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**BITSAT ENTRANCE EXAM**

**SOLVED PAPER 2007**

- 1) The sum of 24 terms of the following series  $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \dots$  is
- (a) 300  
(b)  $200\sqrt{2}$   
(c)  $300\sqrt{2}$   
(d)  $250\sqrt{2}$
- 2) If  $\sin A + \cos B = a$  and  $\sin B + \cos A = b$ , then  $\sin(A + B)$  is equal to
- (a)  $\frac{a^2 + b^2}{2}$   
(b)  $\frac{a^2 - b^2 + 2}{2}$   
(c)  $\frac{a^2 + b^2 - 2}{2}$   
(d) None of these
- 3) The number of solution of the equation  $1 + \sin x \sin^2 \frac{x}{2} = 0$ ,  $-\pi, \pi$  is -
- (a) zero  
(b) one  
(c) two  
(d) three

- 4) If  $C = 2 \cos \theta$ , then the value of the determinant to

$$\Delta = \begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \\ 6 & 1 & C \end{vmatrix} \text{ is}$$

- (a)  $\frac{2 \sin^2 2\theta}{\sin \theta}$
- (b)  $8 \cos^3 \theta - 4 \cos \theta + 6$
- (c)  $\frac{2 \sin 2\theta}{\sin \theta}$
- (d)  $8 \cos^3 \theta + 4 \cos \theta + 6$
- 5) If  $A = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$  and  $I$  is the unit matrix of order 2, then  $A^2$  equals
- (a)  $4A - 3I$
- (b)  $3A - 4I$
- (c)  $A - I$
- (d)  $A + I$
- 6) The horizontal distance between two towers is 60 m and the angle of depression of the top of the first tower as seen from the top of the second is  $30^\circ$ . If the height of the second tower be 150 m, then the height of the first tower is
- (a) 90m
- (b)  $(150 - 60\sqrt{3})$  m
- (c)  $(150 + 20\sqrt{3})$  m
- (d) None of these
- 7) If a vertex of a triangle is (1, 1) and the mid points of two sides

through the vertex are  $(-1, 2)$  and  $(3, 2)$ , then the centroid of the triangle is

- (a)  $1, \frac{7}{3}$
  - (b)  $\frac{1}{3}, \frac{7}{3}$
  - (c)  $-\frac{1}{3}, \frac{7}{3}$
  - (d)  $-1, \frac{7}{3}$
- 8) Let  $R = \{(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)\}$  be a relation on the set  $A = \{1, 2, 3, 4\}$ . The relation  $R$  is
- (a) A function
  - (b) Transitive
  - (c) Not symmetric
  - (d) Reflexive
- 9)  $(x - 1)(x^2 - 5x + 7) < (x - 1)$ , then  $x$  belongs to
- (a)  $(1, 2) \cup (3, \infty)$
  - (b)  $(-\infty, 1) \cup (2, 3)$
  - (c)  $(2, 3)$
  - (d) none of these
- 10) Let  $A$  be an orthogonal non-singular matrix of order  $n$ , then the determinant of matrix ' $A - I_n$ ' ie,  $|A - I_n|$  is equal to
- (a)  $I_n - A$
  - (b)  $A - I_n - A$
  - (c)  $A$
-

(d)  $-1^n A I_n - A$

11) If  $\cos \theta + i \sin \theta = \cos 2\theta + i \sin 2\theta \dots\dots\dots$

$\cos n\theta + i \sin n\theta = 1$ , then the value of  $\theta$  is

(a)  $\frac{2m\pi}{n+1}$

(b)  $4m\pi$

(c)  $\frac{4m\pi}{n+1}$

(d)  $\frac{m\pi}{n+1}$

12) If one root of the quadratic equation  $ax^2 + bx + c = 0$  is equal to  $n$ th power of the other root, then the value of  $ac^{\frac{1}{n+1}} + a^nc^{\frac{1}{n+1}}$  is equal to

(a)  $b$

(b)  $-b$

(c)  $\frac{1}{b^{n+1}}$

(d)  $-b^{n+1}$

13) In how many ways can 5 boys and 5 girls sit in a circle so that no two boys sit together?

(a)  $5! \times 5!$

(b)  $4! \times 5!$

(c)  $\frac{5! \times 5!}{2}$

(d) None of these

14) The probability that the same number appear on throwing three dice simultaneously, is

- (a)  $1/36$
- (b)  $5/36$
- (c)  $1/6$
- (d)  $4/13$

15) The length of the common chord of the ellipse

$$\frac{x+1}{9} + \frac{y-2}{4} = 1 \text{ and the circle}$$

$$x - 1^2 + y - 2^2 = 1 \text{ is}$$

- (a) 0
- (b)  $\sqrt{3}$
- (c) 4
- (d) 5

16) For hyperbola  $\frac{x^2}{\cos^2 a} - \frac{y^2}{\sin^2 a} = 1$  which of the following remains constant with change in 'a.'?

- (a) Abscissae of vertices
- (b) Abscissae of foci
- (c) Eccentricity
- (d) Directrix

17) Area of the region satisfying  $x \leq 2$ ,  $y \leq |x|$  and  $x \geq 0$  is

- (a) 4 sq unit
- (b) 1 sq unit
- (c) 2 sq unit

(d) None of these

18) The solution of the differential equation  $\frac{dy}{dx} + \frac{2yx}{1+x^2} = \frac{1}{1+x^2}$  is

(a)  $y(1+x^2) = c + \tan^{-1} x$

(b)  $\frac{y}{1+x^2} = c + \tan^{-1} x$

(c)  $y \log(1+x^2) = c + \tan^{-1} x$

(d)  $y(1+x^2) = c + \sin^{-1} x$

19) Number of solutions of  $y = e^x$  and  $y = \sin x$  is

(a) 0

(b) 1

(c) 2

(d) infinite

20) If  $f(x) = \begin{cases} \frac{1-\cos x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$  is continuous at  $x = 0$ , then the value of  $k$  is

(a) 0

(b)  $\frac{1}{2}$

(c)  $\frac{1}{4}$

(d)  $-\frac{1}{2}$

21) In  $\Delta ABC$ ,  $a^2 \cos^2 \frac{C}{2} + b^2 \sin^2 \frac{C}{2}$  is equal to

(a)  $a^2$

- (b)  $b^2$
- (c)  $c^2$
- (d) None of these

22)  $\frac{1+\tan^2 x}{1-\tan^2 x} dx$  is equal to

- (a)  $\log \frac{1-\tan x}{1+\tan x} + c$
- (b)  $\log \frac{1+\tan x}{1-\tan x} + c$
- (c)  $\frac{1}{2} \log \frac{1-\tan x}{1+\tan x} + c$
- (d)  $\frac{1}{2} \log \frac{1+\tan x}{1-\tan x} + c$

23)  $\int_0^8 x - 5 dx$  is equal to

- (a) 17
- (b) 9
- (c) 12
- (d) 18

24) If  $I_1 = \int_0^1 2^{x^2} dx$ ,  $I_2 = \int_0^1 2^{x^3} dx$ ,  $I_3 = \int_1^2 2^{x^2} dx$  and  $I_4 = \int_1^2 2^{x^3} dx$ , then

- (a)  $I_3 > I_4$
- (b)  $I_3 = I_4$
- (c)  $I_1 > I_2$
- (d)  $I_2 > I_1$

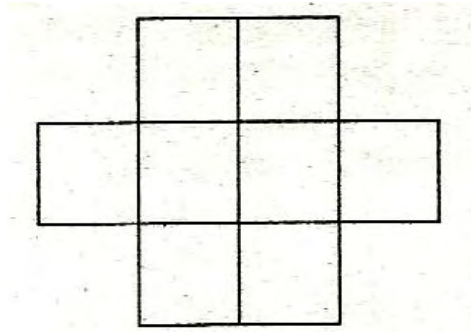


- 25) Distance between the pair of lines represented by the equation

$$x^2 - 6xy + 9y^2 + 3x - 9y - 4 = 0 \text{ is}$$

- (a)  $\frac{15}{10}$
- (b)  $\frac{1}{2}$
- (c)  $-\frac{5}{2}$
- (d)  $\frac{1}{10}$
- 26) Centre of circle whose normals are
- $$x^2 - 2xy - 3x + 6y = 0, \text{ is}$$
- (a)  $3, \frac{3}{2}$
- (b)  $3, -\frac{3}{2}$
- (c)  $\frac{3}{2}, 3$
- (d) None of these
- 27) A coin is tossed n times. The probability of getting head at least once is greater than 0.8, then the least value of n is
- (a) 2
- (b) 3
- (c) 5
- (d) 4
- 28) Six Xs have to be placed in the square of the figure such that
-

each row contains at least one 'X'. In how many different ways can this be done?



