#TestName:

OLTS-1718-JEEA 2018 SAMPLE PAPER FULL TEST PAPER – II

#Time:

180 minutes

#Language:

English

#Attempts:

0

#StartDate:

#EndDate:

#TestPause:

Yes

#Review:

Yes

#ShowCorrectAnswers:

Yes

#SectionShuffle:

No

#QuestionShuffle:

No

#AnswerShuffle:

No

#CourseId:

#TestType:

Full

#Syllabus:

Full Syllabus

#ScheduleId:

#Section:

Physics

#SerialNo:

1

#Subject:

Physics

#SubSection:

SMCQ Single Correct

#SubSectionSerialNo:

1

#MarksPerQuestion:

3

#NegativeMarks:

1

#QuestionType:

SMCQ

#QuestionSerialNo:

1

#Question:

A sphere of mass m moving with a constant velocity u hits another stationary sphere of the same mass. If e is the coefficient of restitution, then ratio of final velocity of the sphere moving initially to the final velocity of the sphere initially at rest is:

#Option1:

#equation$$\left( {{{1 - e} \over {1 + e}}} \right)$$equation#

#Option2:

#equation$$\left( {{{1 + e} \over {1 - e}}} \right)$$equation#

#Option3:

#equation$$\left( {{{e + 1} \over {e + 1}}} \right)$$equation#

#Option4:

#equation$$\left( {{{e - 1} \over {e + 1}}} \right)$$equation#

#Answer:

Option1

#Solution:

mu = mv1 + mv2 ; v1 + v2 = u

–e = #equation$${{{v\_2} - {v\_1}} \over {0 - u}}$$equation#

v2 – v1 = eu

v1 = #equation$${u \over 2}(1 - e)$$equation# ; v2 = #equation$${u \over 2}(1 + e)$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P110605

#ConceptIds:

1409

#QuestionType:

SMCQ

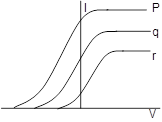
#QuestionSerialNo:

2

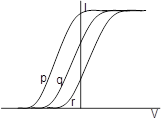
#Question:

Photoelectric effect experiments are performed using three different metal plates p, q and r having work functions fp = 2.0 eV, fq = 2.5 eV and fr = 3.0 eV, respectively. A light beam containing wavelengths of 550 nm, 450 nm and 350 nm with equal intensities illuminates each of the plates. The correct I-V graph for the experiment is

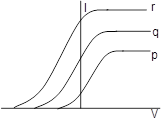
#Option1:



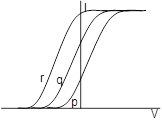
#Option2:



#Option3:



#Option4:



#Answer:

Option1

#Solution:

As l increases saturation current also increases.

#Level:

Conceptual, Easy

#ConceptCode:

P120602

#ConceptIds:

1526

#QuestionType:

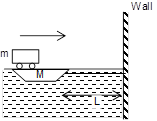
SMCQ

#QuestionSerialNo:

3

#Question:

A car of mass m is initially at rest on the boat of mass M tied to the wall of dock through a massless inextensible string. The car accelerates from rest to velocity v0 in times t­0. At t = t0 the car applies brake and comes to rest relative to the boat in negligible time. Neglect friction between the boat and water; the time ‘t’ at which boat will strike the wall is



#Option1:

#equation$${t\_0} + \left( {L/{v\_0}} \right)$$equation#

#Option2:

#equation$${t\_0} + {{L\left( {M + m} \right)} \over {m{v\_0}}}$$equation#

#Option3:

#equation$${{LM} \over {m{v\_0}}}$$equation#

#Option4:

none of these

#Answer:

Option2

#Solution:

After brakes applied,

Common velocity of car and boat = #equation$$\left( {{{m{v\_o}} \over {m + M}}} \right)$$equation#

Time taken to hit wall = #equation$${{L(M + m)} \over {m{v\_o}}}$$equation#.

#Level:

Conceptual, Moderate

#ConceptCode:

P110602

#ConceptIds:

1406

#QuestionType:

SMCQ

#QuestionSerialNo:

4

#Question:

A uniform slender rod of length L, cross sectional area A and Young’s modulus Y is acted upon by the forces in the figure. The elongation of the rod is

image006

#Option1:

#equation$${{3FL} \over {5AY}}$$equation#

#Option2:

#equation$${{2FL} \over {5AY}}$$equation#

#Option3:

#equation$${{5FL} \over {8AY}}$$equation#

#Option4:

#equation$${{8FL} \over {3AY}}$$equation#

#Answer:

Option4

#Solution:

Net force is zero

Total elongation #equation$${{3F2L} \over {Y3A}} + {{2FL} \over {3YA}}$$equation# = #equation$${{8FL} \over {3YA}}$$equation#

#Level:

Conceptual, Moderate

#ConceptCode:

P111101

#ConceptIds:

1441

#QuestionType:

SMCQ

#QuestionSerialNo:

5

#Question:

A certain amount of ice is supplied heat at a constant rate for 7 minutes. For the first one minute the temperature rise is uniformly with time. Then it remains constant for the next   
4 minutes and again the temperature rises at uniform rate for the last two minutes (Given Specific heat of ice = 0.5 cal/g-0C, latent heat of fusion = 80 cal/gm and specific heat of water = 1 cal/gm – 0C)

#Option1:

The initial temperature of ice is -300C

#Option2:

The final temperature at the end of 7 min is 40 0C

#Option3:

The final temperature at the end of 7 min is 30 0C

#Option4:

Between t = 1 min to t = 5 min it does not change its phase

#Answer:

Option2

#Solution:

#equation$$\eqalign{

& mx0.5{T\_i} = 1xP \cr

& mx80\,\,\,\,\,\,\, = 4xP \cr

& mx1x{T\_f}\,\,\,\, = 2xP \cr

& \Rightarrow {T\_f} = {40^ \circ }C \cr} $$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P111201

#ConceptIds:

1447

#QuestionType:

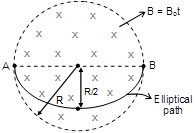
SMCQ

#QuestionSerialNo:

6

#Question:

There is a uniform time varying magnetic field in a circular region as shown in the figure. Find out the potential difference across 2 point along an elliptical path as shown in figure.



#Option1:

#equation$${{\pi {R^2}} \over 2}{B\_o}$$equation#

#Option2:

#equation$${{\pi {R^2}} \over 2}{B\_o}$$equation#

#Option3:

#equation$${{\pi {R^2}} \over 4}{B\_o}$$equation#

#Option4:

#equation$${{\pi {R^2}} \over 5}{B\_o}$$equation#

#Answer:

Option3

#Solution:

#equation$$\Delta V = \left| {{{d\phi } \over {dt}}} \right|$$equation# = #equation$$(Area) \times {{dB} \over {dt}} = {{\pi R} \over 2}\left( {{R \over 2}} \right)\;({B\_o})$$equation#

#equation$$\Delta {V\_{AB}} = {{\pi {R^2}} \over 4}{B\_o}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P120414

#ConceptIds:

6844

#QuestionType:

SMCQ

#QuestionSerialNo:

7

#Question:

In Young’s Double slit Experiment, the wavelength of the red light is 7800 Å and that of blue light is 5200 Å. The value of n for which nth bright band due to red light coincides with   
(n + 1)th bright band due to blue light, is

#Option1:

1

#Option2:

2

#Option3:

3

#Option4:

4

#Answer:

Option2

#Solution:

#equation$${y\_{n(red)}} = {{n{\lambda \_1}D} \over d}$$equation#

#equation$${y\_{n + 1(blue)}} = {{(n + 1){\lambda \_2}D} \over d}$$equation#

Apply yn (red) = yn+1 (blue)

n(lr) = (n + 1)lb

n(7800) = (n + 1) (5200)

Þ

n = 2

#Level:

Analytical, Moderate

#ConceptCode:

P120510

#ConceptIds:

1518

#SubSection:

SMCQ Multi Correct (One or more than one correct)

#SubSectionSerialNo:

2

#MarksPerQuestion:

4

#NegativeMarks:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

8

#Question:

A converging lens is used to form an image on a screen. When the upper half of the lens is covered by an opaque screen,

#Option1:

half the image will disappear.

