National Testing Agency

Question Paper Name :	B TECH 16th March 2021 Shift 2
Subject Name :	B TECH
Creation Date :	2021-03-16 21:03:26
Duration :	180
Number of Questions :	90
Total Marks :	300
Display Marks:	Yes

B TECH

Group Number :	1
Group Id :	86435126
Group Maximum Duration :	0
Group Minimum Duration :	180
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300
Is this Group for Examiner? :	No

Physics Section A

Section Id :	864351151
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	864351151
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 8643512251 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two identical antennas mounted on identical towers are separated from each other by a distance of 45 km. What should nearly be the minimum height of receiving antenna to receive the signals in line of sight ?

(Assume radius of earth is 6400 km)

Options :

8643516751. 79.1 m

8643516752. 39.55 m

8643516753. 158.2 m

8643516754. 19.77 m

Question Number : 2 Question Id : 8643512252 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The de-Broglie wavelength associated with an electron and a proton were calculated by accelerating them through same potential of 100 V. What should nearly be the ratio of their wavelengths ? $(m_p = 1.00727u \quad m_e = 0.00055u)$

Options :

8643516755. 43 : 1

8643516756. 1860 : 1

8643516757. 41.4 : 1

8643516758. $(1860)^2 : 1$

Question Number : 3 Question Id : 8643512253 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The refractive index of a converging lens is 1.4. What will be the focal length of this lens if it is placed in a medium of same refractive index ? Assume the radii of curvature of the faces of lens are R_1 and R_2 respectively.

Options :

8643516759. Zero

8643516760. 1

8643516761. Infinite

8643516762. $\dfrac{R_1\,R_2}{R_1 - R_2}$

Question Number : 4 Question Id : 8643512254 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Red light differs from blue light as they have :

Options :

8643516763. Same frequencies and same wavelengths

8643516764. Different frequencies and different wavelengths

8643516765. Same frequencies and different wavelengths

8643516766. Different frequencies and same wavelengths

Question Number : 5 Question Id : 8643512255 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The magnetic field in a region is given by $\vec{B} = B_o \left(\dfrac{x}{a}\right)\hat{k}$. A square loop of side d is placed with its edges along the x and y axes. The loop is moved with a constant velocity $\vec{v} = v_o\,\hat{i}$.

The emf induced in the loop is :
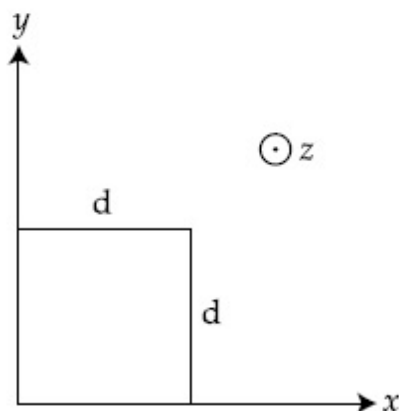
Options :

8643516767. $\dfrac{B_o\, v_o\, d}{2a}$

8643516768. $\dfrac{B_o v_o\, d^2}{a}$

8643516769. $\dfrac{B_o\, v_o^2\, d}{2a}$

8643516770. $\dfrac{B_o\, v_o\, d^2}{2a}$

Question Number : 6 Question Id : 8643512256 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Amplitude of a mass-spring system, which is executing simple harmonic motion decreases with time. If mass = 500g, Decay constant = 20 g/s then how much time is required for the amplitude of the system to drop to half of its initial value ?

(ln 2 = 0.693)

Options :

8643516771. 34.65 s

8643516772. 15.01 s

8643516773. 0.034 s

8643516774. 17.32 s

Question Number : 7 Question Id : 8643512257 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Calculate the value of mean free path (λ) for oxygen molecules at temperature 27°C and pressure 1.01×10^5 Pa. Assume the molecular diameter 0.3 nm and the gas is ideal. ($k = 1.38 \times 10^{-23}$ JK^{-1})

Options :

8643516775. 32 nm

8643516776. 58 nm

8643516777. 86 nm

8643516778. 102 nm

Question Number : 8 Question Id : 8643512258 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

What will be the nature of flow of water from a circular tap, when its flow rate increased from 0.18 L/min to 0.48 L/min ? The radius of the tap and viscosity of water are 0.5 cm and 10^{-3} Pa s, respectively.

(Density of water : 10^3 kg/m^3)

Options :

8643516779. Steady flow to unsteady flow

8643516780. Unsteady to steady flow

8643516781. Remains steady flow

8643516782. Remains turbulent flow

Question Number : 9 Question Id : 8643512259 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A charge Q is moving $\overrightarrow{dl}$ distance in the magnetic field $\overrightarrow{B}$. Find the value of work done by $\overrightarrow{B}$.

Options :

8643516783. 1

8643516784. Zero

8643516785. Infinite

8643516786. −1

Question Number : 10 Question Id : 8643512260 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Calculate the time interval between 33% decay and 67% decay if half-life of a substance is 20 minutes.

Options :

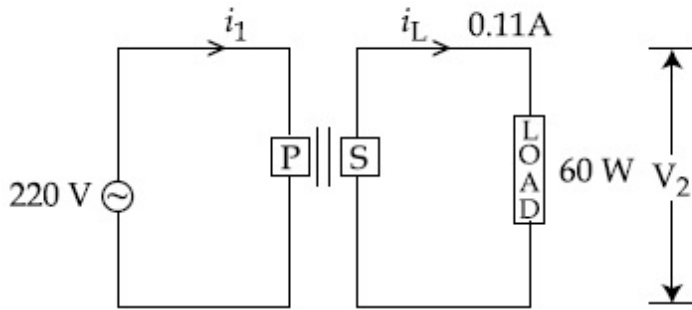8643516787. 20 minutes

8643516788. 40 minutes

8643516789. 60 minutes

8643516790. 13 minutes

Question Number : 11 Question Id : 8643512261 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

For the given circuit, comment on the type of transformer used.