- (a) 27
- (b) 28
- (c) 26
- (d) 35
- 29) For all complex numbers  $z_1, z_2$  satisfying  $|z_1| = 12$  and  $|z_2 - 3 - 4i| = 5$ , the minimum value of  $|z_1 - z_2|$  is
- (a) 4
- (b) 3
- (c) 1
- (d) 2
- 30) If  $a = \log_2 3$ ,  $b = \log_2 5$ ,  $C = \log_7 2$ , then  $\log_{140} 63$  in terms of  $a, b, c$  is
- (a)  $\frac{2ac+1}{2c+abc+1}$
- (b)  $\frac{2ac+1}{2a+c+a}$
- (c)  $\frac{2ac+1}{2c+ab+a}$
- (d) None of these

- 31)  $49^n + 16n - 1$  is divisible by
- (a) 3
  - (b) 29
  - (c) 19
  - (d) 64
- 32) The solution set of the equation  $\sin^{-1} x = 2 \tan^{-1} x$  is
- (a)  $\{1, 2\}$
  - (b)  $\{-1, 2\}$
  - (c)  $\{-1, 1, 0\}$
  - (d)  $1, \frac{1}{2}, 0$
- 33) The sum to  $n$  terms of the infinite series  $1 \cdot 3^2 + 2 \cdot 5^2 + 3 \cdot 7^2 + \dots \infty$  is
- (a)  $\frac{n}{6} (n + 1) (6n^2 + 14n + 7)$
  - (b)  $\frac{n}{6} (n + 1) (2n + 1) (3n + 1)$
  - (c)  $4n^3 + 4n^2 + n$
  - (d) None of the above
- 34) The minimum value of  $2x + 3y$ , when  $xy = 6$ , is
- (a) 9
  - (b) 12
  - (c) 8
  - (d) 6
-

- 35) The derivative of  $\sin^{-1} \frac{2x}{1+x^2}$  with respect to  $\cos^{-1} \frac{1-x^2}{1+x^2}$  is
- (a) -1
  - (b) 1
  - (c) 2
  - (d) 4
- 36) The equation of the sides of a triangle are  $x - 3y = 0$ ,  $4x + 3y = 5$  and  $3x + y = 0$ . The line  $3x - 4y = 0$  passes through
- (a) the incentre
  - (b) the centroid
  - (c) the orthocentre
  - (d) the circumcentre
- 37) The centres of a set of circles, each of radius 3, lie on the circle  $x^2 + y^2 = 25$ . The locus of any point in the set is
- (a)  $4 \leq x^2 + y^2 \leq 64$
  - (b)  $x^2 + y^2 \leq 25$
  - (c)  $x^2 + y^2 \geq 25$
  - (d)  $3 \leq x^2 + y^2 \leq 9$
- 38) If  $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{2}$ , then  $\frac{dy}{dx}$  is equal to
- (a)  $\frac{x}{y}$
  - (b)  $-\frac{x}{y}$
-

(c)  $\frac{y}{x}$

(d)  $-\frac{y}{x}$

39) If  $\lim_{x \rightarrow \infty} \frac{x^3+1}{x^2+1} - ax + b = 2$ , then

(a)  $a = 1$  and  $b = 1$

(b)  $a = 1$  and  $b = -1$

(c)  $a = 1$  and  $b = -2$

(d)  $a = 1$  and  $b = 2$

40) The unit vector which is orthogonal to the vector

$3\mathbf{i} + 2\mathbf{j} + 6\mathbf{k}$  and is coplanar with the vectors  $2\mathbf{i} + \mathbf{j} + \mathbf{k}$  and  $\mathbf{i} - \mathbf{j} + \mathbf{k}$  is

(a)  $\frac{2\mathbf{i} + 6\mathbf{j} + \mathbf{k}}{41}$

(b)  $\frac{2\mathbf{i} - 3\mathbf{j}}{13}$

(c)  $\frac{3\mathbf{j} - \mathbf{k}}{10}$

(d)  $\frac{4\mathbf{i} + 3\mathbf{j} - 3\mathbf{k}}{34}$

41) Let  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{c}$  be three non-coplanar vectors and let  $\mathbf{p}$ ,  $\mathbf{q}$  and  $\mathbf{r}$  be vectors defined by the relations

$$\mathbf{p} = \frac{\mathbf{b} \times \mathbf{c}}{abc}, \mathbf{q} = \frac{\mathbf{c} \times \mathbf{a}}{abc} \text{ and } \mathbf{r} = \frac{\mathbf{a} \times \mathbf{b}}{abc}$$

Then the value of the expression

$(\mathbf{a} + \mathbf{b}) \cdot \mathbf{p} + (\mathbf{b} + \mathbf{c}) \cdot \mathbf{q} + (\mathbf{c} + \mathbf{a}) \cdot \mathbf{r}$  is equal to

(a) 0

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- (b) 1
  - (c) 2
  - (d) 3
- 42) The points  $(5, -4, 2)$ ,  $(4, -3, 1)$ ,  $(7, -6, 4)$  and  $(8, -7, 5)$  are the vertices of
- (a) a rectangle
  - (b) a square
  - (c) a parallelogram
  - (d) None of these
- 43) Let  $A = [-1, 1]$  and  $f: A \rightarrow A$  be defined as  $f(x) = x |x|$  for all  $x \in A$ , then  $f(x)$  is
- (a) many-one into function
  - (b) one-one into function
  - (c) many-one onto function
  - (d) one-one onto function
- 44) The radius of a cylinder is increasing at the rate of 3 m/s and its altitude is decreasing at the rate of 4 m/s. The rate of change of volume when radius is 4 m/s. The rate of change of volume when radius is 4m and altitude is 6m, is
- (a)  $80 \pi$  cu m/s
  - (b)  $144 \pi$  cu m/s
  - (c) 80 cu m/s
  - (d) 64 cu m/s
-

45) Equation of the parabola with its vertex at (1, 1) and focus (3, 1) is

(a)  $(x - 1)^2 = 8 (y - 1)$

(b)  $(y - 1)^2 = 8 (x - 3)$

(c)  $(y - 1)^2 = 8 (x - 1)$

(d)  $(x - 3)^2 = 8(y - 1)$

### Physics

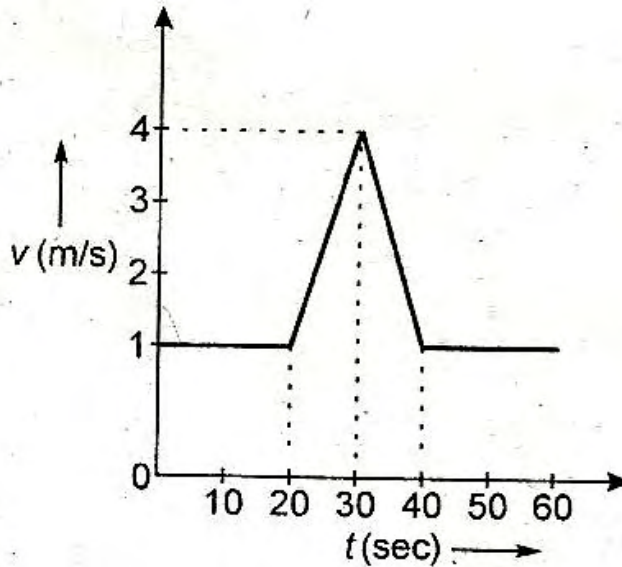
46) In the relation  $P = \frac{a}{\beta} e^{-\frac{az}{k\theta}}$ ,  $p$  is the pressure,  $z$  the distance,  $k$  is Boltzmann constant and  $\theta$  is the temperature, the dimensional formula of  $\beta$  will be –

(a)  $M^0 L^2 T^0$

(b)  $ML^2 T$

- (c)  $ML^0T^{-1}$   
 (d)  $ML^2T^{-1}$

47) Velocity time ( $v - t$ ) graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is non-zero acceleration and retardation is –



- (a) 60 m  
 (b) 50 m  
 (c) 30 m  
 (d) 40 m
- 48) Three weights  $w$ ,  $2w$  and  $3w$  are connected to identical springs suspended from a rigid horizontal rod. The assembly of the rod and the weights fall freely. The positions of the weights from the rod are such that
- (a)  $3w$  will be farthest  
 (b)  $w$  will be farthest  
 (c) All will be at the same distance



- (d) 2w will be farthest
- 49) At the top of the trajectory of a projectile, the direction of its velocity and acceleration are
- (a) Perpendicular to each other
  - (b) Parallel to each other
  - (c) Inclined to each other at an angle of  $45^\circ$
  - (d) Antiparallel to each other
- 50) Consider the following statement. When jumping from some height, you should bend your knees as you come to rest instead of keeping your legs stiff. Which of the following relations can be useful in explaining the statement?
- (a)  $\Delta p_1 = -\Delta p_2$
  - (b)  $\Delta E = -\Delta PE + KE = 0$
  - (c)  $F \Delta t = m \Delta F$
  - (d)  $\Delta x \propto \Delta F$
- where symbols have their usual meaning.
- 51) A ball is released from the top of a tower. The ratio of work done by force of gravity in first, second and third second of the motion of the ball is
- (a) 1: 2: 3
  - (b) 1: 4: 9
  - (c) 1: 3: 5
  - (d) 1: 5: 3
-

- 52) Two rings of radius  $R$  and  $nR$  made up of same material have the ratio of moment of inertia about an axis passing through centre is  $1: 8$ . The value of  $n$  is
- (a) 2
  - (b)  $2\sqrt{2}$
  - (c) 4
  - (d)  $\frac{1}{2}$
- 53) There are two planets. The ratio of radius of the two planets is  $K$  but ratio of acceleration due to gravity of both planets is  $g$ . What will be the ratio of their escape velocity?
- (a)  $(Kg)^{1/2}$
  - (b)  $(Kg)^{-1/2}$
  - (c)  $(Kg)^2$
  - (d)  $(Kg)^{-2}$
- 54) The extension in a string obeying Hooke's law is  $x$ . The speed of sound in the stretched string is  $v$ . If the extension in the string is increased to  $1.5x$ , the speed of sound will be
- (a)  $1.22v$
  - (b)  $0.61v$
  - (c)  $1.50v$
  - (d)  $0.75v$
- 55) A ball whose density is  $0.4 \times 10^3 \text{ kg/m}^3$  falls into water from a height of  $9 \text{ cm}$ . To what depth does the ball sink?
- (a)  $9 \text{ cm}$
  - (b)  $6 \text{ cm}$
-

- (c) 4.5 cm
- (d) 2.25 cm
- 56) A thermodynamical system is changed from state  $(P_1, V_1)$  to  $(P_2, V_2)$  by two different processes, the quantity which will remain same will be
- (a)  $\Delta Q$
- (b)  $\Delta W$
- (c)  $\Delta Q + \Delta W$
- (d)  $\Delta Q - \Delta W$
- 57) The relative humidity on a day when partial pressure of water vapour is  $0.012 \times 10^5$  Pa at  $12^\circ\text{C}$  is (Take vapour pressure of water at this temperature as  $0.016 \times 10^5$  Pa)
- (a) 70%
- (b) 40%
- (c) 75%
- (d) 25%
- 58) In the absence of intermolecular forces of attraction, the observed pressure  $P$  will be
- (a)  $P$
- (b)  $< P$
- (c)  $> P$
- (d) Zero

- 59) In a second pendulum, mass of bob is 30 g. If it is replaced by 90 g mass, then its time period will be
- (a) 1 s
  - (b) 2 s
  - (c) 4s
  - (d) 3s
- 60) A wave has velocity  $v$  in medium P and velocity  $2v$  in medium Q. If the wave is incident in medium P at an angle of  $30^\circ$ , then the angle of refraction will be
- (a)  $30^\circ$
  - (b)  $45^\circ$
  - (c)  $60^\circ$
  - (d)  $90^\circ$
- 61) The equation of progressive wave is  $y = 0.2 \sin 2\pi \left( \frac{t}{0.01} - \frac{x}{0.3} \right)$ , where  $x$  and  $y$  are in metre and  $t$  is in second. The velocity of propagation of the wave is
- (a) 30 m/s
  - (b) 40 m/s
  - (c) 300 m/s
  - (d) 400 m/s
- 62) The displacement of a charge  $Q$  in the electric field  $\mathbf{E} = e_1 \mathbf{i} + e_2 \mathbf{j} + e_3 \mathbf{k}$  is  $\mathbf{r} = a\mathbf{i} + b\mathbf{j}$ . The work done is
- (a)  $Q(ae_1 + be_2)$
-

- (b)  $Q \sqrt{ae_1^2 + be_2^2}$
- (c)  $Q(e_1 + e_2) \sqrt{a^2 + b^2}$
- (d)  $Q \sqrt{e_1^2 + e_2^2} \quad a + b$
- 63) An electric line of force in the xy plane is given by equation  $x^2 + y^2 = 1$ . A particle with unit positive charge, initially at rest at the point  $x = 1, y = 0$  in the xy plane
- (a) not move at all
- (b) will move along straight line
- (c) will move along the circular line of force
- (d) information is insufficient to draw any conclusion
- 64) If a rod has resistance 40 and if rod is turned as half circle, then the resistance along diameter is
- (a)  $1.56 \Omega$
- (b)  $2.44 \Omega$
- (c)  $4 \Omega$
- (d)  $2 \Omega$
- 65) The relation between voltage sensitivity ( $\sigma_v$ ) and current sensitivity ( $\sigma_i$ ) of a moving coil galvanometer is (resistance of galvanometer is G).
- (a)  $\frac{a_i}{G} = \sigma_v$
- (b)  $\frac{\sigma_v}{G} = \sigma_i$
- (c)  $\frac{G}{\sigma_v} = \sigma_i$

(d)  $\frac{G}{\sigma_i} = \sigma_v$

66) A current carrying small loop behaves like a small magnet. If A be its area and M its magnetic moment, the current in the loop will be

(a) W/A

(b) A/M

(c) MA

(d)  $AM^2$

67) A magnet of magnetic moment 20 CGS units is freely suspended in a uniform magnetic field of intensity 0.3 CGS units. The amount of work done in deflecting it by an angle of  $30^\circ$  in CGS units is

(a) 6

(b)  $3\sqrt{3}$

(c)  $3(2 - \sqrt{3})$

(d) 3

68) An inductor of 2 H and a resistance of 100 are connected in series with a battery of 5 V. The initial rate of change of current is

(a) 0.5 A/s

(b) 2.0 A/s

(c) 2.5 A/s

(d) 0.25 A/s

- 69) When radiation is incident on a photoelectron emitter, the stopping potential is found to be 9V. If  $h$  for the electron is  $1.8 \times 10^{-11} \text{ C kg}^{-1}$ , the maximum velocity of the ejected electron is
- (a)  $6 \times 10^5 \text{ ms}^{-1}$
  - (b)  $8 \times 10^5 \text{ ms}^{-1}$
  - (c)  $1.8 \times 10^6 \text{ ms}^{-1}$
  - (d)  $1.8 \times 10^5 \text{ ms}^{-1}$
- 70) A and B are two radioactive substances whose half-lives are 1 and 2 years respectively. Initially 10 g of A and, 1 g of B is taken. The time (approximate) after which they will have same quantity remaining is
- (a) 6.62 year
  - (b) 5 year
  - (c) 3.2 year
  - (d) 7 year
- 71) The optical path of a monochromatic light is same if it goes through 4.0 cm of glass of 4.5 cm of water. If the refractive index of glass is 1.53, the refractive index of the water is
- (a) 1.30
  - (b) 1.36
  - (c) 1.42
  - (d) 1.46
- 72) The length, breadth and thickness of a block are given by  $l = 12 \text{ cm}$ ,  $b = 6 \text{ cm}$ , and  $t = 2.45 \text{ cm}$ . The volume of the block according to the idea of significant figure should be
-

- (a)  $1 \times 10^2 \text{ cm}^3$
  - (b)  $2 \times 10^2 \text{ cm}^3$
  - (c)  $1.763 \times 10^2 \text{ cm}^3$
  - (d) None of these
- 73) 10000 small balls, each weighing 1g strike one square centimetre of area per second with a velocity 100 m/s in a normal direction and rebound with the same velocity. The value of pressure on the surface will be
- (a)  $2 \times 10^3 \text{ N/m}^2$
  - (b)  $2 \times 10^5 \text{ N/m}^2$
  - (c)  $10^7 \text{ N/m}^2$
  - (d)  $2 \times 10^7 \text{ N/m}^2$
- 74) Two springs have their force constant as  $k_1$  and  $k_2$  ( $k_1 > k_2$ ). when they are stretched by the same force
- (a) no work is done in case of both the springs
  - (b) equal work is done in case of both the springs
  - (c) more work is done in case of second spring
  - (d) more work is done in case of first spring
- 75) A mass  $m$  is moving with a constant velocity along a line parallel to x-axis. Its angular momentum with respect to origin on z-axis is
- (a) Zero
  - (b) Remains constant
  - (c) Goes on increasing
-



(d) Goes on decreasing

76) At a given place where acceleration due to gravity is ' $g$ '  $\text{m/s}^2$ , a sphere of lead of density ' $d$ '  $\text{kg/m}^3$  is gently released in a column of liquid of density ' $\rho$ '  $\text{kg/m}^3$ . If  $d > \rho$ , the sphere will

(a) fall vertically with an acceleration ' $g$ '  $\text{m/s}^2$

(b) fall vertically with no acceleration

(c) fall vertically with an acceleration  $g \frac{d-\rho}{d}$

(d) fall vertically with an acceleration  $g \frac{\rho}{d}$

77) Amplitude of a wave is represented by

$$A = \frac{c}{a+b-c}$$

Then resonance will occur when

(a)  $b = -c/2$

(b)  $b = 0$  and  $a = c$

(c)  $b = -a/2$

(d) None of these

78) Capacitance of a capacitor made by a thin metal foil is  $2\mu\text{F}$ . If the foil is folded with paper of thickness  $0.15 \text{ mm}$ , dielectric constant of paper is  $2.5$  and width of paper is  $400 \text{ mm}$ , the length of foil will be

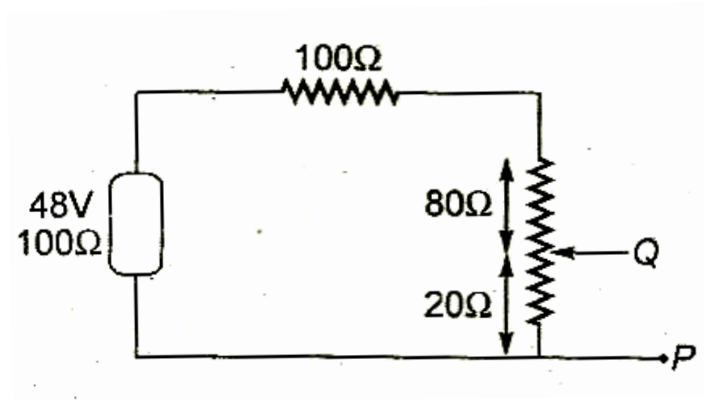
(a)  $0.34 \text{ m}$

(b)  $1.33 \text{ m}$

(c)  $13.4 \text{ m}$

(d) 33.9 m

- 79) In the circuit, the potential difference across PQ will be nearest to



- (a) 9.6 V  
 (b) 6.6 V  
 (c) 4.8 V  
 (d) 3.2 V
- 80) A rod of a certain metal is 1.0 m long and 0.6 cm in diameter. Its resistance is  $3.0 \times 10^{-3}$  ohm.

Another disc made of the same metal is 2.0 cm in diameter and 1.0 mm thick. What is the resistance between the round faces of the disc?

- (a)  $1.35 \times 10^{-8} \Omega$   
 (b)  $2.70 \times 10^{-7} \Omega$   
 (c)  $4.05 \times 10^{-6} \Omega$   
 (d)  $8.10 \times 10^{-5} \Omega$
- 81) The cyclotron frequency of an electron grating in a magnetic field

- of 1 T is approximately
- (a) 28 MHZ
  - (b) 280 MHZ
  - (c) 2.8 GHZ
  - (d) 28 GHZ
- 82) The transformation ratio in the step-up transformer is
- (a) 1
  - (b) Greater than one
  - (c) less than one
  - (d) the ratio greater or less than one depends on the other factors
- 83) Radiations of intensity  $0.5 \text{ W/m}^2$  are striking a metal plate. The pressure on the plate is
- (a)  $0.166 \times 10^{-8} \text{ N/m}^2$
  - (b)  $0.332 \times 10^{-8} \text{ N/m}^2$
  - (c)  $0.111 \times 10^{-8} \text{ N/m}^2$
  - (d)  $0.083 \times 10^{-8} \text{ N/m}^2$
- 84) If  $n$  represents the order of a half period zone the area of this zone is approximately proportional to  $n^m$  where  $m$  is equal to
- (a) zero
  - (b) half
  - (c) one
  - (d) two
-

- 85) Monochromatic light of wavelength  $3000 \text{ \AA}$  is incident on a surface area  $4 \text{ cm}^2$ . If intensity of light is  $150 \text{ mW/m}^2$ , then rate at which photons strike the target is
- (a)  $3 \times 10^{10} / \text{sec}$
  - (b)  $9 \times 10^{13} / \text{sec}$
  - (c)  $7 \times 10^{15} / \text{sec}$
  - (d)  $6 \times 10^{19} / \text{sec}$

**Chemistry**

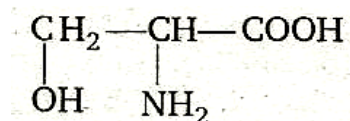
- 86) The ratio of  $\text{Fe}_2\text{O}_3$  and Al, in thermite is
- (a) 1 : 3
  - (b) 1: 2
  - (c) 3: 1
  - (d) None of these
- 87) A solid has a structural in which 'W' atom are located at the corners of a cubic lattice 'O' atom at the centre of edge and Na atoms at the centre of cube. The formula for the compound is
- (a)  $\text{Na}_2 \text{WO}_3$
  - (b)  $\text{Na}_2 \text{WO}_2$
  - (c)  $\text{NaWO}_2$
  - (d)  $\text{Na WO}_3$
- 88) Which one of the following substances is used in the laboratory for a fast drying of neutral gases?
- (a) Phosphorous pentoxide
-

- (b) Active charcoal
- (c) Anhydrous calcium chloride
- (d)  $\text{Na}_3\text{PO}_4$

89)  $\text{H}_2\text{O}_2$  used in rocket has the concentration

- (a) 50%
- (b) 70%
- (c) 30%
- (d) 90%

90) The IUPAC name of the compound,



- (a) 2-Amino-3-hydroxy propanoic acid
- (b) 1-Hydroxy-2-amino propan-3-oic acid
- (c) 1-Amino-2-hydroxypropanoic acid
- (d) 3-Hydroxy-2-amino propanoic acid

91) The compound which gives the most stable carbonium ion on dehydration is

- (a)  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$
- (b)  $(\text{CH}_3)_3\text{COH}$
- (c)  $\text{CH}_2 = \text{CHCH}_2\text{CH}_2\text{OH}$
- (d)  $\text{CH}_3\text{CHOHCH}_2\text{-CH}_3$

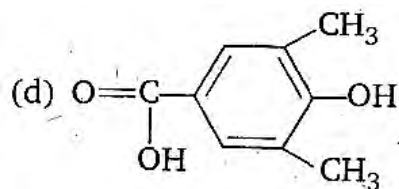
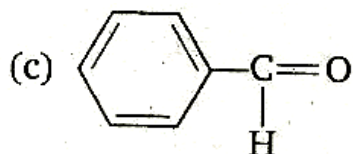
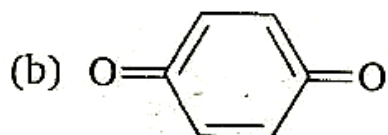
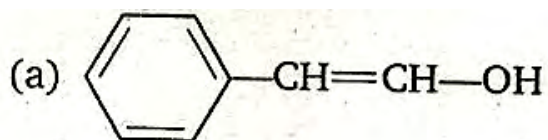
- 92) The ionic conductance is least for
- (a)  $\text{Cs}^+$
  - (b)  $\text{Rb}^+$
  - (c)  $\text{K}^+$
  - (d)  $\text{Na}^+$
- 93) Setting of plaster of Paris involves
- (a) Oxidation with atmospheric oxygen
  - (b) Combination with atmospheric  $\text{CO}_2$
  - (c) Dehydration
  - (d) hydration to yield another hydrate
- 94) A solution of sucrose (Molar mass = 342g/mol) is prepared by dissolving 68.4 g of it per litre of solution, what is its osmotic pressure ( $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$ ) at 273 K?
- (a) 3.92 atm
  - (b) 4.48 atm
  - (c) 5.92 atm
  - (d) 29.4 atm
- 95) At 27°C one mole of an ideal gas is compressed isothermally and reversibly from a pressure of 2 atm to 10 atm. The value of  $\Delta U$  and  $q$  are ( $R = 2 \text{ cal}$ )
- (a) 0, - 965.84 cal
  - (b) - 965.84 cal, - 865.58 cal
  - (c) + 865.58 cal, - 865.58 cal

(d) + 965.84 cal, + 865.58 cal

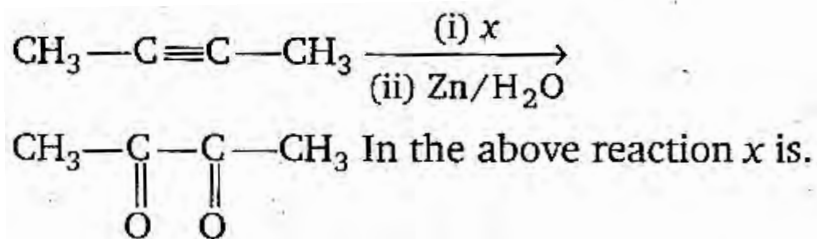
96) For a reaction equilibrium,  $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ , the concentrations of  $\text{N}_2\text{O}_4$  and  $\text{NO}_2$  at equilibrium are  $4.8 \times 10^{-2}$  and  $1.2 \times 10^{-2}$  mol/L respectively. The value of  $k$ , for the reaction is:

- (a)  $3 \times 10^{-3}$  mol/L
- (b)  $3.3 \times 10^{-3}$  mol/L
- (c)  $3 \times 10^{-1}$  mol/L
- (d)  $3.3 \times 10^{-1}$  mol/L

97) Tautomerism is exhibited by

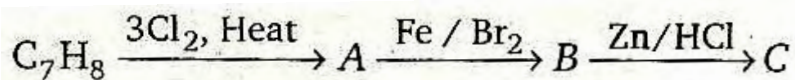


98)



- (a)  $\text{HNO}_3$
- (b)  $\text{O}_2$
- (c)  $\text{O}_3$
- (d)  $\text{KMnO}_4$

99)



Here, the compound C is

- (a) 3-Bromo 2, 4, = 6-trichlorotoluene
- (b) O- bromo toluene
- (c) P - bromo toluene
- (d) m - bromo toluene

100) Alizarin belongs to the class of

- (a) Vat dyes
- (b) Mordant dyes
- (c) Basic dyes
- (d) Reactive dyes



- 101) 2,4-Dichlorophenoxyacetic acid is used as
- (a) Fungicide
  - (b) Insecticide
  - (c) Herbicide
  - (d) Moth repellent
- 102) Which glass has the highest percentage of lead?
- (a) Soda glass
  - (b) Flint glass
  - (c) Jena glass
  - (d) Pyrex glass
- 103) Which one of the following pentafluorides cannot be formed?
- (a)  $\text{PF}_5$
  - (b)  $\text{AsF}_5$
  - (c)  $\text{SbF}_5$
  - (d)  $\text{BiF}_5$
- 104) Which out of the following compounds is called photographer's fixer?
- (a)  $\text{Na}_2\text{SO}_3$
  - (b)  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
  - (c)  $\text{Na}_2\text{SO}_4$
  - (d)  $\text{Na}_2\text{S}$
-

105) The isoelectronic pair is

- (a)  $\text{Cl}_2\text{O}$ ,  $\text{ICl}_2^-$
- (b)  $\text{Cl}_2$ ,  $\text{ClO}_2$
- (c)  $\text{IF}_2^+$ ,  $\text{I}_3^-$
- (d)  $\text{ClO}_2$ ,  $\text{ClF}_2^+$

106) When radioactive minerals like cleveite, monazite and pitchblende are heated to 1273 K in vacuo the noble gas obtained is

- (a) Rn
- (b) Kr
- (c) He
- (d) Ne

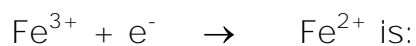
107) Conjugate base of  $\text{H}_2\text{PO}_4$  is

- (a)  $\text{H}_3\text{PO}_4$
- (b)  $\text{P}_2\text{O}_5$
- (c)  $\text{PO}_4^{3-}$
- (d)  $\text{HPO}_4^{2-}$

108) Given standard electrode potentials

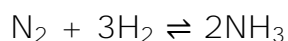


The standard electrode potential ( $E^\circ$ ) for



- (a) + 0.772 V
- (b) - 0.772 V
- (c) + 0.417 V
- (d) - 0.414 V

109) For the reaction



The rate of change of concentration for hydrogen is

$$0.3 \times 10^{-4} \text{ Ms}^{-1}$$

The rate of change of concentration of ammonia is:

- (a)  $-0.2 \times 10^{-4}$
- (b)  $0.2 \times 10^{-4}$
- (c)  $0.1 \times 10^{-4}$
- (d)  $0.3 \times 10^{-4}$

110) The root mean square velocity of a gas is double when temperature is

- (a) increased four times
- (b) increased two times
- (c) reduced to half
- (d) reduced to one-fourth

111) The specific conductivity of 0.1 N KCl solution is  $0.0129 \text{ ohm}^{-1} \text{ cm}^{-1}$ . The resistance of the solution in the cell is 100 n. The cell constant of the cell will be

- (a) 1.10
-

- (b) 1.29
- (c) 0.56
- (d) 2.80

112) Which of the most volatile compounds?

- (a) HI
- (b) HCl
- (c) HBr
- (d) HF

113) Which of the following transition metal ions will have definite value of magnetic moment?

- (a)  $\text{Sc}^{3+}$
- (b)  $\text{Ti}^{3+}$
- (c)  $\text{Cu}^{+}$
- (d)  $\text{Zn}^{2+}$

114) Cr has electronic configuration as

- (a)  $3s^2 3p^6 3d^4 4s^1$
- (b)  $3s^2 3p^6 3d^5 4s^1$
- (c)  $3s^2 3p^6 3d^6$
- (d) None of these

115) Which of the following compound is expected to be coloured?

- (a)  $\text{Ag}_2\text{SO}_4$
-

(b)  $\text{CuF}_2$

(c)  $\text{MgF}_2$

(d)  $\text{CuCl}$

116) The effective atomic number of Cr (at no = 24) in  $[\text{Cr}(\text{NH}_3)_6] \text{Cl}_3$  is

(a) 35

(b) 27

(c) 33

(d) 36

117) In Nessler's reagent for the detection of ammonia the active species is

(a)  $\text{Hg}_2\text{Cl}_2$

(b)  $\text{Mg}^{2+}$

(c)  $\text{Hg}_2\text{I}_2$

(d)  $\text{HgI}_4^{2-}$

118) Which of the following ketones will not respond to iodoform test?

(a) Methyl isopropyl ketone

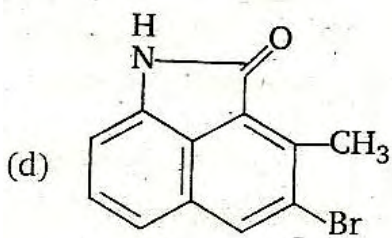
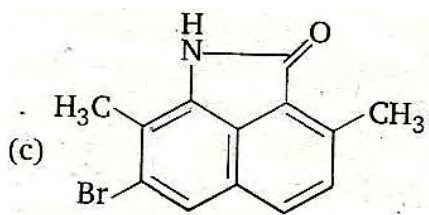
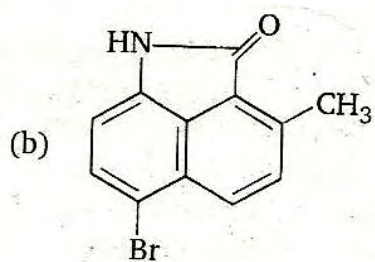
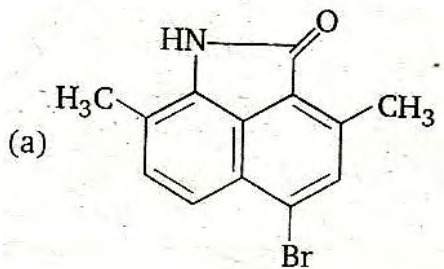
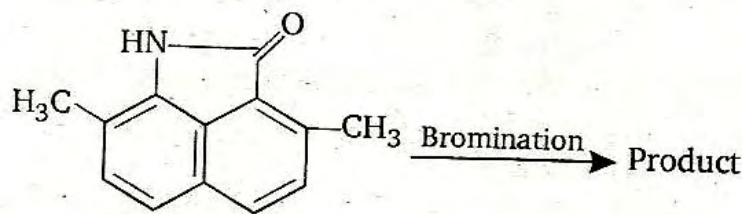
(b) Ethyl isopropyl ketone

(c) Dimethyl ketone

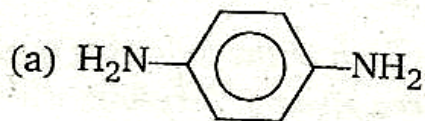
(d) 2-hexanone

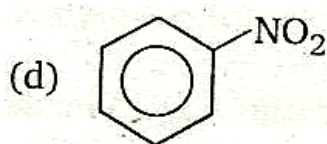
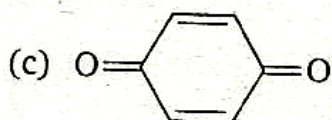
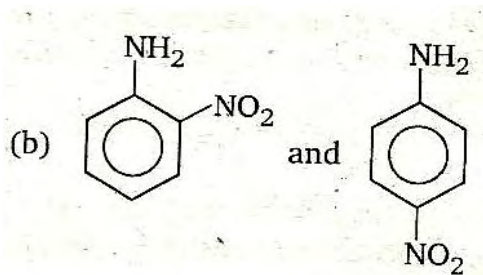
119)

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120) Aniline reacts with cone  $\text{HNO}_3$  to give





121) Bakelite is a product of the reaction between

- (a) formaldehyde and NaOH
- (b) aniline and Urea
- (c) phenol and Methanal
- (d) phenol and Chloroform

122) Cellulose is a polymer of

- (a) glucose
- (b) fructose
- (c) ribose
- (d) sucrose

123) Iodine value related to

- (a) fats and oils
- (b) alcohols

- (c) Esters
- (d) hydrocarbon

124) In aqueous solution, amino acids mostly exist as

- (a)  $\text{NH}_2 - \text{CHR} - \text{COOH}$
- (b)  $\text{NH}_2 - \text{CHR} - \text{COO}^-$
- (c)  $\text{NH}_3 - \text{CHR} - \text{COOH}$
- (d)  $\text{H}_3\text{N}^+ \text{CHR} - \text{COO}^-$

125) Gibbs free energy  $G$ , enthalpy  $H$  and entropy  $S$  are interrelated as in

- (a)  $G = H + TS$
- (b)  $G = H - TS$
- (c)  $G - TS = H$
- (d)  $G = S = H$

**English**



**Directions:** In each of the following questions, a sentence has been given in Active/Passive voice. Out of the four alternatives, select the one which best expresses the same sentence in Passive/Active voice.

- 126) People claim to have seen the suspect in several cities
- (a) The suspect is being seen in several cities
  - (b) The suspect has been the people in several cities
  - (c) The suspect is claimed to have been seen in several cities
  - (d) The suspect was seen by people in several cities
- 127) The teacher punished the boys who had not done their homework.
- (a) The boys who had not done their homework had been punished by their teacher
  - (b) The boys were punished by their teacher who had not done their homework
  - (c) The boys who had not done their homework were punished by the teacher
  - (d) The boys who had not done their homework were being punished by the teacher

**Directions:** In each of the following questions, choose the alternative which best expresses the meaning of the idiom/phrase given in italics in the sentence.

- 128) The prices are going up by leaps and bounds.
- (a) systematically
-

- (b) irregularly
- (c) gradually
- (d) rapidly

129) He bids fair to be an excellent cricketer.

- (a) seems likely
- (b) is ambitious
- (c) is confident
- (d) is unlikely

130) To find real happiness in the world is a wild goose chase –

- (a) ideal seeking
- (b) hunting
- (c) futile search
- (d) real aim

**Directions:** In each of the following questions, choose the alternative which can best improve the given sentence by substituting the italicised portion. If the sentence is correct as it is, your answer is (d).

131) The monograph which was published 3 years ago, would suggest that by 2001 there will be 73 million TV sets in India.

- (a) has been suggesting
- (b) had suggested
- (c) would have suggested

- (d) no improvement
- 132) Vishal, who studies medicine at present, hopes to go abroad after graduation.
- (a) has been studying
- (b) is studying
- (c) will study
- (d) no improvement
- 133) The greatest thing in style is to have a use of metaphor.
- (a) command
- (b) knowledge
- (c) need
- (d) no improvement

**Directions:** In each of the following questions, choose the best alternative to fill in the blank.

- 134) Mr. Shyam Lal. has gone to his native village with the ..... of starting an adult school.
- (a) suggestion
- (b) presumption
- (c) opinion
- (d) intention
- 135) The twins are so alike that I cannot.. .... one from the other.
- (a) discern

\_\_\_\_\_

- (b) tell
- (c) say
- (d) notice

136) We must ..... to authority.

- (a) bend
- (b) surrender
- (c) subdue
- (d) submit

**Directions:** In each of the following questions, choose the alternative 'which is closest to the opposite in meaning of the italicised word.

137) The doctor advised us to give him wholesome nutrition.

- (a) sickly
- (b) stupendous
- (c) depressing
- (d) fragmentary

138) He is good fellow; but what I dislike is his reckless handling of things.

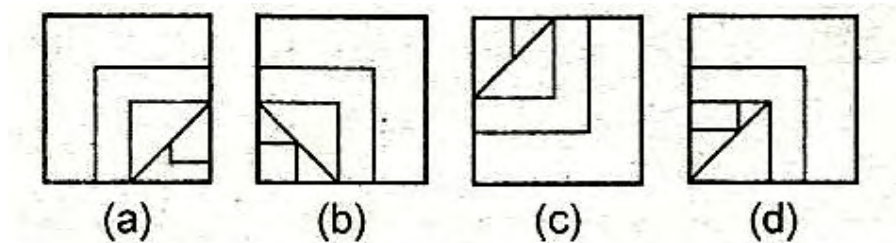
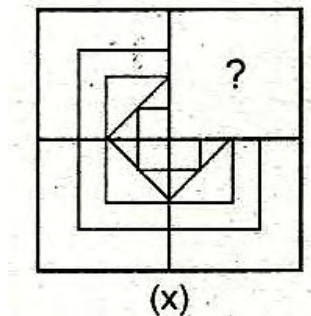
- (a) intelligent
- (b) cautious
- (c) soft
- (d) brilliant

**Directions:** In each of the following questions, choose the alternative which best expresses the meaning of the italicized word.

- 139) The one who is rich possesses many superfluous things.
- (a) needless
  - (b) superior
  - (c) essential
  - (d) expensive
- 140) Many of his acquaintances avoid him because he is so garrulous.
- (a) proud
  - (b) unreasonable
  - (c) talkative
  - (d) quarrelsome
- 141) 'Cell' is related to 'Tissue' in the same way as Tissue' is related to :
- (a) object
  - (b) organ
  - (c) limb
  - (d) None of these
- 142) In the following question, which pair of numbers is different from the other three.
- (a) 488
-

- (b) 929
- (c) 776
- (d) 667

143) Identify the missing part of the figure and select it from the given alternatives.



**Direction:** In the following question, a statement is given followed by some conclusions. Choose the conclusion which logically follows from the given statement.

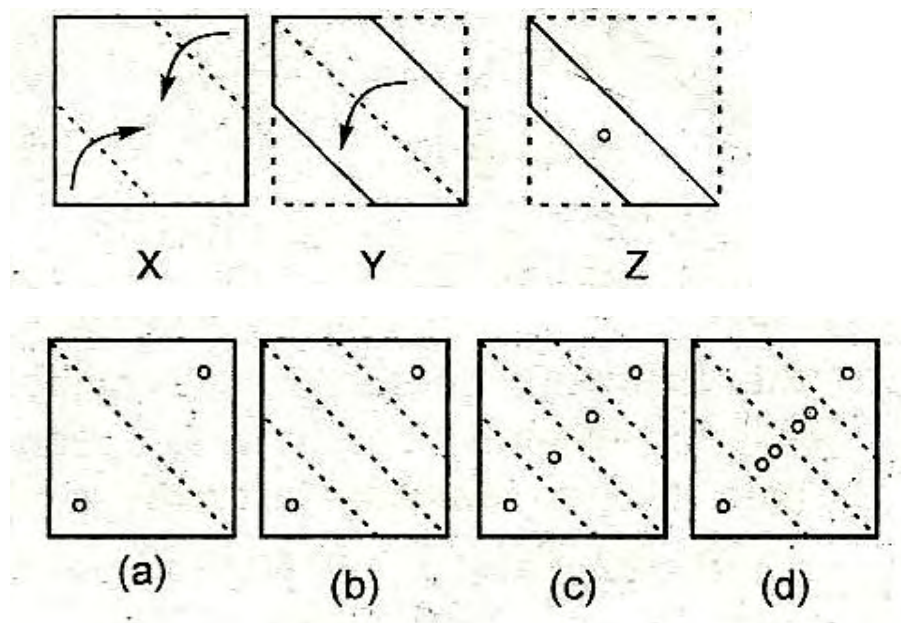
144) **Statement:** Soldiers serve their country.

**Conclusions:**

- (a) men generally serve their country
- (b) These who serve their country are soldiers
- (c) Some men who are soldiers serve their country

- (d) Women do not serve their country because they are not soldiers.

