n f(1) - f(x)}{x - 1} = 44 \text{ is } \text{_____}.$$

Given **7**

Answer :

Question Type : **SA**

Question ID : **86435121601**

- Q.7** Let X be a random variable with distribution.

x	-2	-1	3	4	6
$P(X=x)$	$\frac{1}{5}$	a	$\frac{1}{3}$	$\frac{1}{5}$	b

If the mean of X is 2.3 and variance of X is σ^2 , then $100 \sigma^2$ is equal to :

Given --

Answer :

Question Type : **SA**

Question ID : **86435121607**

- Q.8** If for the complex numbers z satisfying $|z - 2 - 2i| \leq 1$, the maximum value of $|3iz + 6|$ is attained at $a + ib$, then $a + b$ is equal to _____.

Given --
Answer :

Question Type : **SA**
Question ID : **86435121600**

- Q.9** If the sum of the coefficients in the expansion of $(x + y)^n$ is 4096, then the greatest coefficient in the expansion is _____.

Given --
Answer :

Question Type : **SA**
Question ID : **86435121605**

- Q.10** Let $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$. Let a vector \vec{v} be in the plane containing \vec{a} and \vec{b} . If \vec{v} is perpendicular to the vector $3\hat{i} + 2\hat{j} - \hat{k}$ and its projection on \vec{a} is 19 units, then $|2\vec{v}|^2$ is equal to _____.

Given **31**
Answer :

Question Type : **SA**
Question ID : **86435121608**