Options :

8643516791. Step - up transformer

8643516792. Step down transformer

8643516793. Auto transformer

8643516794. Auxilliary transformer

Question Number : 12 Question Id : 8643512262 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The half-life of Au^{198} is 2.7 days. The activity of 1.50 mg of Au^{198} if its atomic weight is 198 g mol^{-1} is, ($N_A = 6 \times 10^{23}$/mol).
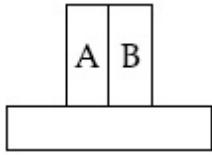
Options :

8643516795. 240 Ci

8643516796. 357 Ci

8643516797. 252 Ci

8643516798. 535 Ci

Question Number : 13 Question Id : 8643512263 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A bimetallic strip consists of metals A and B. It is mounted rigidly as shown. The metal A has higher coefficient of expansion compared to that of metal B. When the bimetallic strip is placed in a cold bath, it will :

Options :

8643516799. Bend towards the right

8643516800. Bend towards the left
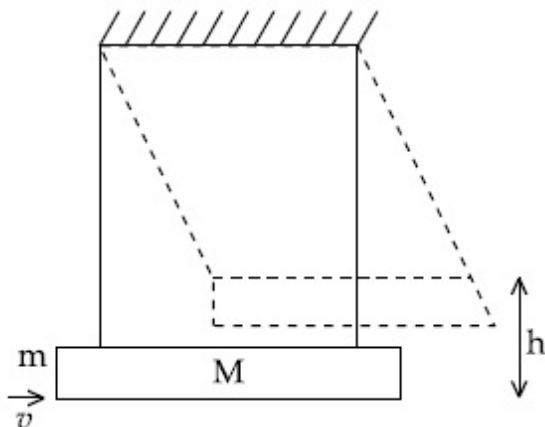
8643516801. Not bend but shrink

8643516802. Neither bend nor shrink

Question Number : 14 Question Id : 8643512264 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A large block of wood of mass M = 5.99 kg is hanging from two long massless cords. A bullet of mass m = 10 g is fired into the block and gets embedded in it. The (block + bullet) then swing upwards, their centre of mass rising a vertical distance h = 9.8 cm before the (block + bullet) pendulum comes momentarily to rest at the end of its arc. The speed of the bullet just before collision is :

(take g = 9.8 ms^{-2})

Options :

8643516803. 811.4 m/s

8643516804. 821.4 m/s

8643516805. 831.4 m/s

8643516806. 841.4 m/s

Question Number : 15 Question Id : 8643512265 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Statement I : A cyclist is moving on an unbanked road with a speed of 7 kmh^{-1} and takes a sharp circular turn along a path of radius of 2m without reducing the speed. The static friction coefficient is 0.2. The cyclist will not slip and pass the curve. (g=9.8 m/s^2)

Statement II : If the road is banked at an angle of 45°, cyclist can cross the curve of 2m radius with the speed of 18.5 kmh^{-1} without slipping.

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

Options :

8643516807. Both statement I and statement II are true

8643516808. Both statement I and statement II are false

8643516809. Statement I is correct and statement II is incorrect

8643516810. Statement I is incorrect and statement II is correct

Question Number : 16 Question Id : 8643512266 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A mosquito is moving with a velocity $\vec{v} = 0.5\, t^2\, \hat{i} + 3t\, \hat{j} + 9\hat{k}$ m/s and accelerating in uniform conditions. What will be the direction of mosquito after 2 s ?

Options :

8643516811. $\tan^{-1}\left(\dfrac{5}{2}\right)$ from x-axis

$$\tan^{-1}\left(\frac{5}{2}\right) \text{ from } y\text{-axis}$$

8643516812.

$$\tan^{-1}\left(\frac{2}{3}\right) \text{ from } x\text{-axis}$$

8643516813.

$$\tan^{-1}\left(\frac{2}{3}\right) \text{ from } y\text{-axis}$$

8643516814.

Question Number : 17 Question Id : 8643512267 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In order to determine the Young's Modulus of a wire of radius 0.2 cm (measured using a scale of least count = 0.001 cm) and length 1m (measured using a scale of least count = 1 mm), a weight of mass 1 kg (measured using a scale of least count = 1 g) was hanged to get the elongation of 0.5 cm (measured using a scale of least count 0.001 cm). What will be the fractional error in the value of Young's Modulus determined by this experiment ?

Options :

8643516815. 1.4 %

8643516816. 0.9 %

8643516817. 0.14 %

8643516818. 9 %

Question Number : 18 Question Id : 8643512268 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A resistor develops 500 J of thermal energy in 20 s when a current of 1.5A is passed through it. If the current is increased from 1.5 A to 3 A, what will be the energy developed in 20 s.

Options :

8643516819. 500 J

8643516820. 1000 J

8643516821. 1500 J

8643516822. 2000 J

Question Number : 19 Question Id : 8643512269 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Find out the surface charge density at the intersection of point $x=3$ m plane and x-axis, in the region of uniform line charge of 8 nC/m lying along the z-axis in free space.