#Option2:

complete image will be formed.

#Option3:

intensity of the image will increase

#Option4:

intensity of the image will decrease.

#Answer:

Option2, 4

#Solution:

Some light will be absorbed.

#Level:

Conceptual, Easy

#ConceptCode:

P120502

#ConceptIds:

1510

#QuestionType:

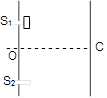
SMCQ

#QuestionSerialNo:

9

#Question:

A YDSE is performed in a medium of refractive index#equation$${\mu \_1}$$equation#. In front of one of the slits say S1 as shown a thin glass slab of refractive index #equation$${\mu \_2}\left( { < {\mu \_1}} \right)$$equation# is kept. If initially the central maxima was formed on the central line OC then



#Option1:

central maxima will shift upwards

#Option2:

central maxima will shift downwards

#Option3:

the waves reaching on the screen at C from S1 will lead the waves reaching from S2

#Option4:

the waves reaching C from S1 will lag from the waves reaching from S2

#Answer:

Option2, 3

#Solution:

Introduction of sheet decrease optical path length.

#Level:

Conceptual, Moderate

#ConceptCode:

P120510

#ConceptIds:

1518

#QuestionType:

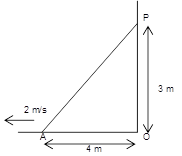
SMCQ

#QuestionSerialNo:

10

#Question:

A ladder AP of length 5m is inclined to a vertical wall is slipping over a horizontal surface with velocity of 2 m/s when P is at a distance 3m from ground what is the velocity of centre of mass at this moment.



#Option1:

1.25 m/s

#Option2:

5/3 m/s

#Option3:

1 m/s

#Option4:

2 m/s

#Answer:

Option2

#Solution:

#equation$${V\_{cm}} = {2 \over 3} \times {{\sqrt {{{(3)}^3} + {{(4)}^2}} } \over 2}$$equation#

#Level:

Conceptual, Moderate

#ConceptCode:

P110602

#ConceptIds:

1406

#QuestionType:

SMCQ

#QuestionSerialNo:

11

#Question:

A long straight wire of radius r carries a current distributed uniformly over its cross section. The magnitude of the magnetic field is

#Option1:

maximum at the axis of the wire

#Option2:

minimum at the axis of the wire

#Option3:

maximum at the surface of the wire

#Option4:

minimum at the surface of the wire

#Answer:

Option2, 3

#Solution:

At the axis B = 0 and B µ x inside wire.

#Level:

Analytical, Moderate

#ConceptCode:

P120301

#ConceptIds:

1486

#QuestionType:

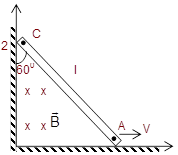
SMCQ

#QuestionSerialNo:

12

#Question:

A rod of length l slides against the perpendicular walls such that the lowest point (A) of the rod moves with a speed #equation$$\vec v$$equation#in the magnetic field #equation$$\vec B$$equation#. The induced emf between the ends A & C of the rod is



#Option1:

BlV

#Option2:

#equation$${{BlV} \over 2}$$equation#

#Option3:

3#equation$${{BlV} \over 2}$$equation#

#Option4:

#equation$${3 \over 4}BlV$$equation#

#Answer:

Option2

#Solution:

#equation$$emf = BV\sin \;{30^o}\;\ell $$equation# = #equation$${{BV\ell } \over 2}$$equation#

#Level:

Analytical, Easy

#ConceptCode:

P120403

#ConceptIds:

1499

#QuestionType:

SMCQ

#QuestionSerialNo:

13

#Question:

35 keV electrons are allowed to strike molybdenum and tungsten targets separately. Then

#Option1:

the minimum wavelengths of the X-rays produced for the two target materials will be

same

#Option2:

the minimum wavelength of the X-ray produced for tungsten will be less than the

minimum wavelength produced for molybdenum

#Option3:

wavelengths of the ka radiation for tungsten and molybdenum will be same

#Option4:

wavelengths of the ka radiation for tungsten and molybdenum will be different

#Answer:

Option1, 4

#Solution:

lmin = #equation$${{hc} \over {{k\_e}}}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P120606

#ConceptIds:

1530

#QuestionType:

SMCQ

#QuestionSerialNo:

14

#Question:

A closed organ pipe of length 28 cm closed at one end is found to be at resonance when a tuning fork of frequency 850 Hz is sounded near the open end. If velocity of sound in air is 340 m/s, then the

#Option1:

air in the pipe is vibrating in fundamental mode

#Option2:

air in the pipe is vibrating in first overtone

#Option3:

end correction of the pipe is 1 cm

#Option4:

end correction of the pipe is 2 cm

#Answer:

Option2D

#Solution:

For nth mode of vibration #equation$${\lambda \_n} = {{4\ell } \over {(2n - 1)}}$$equation#.

#Level:

Conceptual, Moderate

#ConceptCode:

P111306

#ConceptIds:

1460

#SubSection:

SMCQ Single Correct

#SubSectionSerialNo:

3

#MarksPerQuestion:

3

#NegativeMarks:

0

#QuestionType:

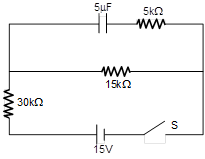
Passage

#Paragraph:

Comprehension Type

Paragraph for question nos. 15 –16

In the circuit shown in figure. Switch S is closed for 6s to get the capacitor charged. Initial charge on the capacitor was zero, then



#TotalQuestions:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

15

#Question:

Current through the resistance 15kW change with time according to the expression

#Option1:

#equation$$I = \left( {2.5 \times {{10}^{ - 4}}} \right)\left( {{e^{ - 10t}} - {e^{ - 10\left( {t + 8} \right)}}} \right)$$equation#A

#Option2:

#equation$$I = \left( {2.5 \times {{10}^{ - 4}}} \right){e^{ - {{\left( {t - 6} \right)} \over {10}}}}A$$equation#

#Option3:

#equation$$I = {4 \over 9} \times {10^{ - 3}}{e^{\left( {{{ - 40t} \over 3}} \right)}}$$equation#

#Option4:

#equation$$I = {{{{10}^{ - 3}}} \over 9}\left( {3 - 2{e^{{{ - 40t} \over 3}}}} \right)A$$equation#

#Answer:

Option4

#Solution:

i × 15 × 103 = #equation$${5 \over 3}\;\left\langle {3 - 2{e^{ - {{40t} \over 3}}}} \right\rangle $$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P120209

#ConceptIds:

1485

#QuestionType:

SMCQ

#QuestionSerialNo:

16

#Question:

The capacitor begins to discharge at t =  sec time interval in which charge on the capacitor falls to one fourth of the maximum value is t then t equals to

#Option1:

0.02 sec

#Option2:

0.14 sec

#Option3:

0.32 sec

#Option4:

0.68 sec

#Answer:

Option2

#Solution:

#equation$${1 \over 4} = {e^{ - 10\;t}}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P120209

#ConceptIds:

1485

#QuestionType:

Passage

#Paragraph:

Paragraph for question nos. 17 – 18

There is a spherical cavity inside a uniform spherical volume charge of charge density +r as shown in figure. If radius of cavity is R/4 and radius of spherical charge distribution is R then answer the following

#TotalQuestions:

2

#QuestionType:

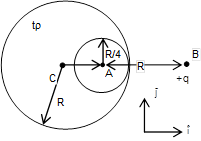
SMCQ

#QuestionSerialNo:

17

#Question:

The field at any point inside the cavity is



#Option1:

#equation$${{\rho R} \over {3{\varepsilon \_0}}}\hat i$$equation#

#Option2:

#equation$${{\rho R} \over {4{\varepsilon \_0}}}\hat i$$equation#

#Option3:

#equation$${{\rho R} \over {12{\varepsilon \_0}}}\hat i$$equation#

#Option4:

none of these

#Answer:

Option2

#Solution:

#equation$$\vec E = {\rho \over {3{\varepsilon \_o}}}\;\left( {R - {R \over 4}} \right)\hat i$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P120102

#ConceptIds:

1463

#QuestionType:

SMCQ

#QuestionSerialNo:

18

#Question:

The force acting on a charge particle q at B is

#Option1:

#equation$${{3\rho qR} \over {25{\varepsilon \_0}}}\hat i$$equation#

#Option2:

– #equation$${{3\rho qR} \over {25{\varepsilon \_0}}}\hat i$$equation#

#Option3:

#equation$${{6\rho qR} \over {25{\varepsilon \_0}}}\hat i$$equation#

#Option4:

none of these

#Answer:

Option4

#Solution:

#equation$$\vec F = {{q\rho R} \over {3{\varepsilon \_o}}}\;\left\langle {{{16} \over {25}} - {1 \over {64}}} \right\rangle \;\hat i$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

P120102

#ConceptIds:

1463

#Section:

CHEMISTRY

#SerialNo:

2

#Subject:

CHEMISTRY

#SubSection:

SMCQ Single Correct

#SubSectionSerialNo:

1

#MarksPerQuestion:

3

#NegativeMarks:

1

#QuestionType:

SMCQ

#QuestionSerialNo:

19

#Question:

Extraction of zinc from zinc blende is achieved by

#Option1:

electrolytic reduction

#Option2:

roasting followed by reduction with carbon

#Option3:

roasting following by reduction with another metal

#Option4:

roasting following by self - reduction

#Answer:

Option2

#Solution:

B is correct.

