

## Previous Paper Questions

1. Q.Id: 194397

The solution of the differential equation  $\frac{d^2y}{dx^2} + y = 0$  is

**A)**  $y = 3 \sin x + 4 \cos x$

**B)**  $y = x^2$

**C)**  $y = x + 2$

**D)**  $y = \log x$

2. Q.Id: 194396

$\int_{-1/2}^{1/2} \left\{ [x] + \log \left( \frac{1+x}{1-x} \right) \right\} dx$  is equal to

**A)**  $2 \log (1/2)$

**B)** 0

**C)**  $-1/2$

**D)** 1

3. Q.Id: 194388

$\int_2^4 \{ |x-2| + |x-3| \} dx$  is equal to

**A)** 1

**B)** 2

**C)** 3

**D)** 4

4. Q.Id: 194386

If

$$\int \frac{1 - (\cot x)^{2021}}{\tan x + (\cot x)^{2022}} dx = \frac{1}{A} \log$$

$$|(\sin x)^{2023} + (\cos x)^{2023}| + c,$$

then A is equal to

**A)** 2020

**B)** 2021

**C)** 2022

**D)** 2023

5. Q.Id: 194381

If  $\int \frac{(x-1)^2}{(x^2+1)^2} dx = \tan^{-1}(x) + g(x) + k,$

then g(x) is equal to

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

**B)**  $\frac{1}{x^2+1}$

**C)**  $\frac{1}{2(x^2+1)}$

**D)**  $\frac{2}{x^2+1}$

6. Q.Id: 194378  
 $\int \frac{e^x(x+3)}{(x+5)^3} dx$  is equal to

A)  $\frac{e^x}{(x+5)^2} + C$

B)  $e^x(x+5)^2 + C$

C)  $e^x(x+3)^2 + C$

D)  $\frac{e^x}{(x+3)^2} + C$

7. Q.Id: 194377  
 If  $\int \frac{dx}{x(\sqrt{x^4-1})} = \frac{1}{k} \sec^{-1}(x^k)$ , then the value of k is equal to

A) 1

B) 2

C) 3

D) 4

8. Q.Id: 194376  
 The distance between the origin and the normal to the curve  $y = e^{2x} + x^2$  drawn at  $x = 0$  is..... units

A) 2

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

C)  $\frac{2}{\sqrt{5}}$

D) 1/2

9. Q.Id: 194371  
 For which value(s) of a  
 $f(x) = -x^3 + 4ax^2 + 2x - 5$  is decreasing for every x?

A) (1, 2)

B) (3, 4)

C) R

D) no value of a

10. Q.Id: 194368  
 Which statement among the following is true?  
 (i) the function  $f(x) = x|x|$  is strictly increasing on  $\mathbb{R} - \{0\}$ .  
 (ii) the function  $f(x) = \log_{(1/4)} x$  is strictly increasing on  $(0, \infty)$ .  
 (iii) a one - one function is always an increasing function.  
 (iv)  $f(x) = x^{1/3}$  is strictly decreasing on  $\mathbb{R}$

A) (i)

B) (ii)

C) (iii)

D) (iv)



17. Q.Id: 194326  
If the function  $f(x)$ , defined below is continuous in the interval  $[0, \pi]$ , then

$$f(x) = \begin{cases} x + a\sqrt{2}(\sin x), & 0 \leq x < \frac{\pi}{4} \\ 2x(\cot x) + b, & \frac{\pi}{4} \leq x \leq \frac{\pi}{2} \\ a(\cos 2x) - b(\sin x), & \frac{\pi}{2} < x \leq \pi \end{cases}$$

A)  $a = \frac{\pi}{6}, b = \frac{\pi}{12}$

B)  $a = \frac{-\pi}{6}, b = \frac{\pi}{12}$

C)  $a = \frac{-\pi}{6}, b = \frac{-\pi}{12}$

D)  $a = \frac{\pi}{6}, b = \frac{-\pi}{12}$

18. Q.Id: 194308

$$f(x) = \begin{cases} \frac{72^x - 9^x - 8^x + 1}{\sqrt{2} - \sqrt{1 + \cos x}}, & x \neq 0 \\ K \log 2 \log 3, & x = 0 \end{cases}$$

find the value of  $k$  for which the function  $f$  is continuous.

A)  $\sqrt{2}$

B) 24

C)  $18\sqrt{3}$

D)  $24\sqrt{2}$

19. Q.Id: 194304

$$\lim_{z \rightarrow 1} \frac{z^{(1/3)} - 1}{z^{(1/6)} - 1} \text{ is equal to}$$

A) -1

B) 1

C) 2

D) -2

20. Q.Id: 194301

Let  $O$  be the origin and  $P$  be a point which is at a distance of 3 units from the origin. If the direction ratios of  $\overline{OP}$  are  $(1, -2, -2)$ , then the coordinates of  $P$  are

A)  $(1, -2, -2)$

B)  $(3, -6, -6)$

C)  $\left(\frac{1}{3}, \frac{-2}{3}, \frac{-2}{3}\right)$

D)  $\left(\frac{1}{9}, \frac{-2}{9}, \frac{-2}{9}\right)$

21. Q.Id: 194292  
The direction cosines of a line which makes equal angles with the coordinate axes are

A)  $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

B)  $\left(\frac{-1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}\right)$

C)  $\left(\frac{\pm 1}{\sqrt{3}}, \frac{\pm 1}{\sqrt{3}}, \frac{\pm 1}{\sqrt{3}}\right)$

D)  $\left(\frac{12}{13}, \frac{5}{13}, 0\right)$

22. Q.Id: 194287  
The ratio in which the YZ - plane divides the line joining (2, 4, 5) and (3, 5, -4) is

A) 2 : 3 internally

B) 3 : 2 internally

C) 3 : 2 externally

D) 2 : 3 externally

23. Q.Id: 194280

The asymptotes of the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ , with any tangent to the hyperbola form a triangle whose area is  $a^2 \tan(\alpha)$ . Then, its eccentricity equals

A)  $\sec(\alpha)$

B)  $\operatorname{cosec}(\alpha)$

C)  $\sec^2(\alpha)$

D)  $\operatorname{cosec}^2(\alpha)$

24. Q.Id: 194275

If a point P(x, y) moves along the ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$  and if C is the center of the ellipse, then the sum of maximum and minimum values of CP is

A) 25

B) 9

C) 4

D) 5

25. Q.Id: 194270

If one end of focal of the parabola  $y^2 = 8x$  is  $\left(\frac{1}{2}, 2\right)$ , then the length of the focal chord is ..... Units.

A)  $625/4$

B)  $\frac{5}{\sqrt{2}}$

C)  $25/2$

D) 25

26. Q.Id: 194268  
**The point which has the same power with respect to each of the circles**  
 $x^2 + y^2 - 8x + 40 = 0$ ,  $x^2 + y^2 - 5x + 16 = 0$   
 and  $x^2 + y^2 - 8x + 16y + 160 = 0$

- A)  $\left(-8, \frac{-15}{2}\right)$                       B)  $\left(8, \frac{-15}{2}\right)$   
 C)  $\left(8, \frac{15}{2}\right)$                       D)  $\left(-8, \frac{15}{2}\right)$

27. Q.Id: 194262  
**The radius of the circle whose center lies at (1, 2) while cutting the circle**  
 $x^2 + y^2 + 4x + 16y - 30 = 0$  **orthogonally, is ..... units.**

- A)  $\sqrt{41}$                       B)  $\sqrt{31}$   
 C)  $\sqrt{21}$                       D)  $\sqrt{11}$

28. Q.Id: 194258  
**Let  $L_1$  be a straight line passing through the origin and  $L_2$  be the straight line**  
 $x + y = 1$ . **If the intercepts made by the circle  $x^2 + y^2 - x + 3y = 0$  on  $L_1$  and  $L_2$  are**  
**equal, then which of the following equations represent  $L_1$**

- A)  $x + y = 0$  and  $x + 7y = 0$                       B)  $x - y = 0$  and  $x + 7y = 0$   
 C)  $x - 7y = 0$  and  $x + y = 0$                       D)  $x - 7y = 0$  and  $x - y = 0$

29. Q.Id: 194253  
**Find the equation of the circle passing through (1, -2) and touching the X -**  
**axis at (3, 0).**

- A)  $x^2 + y^2 + 6x - 4y - 9 = 0$                       B)  $x^2 + y^2 - 6x - 4y + 9 = 0$   
 C)  $x^2 + y^2 - 6x - 4y - 9 = 0$                       D)  $x^2 + y^2 - 6x + 4y + 9 = 0$

30. Q.Id: 194252  
**If the chord of contact of tangent from a point on the circle**  
 $x^2 + y^2 = r_1^2$  **to the circle  $x^2 + y^2 = r_2^2$**   
**touches the circle  $x^2 + y^2 = r_3^2$ , then,**  
 $r_1, r_2$  **and  $r_3$**   
**are in**

- A) AP                      B) HP  
 C) GP                      D) AGP

31. Q.Id: 194247  
Find the equations of the tangents drawn to the circle  $x^2 + y^2 = 50$  at the points where the line  $x + 7 = 0$  meets it.

A)  $7x + y + 50 = 0$  and  $7x - y + 50 = 0$       B)  $x + y + 50 = 0$  and  $x - y = 0$   
C)  $x + 7y + 5 = 0$  and  $y - 7x + 5 = 0$       D)  $x + 7y + 50 = 0$  and  $x - 7y + 50 = 0$

32. Q.Id: 194245  
If the slope of one of the lines represented by  $ax^2 + 2hxy + by^2 = 0$  is the square of the other then,  $\left| \frac{a+b}{h} + \frac{8h^2}{ab} \right|$  is equal to

A) 3      B) 2  
C) 6      D) 4

33. Q.Id: 194243  
If  $m_1$  and  $m_2$ , ( $m_1 > m_2$ ) are the slopes of the lines represented by  $5x^2 - 8xy + 3y^2 = 0$ , then  $m_1:m_2$  equals

A) 5 : 1      B) 2 : 1  
C) 5 : 3      D) 3 : 2

34. Q.Id: 194241  
If the centroid of the triangle formed by the lines  $2y^2 + 5xy - 3x^2 = 0$  and  $x + y = k$  is  $\left( \frac{1}{18}, \frac{11}{18} \right)$ , then the value of  $k$  equals

A) -1      B) 0  
C) 1      D) 2

35. Q.Id: 194240  
The equation of the pair of straight lines perpendicular to the pair  $2x^2 + 3xy + 2y^2 + 10x + 5y = 0$  and passing through the origin is

A)  $2x^2 + 5xy + 2y^2 = 0$       B)  $2x^2 - 3xy + 2y^2 = 0$   
C)  $2x^2 + 3xy + y^2 = 0$       D)  $2x^2 - 5xy + 2y^2 = 0$

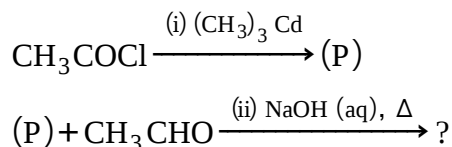
36. Q.Id: 194239  
If  $2x + 3y + 4 = 0$  is the perpendicular bisector of the line segment joining the points  $A(1, 2)$  and  $B(\alpha, \beta)$ , then the value of  $13\alpha + 13\beta$  equals

A) -81      B) -99  
C) 99      D) 81





42. Q.Id: 194153  
The total number of products formed in the following reaction sequence is



- A) 2  
B) 4  
C) 1  
D) 3

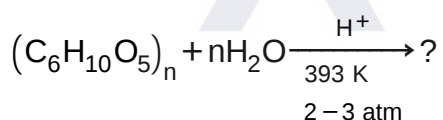
43. Q.Id: 194152  
During the action of enzyme 'zymase' glucose is converted into .....,with the liberation of carbon dioxide gas.

- A) Phenol  
B) Ethanol  
C) Methanol  
D) Isopropyl alcohol

44. Q.Id: 194151  
The number of optical isomers possible for 2-bromo-3-chloro butane are

- A) 8  
B) 10  
C) 4  
D) 2

45. Q.Id: 194150  
Identify the product of the following reaction.



- A) Fructose  
B) Glucose  
C) Lactose  
D) Maltose

46. Q.Id: 194149  
A compound A is used in paints instead of salts of lead, Compound A is obtained when a white compound B is strongly heated. Compound B is insoluble in water but dissolves in NaOH solution forming a solution of compound C. The compound A on heating with coke gives a volatile metal D and a gas E which burns with a blue flame. Identify the possible species D and C can be respectively?

- A) D = Hg, C = Hg(OH)<sub>2</sub>  
B) D = Cd, C = Na<sub>2</sub>(CdO<sub>2</sub>)  
C) D = Zn, C = Na<sub>2</sub>ZnO<sub>2</sub>  
D) D = Zn, C = Zn(OH)<sub>2</sub>

47. Q.Id: 194148

What is coordination of the metal in  $[\text{Co}(\text{en})_2\text{Cl}_2]^{2+}$  ?

A) 3

B) 4

C) 5

D) 6

48. Q.Id: 194147

Match the following compounds with their corresponding physical properties.

List1

List2

A. IBr

I. Orange solid

B.  $\text{ClF}_3$

II. Yellow-green liquid

C.  $\text{BrF}_3$

III. Black solid

D.  $\text{ICl}_3$

IV. Colourless gas

A) A->ii; B->i; C->iv; D->iii

B) A->i; B->iii; C->ii; D->iv

C) A->iii; B->iv; C->ii; D->i

D) A->iv; B->ii; C->i; D->iii

49. Q.Id: 194146

A plot of  $\log(x/m)$  versus  $\log(p)$  for adsorption of a gas on a solid gives a straight line with a slope of

A)  $-\log k$

B)  $\log(1/n)$

C)  $\frac{1}{n}$

D)  $\text{antilog}(1/n)$

50. Q.Id: 194145

If the rate constant for a first order reaction is  $2.303 \times 10^{-3} \text{ s}^{-1}$ . Find the time required to reduce 4 g of the reactant to 0.2 g.

A) 1.30 hours

B) 21.60 hours

C) 0.36 hours

D) 2.60 hours

51. Q.Id: 194114

The molar conductivities ( $\lambda_m^0$ ) at infinite dilution of KBr, HBr and  $\text{KNH}_2$  are 120.5, 420.6 and 90.48  $\text{Scm}^{-1} \text{ mol}^{-1}$  respectively. Find the value of  $\lambda_m^0$  for  $\text{NH}_3$ .

A)  $511.0 \text{ Scm}^2 \text{ mol}^{-1}$

B)  $390.5 \text{ Scm}^2 \text{ mol}^{-1}$

C)  $256.2 \text{ Scm}^2 \text{ mol}^{-1}$

D)  $240.9 \text{ Scm}^2 \text{ mol}^{-1}$





62. Q.Id: 194103

**Assertion (A)** K, Rb and Cs form superoxides.

**Reason (R)** The stability of superoxides increases from K to Cs due to decrease in lattice energy.

- A) Both A and R are true and R is a correct explanation of A  
B) Both A and R are true but R is not a correct explanation of A.  
C) A is true but R is false  
D) A is false but R is true

63. Q.Id: 194102

Which metal oxide among the following gives  $\text{H}_2\text{O}_2$  on treatment with dilute acid?

- A)  $\text{BaO}_2$   
B)  $\text{RbO}_2$   
C)  $\text{MnO}_2$   
D)  $\text{Al}_2\text{O}_3$

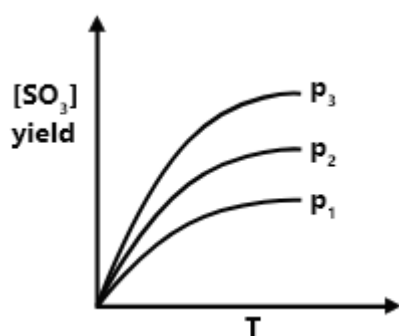
64. Q.Id: 194094

Which among the following denotes the correct relationship between  $K_p$  and  $K_c$  for the reaction,  $2\text{A}(\text{g}) \rightleftharpoons \text{B}(\text{g}) + \text{C}(\text{g})$

- A)  $K_p > K_c$   
B)  $K_c > K_p$   
C)  $K_c = (K_p)^2$   
D)  $K_p = K_c$

65. Q.Id: 194090

For the reaction  $\text{SO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightleftharpoons \text{SO}_3(\text{g})$ , the percentage yield of product at different pressure is shown in the figure. Then, which among the following is true?



- A) Pressure has no effect  
B)  $p_1 < p_2 < p_3$   
C)  $p_1 > p_2 > p_3$   
D)  $p_1 = p_2 = p_3 \neq 0$

66. Q.Id: 194089  
Standard entropies of  $X_2$ ,  $Y_2$  and  $XY_3$  are 60, 40 and 50  $\text{JK}^{-1} \text{mol}^{-1}$  respectively. At what temperature, the following reaction will be at equilibrium? [given :  $\Delta H^\circ = -30 \text{ kJ}$ ]
- $$\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$$

- A) 500 K  
B) 750 K  
C) 1000 K  
D) 1250 K

67. Q.Id: 194088  
If a chemical reaction is known to be non-spontaneous at 298 K but spontaneous at 350 K, then which among the following conditions is true for the reaction?

- A)  $\Delta G = -ve$ ,  $\Delta H = -ve$ ,  $\Delta S = +ve$   
B)  $\Delta G = +ve$ ,  $\Delta H = +ve$ ,  $\Delta S = +ve$   
C)  $\Delta G = -ve$ ,  $\Delta H = +ve$ ,  $\Delta S = +ve$   
D)  $\Delta G = +ve$ ,  $\Delta H = +ve$ ,  $\Delta S = -ve$

68. Q.Id: 194087  
Which among the following species acts as a self-indicator?

- A)  $\text{H}_2\text{O}_2$   
B)  $\text{I}^-$   
C)  $\text{Cr}_2\text{O}_7^{2-}$   
D)  $\text{MnO}_4^-$

69. Q.Id: 194076  
When 20 g of  $\text{CaCO}_3$  is treated with 20 g of  $\text{HCl}$ , the mass of  $\text{CO}_2$  formed would be

- A) 10 g  
B) 8.8 g  
C) 22.2 g  
D) 20 g

70. Q.Id: 194075  
A die is tossed thrice. If event of getting an even number is a success, then the probability of getting at least 2 successes is

- A)  $7/8$   
B)  $1/4$   
C)  $2/3$   
D)  $1/2$











89. Q.Id: 194052  
To which group of the periodic table does an element having electronic configuration  $[Ar]3d^54s^2$  belong?
- A) Second  
B) Fourth  
C) Seventh  
D) Third
90. Q.Id: 194050  
Angle made by the position vector of the point (5, -4, -3) with the positive direction of X - axis is
- A)  $\frac{\pi}{2}$   
B)  $\frac{\pi}{6}$   
C)  $\frac{\pi}{4}$   
D)  $\frac{\pi}{3}$
91. Q.Id: 194049  
On the basis of Bohr's model, the radius of the 3rd orbit is
- A) Equal to the radius of 1st orbit  
B) 3 times the radius of 1st orbit  
C) 5 times the radius of 1st orbit  
D) 9 times the radius of 1st orbit
92. Q.Id: 194047  
The spectrum of helium is expected to be similar to that of
- A)  $Li^+$   
B) H  
C) Na  
D)  $He^+$
93. Q.Id: 194045  
If two particles A and B are moving with the same velocity, but wavelength of A is found to be double than that of B. Which of the following statement is correct?
- A) Both A and B have same mass.  
B) Mass of A is half that of B.  
C) Mass of B is half that of A.  
D) Mass of B is one-fourth that of A.
94. Q.Id: 194044  
A vector makes equal angles  $\alpha$  with X and Y - axis, and  $90^\circ$  with Z - axis. Then,  $\alpha$  is equal to
- A)  $60^\circ$  or  $120^\circ$   
B)  $30^\circ$  or  $150^\circ$   
C)  $45^\circ$  or  $135^\circ$   
D)  $90^\circ$





105. Q.Id: 194025

**Assertion (A)** is more difficult move magnet into coil with more loops.

**Reason (R)** This is because emf induced each current loop resists the motion the mag

**A)** Both A and R are true and R is a correct explanation for A.

**B)** Both A and R are true but R is not a correct explanation for A.

**C)** A is true and R is false.

**D)** A is false, R is true.

106. Q.Id: 194023

The plane of dip circle is set in the geographic meridian and apparent dip is  $\delta_1$  It is then set in a vertical plane perpendicular to the geographic meridian The apparent dip angle is  $\delta_2$  The declination  $\theta$  at the place is

**A)**  $\tan^{-1} (\tan \delta_1 \tan \delta_2)$

**B)**  $\tan^{-1} (\tan \delta_1 + \tan \delta_2)$

**C)**  $\tan^{-1} \left( \frac{\tan \delta_1}{\tan \delta_2} \right)$

**D)**  $\tan^{-1} (\tan \delta_1 - \tan \delta_2)$

107. Q.Id: 194022

If

$$\tan^{-1} \left[ \frac{1}{1+1.2} \right] + \tan^{-1} \left[ \frac{1}{1+2.3} \right] + \dots + \tan^{-1} \left[ \frac{1}{1+n(1+1)} \right] = \tan^{-1} [x]$$

then x is equal to

**A)**  $\frac{1}{n+1}$

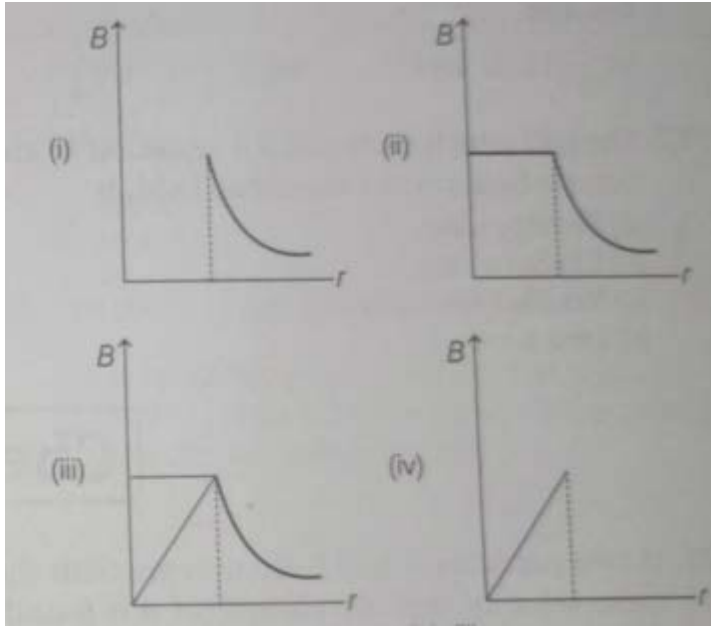
**B)**  $\frac{n}{n+1}$

**C)**  $\frac{1}{n+2}$

**D)**  $\frac{n}{n+2}$

108. Q.Id: 194021

A long thin hollow metallic cylinder of radius  $R$  has a current  $i$  ampere. The magnetic induction  $B$  away from the axis at a distance  $r$  from the axis varies as shown in



A) (i)

B) (ii)

C) (iii)

D) (iv)

109. Q.Id: 194020

In which of the following case no force exerted by a magnetic field on a chargw

A) Moving with constant velocity

B) Moving in a circle

C) At rest

D) Moving along a curved path

110. Q.Id: 194019

A cell of emf  $1.8\text{ V}$  gives a current of  $17\text{ A}$  when directly connected to an ammeter of resistance  $0.06\ \Omega$ . Internal resistance of the cell is

A)  $0.046\ \Omega$

B)  $0.066\ \Omega$

C)  $0.10\ \Omega$

D)  $10\ \Omega$

111. Q.Id: 194018

The value of  $X$  satisfying the equation  $3 \operatorname{cosec} x = 4 \sin x$  are

A)  $\frac{\pi}{6}, \frac{\pi}{3}$

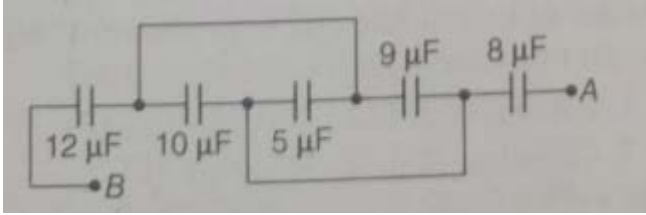
B)  $\pm \frac{\pi}{6}$

C)  $\pm \frac{\pi}{3}$

D)  $\frac{\pi}{3}, \frac{\pi}{4}$

112. Q.Id: 194017

In the given circuit, if the potential difference between A and B is 80 V, then the equivalent capacitance between A and B and the charge on  $10 \mu\text{F}$  capacitor respectively, are



A)  $4 \mu\text{F}$  and  $133 \mu\text{C}$

B)  $164 \mu\text{F}$  and  $150 \mu\text{C}$

C)  $15 \mu\text{F}$  and  $200 \mu\text{C}$

D)  $4 \mu\text{F}$  and  $50 \mu\text{C}$

113. Q.Id: 194016

Which statement(s) among the following are incorrect?

(i) A negative test charge experiences a force opposite to the direction of the field. (ii) The tangent drawn to a line of force represents the direction of electric field.

(iii) The electric field lines never intersect. (iv) The electric field lines form a closed loop

A) Only (i)

B) Both (ii) and (iii)

C) Only (iii)

D) Only (iv)

114. Q.Id: 194015

If  $\sin \alpha - \cos \alpha = m$  and  $\sin 2 \alpha = n - m^2$ , where  $-\sqrt{2} \leq m \leq \sqrt{2}$ , then n is equal to

A) 0

B) 1

C) 2

D) -2

115. Q.Id: 194014

$\tan 2 \alpha \cdot \tan (30^\circ - \alpha) + \tan 2 \alpha - \tan(60^\circ - \alpha)$   
 $+ \tan(60^\circ - \alpha) \cdot \tan(30^\circ - \alpha)$

is equal to

A)  $\tan 3 \alpha$

B)  $\tan^2 2 \alpha - \tan^2 60^\circ$

C) 1

D) 0









132. Q.Id: 193984

If  $a_1, a_2, \dots, a_9$  are in GP, then

$$\begin{vmatrix} \log a_1 & \log a_2 & \log a_3 \\ \log a_4 & \log a_5 & \log a_6 \\ \log a_7 & \log a_8 & \log a_9 \end{vmatrix}$$
 is equal to

- A)  $\log(a_1, a_2, \dots, a_n)$                       B) 1  
C)  $(\log a_9)^9$                                 D) 0

133. Q.Id: 193982

In a steady state, the temperature at the end A and end B of a 20 cm long rod AB are  $100^\circ\text{C}$  and  $0^\circ\text{C}$ . The temperature of a point 9 cm from A is

- A)  $55^\circ\text{C}$     B)  $45^\circ\text{C}$   
C)  $65^\circ\text{C}$     D)  $50^\circ\text{C}$

134. Q.Id: 193980

An ideal liquid flows through a horizontal tube of variable diameter. The pressure is lowest where the

- A) velocity is highest                              B) velocity is lowest  
C) diameter is largest                              D) velocity is intermediate

135. Q.Id: 193979

The lower end of a capillary tube is dipped into water and it is observed that the water in capillary tube rises by 7.5 cm. Find the radius of the capillary tube used, if surface tension of water is  $7.5 \times 10^{-2} \text{ Nm}^{-1}$ , Angle of contact between water and glass is  $0^\circ$  and acceleration due to gravity is  $10 \text{ ms}^{-2}$

- A) 0.2 cm    B) 0.1 cm  
C) 0.4 mm    D) 0.2 mm

136. Q.Id: 193976

The Young's modulus of a rubber string of length 12 cm and density  $1.5 \text{ kgm}^{-3}$  is  $5 \times 10^8 \text{ Nm}^{-2}$ . When this string is suspended vertically, the increase in its length due to its own weight is (Take,  $g = 10 \text{ ms}^{-2}$ )

- A)  $2.16 \times 10^{-10} \text{ m}$                                 B)  $9.6 \times 10^{-11} \text{ m}$   
C)  $9.6 \times 10^{-3} \text{ m}$                                 D)  $2.16 \times 10^{-3} \text{ m}$



141. Q.Id: 193962

**Assertion (A)** Two identical trains move in opposite senses in equatorial plane with same speed relative to the Earth's surface. They have equal magnitude of normal reaction.

**Reason (R)** The trains have different centripetal accelerations due to different speeds.

- A)** Both A and R are true and R is a correct explanation for A
- B)** Both A and R are true but R is not a correct explanation for A
- C)** A is true, R is false.
- D)** A is false, R is true.

142. Q.Id: 193961

The sum of moments of all the particles in a system about its centre of mass is always

- A)** minimum
- B)** zero
- C)** maximum
- D)** infinite

143. Q.Id: 193960

The rank of the matrix  $\begin{bmatrix} 4 & 2 & (1-x) \\ 5 & k & 1 \\ 6 & 3 & (1+x) \end{bmatrix}$  is 1, then,

- A)**  $k = 5/2, x = 1/5$
- B)**  $k = \frac{5}{2}, x \neq \frac{1}{5}$
- C)**  $k = 1/5, x = 5/2$
- D)**  $k \neq \frac{5}{2}, x = \frac{1}{5}$

144. Q.Id: 193958

$A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}, 10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$  and

$B = A^{-1}$ , then the value of  $\alpha$  is

- A)** 2
- B)** 0
- C)** 5
- D)** 4

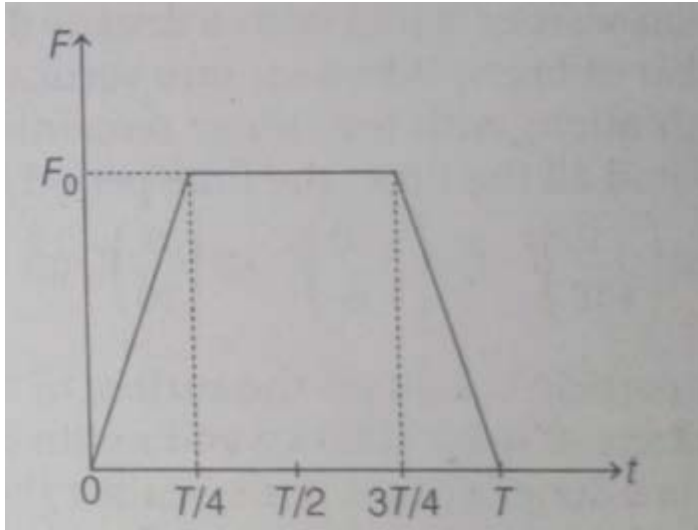
145. Q.Id: 193957

Which of the following type of wheels of same mass and radius will have largest moment of inertia?

- A)** Ring
- B)** Angular disc
- C)** Solid disc
- D)** Cylindrical disc

146. Q.Id: 193955

A mass  $m$ , moving makes an elastic collision in one with a stationary particle of mass  $m$ . After the collision, they remain in contact for an extremely small time. Their force of contact, with time is shown in the figure. Then,  $F_0$



A)  $\frac{3mv}{T}$

B)  $\frac{4mv}{T}$

C)  $\frac{mv}{T}$

D)  $\frac{3mv}{T}$

147. Q.Id: 193954

Let  $a$  and  $b$  be non-zero real numbers such that  $ab = 5/2$  and given

$A = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$  and  $AA^T = 20I$  ( $I$  is unit matrix), then the equation whose roots are  $a$  and  $b$  is

A)  $x^2 - 10x + 5 = 0$

B)  $2x^2 \pm 10x + 5 = 0$

C)  $x^2 - 5x + \frac{5}{2} = 0$

D)  $x^2 - 25x + \frac{5}{2} = 0$

148. Q.Id: 193952

A body of mass  $8 \text{ kg}$  under the action of a force is displaced according to the question,

$s = \frac{r^2}{4} \text{ m}$ , where  $t$  is the time. find the work

A)  $9 \text{ J}$

B)  $16 \text{ J}$

C)  $6 \text{ J}$

D)  $3 \text{ J}$

149. Q.Id: 193949

The equation whose roots are the values of the equation  $\begin{vmatrix} 1 & -3 & 1 \\ 1 & 6 & 4 \\ 1 & 3x & x^2 \end{vmatrix} = 0$  is

A)  $x^2 + x + 2 = 0$

B)  $x^2 + x - 2 = 0$

C)  $x^2 + 2x + 2 = 0$

D)  $x^2 - x - 2 = 0$

150. Q.Id: 193947

A metal ball of mass 2 kg moving with a velocity of 36 km/h has a head on collision with a stationary ball of mass 3 kg. After the collision, of both ball move together, then the loss in kinetic energy due to collision is

A) 40 J

B) 60 J

C) 100 J

D) 140 J

151. Q.Id: 193946

$n \in \mathbb{N}$  then, the statement  $8n + 16 \leq 2^n$  is true for

A)  $n = 2$

B)  $n = 3$

C)  $n = 6$

D)  $n = 5$

152. Q.Id: 193943

If  $f$  is a function defined on  $(0, 1)$  by  $f(x) = \min\{x - [x], -x - [x]\}$ , then  $(f \circ f \circ f \circ f)(x)$  is equal to  $\rightarrow ([.]$  greatest integer function)

A)  $x$

B)  $-x$

C)  $4x$

D)  $2x$

153. Q.Id: 193941

When a body is placed on a rough plane (coefficient of friction =  $\mu$ ) inclined at an angle  $\theta$  to the horizontal, its acceleration is .....

(acceleration due to gravity =  $g$ )

A)  $g(\sin \theta - \mu \cos \theta)$

B)  $g(\sin \theta - \cos \theta)$

C)  $g\mu(\sin \theta - \cos \theta)$

D)  $g(\sin \theta - \cos \theta)$

154. Q.Id: 193938

Given, the function  $f(x) = \frac{a^x + a^{-x}}{2}$ , ( $a > 2$ ), then  $f(x + y) + f(x - y)$  is equal to

A)  $f(x) - f(y)$

B)  $f(y)$

C)  $2f(x)f(y)$

D)  $f(x)f(y)$