Options :

8643516823. 47.88 C/m
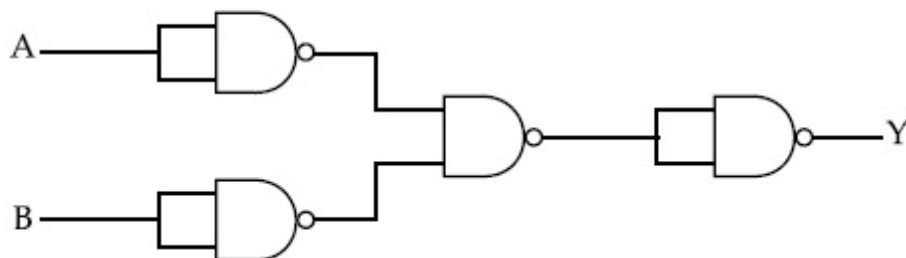
8643516824. 0.07 nC m^{-2}

8643516825. 0.424 nC m^{-2}

8643516826. 4.0 nC m^{-2}

Question Number : 20 Question Id : 8643512270 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The following logic gate is equivalent to :

Options :

8643516827. AND Gate

8643516828. NAND Gate

8643516829. OR Gate

8643516830. NOR Gate

Physics Section B

Section Id : 864351152
Section Number : 2
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 10
Number of Questions to be attempted : 5
Section Marks : 20
Mark As Answered Required? : Yes
Sub-Section Number : 1
Sub-Section Id : 864351152
Question Shuffling Allowed : Yes

Question Number : 21 Question Id : 8643512271 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If one wants to remove all the mass of the earth to infinity in order to break it up completely.

The amount of energy that needs to be supplied will be $\frac{x}{5} \frac{GM^2}{R}$ where x is _____

(Round off to the Nearest Integer)

(M is the mass of earth, R is the radius of earth, G is the gravitational constant)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 22 Question Id : 8643512272 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A swimmer can swim with velocity of 12 km/h in still water. Water flowing in a river has velocity 6 km/h. The direction with respect to the direction of flow of river water he should swim in order to reach the point on the other bank just opposite to his starting point is _____°. (Round off to the Nearest Integer)

(Find the angle in degrees)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 23 Question Id : 8643512273 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A body of mass 2 kg moves under a force of $\left(2\hat{i} + 3\hat{j} + 5\hat{k}\right)$ N. It starts from rest and was at

the origin initially. After 4 s, its new coordinates are (8, b, 20). The value of b is _____.

(Round off to the Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 24 Question Id : 8643512274 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A force $\vec{F} = 4\hat{i} + 3\hat{j} + 4\hat{k}$ is applied on an intersection point of $x = 2$ plane and x-axis. The

magnitude of torque of this force about a point (2, 3, 4) is _____. (Round off to the

Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
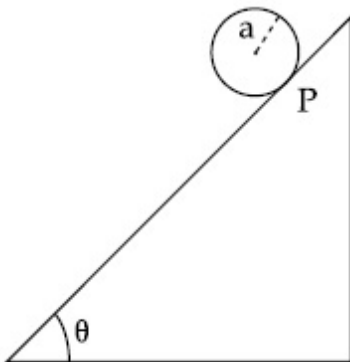**Text Areas :** PlainText

Question Number : 25 Question Id : 8643512275 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A solid disc of radius 'a' and mass 'm' rolls down without slipping on an inclined plane

making an angle θ with the horizontal. The acceleration of the disc will be $\frac{2}{b}$ g sinθ where

b is _____. (Round off to the Nearest Integer)

(g = acceleration due to gravity

θ = angle as shown in figure)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 26 Question Id : 8643512276 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

For an ideal heat engine, the temperature of the source is 127°C. In order to have 60% efficiency the temperature of the sink should be _____°C. (Round off to the Nearest Integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

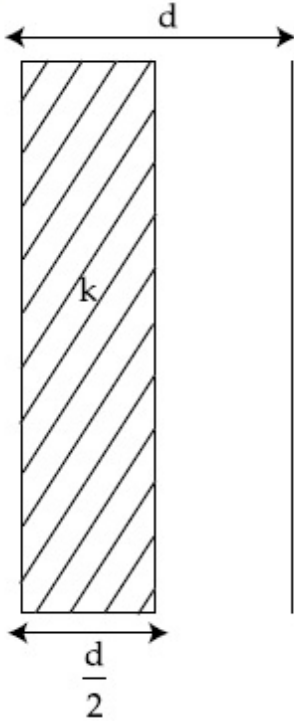**Answers Type :** Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 27 Question Id : 8643512277 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

In a parallel plate capacitor set up, the plate area of capacitor is 2 m² and the plates are separated by 1 m. If the space between the plates are filled with a dielectric material of thickness 0.5 m and area 2 m² (see fig) the capacitance of the set-up will be _____ ε_o. (Dielectric constant of the material=3.2) (Round off to the Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 28 Question Id : 8643512278 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The energy dissipated by a resistor is 10 mJ in 1 s when an electric current of 2 mA flows through it. The resistance is _____ Ω. (Round off to the Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 29 Question Id : 8643512279 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A deviation of 2° is produced in the yellow ray when prism of crown and flint glass are achromatically combined. Taking dispersive powers of crown and flint glass as 0.02 and 0.03 respectively and refractive index for yellow light for these glasses are 1.5 and 1.6 respectively. The refracting angles for crown glass prism will be _____° (in degree). (Round off to the Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 30 Question Id : 8643512280 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A closed organ pipe of length L and an open organ pipe contain gases of densities ρ_1 and ρ_2 respectively. The compressibility of gases are equal in both the pipes. Both the pipes are vibrating in their first overtone with same frequency. The length of the open pipe is $\frac{x}{3} L \sqrt{\frac{\rho_1}{\rho_2}}$ where x is _____. (Round off to the Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Chemistry Section A

Section Id :	864351153
Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80

Question Number : 31 Question Id : 8643512281 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The **INCORRECT** statement regarding the structure of C_{60} is :

Options :

8643516841. It contains 12 six-membered rings and 24 five-membered rings.

8643516842. The six-membered rings are fused to both six and five-membered rings.

8643516843. The five-membered rings are fused only to six-membered rings.

8643516844. Each carbon atom forms three sigma bonds.

Question Number : 32 Question Id : 8643512282 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The **INCORRECT** statements below regarding colloidal solutions is :

Options :

8643516845. A colloidal solution shows colligative properties.

8643516846. A colloidal solution shows Brownian motion of colloidal particles.

8643516847. The flocculating power of Al^{3+} is more than that of Na^{+}.

8643516848. An ordinary filter paper can stop the flow of colloidal particles.

Question Number : 33 Question Id : 8643512283 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The characteristics of elements X, Y and Z with atomic numbers, respectively, 33, 53 and 83 are :

8643516849. X, Y and Z are metals.

8643516850. X and Z are non-metals and Y is a metalloid.

8643516851. X is a metalloid, Y is a non-metal and Z is a metal.

8643516852. X and Y are metalloids and Z is a metal.

Question Number : 34 Question Id : 8643512284 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following reduction reaction **CANNOT** be carried out with coke ?