(i) First of all sulphide ore is concentrated by Froth floatation process.

(ii) The sulphide ore is roasted to remove volatile impurities and sulphides are converted to oxides as it is easy to reduce oxides and not sulphides.

(iii) Reduction of zinc oxide with carbon

#equation$$2ZnS + 3{O\_2} \to 2ZnO + 2S{O\_2} \uparrow $$equation#

#equation$$ZnO + C \to Zn + CO$$equation#

#equation$$ZnO + CO \to Zn + C{O\_2}$$equation#



(A) is not correct. ZnS is not highly ionic such that electrolytic reduction can lead to profitably extraction of #equation$$Zn$$equation#.

(B) is incorrect because it is roasting which comes first but carbon reduction is a cheaper reduction process than other.

(D) is incorrect as from explanations of (a), (b) and (c).

#Level:

Conceptual, Easy

#ConceptCode:

C120703

#ConceptIds:

1318

#QuestionType:

SMCQ

#QuestionSerialNo:

20

#Question:

The decreasing order of acidic strength



#Option1:

I > II > III

#Option2:

II > I > III

#Option3:

III > I > II

#Option4:

I > III > II

#Answer:

Option3

#Solution:

The acidic strength depends on the stability of the conjugate base. The stability of the conjugate base depends upon the –I effect. An sp–carbon atom has greater –I effect sp2 carbon which in turn has greater –I effect than sp3 carbon atom. Acid conjugate base in #equation$$C{H\_2} = CH - COOH \to C{H\_2} = CH - CO{O^ - } + {H^ + }$$equation#

#equation$$C{H\_3}C{H\_2} - COOH \to C{H\_3}C{H\_2}CO{O^ - } + {H^ + }$$equation#

#equation$$CH \equiv C - COOH \to CH \equiv C - CO{O^ - } + {H^ + }$$equation#

In C, the –I effect is maximum, then it is less in A and least in B. Hence the conjugate base stability is C > A > B. Hence acidic strength order is III > I > II.

So (C) is correct while (A), (B) and (D) are incorrect.

#Level:

Analytical, Moderate

#ConceptCode:

C111302

#ConceptIds:

1224

#QuestionType:

SMCQ

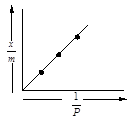
#QuestionSerialNo:

21

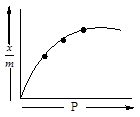
#Question:

Which of the following represents Freundlich adsorption isotherm?

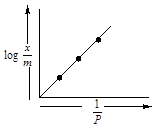
#Option1:



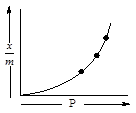
#Option2:



#Option3:



#Option4:



#Answer:

Option2

#Solution:

(B) is correct because extent of adsorption. i.e., #equation$${x \over m}$$equation# increases when P increases at low pressure but becomes independent of pressure when pressure is high.

#Level:

Ultimate, Difficult

#ConceptCode:

C121301

#ConceptIds:

1364

#QuestionType:

SMCQ

#QuestionSerialNo:

22

#Question:

Copper(II) sulphate solution on reaction with excess KCN gives a complex compound X . Then the incorrect statement regarding X is:

#Option1:

The oxidation state of the central metal atom in X is + 1

#Option2:

X is a paramagnetic compound

#Option3:

The central metal atom/ion is #equation$$s{p^3}$$equation# hybridized state in X

#Option4:

X is a diamagnetic compound

#Answer:

Option2

#Solution:

#equation$$X = {K\_3}\left[ {Cu{{\left( {CN} \right)}\_4}} \right]$$equation#

#Level:

Analytical, Difficult

#ConceptCode:

C120404

#ConceptIds:

1297

#QuestionType:

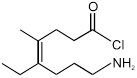
SMCQ

#QuestionSerialNo:

23

#Question:

The correct IUPAC name of the following compound is :



#Option1:

7-Chlorocarbonyl-4-ethyl-5-methyl hept-4-en-8-amine

#Option2:

8-Amino-1-chloro-5-ethyl-4-methyl oct-4-ene-1-one

#Option3:

8-Amino-5-ethyl-4-methyl oct-4-enoyl chloride

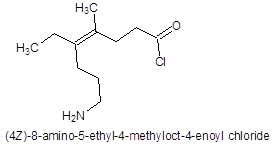
#Option4:

1-Chloro-5-ethyl-4-methyl-1-oxo oct-4-en-8-amine

#Answer:

Option3

#Solution:



Analytical, Moderate

#ConceptCode:

C111304

#ConceptIds:

1226

#QuestionType:

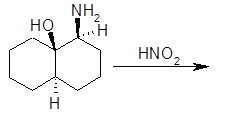
SMCQ

#QuestionSerialNo:

24

#Question:

Predict the product of the following reaction



#Option1:



#Option2:



#Option3:



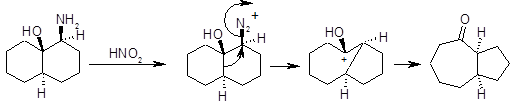
#Option4:



#Answer:

Option2

#Solution:



#Level:

Conceptual, Easy

#ConceptCode:

C120813

#ConceptIds:

6853

#QuestionType:

SMCQ

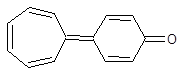
#QuestionSerialNo:

25

#Question:

Which of the following structures will not have permanent dipole moment?

#Option1:



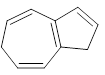
#Option2:

image026

#Option3:

image027

#Option4:



#Answer:

Option4

#Solution:

Due to cleavage of pi bond aromaticity is gained in a,b,c

#Level:

Analytical, Moderate

#ConceptCode:

C110304

#ConceptIds:

1156

#SubSection:

SMCQ Multi Correct (One or more than one correct)

#SubSectionSerialNo:

2

#MarksPerQuestion:

4

#NegativeMarks:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

26

#Question:

Which of the following statement(s) is/are correct?

#Option1:

F – S – F (equatorial) bond angle is greater in #equation$$OS{F\_4}$$equation# than that of in #equation$$S{F\_4}$$equation#

#Option2:

#equation$$O\_2^{2 - }$$equation#will have bond order equal to that of #equation$${H\_2}$$equation#and diamagnetic

#Option3:

Among #equation$$SiO\_4^{4 - }$$equation#, #equation$$PO\_4^{3 - }$$equation#, #equation$$ClO\_4^ - $$equation# and #equation$$SO\_4^{2 - }$$equation#; perchlorate ion have least tendency to undergo polymerization

#Option4:

The bond angle ‘halogen – S – halogen’ order in #equation$$OS{F\_2},OSB{r\_2},OSC{l\_2}$$equation# is #equation$$OS{F\_2} < OSC{l\_2} < OSB{r\_2}$$equation#

#Answer:

Option1, 2, 3, 4

#Solution:

#equation$$SiO\_4^{4 - }$$equation# has more tendency to undergo polymerization.

#Level:

Easy, Moderate

#ConceptCode:

C110306

#ConceptIds:

1158

#QuestionType:

SMCQ

#QuestionSerialNo:

27

#Question:

Which one of the following contains #equation$$p\pi - d\pi $$equation#bond (don’t consider dative bonded structures for SO2 and SO3)?

