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FOR VSAT EXAM PREPARATION

VSAT 2021 Question Paper · MPC Code A

EXAM	YEAR	TYPE	SUBJECT
VSAT	2021	Question Paper	MPC Code A

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be UNIVERSITY)
-Estd. u/s 3 of UGC Act 1956

V-SAT '21

VIGNAN'S SCHOLASTIC APTITUDE TEST

This booklet contains 24 printed pages

PAPER -1: MATHEMATICS, PHYSICS, CHEMISTRY, & ENGLISH / APTITUDE

Read carefully the following Instructions before opening the seal of this booklet.

Do not open this Test Booklet untill you are instructed by the invigilator.

BOOKLET

CODE	SERIAL No.
A	

Important Instructions:

1. Immediately fill in the particulars at the bottom of this test booklet with blue/black ball point pen. Use of pencil is strictly prohibited.
2. A separate OMR answer sheet is provided along with this test booklet. When you are directed to open the test booklet, take the OMR answer sheet and fill in the required particulars carefully.
3. The CODE for this booklet is **A**. Make sure that the CODE on the OMR Answer Sheet should be marked as that on this booklet.
4. Immediately on opening the booklet, please check for (i) the same booklet code (A/B/C/D) on the top of each page (ii) serial number of the questions (1-120) (iii) the number of pages (iv) correct printing.
5. The test is of $2\,^1/_2$ **hours** duration.
6. The test consists of 120 Questions. The maximum marks are 120.
7. There are 4 sections in the question paper. Each question carries 1 mark for correct answer and there is no negative marking for incorrect answer.

   Section I - MATHEMATICS (30 Marks) consists of 30 questions (1 to 30).

   Section II - PHYSICS (30 Marks) consists of 30 questions (31 to 60).

   Section III - CHEMISTRY (30 Marks) consists of 30 questions (61 to 90).

   Section IV - ENGLISH / APTITUDE (30 Marks) consists of 30 questions (91 to 120).
8. Candidates will be awarded marks as stated in instruction No.6 for correct response to each question. Marks will not be awared for unattempted / unmarked questions on the answer sheet.
9. No candidate is allowed to carry any textual material,printed or written, bits of papers, blank papers, mobile phone, any electronic device, etc., except the hall ticket, ball point pen, HB pencil, eraser and sharpner inside the examination hall/room.
10. Rough work is to be done in the space provided at the bottom of each page, on pages 2 and 21 to 24 in the test booklet only.
11. On completion of the test, the candidate must hand over the test booklet along with OMR answer sheet to the Invigilator in the room/hall.
12. Do not fold, mutilate or make any stray marks on the OMR answer sheet.

Name of the Candidate (in Capital Letters):_____

Parent's Mobile No. : | | | | | | | | | | | Jr.Inter Marks [ ]

School/Coching Centre Name : _____

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A

SPACE FOR ROUGH WORK

Rough Work

SET - II V - SAT-'21

A

SECTION - I
MATHEMATICS

1. $\lim_{n\to\infty}\left(\frac{1}{5}\right)^{\log_{\sqrt{5}}\left(\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+....\infty\right)}$ equals

A. 2 B. 4 C. 8 D. 0 [ ]

2. Two cars are travelling along two roads which cross each other at right angles at *A*. One car is travelling towards A at 21 *kmph* and the other is travelling towards A at 28 *kmph*. If initially their distances from A are 1500 *km* and 2100 *km* respectively. Then the nearest distance between them is

A. 30 B. 45 C. 60 D. 75 [ ]

3. Suppose that *f* is a differentiable function with the property that *f(x + y)= f(x)+f(y)+xy* and $\lim_{h\to 0}\frac{f(h)}{h}=3$ Then

A. *f* is a linear function B. $f(x)=3x+x^2$

C. $f(x)=3x+\frac{x^2}{2}$ D. $f(x)=3x-\frac{x^2}{2}$ [ ]

4. Mean of 100 items is 49. It was discovered that three items which should have been 60, 70, 80, were wrongly read as 40, 20, 50 respectively. The correct mean is

A. 48 B. $82\frac{1}{2}$ C. 80 D. 50 [ ]

5. If $f(x)=x^2-(a+b)x+ab$ and *A* and *H* be the *A.M* and *H.M* between two quantities a and b. Then

A. *A f(A) = H f(H)* B. *A f(H) = H f(A)*

C. *A + f(A) = H +f(H)* D. *f(A)+H = f(H)+A* [ ]

6. The statement $p\to(q\to p)$ is equivalent to

A. $p\to(p\to q)$ B. $p\to(q\vee p)$

C. $p\to(q\wedge p)$ D. $p\to(p\leftrightarrow q)$ [ ]

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7. Let $2\sin^2 x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$ (x is measured in radians). Then x lies in the interval

A. $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ B. $\left(-1, \frac{5\pi}{6}\right)$ C. $(-1, 2)$ D. $\left(\frac{\pi}{6}, 2\right)$ [ ]

8. A lamp post standing at a point A on a circular path of radius r subtends an angle 30^0 at some point B on the path and AB subtends an angle of 45^0 at any other point on the path, then height of the lamp post is

A. $\sqrt{6}r$ B. $\frac{r}{\sqrt{6}}$ C. $\sqrt{\frac{2}{3}}r$ D. $\sqrt{\frac{3}{2}}r$ [ ]

9. Let Z be a complex number and a be a real parameter such that $z^2 + az + a^2 = 0$, then locus of z is a

A. Circle B. Pair of straight lines C. Ellipse D. Parabola [ ]

10. A coin is tossed $(m+n)$ times $(m>n)$ then the probability of getting at least m consecutive heads is

A. $\frac{n}{2^{m+1}}$ B. $\frac{n+2}{2^{m+1}}$ C. $\frac{n+1}{2^{m+1}}$ D. Cannot be determined [B]

11. The roots of the quadratic equation $8x^2 - 10x + 3 = 0$ are α and β^2 where $\beta^2 > \frac{1}{2}$ then the equation whose roots are $(\alpha + i\beta)^{100}$ and $(\alpha - i\beta)^{100}$ is [ ]