Options :

8643516853. $Fe_2O_3 \rightarrow Fe$

8643516854. $ZnO \rightarrow Zn$

8643516855. $Cu_2O \rightarrow Cu$

8643516856. $Al_2O_3 \rightarrow Al$

Question Number : 35 Question Id : 8643512285 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The correct statements about H_2O_2 are :

(A) used in the treatment of effluents.

(B) used as both oxidising and reducing agents.

(C) the two hydroxyl groups lie in the same plane.

(D) miscible with water.

Choose the **correct** answer from the options given below :

Options :

8643516857. (A), (B) and (D) only

8643516858. (B), (C) and (D) only

8643516859. (A), (C) and (D) only

8643516860. (A), (B), (C) and (D)

Question Number : 36 Question Id : 8643512286 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Identify the elements X and Y using the ionisation energy values given below :

Ionization energy (kJ/mol)

	1st	2nd
X	495	4563
Y	731	1450

Options :

8643516861. $X = Na$; $Y = Mg$

8643516862. $X = Mg$; $Y = Na$

8643516863. $X = F$; $Y = Mg$

8643516864. $X = Mg$; $Y = F$

Question Number : 37 Question Id : 8643512287 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The exact volumes of 1 M NaOH solution required to neutralise 50 mL of 1 M H_3PO_3 solution and 100 mL of 2 M H_3PO_2 solution, respectively, are :

Options :

8643516865. 50 mL and 50 mL

8643516866. 100 mL and 50 mL

8643516867. 100 mL and 200 mL

8643516868. 100 mL and 100 mL

Question Number : 38 Question Id : 8643512288 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Arrange the following metal complex/compounds in the increasing order of spin only magnetic moment. Presume all the three, high spin system.

(Atomic numbers Ce=58, Gd=64 and Eu=63.)

(a) $(NH_4)_2[Ce(NO_3)_6]$ (b) $Gd(NO_3)_3$ and (c) $Eu(NO_3)_3$

Answer is :

Options :

8643516869. (a) < (b) < (c)

8643516870. (a) < (c) < (b)

8643516871. (b) < (a) < (c)

8643516872. (c) < (a) < (b)

Question Number : 39 Question Id : 8643512289 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Fex_2 and Fey_3 are known when x and y are :

Options :

8643516873. $x=$F, Cl, Br, I and $y=$F, Cl, Br, I

8643516874. $x=$F, Cl, Br, I and $y=$F, Cl, Br

8643516875. $x=$F, Cl, Br and $y=$F, Cl, Br, I

8643516876. $x=$Cl, Br, I and $y=$F, Cl, Br, I

Question Number : 40 Question Id : 8643512290 Question Type : MCQ Option Shuffling : Yes Is

The green house gas/es is (are) :

(A)   Carbon dioxide

(B)   Oxygen

(C)   Water vapour

(D)   Methane

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

Options :

8643516877.   (A) only

8643516878.   (A) and (C) only

8643516879.   (A), (C) and (D) only

8643516880.   (A) and (B) only

Question Number : 41 Question Id : 8643512291 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Match List-I with List-II :

List-I		List-II	
Test/Reagents/Observation(s)		Species detected	
(a)	Lassaigne's Test	(i)	Carbon
(b)	Cu(II) oxide	(ii)	Sulphur
(c)	Silver nitrate	(iii)	N, S, P, and halogen
(d)	The sodium fusion extract gives black precipitate with acetic acid and lead acetate	(iv)	Halogen Specifically

The **correct** match is :

Options :

8643516881.   (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

8643516882.   (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

8643516883. (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

8643516884. (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

Question Number : 42 Question Id : 8643512292 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Statement I :   Sodium hydride can be used as an oxidising agent.

Statement II :   The lone pair of electrons on nitrogen in pyridine makes it basic.

Choose the **CORRECT** answer from the options given below :

Options :

8643516885.   Both statement I and statement II are true

8643516886.   Both statement I and statement II are false

8643516887.   Statement I is true but statement II is false

8643516888.   Statement I is false but statement II is true

Question Number : 43 Question Id : 8643512293 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
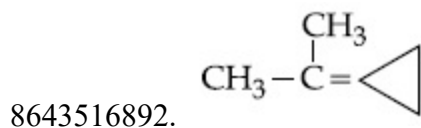**Correct Marks : 4 Wrong Marks : 1**

An unsaturated hydrocarbon X on ozonolysis gives A. Compound A when warmed with ammonical silver nitrate forms a bright silver mirror along the sides of the test tube. The unsaturated hydrocarbon X is :
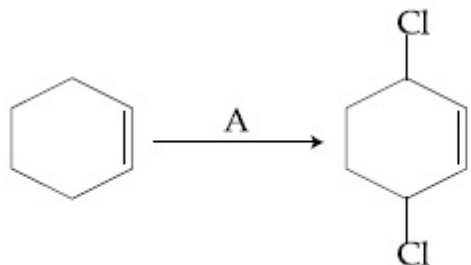
Options :

8643516889. $CH_3-C{\equiv}C-CH_3$

8643516890. $CH_3-\underset{\underset{CH_3}{|}}{C}=\underset{\underset{CH_3}{|}}{C}-CH_3$

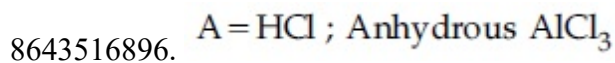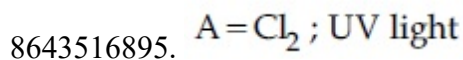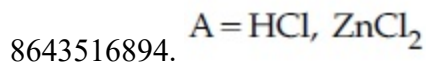8643516891. $HC{\equiv}C-CH_2-CH_3$

8643516892.