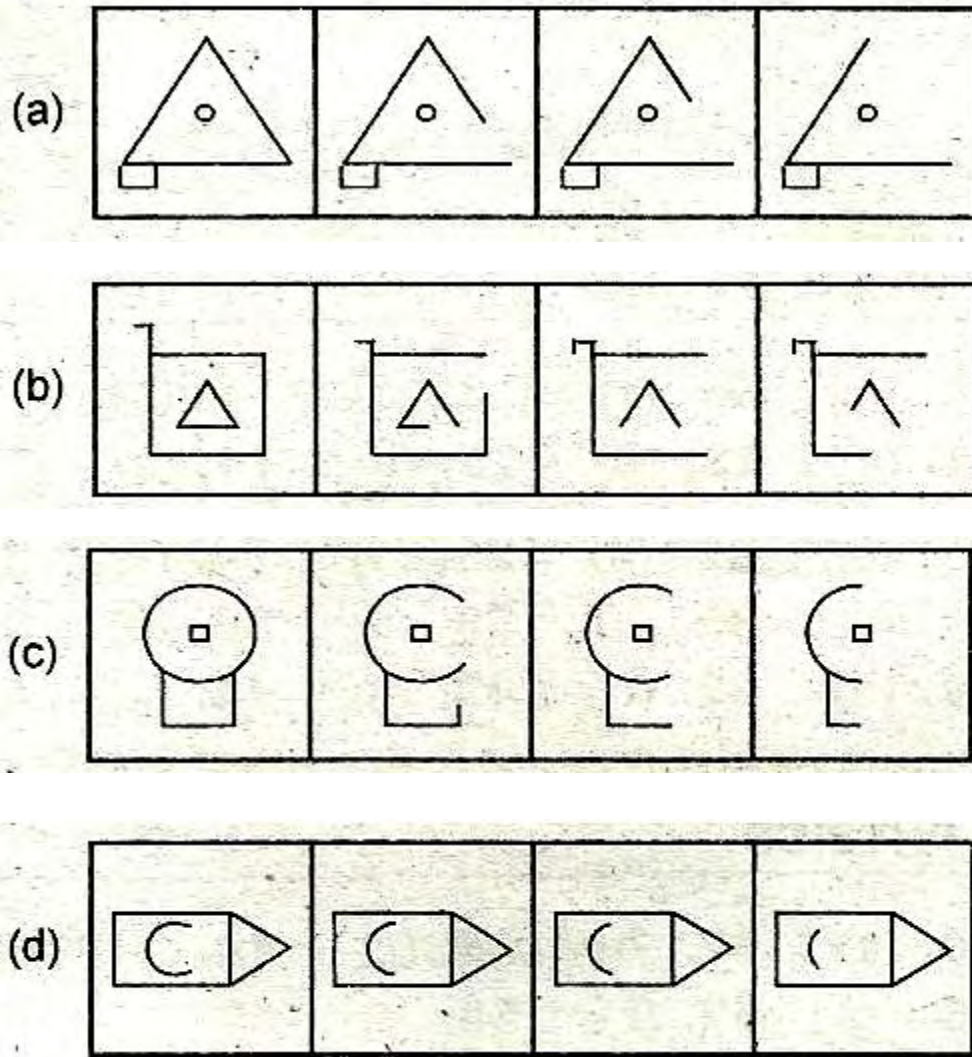
145) In the following question, a set of three figures X, Y and Z showing a sequence in which a paper is folded and finally cut from a particular section. Below these figures a set of answer figures marked (a, b, c and d) showing the design which the paper actually acquires when it is unfolded. You have to select the answer figure which most closely resembles the unfolded piece of paper.



**Direction:** In the following question, choose the set of figures which follows the given rule.

146) **Rule:** Closed figures become more and more open and open figures become more and more closed.



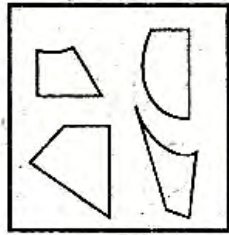


**Direction:** In the following question, find out which of the figures (a), (b), (c) and (d) can be formed from the pieces given in (x).

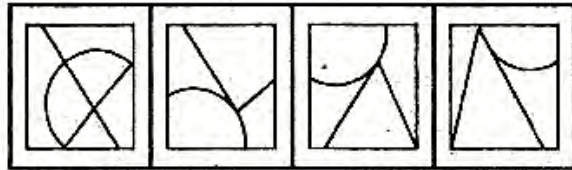
147) In (X)

\_\_\_\_\_





(X)



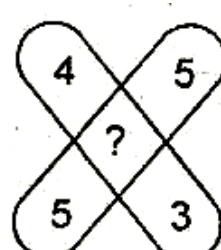
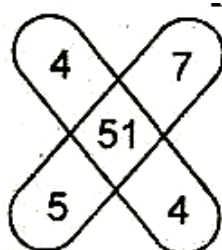
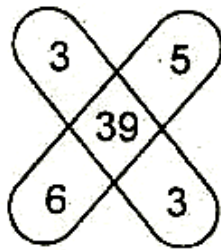
(a)

(b)

(c)

(d)

148) Which number will come in place of '2'?



(a) 35

(b) 37

(c) 45

(d) 47

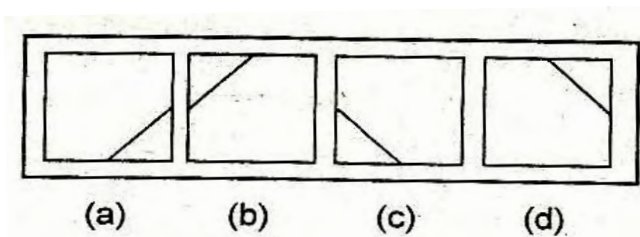
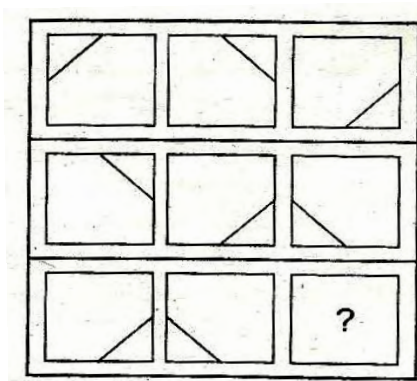
149) In the following questions, one number is missing in the series. You have to understand the pattern of the series and insert the number.

83, 82, 81, ..... 69, 60, 33

\_\_\_\_\_

- (a) 73
- (b) 80
- (c) 77
- (d) None of these

150) Select one alternative figure out of (a), (b), (c) and (d) which completes the given matrix.



### ANSWERS

### MATHEMATICS

- |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 1. (c)  | 2. (c)  | 3. (a)  | 4. (b)  | 5. (a)  | 6. (c)  |
| 7. (a)  | 8. (c)  | 9. (b)  | 10. (b) | 11. (c) | 12. (b) |
| 13. (b) | 14. (a) | 15. (a) | 16. (b) | 17. (c) | 18. (a) |

- |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 19. (d) | 20. (a) | 21. (c) | 22. (d) | 23. (a) | 24. (c) |
| 25. (c) | 26. (a) | 27. (b) | 28. (c) | 29. (d) | 30. (d) |
| 31. (d) | 32. (c) | 33. (a) | 34. (b) | 35. (b) | 36. (c) |
| 37. (a) | 38. (b) | 39. (c) | 40. (c) | 41. (d) | 42. (c) |
| 43. (d) | 44. (a) | 45. (c) |         |         |         |

### **PHYSICS**

- |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|
| 46. (a) | 47. (b) | 48. (c) | 49. (a) | 50. (c) | 51. (c) |
| 52. (a) | 53. (a) | 54. (a) | 55. (b) | 56. (d) | 57. (c) |
| 58. (c) | 59. (b) | 60. (d) | 61. (a) | 62. (a) | 63. (c) |
| 64. (c) | 65. (a) | 66. (a) | 67. (c) | 68. (c) | 69. (c) |
| 70. (a) | 71. (b) | 72. (b) | 73. (d) | 74. (c) | 75. (b) |
| 76. (c) | 77. (b) | 78. (d) | 79. (d) | 80. (b) | 81. (d) |
| 82. (b) | 83. (a) | 84. (a) | 85. (b) |         |         |

### **CHEMISTRY**

- |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|
| 86. (c)  | 87. (d)  | 88. (c)  | 89. (d)  | 90. (a)  | 91. (b)  |
| 92. (d)  | 93. (d)  | 94. (b)  | 95. (a)  | 96. (a)  | 97. (a)  |
| 98. (c)  | 99. (d)  | 100. (b) | 101. (c) | 102. (b) | 103. (d) |
| 104. (b) | 105. (d) | 106. (c) | 107. (d) | 108. (a) | 109. (b) |
| 110. (a) | 111. (b) | 112. (b) | 113. (b) | 114. (b) | 115. (b) |
| 116. (c) | 117. (d) | 118. (b) | 119. (b) | 120. (c) | 121. (c) |

122. (a)    123. (a)    124. (d)    125. (b)

**ENGLISH**

126. (c)    127. (c)    128. (d)    129. (a)    130. (c)    131. (b)

132. (b)    133. (b)    134. (d)    135. (b)    136. (d)    137. (a)

138. (b)    139. (a)    140. (c)

**REASONING**

141 (b)    142. (d)    143. (b)    144. (c)    145. (c)

146. (b)    147. (b)    148. (b)    149. (c)    150. (b)