A. $x^2 - x + 1 = 0$ B. $x^2 + x + 1 = 0$ C. $x^2 - x - 1 = 0$ D. $x^2 + x - 1 = 0$

12. If M is a 3×3 matrix, where $M^T M = I$ and *det(M)*=1 then *det(M-I)* =

A. 1 B. -1 C. 0 D. 2 [ ]

13. Consider the system of linear equations in x, y, z $(Sin3\theta)x - y + z = 0; (\cos 2\theta)x + 4y + 3z = 0$ and $2x + 7y + 7z = 0$ then a value(s) of θ in $(0, \pi)$ for which the system has non–trivial solution is

A. $\frac{5\pi}{6}$ B. $\frac{\pi}{3}$ C. $\frac{2\pi}{3}$ D. $\frac{\pi}{2}$ [ ]

14. Between two junction stations there are 12 intermediate stations. Then the number of ways can a train be made to stop at 4 of these if no two of these halting stations are consecutive is [ ]

A. 252 B. 70 C. 6300 D. 126

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15. Coefficient of x^4 in the expansion of $(2x^2+x-3)^6$ is

A. 384 B. 192 C. 572 D. 64 [ ]

16. A focal chord of parabola $y^2=4x$ is inclined at an angle of $\frac{\pi}{4}$ with positive direction of X-axis, then the slopes of normals drawn at the ends of focal chord will satisfy the equation [ ]

A. $m^2-2m-1=0$ B. $m^2+2m-1=0$

C. $m^2-1=0$ D. $m^2+2m+1=0$

17. P is variable point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ whose foci are the points S_1 and S_2 'e' is the eccentricity of the given ellipse. Locus of the incentre of ΔPS_1S_2 is an ellipse whose eccentricity is

A. $\frac{2e}{1-e}$ B. $\frac{2e}{1+e}$ C. $\sqrt{\frac{2e}{1-e}}$ D. $\sqrt{\frac{2e}{1+e}}$ [ ]

18. The centre of a circle passing through the point (0,1) and touching the curve $y=x^2$ at (2, 4) is

A. $\left(\frac{-16}{5},\frac{27}{10}\right)$ B. $\left(\frac{-16}{7},\frac{5}{10}\right)$ C. $\left(\frac{-16}{5},\frac{53}{10}\right)$ D. None [ ]

19. Let $f(x)$ be a function differentiable on $[0,\alpha]$ such that $f(0)=1$, $f(\alpha)=3^{1/6}$

If $f^1(x)\geq[f(x)]^4+[f(x)]^{-2}$, then the maximum value of α is [ ]

A. $\frac{\pi}{6}$ B. $\frac{\pi}{12}$ C. $\frac{\pi}{24}$ D. $\frac{\pi}{36}$

20. $\int\frac{\cos 7x-\cos 8x}{1+2\cos 5x}=$

A. $\frac{1}{2}\sin 2x+\frac{1}{3}\sin 3x+c$ B. $\frac{1}{2}\sin 2x-\frac{1}{2}\cos 3x+c$

C. $\frac{1}{2}\sin 2x-\frac{1}{3}\sin 3x+c$ D. $\frac{1}{2}\sin 3x-\frac{1}{2}\sin 2x+c$ [ ]

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21. Let the position vectors of the points *P, A* and *B* be $\bar{r}, \bar{i}+\bar{j}+\bar{k}$ and $-\bar{i}+\bar{k}$. If *PA* is perpendicular to *PB* but $\bar{r}$ is not perpendicular to $\bar{r}-\left(\bar{j}+2\bar{k}\right)$ then $\bar{r}$ is [ ]

A. $\bar{i}+2\bar{k}$ B. $\bar{i}+2\bar{j}$ C. $\bar{j}-2\bar{k}$ D. $\bar{j}+2\bar{k}$

22. *BE* and *CF* are two medians of ΔABC whose vertex *A* is (1, 3). The equation to *BE* is $x-2y+1=0$ and *CF* is $y-1=0$ then the equation of *AB* and *AC* are [ ]

A. $3x+2y-7=0, x-y+2=0$ B. $3x-2y-7=0, x+y-2=0$

C. $3x+2y-7=0, x+y-2=0$ D. $3x+2y-7=0, x+y+2=0$

23. Equation of the curve satisfying the differential equation $y\left(x+y^3\right)dx = x\left(y^3-x\right)dy$, and passing through point (4, 2) is [ ]

A. $x^2+y^2 = 2Tan^{-1}\frac{y}{x}+c$ B. $x^2+y^2+2Tan^{-1}\frac{y}{x}=c$

C. $x^2+y^2 = 2Sin^{-1}\frac{y}{x}+c$ D. $x^2+y^2+2Sec^{-1}\frac{y}{x}=c$

24. The cure $y=a\sqrt{x}+bx$ passes through the point (1, 2) and the area enclosed by the curve, the axis of *X* and the line $x=4$ is 8 square units, then the values of *a, b* are [ ]

A. 3, -1 B. -3 , 1 C. 3, 1 D. -3, -1

25. If the angle θ between the line $\frac{x+1}{1}=\frac{y-1}{2}=\frac{z-2}{2}$ and the plane $2x-y+\sqrt{\lambda}z+4=0$ is such that $\sin\theta=\frac{1}{3}$ then the value of λ is [ ]

A. $\frac{3}{4}$ B. $\frac{-4}{3}$ C. $\frac{5}{3}$ D. $\frac{-3}{5}$

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26. Direction ratios of the line of intersection of the planes $x+y+z-1=0$ and $2x+3y+4z-7=0$ are

A. 1, 2, -3 B. 2, 1,-3 C. 4, 2, -6 D. 1, -2, 1 [ ]

27. $PQRS$ is a trapezium with PQ and RS parallel. $PQ = 6$, $QR = 5$, $RS = 3$, $PS = 4$ and $\angle P = 90^0$. The area of $PQRS$ is

A. 27 B. 12 C. 18 D. 20 [ ]

28. If $g(x) = 2f\left(\frac{x}{2}\right) + f(2-x)$ and $f^{11}(x) < 0$ for all $x \in (0,2)$ then $g(x)$ is increasing on

A. $\left(0,\frac{4}{3}\right)$ B. $\left(\frac{4}{3},2\right)$ C. $(0,2)$ D. $\left(0,\frac{3}{4}\right)$ [ ]

29. Let A,B,C be three angles such that $A = \frac{\pi}{4}$ and $\tan B \tan C = P$ then all possible value of P such that A, B, C are the angles of a triangles are

A. $\left(3-2\sqrt{2},3+2\sqrt{2},\right)$ B. $\left(0,3+2\sqrt{2}\right)$

C. $\left(-\infty,3-2\sqrt{2}\right)\cup\left(3+2\sqrt{2},\infty\right)$ D. $\left(3-2\sqrt{2},0\right)\cup\left(3+2\sqrt{2},\infty\right)$ [ ]

30. If $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{ab}{a+b}$ then the value of $\frac{x^{n+1}}{a}+\frac{y^{n+1}}{b}$ is [ ]

A. 1 B. $\left(\frac{1}{a}+\frac{1}{b}\right)^n$ C. $\frac{ab}{a+b}$ D. $\left(\frac{ab}{a+b}\right)^n$

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A

SECTION - II
PHYSICS

31. When a current of $(2.5 \pm 0.5)A$ flows through a wire, it develops a potential difference of $(20 \pm 1)V$. The resistance of the wire is [ ]

A. $(8 \pm 1.5)\Omega$ B. $(8 \pm 2)\Omega$ C. $(8 \pm 3)\Omega$ D. $(8 \pm 1.6)\Omega$

32. A particle is projected with velocity u along the x-axis. The deceleration on the particle is proportional to the square of the distance from the origin as $a = \alpha x^2$, the distance at which the particle stop is

A. $\sqrt{\frac{3u}{2\alpha}}$ B. $\left(\frac{3u^2}{2\alpha}\right)^{1/3}$ C. $\left(\frac{3u}{2\alpha}\right)^{1/3}$ D. $\sqrt{\frac{2u^2}{3\alpha}}$ [ ]

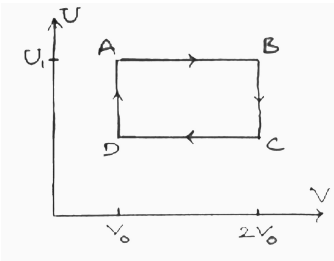
33. A stone is projected with a velocity $10\sqrt{2}m/s$ at an angle of 45^0 to the horizontal. The average velocity of stone during its motion from starting point to its maximum height is $(g = 10m/s^2)$

A. $10\sqrt{5}m/s$ B. $5\sqrt{5}m/s$ C. $20\sqrt{2}m/s$ D. $20m/s$ [ ]

34. About 0.014kg of nitrogen gas is enclosed in a vessel at a temperature of $27^0 c$. The amount of heat to be transferred to the gas to double the r. m. s. speed of its molecules is ____ (R=2 $cal/mol\ k$)

A. 900 cal B. 4500 cal C. 2250 cal D. 450 cal [ ]

35. One mole of an ideal gas has an internal energy given by $U = U_0 + 2PV$ where P is the pressure and V the volume of the gas. U_0 is a constant . This gas under goes the quasistatic cyclic process $ABCDA$ as shown in U-V diagram



(a). The molar heat capacity of the gas at constant pressure is 3R.

(b). The work done by the ideal gas in the process AB is $\frac{U_1 - U_0}{2}\ln 2$

(c). Assuming that the gas consists of a mixture of two gases, the gas is a mixture of di and tri atomic gases

The correction option is

A. Only a, b are correct B. Only b, c are correct

C. Only c is correct D. All are correct [ ]

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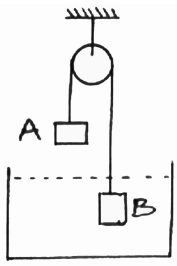
36. In the arrangement shown, $m_B = 3m$,density of liquid is ρ and density of block B is 2ρ. The system is released from rest so that block *B* moves up when in liquid and moves down when completely out of liquid with the same acceleration. The mass of block *A* is [ ]

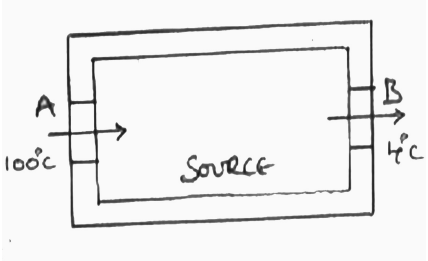


A. $\frac{9m}{2}$ B. $\frac{9m}{4}$ C. $2m$ D. $\frac{7m}{4}$

37. A refrigerator placed in a room at 300 k has inside temperature 200 *k*. How many calories of heat shall be delivered to the room for each 2 *kcal* of energy consumed by the refrigerator ideally?

A. 4 kcal B. 2 kcal C. 6 kcal D. 8 kcal [ ]

38. A closed cubical box made of perfectly insulating material has walls of thicken 8cm and the only way for the heat to enter or leave the box is through the solid, cylindrical, metal plugs each of cross sectional area 12 cm^2 and length 8 *cm* fixed in the opposite walls of the box as shown in fig. The outer surface A is kept at $100^0 c$ while the outer surface B of other plug is kept at $4^0 c$ .The coefficient of thermal conductivity of material of the plugs is $0.5 cal/cm - \sec^0 c$ .A source of energy generating 36 cal/sec is enclosed inside the box. The equilibrium temperature of the inner surface of the box assuming that it is same at all points on the inner surface is

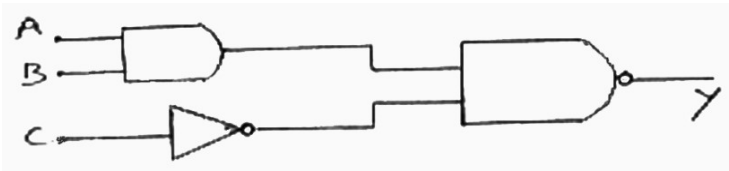


A. $52^0 c$ B. $76^0 c$ C. $48^0 c$ D. $62^0 c$ [ ]

39. Suppose potential energy between electron and proton at separation r is given by $U = K \log r$, where K is a constant. For such a hypothetical hydrogen atom, the radius of nth Bohr's orbit is

A . $\frac{nh}{2\pi\sqrt{mk}}$ B. $\frac{2\pi h}{n\sqrt{mk}}$ C. $\frac{nh}{2\pi mk}$ D. $\frac{n^2h^2}{2\pi mk}$ [ ]

40. What is the output Y in the following circuit, when all the three inputs A, B, C are first 1 and then 0?



A. 0, 1 B. 0, 0 C. 1, 0 D. 1, 1 [ ]

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41. A sample of radioactive material decays simultaneously by two processes A and B with half- lives $\frac{1}{2}$ hr and $\frac{1}{4}$ hr respectively. For first half hour it decay with the process A, next one hour with the process B and for further half an hour with both A and B. If originally there were N_0 nuclei, the number of nuclei after 2 hours of such decay is [ ]

A. $\frac{N_0}{2^4}$ B. $\frac{N_0}{2^2}$ C. $\frac{N_0}{2^6}$ D. $\frac{N_0}{2^8}$

42. A source of light is placed above a sphere of radius 10*cm*. Find the maximum number of electrons emitted by the sphere before emission of photo electrons stop. The energy of incident photon is 4.2*ev* and the work function of metal is 1.5*ev* [ ]

A. 2.08×10^{18} B. 4×10^{19} C. 1.875×10^{8} D. 2.88×10^{8}

43. A sinusoidal voltage *V (t) =100sin500t* is applied across a pure inductance of *L= 0.02H*. The current through the coil is [ ]

A. -10cos500t B. -10sin500t

C. 10sin500t D. 10cos500t

44. The torque required to hold a small circular coil of 10 *turns*, area $1mm^2$ and carrying a current of $\left(\frac{21}{44}\right)A$ in the middle of a long solenoid of 10^3 *turns/m* carrying a current of 2.5 A, with its axis perpendicular to the axis of solenoid is [ ]

A. Zero B. $1.5\times10^{-8}\,N-m$

C. $1.5\times10^{-3}\,N-m$ D. $1.5\times10^{-6}\,Nm$

45. Two identical drops of water are falling through air with a steady speed of *V* each. If the drops coalese to from a single drop, the new terminal velocity is [ ]

A. $V^1 = 2^{3/2}V$ B. $V^1 = 2V$ C. $V^1 = 2^{2/3}V$ D. $V^1 = 2^2V$

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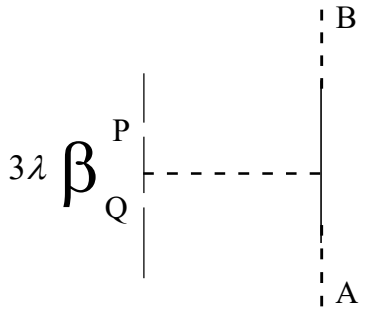
46. Two coherent light sources P and Q each of wave length λ are separated by a distance of 3λ. The maximum number of minima formed on line AB, which runs from $-\infty$ to $+\infty$ is



A. 6 B. 4

C. 8 D. 2 [ ]

47. A circular disc rotates freely about a vertical axis through its centre with angular velocity ω_1. A ring having the same mass and radius as the disc is placed on the disc and the system now rotates with an angular velocity ω_2 about the same vertical axis. Then ω_2/ω_1 is [ ]

A. $\frac{1}{2}$ B. $\frac{3}{2}$ C. 2/3 D. 1/3

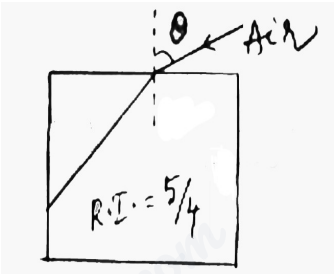
48. For a certain organ pipe 3 successive resonant frequencies are observed at 425 *Hz*, 595 *Hz* and 765 *Hz*. If the speed of sound in air is 340 *m/s*, then length of pipe is

A. 2 m B. 1 m C. 0.4 m D. 0.5 m [ ]

49. The work done in slowly lifting a body from earth's surface to a height R (radius of earth) is equal to two times the work done in lifting the body from earth's surface to a height h. Here h is equal to [ ]

A. $\frac{R}{4}$ B. $\frac{R}{6}$ C. $\frac{R}{3}$ D. $\frac{R}{2}$

50. The maximum angle θ for which the light suffers total internal reflection at the vertical surface is [ ]



A. $\sin^{-1}(1/3)$ B. $\sin^{-1}(3/4)$

C. $\sin^{-1}(2/3)$ D. $\sin^{-1}(4/5)$

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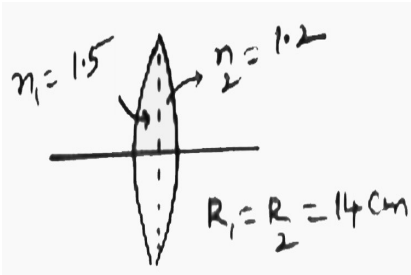
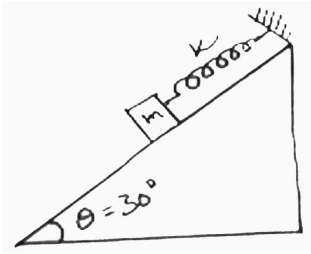
51. A biconvex lens is formed with two Plano convex lenses as shown in fig. Refractive index of the lens is 1.5 and that of the second lens 1.2. Both the curved surfaces are of the same radius of curvature R=14 *cm*. For this biconvex lens, for an object distance of *40 cm*, the image distance will be [ ]



A. -280 cm B. 40 cm

C. 13.3 cm D. 21.5 cm

52. One end of a mass less spring of relaxed length 50 *cm* and spring constant *k* is fixed on top of a frictionless inclined plane of inclination $\theta = 30^0$ as shown in fig. When a mass m=1.5 *kg* is attached at the other end, the spring extends by 2.5 *cm*. The mass is displaced slightly and released. The time period (in seconds) of the resulting oscillation will be



A. $\frac{2\pi}{5}$ B. $\frac{\pi}{5}$ C. $\frac{2\pi}{7}$ D. $\frac{\pi}{7}$ [ ]

53. A bullet of mass 10 *gm* moving horizontally with a velocity of 400 *m/s* strikes a wooden block of mass 2 *kg* which is suspended by a light inextensible string of length 5*m*. As a result, the centre of gravity of the block is found to rise a vertical distance of 10 *cm*. The speed of the bullet after it emerges out horizontally from the block will be

A. 120 m/s B. 60 m/s C. 100 m/s D. 160 m/s [ ]

54. A particle moves on a rough horizontal ground with some initial velocity v_0. If $\frac{3}{4}th$ of its kinetic energy is lost due to friction in time t_0, the coefficient of friction between the particle and the ground is

A. $\frac{v_0}{2gt_0}$ B. $\frac{v_0}{4gt_0}$ C. $\frac{3v_0}{4gt_0}$ D. $\frac{v_0}{gt_0}$ [ ]

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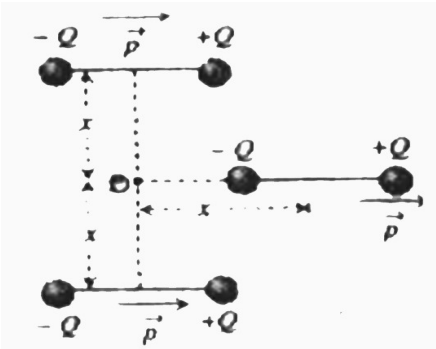
SET - II **V - SAT-'21**

A

55. Three identical dipoles are arranged as shown in fig. The net electric field at 'o' is $\left(K = \frac{1}{4\pi \in_0}\right)$



A. $\frac{KP}{x^3}$ B. $\frac{2KP}{x^3}$

C. Zero D. $\frac{\sqrt{2}KP}{x^3}$ [ ]

56. Calculate the stress in a tight wire of a material whose youngs modulus is $19.6 \times 10^{11} dyne/cm^2$ so that speed of the longitudinal wave is 10 times the speed of transverse wave. [ ]

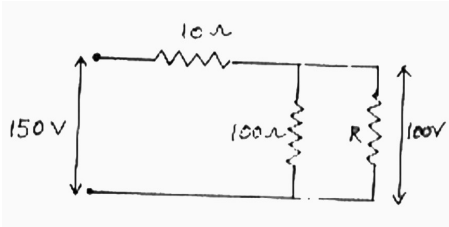
A. $19.6 \times 10^8 N/m^2$ B. $19.6 \times 10^9 N/m^2$

C. $19.6 \times 10^{12} N/m^2$ D. $19.6 \times 10^{10} N/m^2$

57. The driver of a car approaching a vertical wall notices that the frequency of the horn of his car changes from 400 *Hz* to 450 *Hz* after being reflected from the wall. Assuming speed of sound to be *340m/s*, the speed of approach of car towards the wall is [ ]

A. 10 m/s B. 20 m/s C. 30 m/s D. 40 m/s

58. The value of resistance *R* in the circuit shown is



A. 100Ω B. 50Ω

C. 150Ω D. 25Ω [ ]

59. When a known resistance 10Ω and a conductor are connected in the right and left gaps respectively and the conductor is kept at $0^0 c$, the balancing length is 50*cm*. If the temperature of the conductor in left gap is increased to $100^0 c$, the balancing length shifts by 10*cm*. The temperature coefficient of resistance of the material of the conductor is [ ]

A. $0.005/^0 c$ B. $0.05/^0 c$ C. $0.025/^0 c$ D. $0.0025/^0 c$

60. The electric field in a region of space is given by $\vec{E} = E_0 \hat{i} + 2E_0 \hat{j}$ where $E_0 = 70 N/C$. The flux of this field through a circular surface of radius 2*cm* parallel to *X-Z plane* is

A. $0.125 Nm^2/c$ B. $0.176 Nm^2/c$ C. Zero D. $0.70 Nm^2/c$ [ ]

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A

SECTION - III
CHEMISTRY

61. In SN^2 reactions the correct order of reactivity for the following compounds

$CH_3Cl, CH_3CH_2Cl, (CH_3)_2CHCl$ and $(CH_3)_3Ccl$ is [ ]

A. $CH_3Cl > CH_3CH_2Cl > (CH_3)_2CHcl > (CH_3)_3Ccl$

B. $CH_3CH_2Cl > CH_3Cl > (CH_3)_2CHcl > (CH_3)_3Ccl$

C. $(CH_3)_2CHcl > CH_3CH_2Cl > CH_3Cl > (CH_3)_3Ccl$

D. $CH_3Cl > (CH_3)_2CHcl > CH_3CH_2Cl > (CH_3)_3Ccl$

62. For the non Stoichiometric reaction $2A + B \rightarrow C + D$ the following kinetic data were obtained in the separate experiments all at 298K [ ]

Initial Concentration [A]	*Initial Concentration* [B]	*Initial rate of formation of C* $mol.lit^{-1}\sec^{-1}$
0.1	0.1	1.2×10^{-3}
0.1	0.2	1.2×10^{-3}
0.2	0.1	2.4×10^{-3}

The rate law for formation of C is

A. $\frac{dc}{dt} = K[A]^2[B]$

B. $\frac{dc}{dt} = K[A][B]^2$

C. $\frac{dc}{dt} = K[A]$

D. $\frac{dc}{dt} = K[A][B]$

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SET - II

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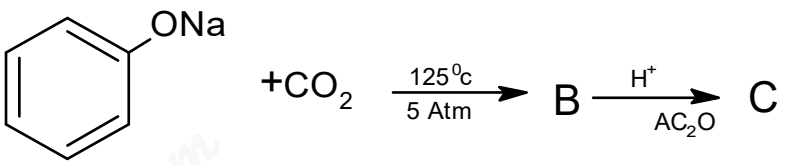
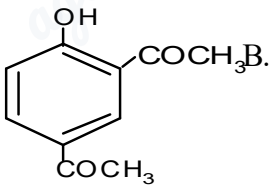
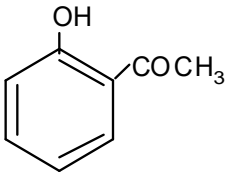
A

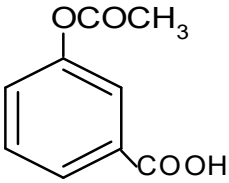
63. Sodium Phenoxide when heated with Co_2 under pressure $125^0 c$ yields a product, which on acetylation produces C.? [ ]

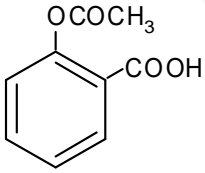


The major product C would be:

A. 

B. 

C. 

D. 

64. The correct set of four quantum numbers for the valency electrons of Rubidium atom (*Z=37)* is

A. 5,1,0,+1/2 B. 5,1,1,+1/2 [ ]

C. 5,0,1,+1/2 D. 5,0,0,+1/2

65. Resistance of *0.2M* solution of an electrolyte is *50 ohms*. The specific conductance of the solution is $1.4 sm^{-1}$. The resistance of *0.5 M* solution of the same electrolyte is 280 ohm. The molar conductivity of 0.5 *M* solution of the electrolyte in $sm^2 mol^{-1}$ is [ ]

A. 5×10^{-3} B. 5×10^{3} C. 5×10^{2} D. 5×10^{-4}

66. The major organic compound formed by the reaction of 1, 1, 1-trichloro ethane with silver powder is

A. Ethene B. 2- Butyne

C. 2 - Butene D. Acetylene [ ]

67. The most suitable reagent for the conversion of $RCH_2OH \rightarrow RCHO$ is

A. $K_2Cr_2O_7$ B. CrO_3 C. PCC D. $KMnO_4$ [ ]

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SET - II **V - SAT-'21**

A

68. Allyl phenyl ether can be prepared by heating [ ]

A. $C_6H_5CH = CH - Br + CH_3ONa$

B. $CH_2 = CHBr + C_6H_5CH_2ONa$

C. $C_6H_5Br + CH_2 = CH - CH_2ONa$

D. $CH_2 = CH - CH_2Br + C_6H_5ONa$

69. Vander Waals equation for a gas is stated as $P = \frac{nRT}{V - nb} - \left(\frac{an^2}{V^2}\right)$. This equation reduces to perfect gas equation $P = \frac{nRT}{V}$ when [ ]

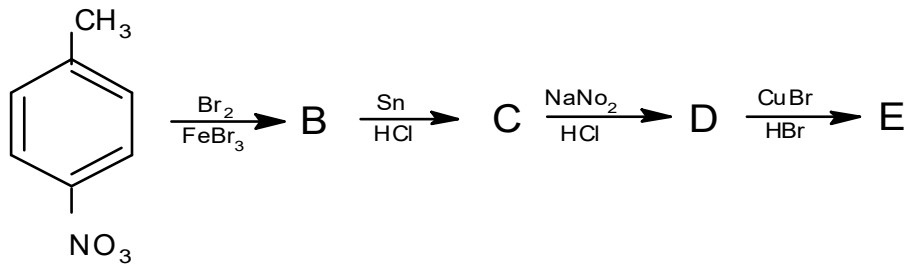
A. Both temperature and pressure are very low

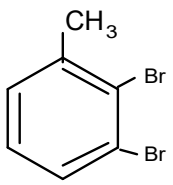
B. Both temperature and pressure are very high

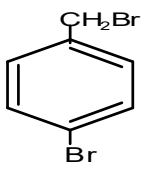
C. Temperature is sufficiently high and pressure is low

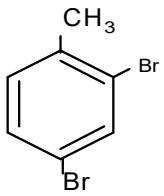
D. Temperature is sufficiently low and pressure is high

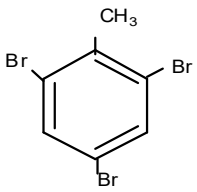
70. In a set of reactions P-nitro toluene yielded a product 'E' [ ]



A. 

B. 

C. 

D. 

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SET - II V - SAT-'21

A

71. For the estimation of nitrogen 1.4*g* of an organic compound was digested by Kjeldahl Method and evolved ammonia was absorbed in 60*ml* of $\frac{M}{10}H_2SO_4$. The unreacted acid requires 20ml of $\frac{M}{10}NaOH$ for complete neutralization. The percentage of nitrogen in the compound is [ ]

A. 10% B. 3% C. 5 % D. 6%

72. *CsCl* crystallizes in body centered cubic lattice. If *'a'* is its edge length then which of the following expression is correct [ ]

A. $rcs^{+} + rcl^{-} = \frac{3a}{2}$ B. $rcs^{+} + rcl^{-} = \frac{\sqrt{3}a}{2}$

C. $rcs^{+} + rcl^{-} = \sqrt{3}a$ D. $rcs^{+} + rcl^{-} = 3a$

73. For complete combustion of ethane $C_2H_5OH_{(l)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$ the amount of heat produced as measured in bomb calorimeter is 1364.47*kj/mol* at 25^0c. Assuming the ideality the Enthalpy of combustion $\Delta_c H$ for the reaction will be

A. -1361.95 kJ /mol B. -1460.50 kJ/mol C. -1350.50 kJ/mol D. -1366.95 kJ/mol [ ]

74. Which one is classified as a Condensation Polymer?

A. Neoprene B. Teflon C. Acrylonitrile D. Dacron [ ]

75. The Octahedral complex of a metal ion M^{+3} with four monodentate ligands L_1, L_2, L_3 and L_4 absorbs wave lengths in the region of red, green, yellow and blue respectively. The increasing order of ligand strengths of four ligands is [ ]

A. $L_1 < L_3 < L_2 < L_4$ B. $L_3 < L_2 < L_4 < L_1$

C. $L_1 < L_2 < L_4 < L_3$ D. $L_4 < L_3 < L_2 < L_1$

76. The cell $Zn/Zn^{+2}(1M)//Cu^{+2}(1M)/Cu$ $\left(E^0cell = 1.10V\right)$ was allowed to be completely discharged at 298K. The relative concentration of Zn^{2+} to $Cu^{2+}\left(\frac{Zn^{+2}}{Cu^{+2}}\right)$ is [ ]

A. Antilog 24.08 B. 37.3 C. $10^{37.3}$ D. 9.65×10^4

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SET - II **V - SAT-'21**

A

77. Silver Mirror test is given by which one of the following compounds.

A. Formaldehyde B. Benzophenone C. Acetaldehyde D. Acetone [ ]

78. *a* and *b* are Vander Waals constants for gases chlorine is more easily liquefied than ethane because

A. a for $Cl_2 < a$ for ethane but b for $Cl_2 > b$ for ethane [ ]

B. a for $Cl_2 > a$ for ethane but b for $Cl_2 < b$ for ethane

C. a and b for $Cl_2 < a$ *and* b for ethane

D. a and b for $Cl_2 > a$ *and* b for ethane

79. The strongest acid among the following compounds is [ ]

A. $CH_3CH_2CH(Cl)CooH$ B. $ClCH_2CH_2CH_2CooH$

C. CH_3CooH D. $HCooH$

80. The correct order of acid strength of the following compounds is [ ]

a. Phenol b. P-Cresol c. m-Nitrophenol d. P- Nitrophenol

A. d > c > a > b B. b > d > a > c C. a > b > d > c D. c > b > a > d

81. Ozonolysis of an organic compound 'A' produces acetone and propionaldehyde in equimolar mixture . Identify 'A' from the following compounds [ ]

A. 1-Pentene B. 2-Pentene

C. 2-Methyl-2-Pentene D. 2-Methyl-1-Pentene

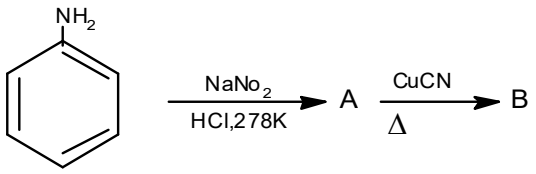
82. In the Chemical reaction the compounds A and B respectively are [ ]

A. Benzene Diazonium Chloride and Benzonitrile

B. Nitro Benzene and Bromo Benzene

C. Fluorobenzene and phenol

D. Phenol and Bromo Benzene



83. The ratio of masses Oxygen and Nitrogen in a particular gaseous mixture is 1 : 4. The ratio of number of their molecule is [ ]

A. 7 : 32 B. 1 : 8 C. 3 : 16 D. 1 : 4

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A

84. Consider separate solutions of 0.500M C_2H_5OH , 0.100M $Mg_3(Po_4)_2(aq)$, 0.25M KBr and 0.125M $Na_3Po_4(aq)$ at 25^0c . Which statement is true about these solutions assuming all salts to be strong electrolytes? [ ]

A. 0.100M $Mg_3(Po_4)_2aq$ has the highest Osmotic pressure

B. 0.125M Na_3Po_4aq has the highest Osmotic pressure

C. 0.500M $C_2H_5OH(aq)$ has the highest Osmotic pressure

D. They all have the same Osmotic pressure

85. The IUPAC name of the complex $[\mathrm{Co(No_2)}(NH_3)_5]Cl_2$ [ ]

A. Nitrito – N – Pentamine Cobalt (III) Chloride

B. Nitrito – N – Pentamine Cobalt (II) Chloride

C. Pentamine Nitrito – N – Cobalt (II) Chloride

D. Pentamine Nitrito – N – Cobalt (III) Chloride

86. The P^{ka} of a weak acid (*HA*) is 4.5.The P^{OH} of an aqueous solution of *HA* in which 50% of the acid is ionized is [ ]

A. 4.5 B. 2.5 C. 9.5 D. 7.0

87. The ionic radii (in A^0) of N^{3-}, O^{2-} and F^- are respectively are [ ]

A. 1.71, 1.40 and 1.36 B. 1.71, 1.36 and 1.40

C. 1.36, 1.40 and 1.71 D. 1.36, 1.71 and 1.40

88. Gold numbers of protective colloids *A, B, C* and D are 0.5, 0.01, 0.1 and 0.005 respectively. The correct order of their protective powers is [ ]