Question Number : 44 Question Id : 8643512294 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Identify the reagent(s) 'A' and condition(s) for the reaction

Options :

8643516893. $A = Cl_2$; dark, Anhydrous $AlCl_3$

8643516894. $A = HCl, ZnCl_2$

8643516895. $A = Cl_2$; UV light

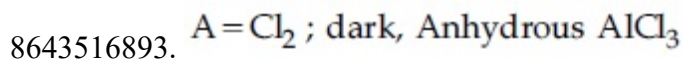8643516896. $A = HCl$; Anhydrous $AlCl_3$

Question Number : 45 Question Id : 8643512295 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In the above reaction, the reagent "A" is :

Options :

8643516897. $LiAlH_4$

8643516898. Alkaline $KMnO_4$, H^+

8643516899. HCl, $Zn-Hg$

8643516900. $NaBH_4$, H_3O^+

Question Number : 46 Question Id : 8643512296 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
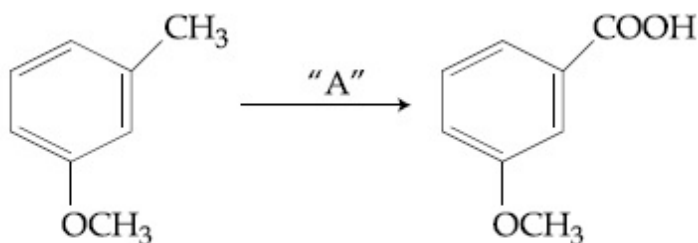
Correct Marks : 4 Wrong Marks : 1

The structure of X is :

Options :

8643516901.

8643516902.
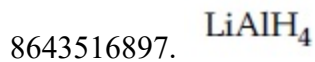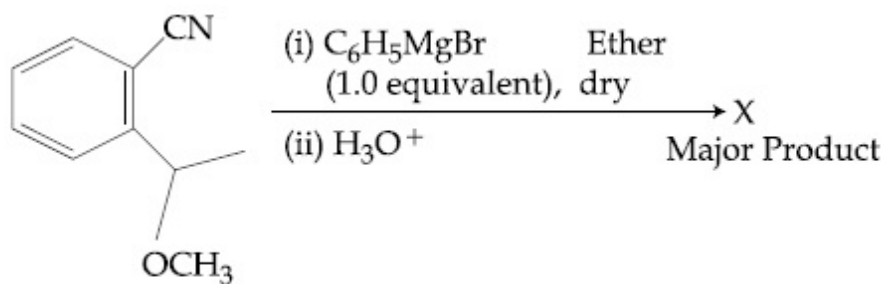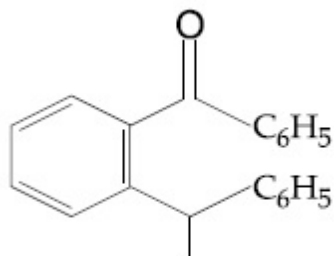

8643516903.

8643516904.

Question Number : 47 Question Id : 8643512297 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following is least basic ?

Options :

8643516905. $(CH_3CO)_2\ddot{N}H$

8643516906. $(C_2H_5)_2\ddot{N}H$

8643516907. $(CH_3CO)\ddot{N}HC_2H_5$
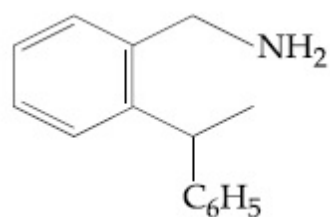
8643516908. $(C_2H_5)_3\ddot{N}$

Question Number : 48 Question Id : 8643512298 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Ammonolysis of Alkyl halides followed by the treatment with NaOH solution can be used to prepare primary, secondary and tertiary amines. The purpose of NaOH in the reaction is :

Options :

8643516909. to remove basic impurities

8643516910. to activate NH_3 used in the reaction

8643516911. to increase the reactivity of alkyl halide
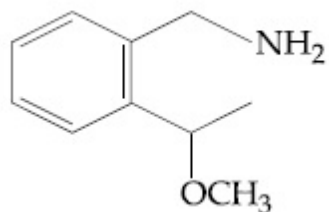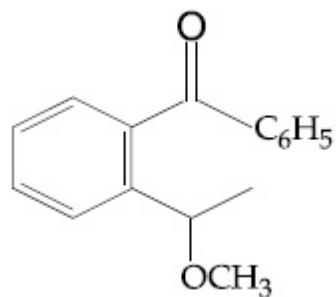
8643516912. to remove acidic impurities

Question Number : 49 Question Id : 8643512299 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following polymer is used in the manufacture of wood laminates ?

Options :

8643516913. Melamine formaldehyde resin

8643516914. Urea formaldehyde resin

8643516915. *cis*-poly isoprene

8643516916. Phenol and formaldehyde resin

Question Number : 50 Question Id : 8643512300 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The secondary structure of protein is stabilised by :

Options :

8643516917. van der Waals forces

8643516918. Peptide bond

8643516919. Hydrogen bonding

8643516920. glycosidic bond

Chemistry Section B

Section Id :	864351154
Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1

Question Number : 51 Question Id : 8643512301 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

When 35 mL of 0.15 M lead nitrate solution is mixed with 20 mL of 0.12 M chromic sulphate solution, _____ $\times 10^{-5}$ moles of lead sulphate precipitate out. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 52 Question Id : 8643512302 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Ga (atomic mass 70 u) crystallizes in a hexagonal close packed structure. The total number of voids in 0.581 g of Ga is _____ $\times 10^{21}$. (Round off to the Nearest Integer).