#Option1:

#equation$${P\_4}{O\_{10}}$$equation#

#Option2:

#equation$$S{O\_2}$$equation#

#Option3:

#equation$$S{O\_3}$$equation#

#Option4:

#equation$$Si{O\_2}$$equation#

#Answer:

Option1, 2, 3

#Solution:

#equation$${P\_4}{O\_{10}}$$equation#,#equation$$S{O\_2}$$equation#,#equation$$S{O\_3}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

C110302

#ConceptIds:

1154

#QuestionType:

SMCQ

#QuestionSerialNo:

28

#Question:

Given #equation$$\Delta H\_f^0\left( {{C\_2}{H\_6},g} \right) = - 85\,kJ/mole,$$equation#

#equation$$\Delta H\_f^0\left( {{C\_3}{H\_8},g} \right) = - 104\,kJ/mole,$$equation#

#equation$$\Delta H\_{sub}^0\left( {C,s} \right) = 718\,kJ/mole\,\& \,B.E.of\left( {H - H} \right) = 436$$equation#kJ/mole.

Then, in kJ/mole, the

#Option1:

C – C bond enthalpy is 218

#Option2:

C – H bond enthalpy is 414

#Option3:

C – C bond enthalpy is 345

#Option4:

C H bond enthalpy is 448

#Answer:

Option2, 3

#Solution:

#equation$$\mathop {2C}\limits\_{\left( s \right)} + \mathop {3{H\_2}}\limits\_{\left( g \right)} \to {C\_2}\mathop {{H\_6}}\limits\_{\left( g \right)} $$equation#

#equation$$\Delta H\_f^0 = \left[ {2 \times \Delta H\_{sub}^0 + 3 \times B.E\left( {H - H} \right)} \right] - \left[ {B.E.\left( {C - C} \right) + 6 \times B.E\left( {C - H} \right)} \right]$$equation#

#equation$$ \Rightarrow - 85 = \left[ {\left( {2 \times 718} \right) + \left( {3 \times 436} \right)} \right] - \left( {x + 6y} \right)$$equation#

…..1

Similarly for #equation$${C\_3}\mathop {{H\_8}}\limits\_{\left( g \right)} $$equation#

#equation$$2x + 8y = 4002$$equation# …..2

Solving (1) & (2), x = 345

y = 414

#Level:

Conceptual, Easy

#ConceptCode:

C111908

#ConceptIds:

1272

#QuestionType:

SMCQ

#QuestionSerialNo:

29

#Question:

Which of the following statement(s) is/are false?

#Option1:

All adiabatic processes are isoentropic (or isentropic) process

#Option2:

The heat of vaporization of water at 1000C is 40.6 kJ/mole. When 9 g of water vapour condenses to liquid at 1000C of 1 atm, then #equation$$\Delta {S\_{system}} = 54.42\,J/K$$equation#

#Option3:

When #equation$${\left( {\Delta {G\_{system}}} \right)\_{T,P}} < 0$$equation#; the reaction must be exothermic

#Option4:

dG = Vdp – S dT is applicable for closed system, both PV and non – PV work

#Answer:

Option1, 2, 3, 4

#Solution:

#equation$$\Delta S = {{\Delta H} \over T} = {{ - 40,600} \over {373}} = - 54.42\,J/K$$equation#

#Level:

Conceptual, Moderate

#ConceptCode:

C111903

#ConceptIds:

1267

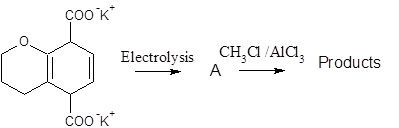
#QuestionType:

SMCQ

#QuestionSerialNo:

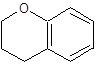
30

#Question:

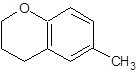


Which of the following are A and products

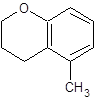
#Option1:



#Option2:



#Option3:



#Option4:

image033

#Answer:

Option1, 2

#Solution:

Conceptual

#Level:

Conceptual, Easy

#ConceptCode:

C111701

#ConceptIds:

1249

#QuestionType:

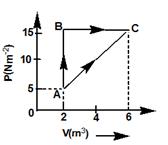
SMCQ

#QuestionSerialNo:

31

#Question:

The given figure shows a change of state A to state C by two paths ABC and AC for an ideal gas. Calculate the internal energy at C, if the internal energy of gas at A is 10J and amount of heat supplied to change its state to C through the path AC is 200 J



#Option1:

190 J

#Option2:

170 J

#Option3:

160 J

#Option4:

180

#Answer:

Option2

#Solution:

For path AC,

#equation$${\rm{q}}\,{\rm{ = }}\,{\rm{\Delta U}}\,{\rm{ = }}\,{\rm{W}}\,\,\,\,\,\,\,\,\,\,\,\,\,{\rm{w}}\,{\rm{ = }}\,{\rm{ - }}\,{\rm{pdv}}$$equation#

#equation$${{\rm{W}}\_{{\rm{AC}}}}\,{\rm{ = }}\,{\rm{ - }}\,\left[ {{{\rm{1}} \over {\rm{2}}}\,\left( {{\rm{5}}\,{\rm{ + }}\,{\rm{15}}} \right)\,{\rm{x}}\,\left( {{\rm{6}}\,{\rm{ - }}\,{\rm{2}}} \right)} \right]\,{\rm{ = }}\,{\rm{ - }}\,{\rm{40}}\,{\rm{J}}$$equation#

Or #equation$${\rm{\Delta U}}\,{\rm{ = }}\,{\rm{q}}\,{\rm{ + }}\,\left( {\rm{W}} \right)\,{\rm{ = }}\,{\rm{200}}\,{\rm{ + }}\,\left( {{\rm{ - }}\,{\rm{40}}} \right)\,{\rm{ = }}\,{\rm{160}}\,{\rm{J}}$$equation#

#equation$${{\rm{U}}\_{\rm{C}}}\,{\rm{ - }}\,{{\rm{U}}\_{\rm{A}}}\,{\rm{ = }}\,{\rm{160}}\,{\rm{J}}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

C111902

#ConceptIds:

1266

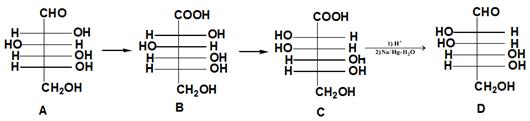
#QuestionType:

SMCQ

#QuestionSerialNo:

32

#Question:



#Option1:

A to B converted by using #equation$${\rm{B}}{{\rm{r}}\_{\rm{2}}}{\rm{/}}{{\rm{H}}\_{\rm{2}}}{\rm{O}}$$equation#

#Option2:

A to D converted by using a base 0.02 M Ca(OH)2

#Option3:

A & D are epimers

#Option4:

B & C are epimers

#Answer:

Option1, 2, 3, 4

#Solution:

1) Br2/H2O mild oxidizing agent

2) alkane base

3) C2 - epimers

4) C2 - epimers

#Level:

Analytical, Difficult

#ConceptCode:

C111404

#ConceptIds:

1230

#SubSection:

SMCQ Single Correct

#SubSectionSerialNo:

3

#MarksPerQuestion:

3

#NegativeMarks:

0

#QuestionType:

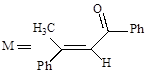
Passage

#Paragraph:

Comprehension Type

Paragraph for question nos. 33 – 34

A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and K. Compound J upon reaction with KOH gives benzyl alcohol and a compound L. Whereas K on reaction with KOH gives only M.



#TotalQuestions:

2

#QuestionType:

SMCQ

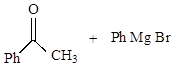
#QuestionSerialNo:

33

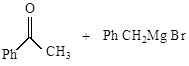
#Question:

Compound H is formed by the reaction of

#Option1:



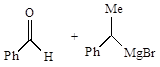
#Option2:



#Option3:

image039

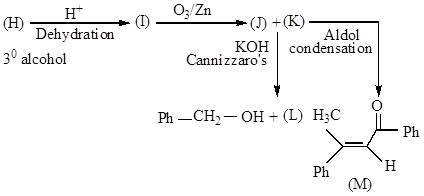
#Option4:

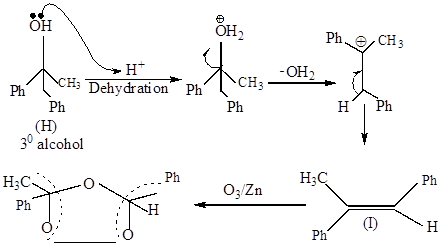


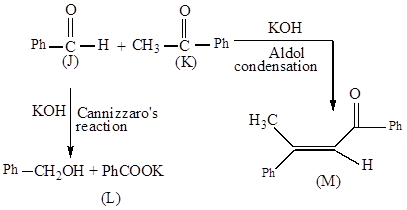
#Answer:

Option2

#Solution:

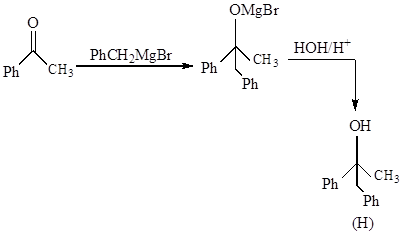






From the above reaction sequence it is clear that the compound (J) is benzaldehyde and (K) is acetophenone so (B)





Therefore (B) is correct answer.

#Level:

Conceptual, Easy

#ConceptCode:

C111708

#ConceptIds:

1256

#QuestionType:

SMCQ

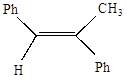
#QuestionSerialNo:

34

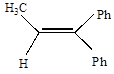
#Question:

The structure of compound I is

#Option1:



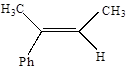
#Option2:



#Option3:

image048

#Option4:



#Answer:

Option1

#Solution:

From above detailed solution (A) is correct answer.

#Level:

Conceptual, Moderate

#ConceptCode:

C111705

#ConceptIds:

1253

#QuestionType:

Passage

#Paragraph:

Paragraph for question nos. 35 – 36

The noble gases have closed –shell electronic configuration and are monatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of 0ther interatomic interactions. The direct reaction of xenon with fluorine leads to a series of compounds with oxidation numbers +2, +4 and +6. #equation$$Xe{F\_4}$$equation# reacts violently with water to give #equation$$Xe{O\_3}$$equation#. The compounds of xenon exhibit rich stereochemistry and their geometries can be deduced considering the total number of electron pairs in the valence shell.

#TotalQuestions:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

35

#Question:

Argon is used in arc welding because

#Option1:

it provide an inert atmosphere

#Option2:

ability to lower the melting point of metal

#Option3:

flammability

#Option4:

high calorific value

#Answer:

Option1

#Solution:

(a) is correct. Argon being inert creates inert atmosphere and thereby prevents metal to combine with #equation$${O\_2}$$equation# of air. Hence (b), (c) and (d) are incorrect.

#Level:

Conceptual, Easy

#ConceptCode:

C121101

#ConceptIds:

1350

#QuestionType:

SMCQ

#QuestionSerialNo:

36

#Question:

The structure of #equation$$Xe{O\_3}$$equation# is

#Option1:

linear

#Option2:

planar

#Option3:

pyramidal

#Option4:

T-shaped

#Answer:

Option3

#Solution:

The electronic configuration #equation$$Xe = \left[ {Kr} \right]4{d^{10}}5{s^2}5{p^6}.In\,Xe{O\_3}$$equation# the oxidation state of

#equation$$Xe = + 6$$equation##equation$$ \Rightarrow Xe$$equation#(ground state) image051#equation$$Xe$$equation# (excited state)

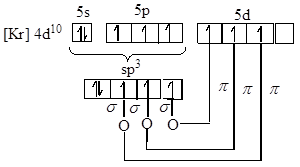


image053

Thus the molecule is #equation$$s{p^3}$$equation# hybridised with one lone pair.

Hence it is pyramidal shaped molecule so choices (a), (b) and (d) are wrong.

#Level:

Analytical, Easy

#ConceptCode:

C121102

#ConceptIds:

1351

#Section:

MATHEMATICS

#SerialNo:

1

#Subject:

Mathematics

#SubSection:

SMCQ Single Correct

#SubSectionSerialNo:

1

#MarksPerQuestion:

3

#NegativeMarks:

1

#QuestionType:

SMCQ

#QuestionSerialNo:

37

#Question:

For any complex number z, the minimum value of #equation$$\left| z \right| + \left| {z - 2i} \right|$$equation# is

#Option1:

0

#Option2:

1

#Option3:

2

#Option4:

none of these

#Answer:

Option3

#Solution:

We have, for #equation$$z \in C$$equation#

#equation$$\left| {2i} \right| = \left| {z + \left( {2i - z} \right)} \right| \le \left| z \right| + \left| {2i - z} \right|$$equation#

#equation$$ \Rightarrow $$equation# #equation$$2 \le \left| z \right| + \left| {z - 2i} \right|$$equation#

Thus, minimum value of #equation$$\left| z \right| + \left| {z - 2i} \right|$$equation# is 2 and it is attained for any z lying on the segment joining z = 0 and #equation$$z = 2i$$equation#.

#Level:

Conceptual, Moderate

#ConceptCode:

M110302

#ConceptIds:

924

#QuestionType:

SMCQ

#QuestionSerialNo:

38

#Question:

If the harmonic mean between roots of #equation$$\left( {5 + \sqrt 2 } \right){x^2} - bx + 8 + 2\sqrt 5 = 0$$equation#

(1)

is 4 then b equals

#Option1:

2

#Option2:

#equation$$4 - \sqrt 5 $$equation#

#Option3:

3

#Option4:

#equation$$4 + \sqrt 5 $$equation#

#Answer:

Option4

#Solution:

Let #equation$$\alpha ,\,\beta $$equation# be the roots of (1), then

#equation$$4 = {{2\alpha \beta } \over {\alpha + \beta }} \Rightarrow {b \over {5 + \sqrt 2 }} = {{8 + 2\sqrt 5 } \over {2\left( {5 + \sqrt 2 } \right)}}$$equation#

#equation$$ \Rightarrow b = 4 + \sqrt 5 $$equation#

#Level:

Conceptual, Easy

#ConceptCode:

M110101

#ConceptIds:

914

#QuestionType:

SMCQ

#QuestionSerialNo:

39

#Question:

Sum of all three digit numbers (no digit being zero) having the property that all digits are perfect squares, is

#Option1:

3108

#Option2:

6216

#Option3:

13986

#Option4:

none of these

#Answer:

Option3

#Solution:

The non – zero perfect square digits are 1, 4 and 9. 1 can occur at units place in #equation$$3 \times 3 = 9$$equation# ways.

Sum due to 1 at unit’s place is #equation$$1 \times 9$$equation#. Similarly, sum due to 1 at ten’s place is #equation$$1 \times 10 \times 9$$equation# and sum due to 1 at hundred’s place is #equation$$1 \times 100 \times 9$$equation#. We can deal with the digits 4 and 9 in a similar way.

Thus, sum of the desired number is #equation$$\left( {1 + 4 + 9} \right)\left( {1 + 10 + 100} \right)\left( 9 \right) = 13986$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

M111201

#ConceptIds:

998

#QuestionType:

SMCQ

#QuestionSerialNo:

40

#Question:

If #equation$$\tan \,{\theta \_1},\,\,\tan \,{\theta \_2},\,\,\tan \,{\theta \_3}$$equation# and #equation$$\tan \,{\theta \_4}$$equation# are the roots of the equation #equation$${x^4} - {x^3}\,\sin \,2\,\beta \, + {x^2}\,\cos \,2\beta - x\,\cos \,\beta - \sin \,\beta = 0\,$$equation#then #equation$$\tan \left( {{\theta \_1} + {\theta \_2} + {\theta \_3} + {\theta \_4}} \right)$$equation# is equal to

#Option1:

#equation$$\sin \,\beta $$equation#

#Option2:

#equation$$\cos \,\beta $$equation#

#Option3:

#equation$$\tan \,\beta $$equation#

#Option4:

#equation$$\cot \,\beta $$equation#

#Answer:

Option4

#Solution:

From the given equation we get

#equation$${S\_1} = \tan \,{\theta \_1} + \tan \,{\theta \_2} + \tan \,{\theta \_3} + \tan \,{\theta \_4} = \sin \,2\,\beta $$equation#.

#equation$${S\_2} = \sum {\tan \,{\theta \_1}\tan \,{\theta \_2} = \cos \,2\,\beta } $$equation#

#equation$${S\_3} = \sum {\tan \,{\theta \_1}\,\tan \,{\theta \_2}} \tan \,{\theta \_3} = \cos \,\beta $$equation#

and #equation$${S\_4} = \tan \,{\theta \_1}\tan \,{\theta \_2}\tan \,{\theta \_3}\tan \,{\theta \_4} = - \sin \,\beta $$equation#

Now #equation$$\tan \left( {{\theta \_1} + {\theta \_2} + {\theta \_3} + {\theta \_4}} \right) = {{{S\_1} - {S\_3}} \over {1 - {S\_2} + {S\_4}}}$$equation#.

#equation$$ = {{\sin \,2\beta - \cos \,\beta } \over {1 - \cos \,2\beta - \sin \,\beta }} = {{\cos \beta \left( {2\sin \,\beta - 1} \right)} \over {\sin \,\beta \left( {2\,\sin \,\beta - 1} \right)}} = \,\cot \,\,\beta $$equation#

#Level:

Analytical, Difficult

#ConceptCode:

M110107

#ConceptIds:

920

#QuestionType:

SMCQ

#QuestionSerialNo:

41

#Question:

The equation #equation$${\sin ^4}x + {\cos ^4}x = a$$equation# has a real solution for

#Option1:

#equation$${{11} \over {10}}$$equation#

#Option2:

#equation$${2 \over 5}$$equation#

#Option3:

#equation$${9 \over {10}}$$equation#

#Option4:

None of these

#Answer:

Option3

#Solution:

We have #equation$${\sin ^4}x + {\cos ^4}x \le {\sin ^2}x + {\cos ^2}x,$$equation# as #equation$$\left| {\sin \,x} \right| \le 1$$equation# and #equation$$\left| {\cos \,x} \right| \le 1$$equation#

#equation$$ \Rightarrow a \le 1$$equation#

(1)

Next, #equation$${\sin ^4}x + {\cos ^4}x = a$$equation#

#equation$$ \Rightarrow {\left( {{{\sin }^2}x + {{\cos }^2}x} \right)^2} - 2\,{\sin ^2}x\,{\cos ^2}x = a$$equation#

#equation$$ \Rightarrow {1 \over 2}{\sin ^2}2x = 1 - a$$equation#

#equation$$ \Rightarrow 1 - a \le {1 \over 2}$$equation#

#equation$$ \Rightarrow {1 \over 2} \le a$$equation#

(2)

From (1) and (2) we get #equation$${1 \over 2} \le a \le 1$$equation#.

#Level:

Conceptual, Moderate

#ConceptCode:

M111301

#ConceptIds:

1008

#QuestionType:

SMCQ

#QuestionSerialNo:

42

#Question:

If two of the lines represented by #equation$${x^4} + {x^3}y + c{x^2}{y^2} - x{y^3} + {y^4} = 0$$equation#bisect the angle between the other two, then the value of c is

#Option1:

0

#Option2:

–1

#Option3:

1

#Option4:

–6

#Answer:

Option4

#Solution:

Since the product of the slopes of the four lines represented by the given equation is 1 and a pair of lines represent the bisectors of the angles between the other two, the product of the slopes of each pair is –1. So let the equation of one pair be #equation$$a{x^2} + 2hxy - a{y^2} = 0$$equation#.

#Level:

Analytical, Moderate

#ConceptCode:

M110710

#ConceptIds:

963

#QuestionType:

SMCQ

#QuestionSerialNo:

43

#Question:

Let f be a function defined on [0, 2], then the function #equation$$g\left( x \right) = f\left( {9{x^2} - 1} \right)$$equation# has domain

#Option1:

#equation$$\left[ {0,\,\,2} \right]$$equation#

#Option2:

#equation$$\left[ { - 1/3,\,\,1/3} \right]$$equation#

#Option3:

#equation$$\left[ { - 3,\,\,3} \right]$$equation#

#Option4:

none of these

#Answer:

Option4

#Solution:

g is meaningful if #equation$$0 \le 9{x^2} - 1 \le 2$$equation#

#equation$$ \Leftrightarrow 1 \le 9{x^2} \le 3$$equation#

i.e. #equation$$x \in \left[ {\left( { - \infty ,\,\, - 1/3} \right] \cup \left[ {1/3,\,\,\infty } \right)} \right] \cap \left[ {{{ - 1} \over {\sqrt 3 }},\,\,{1 \over {\sqrt 3 }}} \right]$$equation#

#equation$$ = \left[ { - {{ - 1} \over {\sqrt 3 }},\,\,{{ - 1} \over 3}} \right] \cup \left[ {{1 \over 3},\,\,{1 \over {\sqrt 3 }}} \right]$$equation#.

#Level:

Conceptual, Easy

#ConceptCode:

M120303

#ConceptIds:

1041

#SubSection:

SMCQ Multi Correct (One or more than one correct)

#SubSectionSerialNo:

2

#MarksPerQuestion:

4

#NegativeMarks:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

44

#Question:

Let P(x) and Q (x) be two polynomials. Suppose that #equation$$f\left( x \right) = P\left( {{x^3}} \right) + xQ\left( {{x^3}} \right)$$equation# is divisible by #equation$${x^2} + x + 1$$equation#, then

#Option1:

P (x) is divisible by #equation$$\left( {x - 1} \right)$$equation# but #equation$$Q\left( x \right)$$equation# is not divisible by #equation$$x - 1$$equation#

#Option2:

#equation$$Q\left( x \right)$$equation# is divisible by #equation$$\left( {x - 1} \right)$$equation# but #equation$$P\left( x \right)$$equation# is not divisible by #equation$$x - 1$$equation#

#Option3:

Both P (x) and Q (x) are divisible by x – 1

#Option4:

#equation$$f\left( x \right)$$equation# is divisible by #equation$$x - 1$$equation#.

#Answer:

Option3, 4

#Solution:

We have #equation$${x^2} + x + 1 = \left( {x - \omega } \right)\left( {x - {\omega ^2}} \right)$$equation#.

Since #equation$$f\left( x \right)$$equation#is divisible by #equation$${x^2} + x + 1,\,f\left( \omega \right) = 0,\,\,f\left( {{\omega ^2}} \right) = 0$$equation#

#equation$$P\left( {{\omega ^3}} \right) + \omega \,Q\left( {{\omega ^3}} \right) = 0 \Rightarrow P\left( 1 \right) + \omega Q\left( 1 \right) = 0$$equation#

(1)

and #equation$$P\left( {{\omega ^6}} \right) + {\omega ^2}Q\left( {{\omega ^6}} \right) = 0 \Rightarrow P\left( 1 \right) + {\omega ^2}Q\left( 1 \right) = 0\left( 2 \right)$$equation#

Solving (1) and (2) we obtain

#equation$$P\left( 1 \right) = 0$$equation# and #equation$$Q\left( 1 \right) = 0$$equation#.

Both P(x) and Q (x) are divisible by x – 1.

#equation$$ \Rightarrow $$equation# #equation$$P\left( {{x^3}} \right)$$equation# and #equation$$Q\left( {{x^3}} \right)$$equation# are divisible by #equation$${x^3} - 1$$equation# and hence by #equation$$x - 1$$equation#

Since #equation$$f\left( x \right) = P\left( {{x^3}} \right) + x\,Q\left( {{x^3}} \right),$$equation# we get f(x) is divisible by #equation$$x - 1$$equation#.

#Level:

Analytical, Moderate

#ConceptCode:

M110305

#ConceptIds:

927

#QuestionType:

SMCQ

#QuestionSerialNo:

45

#Question:

If #equation$$ax + by = 1,\,\,c{x^2} + d{y^2} = 1$$equation# have only one solution, then

#Option1:

#equation$${{{a^2}} \over c} + {{{b^2}} \over d} = 1$$equation#

#Option2:

#equation$$x = {a \over c}$$equation#

#Option3:

#equation$$y = {b \over d}$$equation#

#Option4:

none of these

#Answer:

Option1, 2, 3

#Solution:

We have #equation$$ax + by = 1 \Rightarrow y = {{1 - ax} \over b}$$equation#

Putting this value in the second equation, we get

#equation$$c{x^2} + {d \over {{b^2}}}{\left( {1 - ax} \right)^2} = 1$$equation#

#equation$$ \Rightarrow $$equation# #equation$$\left( {{b^2}c + {a^2}d} \right){x^2} - 2adx + d - {b^2} = 0$$equation#

(1)

This quadratic equation will have equal roots if

#equation$$D = 4{a^2}{d^2} - 4\left( {{b^2}c + {a^2}d} \right)\left( {d - {b^2}} \right) = 0$$equation#

#equation$$ \Rightarrow $$equation# #equation$${a^2}{d^2} + \left( {{b^2}c + {a^2}d} \right){b^2} - {b^2}cd - {a^2}{d^2} = 0$$equation#

#equation$$ \Rightarrow $$equation##equation$${b^2}\left[ {{b^2}c + {a^2}d - cd} \right] = 0$$equation#

#equation$$ \Rightarrow $$equation# #equation$${b^2}c + {a^2}d = cd \Rightarrow {{{b^2}} \over d} + {{{a^2}} \over c} = 1$$equation#

Also, in this case

#equation$$x = {{2ad} \over {2\left( {{b^2}c + {a^2}d} \right)}} = {{ad} \over {cd}} = {a \over c}$$equation#

#equation$$y = {{1 - ax} \over b} = {1 \over b}\left( {1 - {{{a^2}} \over c}} \right) = {1 \over b}.\,{{{b^2}} \over d} = {b \over d}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

M110101

#ConceptIds:

914

#QuestionType:

SMCQ

#QuestionSerialNo:

46

#Question:

If a variable straight line #equation$$x\cos \,\alpha + y\,\sin \,\alpha = p$$equation# which is a chord of the hyperbola #equation$${{{x^2}} \over {{a^2}}} - {{{y^2}} \over {{b^2}}} = 1\left( {b > 0} \right)$$equation#subtend a right angle at the centre of the hyperbola, then it always touches a fixed circle whose

#Option1:

radius is #equation$${{ab} \over {\sqrt {b - 2a} }}$$equation#

#Option2:

radius is #equation$${{ab} \over {\sqrt {{b^2} - {a^2}} }}$$equation#

#Option3:

centre is (0, 0)

#Option4:

centre is at the centre of the hyperbola

#Answer:

Option2, 3, 4

#Solution:

Equation of the pair of straight lines passing through the origin (centre of the hyperbola) and points of intersection of the variable chord and the hyperbola is

#equation$${{{x^2}} \over {{a^2}}} - {{{y^2}} \over {{b^2}}} - {\left\{ {{{x\,\cos \,\alpha + y\,\sin \,\alpha } \over p}} \right\}^2} = 0$$equation#

They are at right angles if

#equation$$\left[ {{1 \over {{a^2}}} - {{{{\cos }^2}\alpha } \over {{p^2}}}} \right] - \left[ {{1 \over {{b^2}}} + {{{{\sin }^2}\alpha } \over {{p^2}}}} \right] = 0$$equation#

#equation$$ \Rightarrow {1 \over {{a^2}}} - {1 \over {{b^2}}} = {1 \over {{p^2}}} \Rightarrow p = {{ab} \over {\sqrt {{b^2} - {a^2}} }}$$equation#

As p is the length of the perpendicular from the origin on the line #equation$$x\,\cos \,\alpha + y\,\sin \,\alpha = p,$$equation# line touches the circle with centre at the origin and radius equal to #equation$${{ab} \over {\sqrt {{b^2} - {a^2}} }}$$equation#.

#Level:

Analytical, Moderate

#ConceptCode:

M111102

#ConceptIds:

6835

#QuestionType:

SMCQ

#QuestionSerialNo:

47

#Question:

If #equation$$\mathop {\lim }\limits\_{x \to 0} {{a\,\sin \,x - bx + c{x^2} + {x^3}} \over {2{x^2}\log \,\left( {1 + x} \right) - 2{x^3} + {x^4}}}$$equation# exists and is finite, then

#Option1:

a = b

#Option2:

c = 0

#Option3:

a = b

#Option4:

c = 2

#Answer:

Option1, 2, 3

#Solution:

#equation$$\mathop {\lim }\limits\_{x \to 0} {{a\left( {x - {{{x^3}} \over 6} + {{{x^5}} \over {120}} - ...} \right) - bx + c{x^2} + {x^3}} \over {2{x^2}\left( {x - {{{x^2}} \over 2} + {{{x^3}} \over 3} - ...} \right) - 2{x^3} + {x^4}}}$$equation#

#equation$$ = \mathop {\lim }\limits\_{x \to 0} {{\left( {a - b} \right)x + c{x^2} + \left( {1 - a/6} \right){x^3} + a{x^5}/120 + ...} \over {2{x^2}/3 - {x^6}/2 + ...}}$$equation#

For this limit to exist we must have #equation$$a - b = 0,\,\,c = 0$$equation#, and #equation$$1 - a/6 = 0,$$equation# that is, a = b = 6 and

c = 0

#Level:

Analytical, Moderate

#ConceptCode:

M110602

#ConceptIds:

945

#QuestionType:

SMCQ

#QuestionSerialNo:

48

#Question:

If #equation$$f\left( x \right) = {\tan ^{ - 1}}x - \left( {{1 \over 2}} \right)\log \,x$$equation#. Then

#Option1:

the greatest value of #equation$$f\left( x \right)$$equation# on #equation$$\left[ {{1 \over {\sqrt 3 }},\,\,\sqrt 3 } \right]$$equation# is #equation$${\pi \over 6} + \left( {{1 \over 4}} \right)\log \,3$$equation#

#Option2:

the least value of #equation$$f\left( x \right)$$equation#on #equation$$\left[ {{1 \over {\sqrt 3 }},\,\,\sqrt 3 } \right]$$equation# is #equation$${\pi \over 3} - \left( {{1 \over 4}} \right)\log \,3$$equation#

#Option3:

#equation$$f\left( x \right)$$equation# decreases on #equation$$\left( {0,\,\,\infty } \right)$$equation#

#Option4:

#equation$$f\left( x \right)$$equation# increases on #equation$$\left( { - \infty ,\,\,0} \right)$$equation#

#Answer:

Option1, 2, 3

#Solution:

The domain of #equation$$f\left( x \right)$$equation#decreases on #equation$$\left( {0,\,\,\infty } \right)$$equation#. For #equation$$x > 0$$equation#,

#equation$$f'\left( x \right) = {1 \over {1 + {x^2}}} - {1 \over {2x}} = {{2x - \left( {1 + {x^2}} \right)} \over {\left( {1 + {x^2}} \right)2x}} = - {{{{\left( {1 - x} \right)}^2}} \over {\left( {1 + {x^2}} \right)2x}}$$equation#

Thus #equation$$f'\left( x \right) < 0$$equation#, i.e. #equation$$f\left( x \right)$$equation# decreases on #equation$$\left( {0,\,\,\infty } \right)$$equation#. Also #equation$$f'\left( x \right) = 0$$equation# if #equation$$x = 1$$equation# and #equation$$f\left( 1 \right) = {\pi \over 4},\,\,f\left( {{1 \over {\sqrt 3 }}} \right) = {\pi \over 6} + \left( {{1 \over 4}} \right)\log \,3,\,\,f\left( {\sqrt 3 } \right) = {\pi \over 3} - \left( {{1 \over 4}} \right)\log \,3$$equation#

Thus the greatest value is #equation$${\pi \over 6} + \log \,3$$equation# and the least value is #equation$${\pi \over 3} - \left( {{1 \over 4}} \right)\log \,3$$equation#.

#Level:

Conceptual, Moderate

#ConceptCode:

M120604

#ConceptIds:

1066

#QuestionType:

SMCQ

#QuestionSerialNo:

49

#Question:

If #equation$$\int {{{\cos \,8x\, - \cos \,7x} \over {1 + 2\,\cos \,5x}}\,dx} $$equation# is expressed as #equation$$K\sin \,3x + M\sin \,2x + C$$equation# then

#Option1:

#equation$$K = {{ - 1} \over 3}$$equation#

#Option2:

#equation$$K = {1 \over 3}$$equation#

#Option3:

#equation$$M = {{ - 1} \over 2}$$equation#

#Option4:

#equation$$M = {1 \over 2}$$equation#

#Answer:

Option2, 3

#Solution:

#equation$${{\cos \,8x - \cos \,7x} \over {1 + 2\,\cos \,5x}} = {{\cos \,8x - \cos \,7x} \over {1 + 2\,\cos \,5x}}.\,{{2\,\sin \,5x} \over {2\,\sin \,5x}}$$equation#

#equation$$ = {{\sin \,13\,x - \sin \,3x - \sin \,12x + \sin \,2x} \over {2\left( {\sin \,5x + \sin \,10\,x} \right)}}$$equation#

#equation$$ = {1 \over 2}.{{\sin \,13x + \sin \,2x - \left( {\sin \,3x + \sin \,12\,x} \right)} \over {\sin \,5x + \sin \,10\,x}}$$equation#

#equation$$ = {1 \over 2}{{2\sin {{15x} \over 2}\cos {{11x} \over 2} - 2\sin {{15x} \over 2}\cos {{9x} \over 2}} \over {2\sin {{15x} \over 2}\cos {{5x} \over 2}}}$$equation#

#equation$$ = {1 \over 2}{{\cos \left( {{{11x} \over 2}} \right) - \cos \left( {{{9x} \over 2}} \right)} \over {\cos \left( {{{5x} \over 2}} \right)}} = {{ - 2\,\sin \,5x\,\sin \left( {x/2} \right)} \over {2\,\cos \left( {5x/2} \right)}}$$equation#

#equation$$ = - 2\,\sin \left( {{{5x} \over 2}} \right)\sin \left( {{x \over 2}} \right) = \cos \,3x - \cos \,2x$$equation#

Hence the given integral is equal to

#equation$$\int {\left( {\cos \,3x - \cos \,2x} \right)dx = {{\sin \,3x} \over 3} - {{\sin \,2x} \over 2} + C} $$equation#.

#Level:

Conceptual, Easy

#ConceptCode:

M120701

#ConceptIds:

1070

#SubSection:

SMCQ Single Correct

#SubSectionSerialNo:

3

#MarksPerQuestion:

3

#NegativeMarks:

0

#QuestionType:

SMCQ

#QuestionSerialNo:

50

#Question:

If a, b, c are three unit vectors such that #equation$$a \times \left( {b \times c} \right) = {1 \over 2}b$$equation#, where b and c being non parallel

then

#Option1:

angle between a and b is #equation$${\pi \over 2}$$equation#

#Option2:

angle between a and c is #equation$${\pi \over 4}$$equation#

#Option3:

angle between a and c is #equation$${\pi \over 3}$$equation#

#Option4:

angle between a and b is #equation$${\pi \over 3}$$equation#

#Answer:

Option1, 3

#Solution:

#equation$$a \times \left( {b \times c} \right) = \left( {a\,.\,c} \right)b - \left( {a\,.\,b} \right)c = {1 \over 2}b$$equation#

#equation$$ \Rightarrow \left( {a\,.\,c - {1 \over 2}} \right)b = \left( {a\,.\,b} \right)c$$equation#

But b and c are non parallel so

#equation$$a\,.\,c - {1 \over 2} = 0,\,\,a\,.\,b = 0$$equation#

#equation$$ \Rightarrow $$equation# angle between a and c is #equation$${\pi \over 3}$$equation# and the angle between a and b is #equation$${\pi \over 2}$$equation#.

#Level:

Analytical, Moderate

#ConceptCode:

M121102

#ConceptIds:

1094

#QuestionType:

Passage

#Paragraph:

Comprehension Type

Paragraph for question nos. 51 - 52

For #equation$$z = x + iy,\,\,x,\,y \in R$$equation#

define #equation$${e^z} = {e^x}\left( {\cos \,y + i\,\,\sin \,y} \right),$$equation#

#equation$$\sin \,h\,z = {1 \over 2}\left( {{e^z} - {e^{ - z}}} \right)$$equation#

#equation$$\cos \,h\,\,z = {1 \over 2}\left( {{e^z} + {e^{ - z}}} \right)$$equation#

#TotalQuestions:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

51

#Question:

For #equation$$z \in C$$equation#, conjugate of #equation$${e^z}$$equation# equals

#Option1:

#equation$${e^{ - z}}$$equation#

#Option2:

#equation$${e^{\overline z }}$$equation#

#Option3:

#equation$${e^{ - \,\overline z }}$$equation#

#Option4:

#equation$${e^z}$$equation#

#Answer:

Option2

#Solution:

Use basic property.

#Level:

Conceptual, Easy

#ConceptCode:

M110304

#ConceptIds:

926

#QuestionType:

SMCQ

#QuestionSerialNo:

52

#Question:

#equation$${\left( {\cosh \,\,z} \right)^2} + {\left( {\sinh \,z} \right)^2}$$equation# equals

#Option1:

1

#Option2:

–1

#Option3:

0

#Option4:

none of these

#Answer:

Option4

#Solution:

Square and add.

#Level:

Conceptual, Easy

#ConceptCode:

M110304

#ConceptIds:

926

#QuestionType:

Passage

#Paragraph:

Paragraph for question nos. 53 - 54

For #equation$$n \in N,$$equation# we put

#equation$${\left( {1 + x + {x^2}} \right)^n} = \sum\limits\_{r = 0}^{2n} {{a\_r}\,{x\_r}} $$equation#

(1)

#TotalQuestions:

2

#QuestionType:

SMCQ

#QuestionSerialNo:

53

#Question:

Which of the following is true?

#Option1:

#equation$${a\_r} = {a\_{n - r}}$$equation#

#Option2:

#equation$${a\_{2r}} = {a\_{n - r}}$$equation#

#Option3:

#equation$${a\_r} = {a\_{2n - r}}$$equation#

#Option4:

none of these

#Answer:

Option3

#Solution:

We have #equation$$\sum\limits\_{r = 0}^{2n} {{a\_r}{{\left( {{1 \over x}} \right)}^r} = {{\left( {1 + {1 \over x} + {1 \over {{x^2}}}} \right)}^n}} $$equation#

#equation$$ = {1 \over {{x^{2n}}}}{\left( {{x^2} + x + 1} \right)^n}$$equation#

#equation$$ \Rightarrow \sum\limits\_{r = 0}^{2n} {{a\_r}\,{x^{2n - r}} = {{\left( {{x^2} + x + 1} \right)}^n} = \sum\limits\_{r = 0}^{2n} {{a\_r}\,{x^r}} } $$equation#

Equating the coefficient of #equation$${x^{2n - r}}$$equation# on both sides, we get #equation$${a\_r} = {a\_{2n - r}}$$equation# for #equation$$0 \le r \le 2n$$equation#.

#Level:

Analytical, Moderate

#ConceptCode:

M110405

#ConceptIds:

937

#QuestionType:

SMCQ

#QuestionSerialNo:

54

#Question:

Value of #equation$$2\left( {{a\_0} + {a\_1} + ...... + {a\_{n - 1}}} \right) + {a\_n}$$equation# is

#Option1:

#equation$${2^{2n - 1}}$$equation#

#Option2:

#equation$${3^n}$$equation#

#Option3:

#equation$${{{3^n}} \over 2}$$equation#

#Option4:

#equation$${{\left( {{3^n} - 1} \right)} \over 2}$$equation#

#Answer:

Option2

#Solution:

Putting #equation$$x = 1$$equation# in (1), we get

#equation$${a\_0} + {a\_1} + {a\_2} + ...... + {a\_{2n}} = {\left( {1 + 1 + 1} \right)^n} = {3^n}$$equation#

But #equation$${a\_r} = {a\_{2n - r}}$$equation# for #equation$$0 \le r < n - 1$$equation#

#equation$$2\left( {{a\_0} + {a\_1} + ... + {a\_{n - 1}}} \right) + {a\_n} = {3^n}$$equation#

#Level:

Analytical, Moderate

#ConceptCode:

M110405

#ConceptIds:

937