A. $D < A < C < B$ B. $C < B < D < A$

C. $A < C < B < D$ D. $B < D < A < C$

89. Using MO theory predict which of the following species has shortest bond length

A. O_2^{2+} B. $O_2^{\oplus}$ C. O_2^- D. O_2^{2-} [ ]

90. The structure of IF_7 is

A. Octahedral B. Pentagonal bipyramidal

C. Square pyramidal D. Trigonal bipyramidal [ ]

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SET - II V - SAT-'21

A

SECTION - IV
ENGLISH / APTITUDE

91. A boatman goes 2 km against the current of the stream in 1 hour and goes 1 *km* along the current in 10 minutes. How long will it take to go 5 *km* in stationary water? [ ]

A. 40 minutes B. 1 hour C. 1 hr 15 min D. 1 hr 30 min

92. Two pipes *A* and *B* together can fill a cistern in 4 hours. Had they been opened separately, then *B* would have taken 6 hours more than A to fill the cistern. How much time will be taken by A to fill the cistern separately? [ ]

A. 1 hour B. 2 hours C. 6 hours D. 8 hours

93. The sum of three numbers is 98. If the ratio of the first to second is 2 :3 and that of the second to the third is 5 : 8, then the second number is [ ]

A. 20 B. 30 C. 48 D. 58

94. Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of new seats?

A. 2 : 3 : 4 B. 6 : 7 : 8 C. 6 : 8 : 9 D. None of these [ ]

95. If $log\,27 = 1.431$, then the value of log 9 is [ ]

A. 0.934 B. 0.945 C. 0.954 D. 0.958

96. If $A = x\%$ of y and $B = y\%$ of x, then which of the following is true? [ ]

A. *A* is smaller than *B*. B. *A* is greater than *B*

C. *A* is equal to *B*. D. If *x* is smaller than *y*, then *A* is greater than *B*.

97. In a 300 *m* race *A* beats *B* by 22.5 *m* or 6 *seconds*. *B*'s time over the course is [ ]

A. 86 sec B. 80 sec C.76 sec D. None of these

98. *A* runs 1 time as fast as *B*. If A gives B a start of 80 *m*, how far must the winning post be so that *A* and *B* might reach it at the same time? [ ]

A. 200 m B. 300 m C. 270 m D. 160 m

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SET - II **V - SAT-'21**

A

99. In a *100 m* race, *A* can beat *B* by *25m* and *B* can beat *C* by *4m*. In the same race, *A* can beat *C* by

A. 21 *m* B. 26 *m* C. 28 *m* D. 29 *m* [ ]

100. Speed of a boat in standing water is *9kmph* and the speed of the stream is *1.5kmph*. A man rows to a place at a distance of *105km* and comes back to the starting point. The total time taken by him is

A. 16 *hours* B. 18 *hours* C. 20 *hours* D. 24 *hours* [ ]

101. A man takes twice as long to row a distance against the stream as to row the same distance in favour of the stream. The ratio of the speed of the boat (in still water) and the stream is [ ]

A. 2 : 1 B. 3 : 1 C. 3 : 2 D. 4 : 3

102. A man rows to a place 48*km* distant and come back in *14hours*. He finds that he can row *4km* with the stream in the same time as *3km* against the stream. The rate of the stream is [ ]

A. 1 *km/hr* B. 1.5 *km/hr* C. 2 *km/hr* D. 2.5 *km/hr*

103. The salaries *A, B, C* are in the ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries? [ ]

A. 3 : 3 : 10 B. 10 : 11 : 20 C. 23 : 33 : 60 D. Cannot be determined

104. If 40% of a number is equal to two-third of another number, what is the ratio of first number to the second number? [ ]

A. 2 : 5 B. 3 : 7 C. 5 : 3 D. 7 : 3

105. The fourth proportional to 5, 8, 15 is [ ]

A. 18 B. 24 C. 19 D. 20

106. He was struck ____ lightning.

A. with B. by C. for D. at [ ]

107. He has been living here _____ a month.

A. from B. since C. for D. of [ ]

108. Bharat goes to the office _____ foot.

A. on B. by C. in D. with [ ]

109. Neena ____ the report by Monday. [ ]

A. will submit B. will have submitted C. is submitting D. will be submitting

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A

110. Sunitha said that she _____ on this novel for five years.

A. has been working B. had been working

C. have been working D. will work [ ]

111. They _____ the old wall when it collapsed.

A. are painting B. was painting C. were painting D. paint [ ]

Fill in the blanks with the suitable collective names front he options give below

112. Children were excited to see a _____ of candies. [ ]

A. mint B. plague C. wisp D. prattle

Sentence improvement.

113. We spent an hour discussing about his character. [ ]

A. on his character B. of his character C. his character D. no improvement

Choose the opt one from the following

114. Neither the principal nor his colleagues _____ given any explanation for this. [ ]

A. has B. have C. are D. were

Choose the suitable meaning from the options for the underlined expression.

115. We should give <u>a wide berth</u> to bad characters. [ ]

A. give publicity to B. not sympathies C. keep away from D. publicly condemn

Choose the suitable meaning from the options for the underlined expression.

116. He made a plan <u>to murder in cold blood.</u> [ ]

A. murder some one in sleep B. to kill a hibernating animal

C. to commit a preplanned murder D. to kill some one accidentally

Choose the suitable meaning from the options for the underlined expression.

117. The boy had a <u>hair – breadth</u> escape from the street accident. [ ]

A. a lucky B. a quick C. an easy D. a narrow

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A

Choose the correct alternative question tag.

118. None of the clerks came _____ ?

A. didn't B. did they C. do they D. didn't they [ ]

Fill in the blanks with suitable relative pronouns.

119. Here is a pen ____ you lost.

A. where B. what C. which D. when [ ]

Choose the correct alternative.

120. The clown was being laughed at by them.

A. they were laughing at the clown B. they were laughing on the clown

C. they laughed at the clown D. the clown was laughed at by them [ ]

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A

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