[Given : $N_A = 6.023 \times 10^{23}$]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 53 Question Id : 8643512303 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The number of orbitals with $n = 5$, $m_l = +2$ is _____. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 54 Question Id : 8643512304 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

At 25°C, 50 g of iron reacts with HCl to form $FeCl_2$. The evolved hydrogen gas expands against a constant pressure of 1 bar. The work done by the gas during this expansion is _____ J.

(Round off to the Nearest Integer).

[Given : $R = 8.314$ J mol^{-1} K^{-1}. Assume, hydrogen is an ideal gas]

[Atomic mass of Fe is 55.85 u]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 55 Question Id : 8643512305 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

At 363 K, the vapour pressure of A is 21 kPa and that of B is 18 kPa. One mole of A and 2 moles of B are mixed. Assuming that this solution is ideal, the vapour pressure of the mixture is _____ kPa. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 56 Question Id : 8643512306 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Sulphurous acid (H_2SO_3) has $Ka_1 = 1.7 \times 10^{-2}$ and $Ka_2 = 6.4 \times 10^{-8}$. The pH of 0.588 M H_2SO_3 is _____. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

Question Number : 57 Question Id : 8643512307 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A 5.0 m mol dm^{-3} aqueous solution of KCl has a conductance of 0.55 mS when measured in a cell of cell constant 1.3 cm^{-1}. The molar conductivity of this solution is _____ mSm^2 mol^{-1}. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 58 Question Id : 8643512308 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A and B decompose via first order kinetics with half-lives 54.0 min and 18.0 min respectively. Starting from an equimolar non reactive mixture of A and B, the time taken for the concentration of A to become 16 times that of B is _____ min. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 59 Question Id : 8643512309 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

$[Ti(H_2O)_6]^{3+}$ absorbs light of wavelength 498 nm during a d$-$d transition. The octahedral splitting energy for the above complex is _____ $\times 10^{-19}$ J. (Round off to the Nearest Integer). h$=6.626 \times 10^{-34}$ Js; c$=3 \times 10^8$ ms^{-1}

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

Question Number : 60 Question Id : 8643512310 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

In Duma's method of estimation of nitrogen, 0.1840 g of an organic compound gave 30 mL of nitrogen collected at 287 K and 758 mm of Hg pressure. The percentage composition of nitrogen in the compound is _____. (Round off to the Nearest Integer).

[Given : Aqueous tension at 287 K = 14 mm of Hg]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Mathematics Section A

Section Id :	864351155
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	864351155
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 8643512311 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the foot of the perpendicular from point $(4, 3, 8)$ on the line $L_1 : \dfrac{x - a}{l} = \dfrac{y - 2}{3} = \dfrac{z - b}{4}$, $l \neq 0$ is $(3, 5, 7)$, then the shortest distance between the line L_1 and line $L_2 : \dfrac{x - 2}{3} = \dfrac{y - 4}{4} = \dfrac{z - 5}{5}$ is equal to :

Options :

8643516931. $\dfrac{1}{\sqrt{6}}$

8643516932. $\dfrac{1}{2}$

8643516933. $\dfrac{1}{\sqrt{3}}$

8643516934. $\sqrt{\dfrac{2}{3}}$

Question Number : 62 Question Id : 8643512312 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let the lengths of intercepts on x-axis and y-axis made by the circle $x^2 + y^2 + ax + 2ay + c = 0$, $(a < 0)$ be $2\sqrt{2}$ and $2\sqrt{5}$, respectively. Then the shortest distance from origin to a tangent to this circle which is perpendicular to the line $x + 2y = 0$, is equal to :

Options :

8643516935. $\sqrt{10}$

8643516936. $\sqrt{11}$

8643516937. $\sqrt{7}$

8643516938. $\sqrt{6}$

Question Number : 63 Question Id : 8643512313 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 5\hat{k}$. If $\vec{r} \times \vec{a} = \vec{b} \times \vec{r}$, $\vec{r} \cdot \left(\alpha\hat{i} + 2\hat{j} + \hat{k} \right) = 3$ and $\vec{r} \cdot \left(2\hat{i} + 5\hat{j} - \alpha\hat{k} \right) = -1$, $\alpha \in \mathbf{R}$, then the value of $\alpha + \left| \vec{r} \right|^2$ is equal to :

Options :

8643516939. 9

8643516940. 11

8643516941. 13

8643516942. 15

Question Number : 64 Question Id : 8643512314 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let f be a real valued function, defined on $R - \{-1, 1\}$ and given by

$$f(x) = 3 \log_e \left| \frac{x - 1}{x + 1} \right| - \frac{2}{x - 1}.$$

Then in which of the following intervals, function $f(x)$ is increasing ?

Options :

8643516943. $(-\infty, \infty) - \{-1, 1\}$

8643516944. $(-\infty, -1) \cup \left(\left[\frac{1}{2}, \infty \right) - \{1\} \right)$

8643516945. $(-\infty, \frac{1}{2}] - \{-1\}$

8643516946. $(-1, \frac{1}{2}]$

Question Number : 65 Question Id : 8643512315 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the points of intersections of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the circle $x^2 + y^2 = 4b$, $b > 4$ lie

on the curve $y^2 = 3x^2$, then b is equal to :

Options :

8643516947. 5

8643516948. 6

8643516949. 10

8643516950. 12

Question Number : 66 Question Id : 8643512316 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let C be the locus of the mirror image of a point on the parabola $y^2 = 4x$ with respect to the line $y = x$. Then the equation of tangent to C at P(2, 1) is :

Options :

8643516951. $x + 3y = 5$

8643516952. $2x + y = 5$

8643516953. $x - y = 1$

8643516954. $x + 2y = 4$

Question Number : 67 Question Id : 8643512317 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let A denote the event that a 6-digit integer formed by 0, 1, 2, 3, 4, 5, 6 without repetitions, be divisible by 3. Then probability of event A is equal to :

Options :

8643516955. $\dfrac{4}{9}$

8643516956. $\dfrac{3}{7}$

8643516957. $\dfrac{11}{27}$

$\dfrac{9}{56}$

8643516958.

