VIDYA CAREER INSTITUTE

विद्या है तो विश्वास है , हर घर शिक्षा VCI का भरोसा

SECTION-A : (Maximum Marks: 80)

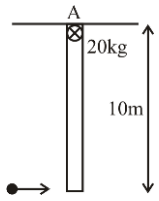
This section contains 20 questions. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) Only one option is correct. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.

Zero Marks : 0 If none of the option is selected.

Negative Marks : –1 If wrong option is selected.

1. A rod of mass 20 kg & length 10m is hinged at A & hanging vertically. A bullet of mass 5kg moving with velocity 10 m/s sticks to one end of rod. Find angular velocity of rod just after the collision particle sticks to it :-



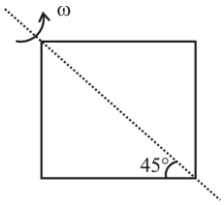
(A) $\frac{7}{3}$ rad/ sec

(B) $\frac{3}{7}$ rad/ sec

(C) $\frac{3}{10}$ rad/ sec

(D) 3 rad/sec

2. Four rod each of mass m form a square length of diagonal b rotates about its diagonal. Its moment of inertia is :-



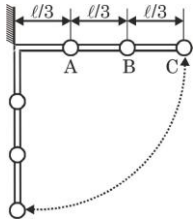
(A) $\frac{mb^2}{3}$

(B) $\frac{mb^2}{12}$

(C) $\frac{mb^2}{6}$

(D) mb^2

3. A light rod carries three equal masses A, B and C as shown in figure. The velocity of B in vertical position of rod if it is released from horizontal position as shown in figure is :-



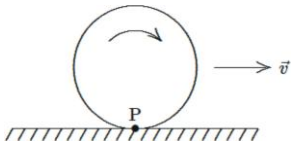
(A) $\sqrt{2g\ell}$

(B) $\sqrt{\frac{18g\ell}{7}}$

(C) $\sqrt{\frac{4g\ell}{3}}$

(D) $\sqrt{\frac{8g\ell}{7}}$

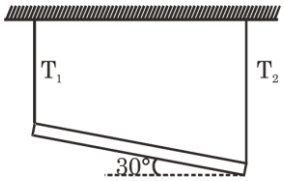
4. A wheel rolls without sliding along a horizontal road as shown. The velocity of the center of the wheel is represented by $\rightarrow$. Point P is painted on the rim of the wheel. The instantaneous acceleration of point P is:



(A) represented by $\rightarrow$ (B) represented by $\leftarrow$

(C) represented by $\uparrow$ (D) zero

5. A uniform rod of mass m and length l is connected with two ideal strings from ends of rod as shown in figure, if tensions in strings are T_1 & T_2 respectively then :-



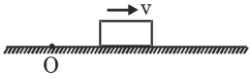
(A) $T_1 > \frac{mg}{2}$

(B) $T_2 > \frac{mg}{2}$

(C) $T_1 < \frac{mg}{2}$

(D) $T_1 = T_2 = \frac{mg}{2}$

6. A block of mass m is moving on a horizontal surface having coefficient of friction μ. A point O is on the surface so about point O



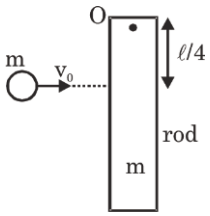
(A) Net torque of all the forces on the block is zero.

(B) Magnitude of angular momentum increases.

(C) Magnitude of angular momentum decreases.

(D) Magnitude of angular momentum remains same.

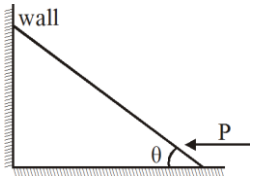
7. Rod of mass m and length ℓ is free to rotate about point 'O' in vertical plane. A particle having same mass m moving horizontally with velocity v_0 hits the rod perpendicular at distance $\frac{\ell}{4}$ from the top end 'O' and stops. Find the magnitude of impulse due to hinge on the rod due to collision.



(A) $\frac{mv_0}{19}$ (B) $\frac{10mv_0}{19}$

(C) $\frac{mv_0}{8}$ (D) $\frac{5mv_0}{8}$

8. Assuming frictionless contacts, the magnitude of external horizontal force P applied at the lower end for equilibrium of the rod (The rod is uniform and its mass is 'm') is equal to



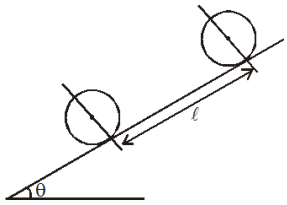
(A) $\frac{mg}{2}$

(B) $\frac{mg}{2}\cos\theta$

(C) $\frac{mg}{2}\tan\theta$

(D) $\frac{mg}{2}\cot\theta$

9. A solid sphere of mass m is placed on a rough inclined plane as shown in figure. The coefficient of friction μ is not sufficient for pure rolling. The centre of sphere slides a length ℓ on the incline from rest and its kinetic energy becomes k. Then work done by friction will be :-



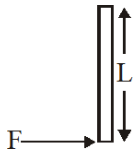
(A) $-\mu mg\ell\cos\theta$

(B) $-mg\ell\sin\theta + k$

(C) $-\frac{2}{5}\mu mg\ell\sin\theta + k$

(D) $-\frac{2}{5}mg\ell\sin\theta$

10. A uniform rod of mass M and length L is lying on a frictionless horizontal surface. A force F is applied at one end of bar perpendicular to its length. Initial acceleration of end at which force is applied is :-



(A) $\frac{F}{M}$

(B) $\frac{4F}{M}$

(C) $\frac{F}{4M}$

(D) $\frac{6F}{M}$

11. A slit of width a is illuminated by red light of wavelength 6500Å°. If the first diffraction minimum falls at 30°, then the value of a is

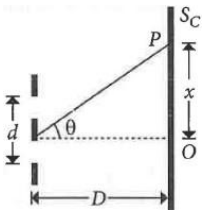
(A) 6.5×10^{-4}mm

(B) 1.3 micron

(C) 3250Å°

(D) 2.6×10^{-4}cm

12. In the Young's double slit experiment a monochromatic source of wavelength λ is used. The intensity of light passing through each slit is I_0. The intensity of light reaching the screen S_c at a point P, a distance x from 0 is given by (Take d << D)

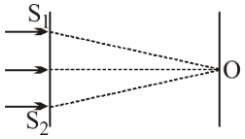


(A) $I_0 \cos^2\left(\frac{\pi D}{\lambda d}x\right)$ (B) $4I_0 \cos^2\left(\frac{\pi d}{\lambda D}x\right)$

(C) $I_0 \sin^2\left(\frac{\pi d}{2\lambda D}x\right)$ (D) $4I_0 \cos\left(\frac{\pi d}{2\lambda D}x\right)$

13. Statement-1: In YDSE, as shown in figure, central bright fringe is formed at *O*. If a liquid is filled between plane of slits and screen, the central bright fringe is shifted in upward direction.

and Statement-2: If path difference at *O* increases, *y*-coordinate of central bright fringe will change.



(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

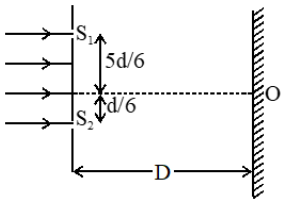
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

14. Light of wavelength λ in air enters a medium of refractive index μ. Two points in this medium, lying along the path of this light, are at a distance *x* apart. The phase difference between these points is :

(A) $\frac{2\pi\mu x}{\lambda}$ (B) $\frac{2\pi x}{\mu\lambda}$

(C) $\frac{2\pi(\mu-1)x}{\lambda}$ (D) $\frac{2\pi x}{(\mu-1)\lambda}$

15. In the figure, if a parallel beam of white light is incident on the plane of the slits S_1 and S_2 then the distance of the nearest white spot on the screen from *O* is [Assume $D >> d$, $d >> \lambda$]



(A) 0 (B) $\frac{d}{3}$

(C) $\frac{d}{2}$ (D) $\frac{d}{6}$

16. Calculate the resolving power of a telescope, assuming the diameter of the objective lens to be 6 *cm* and the wavelength of light used to be 540 *nm*.

(A) 3.2×10^4 (B) 3.1×10^3

(C) 9.2×10^3 (D) 9.1×10^4

17. The intensity of light from a source is $\left(\frac{500}{\pi}\right)$ W/m^2. Find the amplitude of electric field in this wave.

(A) $\sqrt{3} \times 10^2$ N/C (B) $2\sqrt{3} \times 10^2$ N/C

(C) $\frac{\sqrt{3}}{2} \times 10^2$ N/C (D) $2\sqrt{3} \times 10^1$ N/C

18. A carbon dioxide laser emits a sinusoidal electromagnetic wave that travel in vacuum in the negative X-direction. The wavelength is $10.6\ \mu m$ and the E field is parallel to z-axis with $E_{max} = 1.5$ Mv/m. Write vector equation of B as function of time and position.

(A) $B(x,t) = \hat{j}(5.0 \times 10^{-3}\ T) \cos[(5.93 \times 10^5\ rad/m)x + (1.78 \times 10^{14} rad/s)\ t]$

(B) $B(x,t) = -\hat{j}(5.0 \times 10^{-3}\ T) \cos[(5.93 \times 10^5\ rad/m)x + (1.78 \times 10^{14} rad/s)\ t]$

(C) $B(x,t) = \hat{K}(1.5 \times 10^6\ V/m) \cos[(5.93 \times 10^5\ rad/m)x + (1.78 \times 10^{14} rad/s)\ t]$

(D) $B(x,t) = -\hat{K}(1.5 \times 10^6 V/m) \cos[(5.93 \times 10^5 rad/m)x + (1.78 \times 10^{14} rad/s)\ t]$

19. Electric field of plane electromagnetic wave propagating through a non–magnetic medium is given by $E = 20\cos(2 \times 10^{10} t - 200x)$ V/m. The dielectric constant of the medium is equal to : (Take $\mu_r = 1$)

(A) 9 (B) 2

(C) $\frac{1}{3}$ (D) 3

20. The conduction current is the same as displacement current when source is

(A) AC only (B) DC only

(C) Both AC and DC (D) Neither AC or DC

SECTION-B : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a Numerical Value.
For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).
Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +4 If correct answer is entered.
Zero Marks : 0 If the question is unanswered.
Negative Marks : –1 If wrong answer is entered.

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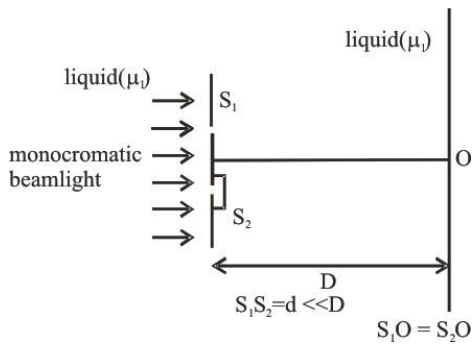
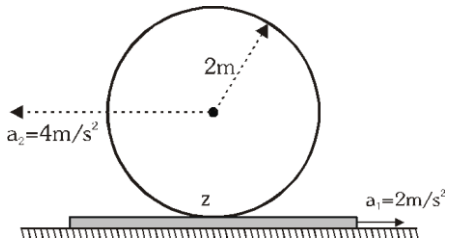
1. Young's double slit experiment is conducted in a liquid of refractive index μ_1 as shown in figure. A thin transparent slab of refractive index μ_2 is placed in front of the slit S_2. If $\mu_2 = \frac{3}{2}$, $\mu_1 = \frac{4}{3}$, $t = 8\ \mu m$, the magnitude of optical path difference (wrt liquid) at 'O' in μm is :



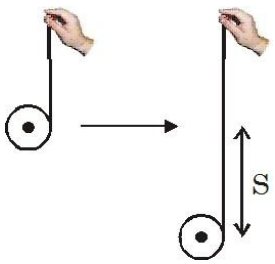
2. The polarizing angle for light in air that is incident on a certain interface is 60º. What is the angle (in degree) of refraction of light incident at this angle ?

3. A light of wavelength 5000 Å falls on a liquid film of refractive index $\frac{4}{3}$ making angle of refraction 60°. The width of film (in 10^{-7}m) so as the reflected rays appear dark is $\frac{x}{4}$. Find the value of x.

4. In figure, a sphere of radius 2 m rolls on a plank. The accelerations of the sphere and the plank are indicated. Find the value of α in rad/s^2.



5. In the given figure, a light string is wound round the rim of a yo-yo of mass m = 1.5kg and radius r = 10cm. One end of the string is held by a person. When the yo-yo is released from rest, it falls and rotates without slipping. What is the tension (in N) in the string ? (Assume yo-yo as solid cylinder)



SECTION-A : (Maximum Marks: 80)

This section contains 20 questions. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) Only one option is correct. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.
Zero Marks : 0 If none of the option is selected.
Negative Marks : –1 If wrong option is selected.

1. For a reversible process at equilibrium, the change in entropy may be expressed as:

(A) $\Delta S = Tq_{rev}$ (B) $\Delta S = \frac{q_{rev}}{T}$

(C) $\Delta S = \frac{T}{\Delta H}$ (D) $\Delta S = \Delta G$

2. A heat engine operating between 227°C and 27°C absorbs 2 kcal of heat from the 227°C reservoir reversibly per cycle. The amount of work done in one cycle is ?

(A) 0.4 kcal (B) 0.8 kcal

(C) 4 kcal (D) 8 kcal

3. The standard enthalpy of formation of propene, C_3H_6, is +20.6 kJ/mole. Calculate the heat of combustion of one mole of C_3H_6. The heats of formation of $CO_2(g)$ and $H_2O(l)$ are –394 kJ/mole and –285.8 kJ/mole respectively.

(A) 1721.2 (B) –1939.1

(C) –2060.0 (D) 2221.6

4. An example of closed system is :

(A) Hot water present in hot beaker

(B) Some amount of water present in equilibrium with it's vapour in a closed and insulated container

(C) Some amount of hot water enclosed in a closed container which is not insulated

(D) none of these

5. A gas expands against a variable pressure given by $P = \frac{10}{V}$ atm, where V is volume of gas of each stage of expansion. Further during expansion from volume 10 L to 100 L, the gas undergoes a change in internal energy of 420 J. How much heat is absorbed by the gas during expansion ?

(A) q = 2752.2 J (B) q = 2652.2 J

(C) q = 2852.2 J (D) q = 2452.2 J

6. A gas is heated at constant pressure. The fraction of heat absorbed used in doing work is

(A) $\frac{1}{\gamma}$ (B) $1 - \frac{1}{\gamma}$

(C) $\gamma - 1$ (D) γ

7. Which of the following compound can give aldol condensation on reaction with dil.NaOH :

(A) Formaldehyde

(B) Benzaldehyde

(C) Benzophenone

(D) Acetophenone

8. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :
Assertion A : Acetal/Ketal is stable in basic medium.
Reason R: The high leaving tendency of alkoxide ion gives the stability to acetal/ketal in basic medium.
In the light of the above statements, choose the correct answer from the options given below: [JEE (Main) January 2023]

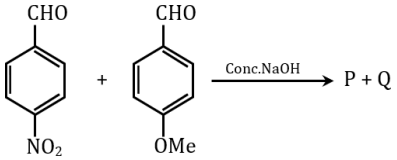
(A) A is true but R is false

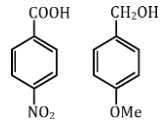
(B) A is false but R is true

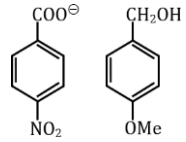
(C) Both A and R are true and R is the correct explanation of A

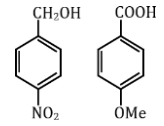
(D) Both A and R are true but R is NOT the correct explanation of A

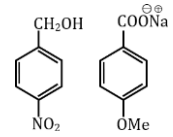
9. Product P and Q in the following reaction



(A) 

(B) 

(C) 

(D) 

10. Identify the reagent/chemical test which can not differentiate between CH_3 - CHO (Acetaldehyde) and CH_3 - CO - CH_3 (Acetone)

(A) Iodoform test (B) Fehling test

(C) Tollen's test (D) Benedict test

11. The most suitable reagent for the conversion of $R - CH_2 - OH \longrightarrow R - CHO$ is :-

(A) CrO_3

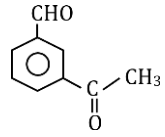
(B) PCC (Pyridinium chlorochromate)

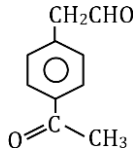
(C) $KMNO_4$

(D) $K_2Cr_2O_7$

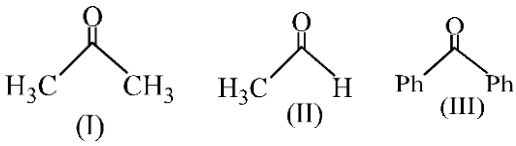
12. Which of the following compound gives positive iodoform test, reduces Tollens', Fehling's as well as Benedict's reagent also?

(A) $C_6H_5 - \overset{\overset{O}{\|}}{C} - CH_3$ (B) $C_6H_5 - CH_2 - CHO$

(C) 

(D) 

13. The order of reactivity of phenyl Magnesium Bromide with the following compounds is



(A) II > III > I

(B) I > III > II

(C) II > I > III

(D) All react with the same rate

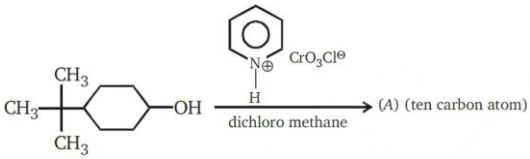
14. The product of acid catalysed hydration of 3–phenylpropene is

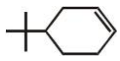
(A) 3–Phenyl–2–propanol

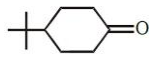
(B) 1–Phenyl–1–propanol

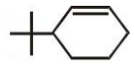
(C) 2–Phenyl–2–propanol

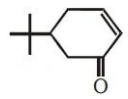
(D) 2–Phenyl–1–propanol

15. 

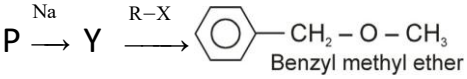
(A) 

(B) 

(C) 

(D) 

16. Find out the reactant P and RX for Williamson synthesis



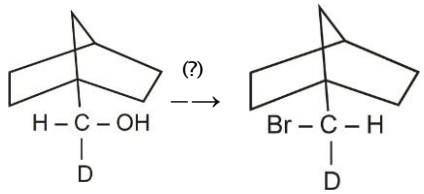
(A) $PhBr + NaOCH_2 - O - CH_3$

(B) $CH_3OH + PhCH_2Br$

(C) $PhCH_2OH + CH_3Br$

(D) Both (B) & (C)

17. Which reaction conditions (reagents) are suitable for the following reactions:

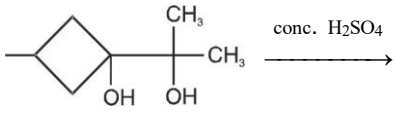


(A) Br_2/CCl_4

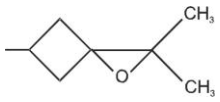
(B) $SOBr_2$

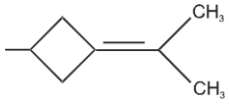
(C) $HBr / ZnBr_2$

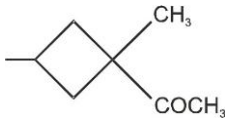
(D) (i) TsCl / pyridine (ii) LiBr in Acetone

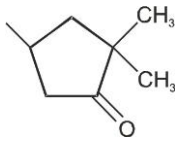
18. In the reaction 

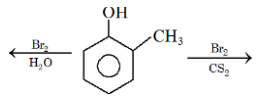
A. The product A is -

(A) 

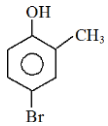
(B) 

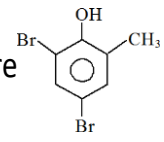
(C) 

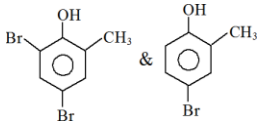
(D) 

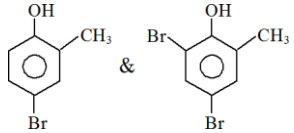
19. 'A' 

'B', 'A' and 'B' respectively are :

(A) Both are 

(B) Both are 

(C) 

(D) 

20. In Kolbe's reaction phenoxide ion is treated with:

(A) Carbon dioxide (B) Sodium hydroxide

(C) Oxygen (D) Hydrogen oxide

SECTION-B : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a Numerical Value.
For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).
Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If correct answer is entered.
Zero Marks : 0 If the question is unanswered.
Negative Marks : –1 If wrong answer is entered.

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1. For a reversible reaction $A \rightleftharpoons B$. Find K_{eq} at 2727°C temperature. (nearest integer)

Given :

$\Delta_r H^\circ = -30\ kJ\ mol^{-1}$ (at 2727°C)

$\Delta_r S^\circ = 10\ JK^{-1}$ (at 2727°C)

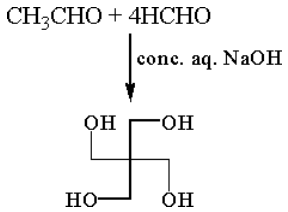
$R = 8.314\ JK^{-1}\ mol^{-1}$

2. The entropies of $H_2(g)$ and H(g) are 60 and 50 J $mole^{-1}$ K^{-1} respectively at 300 K. Using the data given below calculate

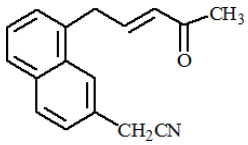
the bond enthalpy of H_2 (g) in Kcal $mole^{-1}$.

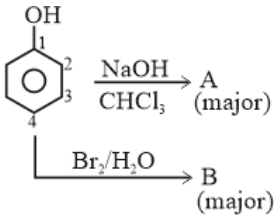
$H_2(g) \rightarrow 2H(g)$; $\Delta G^\circ = 21.6\ KJ\ mole^{-1}$

3. The number of Cannizaro reaction(s) that occurs in the given transformation is



4. Number of electrophilic centre in the given compound is _____



5. 

Position of CHO group in A is x, no. of Br atoms in B is y then x + y = ?

SECTION-A : (Maximum Marks: 80)

This section contains 20 questions. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) Only one option is correct. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.

Zero Marks : 0 If none of the option is selected.

Negative Marks : –1 If wrong option is selected.

1. A student starts from a point P(–3,4) and reaches point Q(0,1) via R(α,0) such that perimeter of the triangle PQR is minimum, then the value of $10|\alpha|$ is -

(A) $\frac{3}{5}$ (B) 6

(C) 5 (D) 3

2. Two consecutive sides of a parallelogram are 3x + 5y = 0 and 5x + 3y = 0. If the equation to one diagonal is 15y + 105x = 32 then the equation of the other diagonal is

(A) 12y + 13x = 0

(B) 11y + 13x = 0

(C) 22y + 15x = 0

(D) None of the above

3. A straight line through the point A(–1, 3) cuts the line x + y = 4 and y = x at B and C respectively. If AB × AC = 16, and possible slopes of the line are m_1 & m_2 then $\left(\frac{m_1 - m_2}{1 + m_1 m_2}\right)^2$ is equal to

(A) 1 (B) $\frac{3}{4}$

(C) 3 (D) $\frac{1}{3}$

4. In a triangle ABC the equation of side BC is x – 7y + λ = 0 with vertex A(1,2) & internal angle bisector through B is y = x, then value of λ is-

(A) 5 (B) 3

(C) –3 (D) –5

5. External angular bisectors of $\angle B$ and $\angle C$ of a triangle ABC are y = x, y = -2x respectively if vertex A = (1,3). Then incentre of Δ^{le} ABC is

(A) (1, 1) (B) $\left(\frac{-1}{2}, 1\right)$

(C) (0, 0) (D) $\left(\frac{1}{2}, \frac{3}{2}\right)$

6. The value of λ for which the point (λ,2) is are interior point of ΔABC formed by x + y = 4, 3x – 7y = 8 and 4x – y = 31 is :

(A) $\lambda \in \left(\frac{22}{3}, \frac{33}{4}\right)$

(B) $\lambda \in \left(\frac{21}{3}, \frac{34}{3}\right)$

(C) $\lambda \in \left(\frac{20}{3}, \frac{31}{4}\right)$

(D) $\lambda \in \left(\frac{21}{4}, \frac{33}{5}\right)$

7. If the three lines x – 3y = p, ax + 2y = q and ax + y = r form a right – angled triangle then :

(A) $a^2 - 6a - 12 = 0$ (B) $a^2 - 9a + 12 = 0$

(C) $a^2 - 9a + 18 = 0$ (D) $a^2 - 6a - 18 = 0$

8. Line x + αy =1 cuts the circle $x^2 + y^2 - 4x - 2y + 1 = 0$ at two points A and B such that Chord AB subtends an angle of 90° at origin then sum of possible values of α is

(A) –1 (B) 1

(C) 2 (D) 4

9. If one of the diagonal of a square is along the line x = 2y and one of its vertices is (3, 0), then its sides through this vertex are given by, the equations

(A) y – 3x + 9 = 0, 3y + x – 3 = 0

(B) y + 3x + 9 = 0, 3y + x – 3 = 0

(C) y – 3x + 9 = 0, 3y – x + 3 = 0

(D) y – 3x + 3 = 0, 3y + x + 9 = 0

10. If the area bounded by the curves $y = x^2$ and $y = \frac{2}{1+x^2}$ is λ sq. units and the area bounded by the region [x][y] = 2 is μ, then the correct relation is (where [*] denotes greatest integer function)

(A) $[\lambda] = 2\mu$ (B) $2[\lambda] = \mu$

(C) $4[\lambda] = \mu$ (D) $[\lambda] = 4\mu$

11. The area of the region which consists of all the points satisfying the conditions $|x - y + |x + y| \le 8$, $xy \ge 2$, $x \ge 0$ and $y \ge 0$ is equal to -

(A) $14 - \ell n64$

(B) $28 - \ell n64$

(C) $14 + \ell n4$

(D) $18 - \ell n4$

12. Area of the region $\left\{(x,y) \in \mathbb{R}^2 : y \ge \sqrt{|x+3|}, 5y \le x + 9 \le 15\right\}$ is equal to

(A) $\frac{1}{6}$ (B) $\frac{4}{3}$

(C) $\frac{3}{2}$ (D) $\frac{5}{3}$

13. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the lines $x = 4$, $y = 4$ and the coordinate axes. If S_1, S_2, S_3 are respectively the areas of these parts numbered from top to bottom, then $S_1 : S_2 : S_3$ is :

(A) 1 : 2 : 1 (B) 1 : 2 : 3

(C) 2 : 1 : 2 (D) 1 : 1 : 1

14. Let Δ be the area of the region $\left\{(x,y) \in \mathbb{R}^2 : x^2 + y^2 \le 21, y^2 \le 4x, x \ge 1\right\}$. Then $\frac{1}{2}\left(\Delta - 21\sin^{-1}\frac{2}{\sqrt{7}}\right)$ is equal to

(A) $2\sqrt{3} - \frac{1}{3}$

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

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

(D) $\sqrt{3} - \frac{4}{3}$

15. Let $f : R^+ \to R^+$ is an invertible function such that $f'(x) > 0$ and $f''(x) > 0 \forall x \in [1,5]$. If $f(1) = 1$ and f(5) = 5 and area bounded by $y = f(x)$, x-axis, x = 1 and x = 5 is 8 sq. units. Then the area bounded by $y = f^{-1}(x)$, x-axis, x = 1 and x = 5 is :

(A) 12 (B) 16

(C) 18 (D) 20

16. Area enclosed by the curve $y^2 = x^2(2 - x)$ and right by the line x = 1 is -

(A) $\sqrt{5} + 7\sqrt{2}$ (B) 4

(C) $2(\sqrt{2} - 1)$ (D) $\frac{4(8\sqrt{2} - 7)}{15}$

17. Let $f : (-1, 0) \to R$ be the function defined by $f(x) = |2\{x\} - 1| + |2\{x\} + 1|$ where {x} denotes the fractional part function. then the area of the region bounded by the curve y = f(x), x = 0, x = –1 and x-axis is equal to :

(A) $\frac{3}{2}$ (B) $\frac{5}{2}$

(C) $\frac{9}{2}$ (D) 3

18. If $\frac{dy}{dx} + \frac{2^{x-y}(2^y - 1)}{2^x - 1} = 0, x, y > 0, y(1) = 1$, then y(2) is equal to :

(A) $2 + \log_2 3$ (B) $2 + \log_2 2$

(C) $2 - \log_2 2$ (D) $2 - \log_2 3$

19. If $y\frac{dy}{dx} = x\left[\frac{\phi\left(\frac{y^2}{x^2}\right)}{y^2 + \frac{\phi\left(\frac{y^2}{x^2}\right)}{x^2}}\right]$, $x > 0$, $\phi > 0$, and $y(1) = -1$, then $\phi\left(\frac{y^2}{4}\right)$ is equal to :

(A) $4\phi(2)$ (B) $4\phi(1)$

(C) $2\phi(1)$ (D) $\phi(1)$

20. The curve satisfies the equation $\frac{dy}{dx} = \frac{y(x + y^3)}{x(y^3 - x)}$ and passes through the point (4, –2) is

(A) $y^2 = -2x + 12$ (B) $2y = -x$

(C) $y^3 = -2x$ (D) $y^2 = x$

SECTION-B : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a Numerical Value.

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If correct answer is entered.

Zero Marks : 0 If the question is unanswered.

Negative Marks : –1 If wrong answer is entered.

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1. Let y = f(x) is a solution of differential equation $\frac{dy}{dx} + y = \frac{2xe^{-x}}{1 + ye^{x}}$ such that f(0) = 1, then $\left\lfloor \frac{f(-1)}{e} \right\rfloor$ is equal to (where [*] denotes greatest integer function)

2. Let y = y(x) be a solution of the differential equation (xcos x)dy + (xysinx + ycos x – l)dx = 0, $0 < x < \frac{\pi}{2}$. If $\frac{\pi}{3} y\left(\frac{\pi}{3}\right) = \sqrt{3}$, then $\left\| \frac{\pi}{6} y''\left(\frac{\pi}{6}\right) + 2y'\left(\frac{\pi}{6}\right) \right|$ is equal to _____

3. If y = y (x) is the solution of the differential equation $\frac{dy}{dx} + \frac{4x}{(x^2 - 1)} y = \frac{x + 2}{(x^2 - 1)^{\frac{5}{2}}}$, x > 1 such that $y(2) = \frac{2}{9}\log_e(2 + \sqrt{3})$ and $y(\sqrt{2}) = \alpha\log_e(\sqrt{\alpha} + \beta) + \beta - \sqrt{\gamma}, \alpha, \beta, \gamma \in N$, then $\alpha\beta\gamma$ is equal to ____.

4. If area enclosed by curve $f(x) = \sin^{-1}\left(\frac{2|x|}{1 + x^2}\right) + \sin^{-1}\left(\frac{|x|}{\sqrt{1 + x^2}}\right)$ and $g(x) = |\tan^{-1}x|$ from x = –1 to x = 1 is $\pi - \text{lnb}$. Then value of [b – π] is, where [ ] is greatest integer function.

5. If P(α, β) lies on the 2x + 3y + 1 = 0 such that |PA – PB| is maximum, then the value of (α + β), where A is (2, 0) and B is (0, 2), is

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विद्या है तो विश्वास है , हर घर शिक्षा VCI का भरोसा