Question Number : 68 Question Id : 8643512318 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $y=y(x)$ is the solution of the differential equation $\dfrac{dy}{dx}+(\tan x)\,y=\sin x,\ 0\le x\le\dfrac{\pi}{3}$, with $y(0)=0$, then $y\!\left(\dfrac{\pi}{4}\right)$ equal to :

Options :

8643516959. $\left(\dfrac{1}{2\sqrt{2}}\right)\log_e 2$

8643516960. $\dfrac{1}{2}\log_e 2$

8643516961. $\log_e 2$

8643516962. $\dfrac{1}{4}\log_e 2$

Question Number : 69 Question Id : 8643512319 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $\alpha\in R$ be such that the function $f(x)=\begin{cases}\dfrac{\cos^{-1}\left(1-\{x\}^2\right)\sin^{-1}(1-\{x\})}{\{x\}-\{x\}^3}, & x\ne 0\\[2mm]\alpha, & x=0\end{cases}$ is

continuous at $x=0$, where $\{x\}=x-[x]$, $[x]$ is the greatest integer less than or equal to x. Then :

Options :

8643516963. $\alpha=0$

8643516964. no such α exists

8643516965. $\alpha = \dfrac{\pi}{\sqrt{2}}$

8643516966. $\alpha = \dfrac{\pi}{4}$

Question Number : 70 Question Id : 8643512320 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If (x, y, z) be an arbitrary point lying on a plane P which passes through the points $(42, 0, 0)$,

$(0, 42, 0)$ and $(0, 0, 42)$, then the value of the expression

$$3 + \frac{x-11}{(y-19)^2\,(z-12)^2} + \frac{y-19}{(x-11)^2\,(z-12)^2} + \frac{z-12}{(x-11)^2\,(y-19)^2} - \frac{x+y+z}{14(x-11)\,(y-19)\,(z-12)}$$

is equal to :

Options :

8643516967. -45

8643516968. 39

8643516969. 0

8643516970. 3

Question Number : 71 Question Id : 8643512321 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $A = \{2, 3, 4, 5, \ldots, 30\}$ and '$\simeq$' be an equivalence relation on $A \times A$, defined by $(a, b) \simeq (c, d)$, if and only if $ad = bc$. Then the number of ordered pairs which satisfy this equivalence relation with ordered pair $(4, 3)$ is equal to :

Options :

8643516971. 5

8643516972. 6

8643516973. 7

8643516974. 8

Question Number : 72 Question Id : 8643512322 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $P(x) = x^2 + bx + c$ be a quadratic polynomial with real coefficients such that $\int_0^1 P(x)\,dx = 1$ and $P(x)$ leaves remainder 5 when it is divided by $(x-2)$. Then the value of $9(b+c)$ is equal to :

Options :

8643516975. 7

8643516976. 9

8643516977. 11

8643516978. 15

Question Number : 73 Question Id : 8643512323 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Consider a rectangle ABCD having 5, 7, 6, 9 points in the interior of the line segments AB, CD, BC, DA respectively. Let α be the number of triangles having these points from different sides as vertices and β be the number of quadrilaterals having these points from different sides as vertices. Then $(\beta - \alpha)$ is equal to :

Options :

8643516979. 1173

8643516980. 1890

8643516981. 717

8643516982. 795

Question Number : 74 Question Id : 8643512324 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Consider the integral

$$I = \int_0^{10} \frac{[x]\, e^{[x]}}{e^{x-1}}\, dx \,,$$

where $[x]$ denotes the greatest integer less than or equal to x. Then the value of I is equal

to :

Options :

8643516983. 45 $(e+1)$

8643516984. 9 $(e+1)$

8643516985. 45 $(e-1)$

8643516986. 9 $(e-1)$

Question Number : 75 Question Id : 8643512325 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $A(-1, 1)$, $B(3, 4)$ and $C(2, 0)$ be given three points. A line $y = mx$, m>0, intersects lines AC and BC at point P and Q respectively. Let A_1 and A_2 be the areas of $\triangle ABC$ and $\triangle PQC$ respectively, such that $A_1 = 3A_2$, then the value of m is equal to :

Options :

8643516987. 1

8643516988. $\dfrac{4}{15}$

8643516989. 2

8643516990. 3

Question Number : 76 Question Id : 8643512326 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The least value of $|z|$ where z is complex number which satisfies the inequality

$$\exp\left(\frac{(|z|+3)\,(|z|-1)}{\||z|+1|}\,\log_e 2\right) \geq \log_{\sqrt{2}}|5\sqrt{7}+9i|,\ i=\sqrt{-1},\ \text{is equal to :}$$

Options :

8643516991. 2

8643516992. $\sqrt{5}$

8643516993. 3

8643516994. 8

Question Number : 77 Question Id : 8643512327 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The maximum value of $f(x) = \begin{vmatrix} \sin^2 x & 1+\cos^2 x & \cos 2x \\ 1+\sin^2 x & \cos^2 x & \cos 2x \\ \sin^2 x & \cos^2 x & \sin 2x \end{vmatrix}$, $x \in R$ is :

Options :

8643516995. $\sqrt{5}$

8643516996. 5

8643516997. $\sqrt{7}$

8643516998. $\dfrac{3}{4}$

Question Number : 78 Question Id : 8643512328 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Given that the inverse trigonometric functions take principal values only. Then, the number

of real values of x which satisfy $\sin^{-1}\left(\dfrac{3x}{5}\right) + \sin^{-1}\left(\dfrac{4x}{5}\right) = \sin^{-1}x$ is equal to :

Options :

8643516999. 0

8643517000. 1

8643517001. 2

8643517002. 3

Question Number : 79 Question Id : 8643512329 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $f : S \to S$ where $S = (0, \infty)$ be a twice differentiable function such that $f(x+1) = xf(x)$. If $g : S \to R$ be defined as $g(x) = \log_e f(x)$, then the value of $|g''(5) - g''(1)|$ is equal to :

Options :

8643517003. $\dfrac{205}{144}$

8643517004. $\dfrac{197}{144}$

8643517005. $\dfrac{187}{144}$

8643517006. 1

Question Number : 80 Question Id : 8643512330 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let C_1 be the curve obtained by the solution of differential equation $2xy \frac{dy}{dx} = y^2 - x^2$, $x > 0$.

Let the curve C_2 be the solution of $\frac{2xy}{x^2 - y^2} = \frac{dy}{dx}$. If both the curves pass through $(1, 1)$, then

the area enclosed by the curves C_1 and C_2 is equal to :

Options :

8643517007. $\frac{\pi}{4} + 1$

8643517008. $\pi - 1$

8643517009. $\frac{\pi}{2} - 1$

8643517010. $\pi + 1$

Mathematics Section B

For real numbers α, β, γ and δ, if

$$\int \frac{(x^2-1) + \tan^{-1}\left(\frac{x^2+1}{x}\right)}{(x^4+3x^2+1)\,\tan^{-1}\left(\frac{x^2+1}{x}\right)}\,dx$$

$$= \alpha\,\log_e\left(\tan^{-1}\left(\frac{x^2+1}{x}\right)\right) + \beta\,\tan^{-1}\left(\frac{\gamma(x^2-1)}{x}\right) + \delta\,\tan^{-1}\left(\frac{x^2+1}{x}\right) + C$$

where C is an arbitrary constant, then the value of $10(\alpha + \beta\gamma + \delta)$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 82 Question Id : 8643512332 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

In ΔABC, the lengths of sides AC and AB are 12 cm and 5 cm, respectively. If the area of ΔABC is 30 cm² and R and r are respectively the radii of circumcircle and incircle of ΔABC, then the value of 2R+r (in cm) is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 83 Question Id : 8643512333 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the distance of the point $(1, -2, 3)$ from the plane $x+2y-3z+10=0$ measured parallel to

the line, $\dfrac{x-1}{3} = \dfrac{2-y}{m} = \dfrac{z+3}{1}$ is $\sqrt{\dfrac{7}{2}}$, then the value of $|m|$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 84 Question Id : 8643512334 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $\vec{c}$ be a vector perpendicular to the vectors $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$. If $\vec{c} \cdot \left(\hat{i} + \hat{j} + 3\hat{k}\right) = 8$ then the value of $\vec{c} \cdot \left(\vec{a} \times \vec{b}\right)$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 85 Question Id : 8643512335 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let $f : \mathbb{R} \to \mathbb{R}$ and $g : \mathbb{R} \to \mathbb{R}$ be defined as

$$f(x) = \begin{cases} x + a, & x < 0 \\ |x - 1|, & x \geq 0 \end{cases} \text{ and } g(x) = \begin{cases} x + 1, & x < 0 \\ (x - 1)^2 + b, & x \geq 0, \end{cases}$$

where a, b are non-negative real numbers. If $(g \circ f)(x)$ is continuous for all $x \in \mathbb{R}$, then $a + b$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 86 Question Id : 8643512336 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Consider the statistics of two sets of observations as follows :

	Size	Mean	Variance
Observation I	10	2	2
Observation II	n	3	1

If the variance of the combined set of these two observations is $\dfrac{17}{9}$, then the value of n is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 87 Question Id : 8643512337 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let n be a positive integer. Let $A = \displaystyle\sum_{k=0}^{n} (-1)^k \; {}^{n}C_k \left[\left(\dfrac{1}{2}\right)^k + \left(\dfrac{3}{4}\right)^k + \left(\dfrac{7}{8}\right)^k + \left(\dfrac{15}{16}\right)^k + \left(\dfrac{31}{32}\right)^k \right]$

If $63A = 1 - \dfrac{1}{2^{30}}$, then n is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 88 Question Id : 8643512338 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $A = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$ and $B = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}$ be two 2×1 matrices with real entries such that $A = XB$, where

$X = \dfrac{1}{\sqrt{3}} \begin{bmatrix} 1 & -1 \\ 1 & k \end{bmatrix}$, and $k \in R$. If $a_1^2 + a_2^2 = \dfrac{2}{3}(b_1^2 + b_2^2)$ and $(k^2+1)\, b_2^2 \neq -2\, b_1\, b_2$, then the

value of k is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 89 Question Id : 8643512339 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $\dfrac{1}{16}$, a and b be in G.P. and $\dfrac{1}{a}$, $\dfrac{1}{b}$, 6 be in A.P., where a, b > 0. Then $72(a+b)$ is equal to

_____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 90 Question Id : 8643512340 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let

$S_n(x) = \log_{a^{1/2}} x + \log_{a^{1/3}} x + \log_{a^{1/6}} x + \log_{a^{1/11}} x + \log_{a^{1/18}} x + \log_{a^{1/27}} x + \ldots$ up to n-terms,

where a > 1. If $S_{24}(x) = 1093$ and $S_{12}(2x) = 265$, then value of a is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :