FIITJEE PET – V (EXTENDED)

MAINS

DATE: 08.09.2018

Time: 3 hours **Maximum Marks: 360**

INSTRUCTIONS:

Instructions to the Candidates

1. This Test Booklet consists of **90 questions**.

   Use **Blue/Black ball Point Pen only** for writing particulars and bubbling of OMR.

2. For each correct answer **4 Marks** will awarded and for each wrong answer **1 Mark** will be deducted.

3. Attempt all questions.

4. In case you have not darkened any bubble you will be awarded 0 mark for that question.

5. Use of calculator/logarithmic table is not permitted.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐☐

1. The equation of the parabola whose focus is the point (0, 0) and the tangent at the vertex is $x - y + 1 = 0$ is
(A) $x^2 + y^2 - 2xy - 4x - 4y - 4 = 0$
(B) $x^2 + y^2 - 2xy + 4x - 4y - 4 = 0$
(C) $x^2 + y^2 + 2xy - 4x + 4y - 4 = 0$
(D) $x^2 + y^2 + 2xy - 4x - 4y + 4 = 0$

2. If PSQ is a focal chord of the parabola $y^2 = 8x$ such that SP = 6, then the length of SQ is
(A) 6
(B) 4
(C) 3
(D) none of these

3. If y_1, y_2 and y_3 are the ordinates of the vertices of a triangle inscribed in the parabola $y^2 = 4ax$, then its area is
(A) $\frac{1}{2a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$
(B) $\frac{1}{4a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$
(C) $\frac{1}{8a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$
(D) none of these

4. If parabolas $y^2 = \lambda x$ and $25[(x - 3)^2 + (y + 2)^2] = (3x - 4y - 2)^2$ are equal, then the value of λ is
(A) 9
(B) 3
(C) 7
(D) 6

5. A water jet from a fountain reaches its maximum height of 4m at a distance 0.5m from the vertical passing through the point O of water outlet. The height of the jet above the horizontal OX at a distance of 0.75m from the point O is
(A) 5m
(B) 6m
(C) 3m
(D) 7m

6. Double ordinate AB of the parabola $y^2 = 4ax$ subtends an angle $\frac{\pi}{2}$ at the focus of the parabola. Then the tangents drawn to the parabola at A and B will intersect at
(A) (–4a, 0)
(B) (–2a, 0)
(C) (–3a, 0)
(D) none of these

7. $y = x + 2$ is any tangent to the parabola $y^2 = 8x$. The point P on this tangent is such that the other tangent from it which is perpendicular to it is
(A) (2, 4)
(B) (–2, 0)
(C) (–1, 1)
(D) (2, 0)

8. The triangle PQR of area A is inscribed in the parabola $y^2 = 4ax$ such that the vertex P lies at the vertex of the parabola and the base QR is a focal chord. The modulus of the difference of the ordinates of the points Q and R is
(A) $\frac{A}{2a}$
(B) $\frac{A}{a}$
(C) $\frac{2A}{a}$
(D) $\frac{4A}{a}$

Space for rough work

9. If P is a point on the parabola $y^2 = 3(2x - 3)$ and M is the foot perpendicular drawn from P on the directrix of the parabola, then the length of each side of the equilateral triangle SMP, where S is the focus of the parabola, is
(A) 2 (B) 4 (C) 6 (D) 8

10. AB is a chord of the parabola $y^2 = 4ax$ with vertex A. BC is drawn perpendicular to AB meeting the axis at C. The projection of BC on the axis of the parabola is
(A) a (B) 2a (C) 4a (D) 8a

11. Consider the parabola $y^2 = 4x$. Let $A \equiv (4, -4)$ and $B \equiv (9, 6)$ be two fixed points on the parabola. Let C be a moving point on the parabola between A and B such that the area of the triangle ABC is maximum. Then the coordinates of C are
(A) $\left(\frac{1}{4}, 1\right)$ (B) (4, 4) (C) $\left(3, 2\sqrt{3}\right)$ (D) $\left(3, -2\sqrt{3}\right)$

12. A tangent is drawn to the parabola $y^2 = 4ax$ at the point P whose abscissa lies in the interval (1, 4). The maximum possible area of the triangle formed by the tangent at P, the ordinates of the point P, and the x-axis is equal to
(A) 8 (B) 16 (C) 24 (D) 32

13. If the normals to the parabola $y^2 = 4ax$ at three points $(ap^2, 2ap)$, $(aq^2, 2aq)$ and $(ar^2, 2ar)$ are concurrent, then the common root of equations $px^2 + qx + r = 0$ and $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$
(A) p (B) q (C) r (D) 1

14. In which of the following functions is Rolle's theorem applicable ?
(A) $f(x) = \begin{cases} x, & 0 \le x < 1 \\ 0, & x = 1 \end{cases}$ on [0, 1]
(B) $f(x) = \begin{cases} \frac{\sin x}{x}, & -\pi \le x < 0 \\ 0, & x = 0 \end{cases}$ on [–π, 0]
(C) $f(x) = \frac{x^2 - x - 6}{x - 1}$ on [–2, 3]
(D) $f(x) = \begin{cases} \frac{x^3 - 2x^2 - 5x + 6}{x - 1}, & \text{if } x \ne 1 \\ -6, & \text{if } x = 1 \end{cases}$ on [–2, 3]

15. A lamp of negligible height is placed on the ground ℓ_1 away from a wall. A man ℓ_2 m tall is walking at a speed of $\frac{\ell_1}{10}$ m/s from the lamp to the nearest point on the wall. When he is midway between the lamp and the wall, the rate of change in the length of this shadow on the wall is
(A) $-\frac{5\ell}{2} m/s$ (B) $-\frac{2\ell_2}{5} m/s$ (C) $-\frac{\ell_2}{2} m/s$ (D) $-\frac{\ell_2}{5} m/s$

Space for rough work

16. The number of points on the rectangle $\{(x, y) \mid -12 \le x \le 12 \text{ and } -3 \le y \le 3\}$ which lie on the curve $y = x + \sin x$ and at which the tangent to the curve is parallel to the x-axis is
(A) 0 (B) 2 (C) 4 (D) 8

17. A continuous and differentiable function $y = f(x)$ is such that its graph cuts line $y = mx + c$ at n distinct points. Then the minimum number of points at which $f''(x) = 0$ is/are
(A) $n - 1$ (B) $n - 3$ (C) $n - 2$ (D) none of these

18. The tangent to the curve $y = e^{kx}$ at a point (0, 1) meets the x–axis at (a, 0), where $a \in [-2, -1]$. Then $k \in$
(A) $\left[-\frac{1}{2}, 0\right]$ (B) $\left[-1, -\frac{1}{2}\right]$ (C) [0, 1] (D) $\left[\frac{1}{2}, 1\right]$

19. Let f be a continuous, differentiable, and bijective function. If the tangent to $y = f(x)$ at $x = a$ is also the normal to $y = f(x)$ at $x = b$, then there exists at least one $c \in (a, b)$ such that
(A) $f'(c) = 0$ (B) $f'(c) > 0$ (C) $f'(c) < 0$ (D) none of these

20. If P(x) is a polynomial of degree less than or equal to 2 and S is the set of all such polynomials so that $P(0) = 0$, $P(1) = 1$, and $P'(x) > 0 \ \forall \in [0, 1]$, then
(A) $S = \phi$ (B) $S = ax + (1 - a)x^2 \ \forall a \in (0, 2)$
(C) $S = ax + (1 - a)x^2 \ \forall a \in (0, \infty)$ (D) $S = ax + (1 - a)x^2 \ \forall a \in (0, 1)$

21. If $f: R \to R$ is a twice differentiable function such that $f''(x) > 0$ for all $x \in R$, and $f\left(\frac{1}{2}\right) = \frac{1}{2}$, $f(1) = 1$, then
(A) $0 < f'(1) \le \frac{1}{2}$ (B) $f'(1) \le 0$ (C) $f'(1) > 1$ (D) $\frac{1}{2} < f'(1) \le 1$

22. If $f(x) = x^{\alpha} \log x$ and $f(0) = 0$, then the value of α for which Rolle's theorem can be applied in [0, 1] is
(A) –2 (B) –1 (C) 0 (D) $\frac{1}{2}$

23. Tangents are drawn to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, (a > b), and the circle $x^2 + y^2 = a^2$ at the points where a common ordinate cuts them (on the same side of the x-axis). Then the greatest acute angle between these tangents is given by
(A) $\tan^{-1}\left(\frac{a-b}{2\sqrt{ab}}\right)$ (B) $\tan^{-1}\left(\frac{a+b}{2\sqrt{ab}}\right)$ (C) $\tan^{-1}\left(\frac{2ab}{\sqrt{a-b}}\right)$ (D) $\tan^{-1}\left(\frac{2ab}{\sqrt{a+b}}\right)$

Space for rough work

24. Let P be any point on a directrix of an ellipse of eccentricity e, S be the corresponding focus, and C the centre of the ellipse. The line PC meets the ellipse at A. The angle between PS and tangent at A is α. Then α is equal to

(A) $\tan^{-1}e$ (B) $\frac{\pi}{2}$ (C) $\tan^{-1}(1 - e^2)$ (D) none of these

25. If tangents PQ and PR are drawn from a point on the circle $x^2 + y^2 = 25$ to the ellipse $\frac{x^2}{4} + \frac{y^2}{b^2} = 1$, (b < 4), so that the fourth vertex S of parallelogram PQSR lies on the circumcircle of triangle PQR, then the eccentricity of the ellipse is

(A) $\frac{\sqrt{5}}{4}$ (B) $\frac{\sqrt{7}}{3}$ (C) $\frac{\sqrt{7}}{4}$ (D) $\frac{\sqrt{5}}{3}$

26. If the ellipse $\frac{x^2}{a^2 - 7} + \frac{y^2}{13 - 5a} = 1$ is inscribed in a square of side length $\sqrt{2}a$, then a is equal to

(A) $\frac{6}{5}$ (B) $\left(-\infty, -\sqrt{7}\right) \cup \left(\sqrt{7}, \frac{13}{5}\right)$

(C) $\left(-\infty, -\sqrt{7}\right) \cup \left(\frac{13}{5}, \sqrt{7}\right)$ (D) no such a exists

27. If $\int x^5 (1 + x^3)^{2/3}\, dx = A(1 + x^3)^{8/3} + B(1 + x^3)^{5/3} + c$, then

(A) $A = \frac{1}{4}, B = \frac{1}{5}$ (B) $A = \frac{1}{8}, B = -\frac{1}{5}$ (C) $A = -\frac{1}{8}, B = \frac{1}{5}$ (D) none of these

28. $\int \frac{\sec x\, dx}{\sqrt{\sin(2x + A) + \sin A}}$ is equal to

(A) $\frac{\sec A}{\sqrt{2}}\sqrt{\tan x \cos A - \sin A} + C$ (B) $\sqrt{2} \sec A \sqrt{\tan x \cos A - \sin A} + C$

(C) $\sqrt{2} \sec A \sqrt{\tan x \cos A + \sin A} + C$ (D) none of these

Space for rough work

29. $\int \frac{2\sin x}{(3+\sin 2x)}$ dx is equal to

(A) $\frac{1}{2}\ln\left|\frac{2+\sin x-\cos x}{2-\sin x+\cos x}\right|-\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\sin x+\cos x}{\sqrt{2}}\right)+C$

(B) $\frac{1}{2}\ln\left|\frac{2+\sin x-\cos x}{2-\sin x+\cos x}\right|-\frac{1}{2\sqrt{2}}\tan^{-1}\left(\frac{\sin x+\cos x}{\sqrt{2}}\right)+C$

(C) $\frac{1}{4}\ln\left|\frac{2+\sin x-\cos x}{2-\sin x+\cos x}\right|-\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\sin x+\cos x}{\sqrt{2}}\right)+C$

(D) none of these

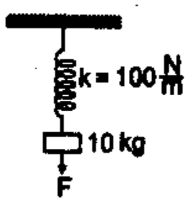
30. $\int e^{\tan^{-1}x}\left(1+x+x^2\right)$ d($\cot^{-1}x$) is equal to

(A) $-e^{\tan^{-1}x}+C$ (B) $e^{\tan^{-1}x}+C$ (C) $-xe^{\tan^{-1}x}+C$ (D) $xe^{\tan^{-1}x}+C$

31. A particle moves on a rough horizontal ground with some initial velocity say v_0. If 3/4th of its kinetic energy is lost in friction in time t_0. Then coefficient of friction between the particle and the ground is :

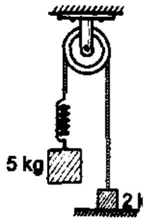
(A) $\frac{v_0}{2gt_0}$ (B) $\frac{v_0}{4gt_0}$ (C) $\frac{3v_0}{4gt_0}$ (D) $\frac{v_0}{gt_0}$

32. A vertical spring of force constant 100 N/m is attached with a hanging mass of 10 kg. Now an external force is applied on the mass so that the spring Is stretched by additional 2m. The work done by the force F is :(g = 10 m/s^2)



(A) 200 J (B) 400 J (C) 450 J (D) 600 J

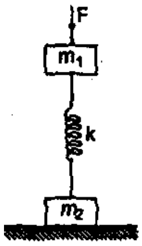
33. System shown in figure is released from rest with the spring un-elongated. Pulley and spring Is massless and friction is absent everywhere. The speed of 5 kg block when 2 kg block just leaves contact with ground is : (Take force constant of spring k = 40 N/m and g = 10 m/s^2)



(A) $\sqrt{2}$ m/s (B) 2$\sqrt{2}$ m/s (C) 2 m/s (D) 4$\sqrt{2}$ m/s

Space for rough work

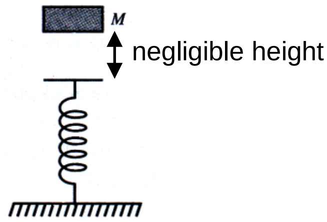
34. A system consists of two cubes of masses m_1 and m_2 respectively connected by a spring of force constant k. The force (F) that should be applied to the upper cube for which the lower one just lifts after the force is removed is:



(A) m_1g (B) $\frac{m_1m_2}{m_1+m_2}g$ (C) $(m_1 + m_2)g$ (D) m_2g

35. One end of a light spring of force constant k is fixed to a wall and the other end is tied to a block placed on a smooth horizontal surface. In a displacement, the work done by the spring is $\frac{1}{2}kx^2$. The possible case(s) may be :
(A) the spring was Initially stretched by a distance 2x and finally was in its natural length
(B) the spring was initially in its natural length and finally it was compressed by a distance x
(C) the spring was initially compressed by a distance x and finally was in its natural length
(D) the spring was initially in its natural length and finally stretched by a distance x

36. A block of mass M kg is dropped onto a vertical spring with force constant k N/m. The block sticks to the spring, and the spring compresses x metre before coming momentarily to rest. While the spring is being compressed, the work done by the force of gravity is



(A) Mgx (B) $\frac{1}{2}kx^2$ (C) $-\frac{1}{2}kx^2$ (D) $Mgx + \frac{1}{2}kx^2$

37. A ball is dropped from a height of 20 cm. Ball rebounds to a height of 10 cm. What is the percentage loss of energy?
(A) 25% (B) 75% (C) 50% (D) 100%

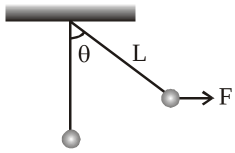
Space for rough work

38. A block of mass m slides down a rough inclined plane of inclination θ with horizontal with zero initial velocity. The coefficient of friction between the block and the plane is μ with $\theta > \tan^{-1}(\mu)$. Rate of work done by the force of friction at time t is
(A) $\mu mg^2 t \sin\theta$ (B) $mg^2 t(\sin\theta - \mu\cos\theta)$
(C) $\mu mg^2 t \cos\theta(\sin\theta - \mu\cos\theta)$ (D) $\mu mg^2 t\cos\theta$

39. A body is moving up an inclined plane of angle θ with an initial kinetic energy E. The coefficient of friction between the plane and the body is μ. The work done against friction before the body comes to rest is
(A) $\frac{\mu\cos\theta}{E\cos\theta+\sin\theta}$ (B) $\mu E\cos\theta$ (C) $\frac{\mu E\cos\theta}{E\cos\theta-\sin\theta}$ (D) $\frac{\mu E\cos\theta}{E\cos\theta+\sin\theta}$

40. A ball whose KE is E_1 is thrown at an angle of 45^o with the horizontal; its KE at the height point of its flight will be
(A) E (B) $E/\sqrt{2}$ (C) E/2 (D) zero

41. An object of mass m is tied to a string of length ℓ and a variable horizontal force is applied on it which is initially zero and gradually increases until the string makes an angle θ with the vertical. Work done by the force F is :



(A) $mg\ell(1-\sin\theta)$ (B) $mg\ell$ (C) $mg\ell(1-\cot\theta)$ (D) $mgl(1-\cos\theta)$

42. A particle moves along the x – axis from x = 0 to x =5 m under the influence of a force given by $F = 7 - 2x + 3x^2$. The work done in the process (in J) is :
(A) 70 (B) 270 (C) 35 (D) 135

43. A force $\vec{F} = -K(y\hat{i} + \hat{j})$ (where K is a positive constant) acts on a particle moving in the xy–plane. Starting from the origin, the particle is taken along the positive x–axis to the point (0,0) and then parallel to the y – axis to the point (a,a).
The total work done by the force $\vec{F}$ on the particle is
(A) $-2Ka^2$ (B) $2Ka^2$ (C) $-Ka^2$ (D) Ka^2

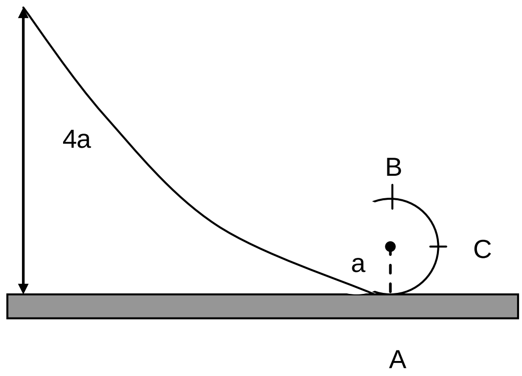
Space for rough work

44. A motor of power P_0 is used to deliver water at a certain rate through a given horizontal pipe. To increase the rate of flow of water through the same pipe n times, the power of motor is increased to P_1. The ratio of P_1 and P_0 is
(A) n:1 (B) $n^2:1$ (C) $n^3:1$ (D) $n^4:1$

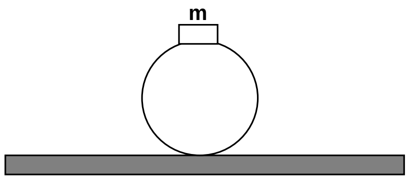
45. When the kinetic energy of a body is doubled, its momentum increase by … times.
(A) $\sqrt{2}$ (B) 2 (C) 4 (D) $2\sqrt{2}$

46. A particle moves in a straight line with retardation proportional to its displacement. Its loss of kinetic energy for any displacement x is proportional to
(A) x^2 (B) e^x (C) x (D) $\log_e^x$

47. Fig shows a smooth path, the section ACB of which is part of a vertical circle of radius 'a'. An object of mass 'm' is released from the highest point of path at height '4a'. Resultant force acting on the object when it is at C, is
(A) $\sqrt{52}$ mg (B) $\sqrt{47}$ mg
(C) $\sqrt{37}$ mg (D) $\sqrt{69}$ mg



48. Fig shows at large frictionless sphere of radius 'R'. The sphere is fixed on the ground. A mass 'm' begins to slide on the sphere from the top of it. Height from the ground where the object leaves contact with the sphere is
(A) $\frac{7}{5}R$ (B) $\frac{9}{4}R$
(C) $\frac{12}{7}R$ (D) $\frac{5}{3}R$



49. A 2 kg block slides on a horizontal floor with a speed of 4 m/s. It strikes a uncompressed spring and compresses it till the block is motionless. The kinetic friction force is 15 N and spring constant is 10,000 N/m. The spring compresses by
(A) 5.5 cm (B) 2.5 cm (C) 11.0 cm (D) 8.5 cm

Space for rough work

50. A simple pendulum with a bob of mass m swings with angular amplitude of 60°. When its angular displacement 30°, find the tension of string.

(A) $\frac{mg}{2}$ (B) $\frac{3\sqrt{3}mg}{2}$ (C) $\frac{mg}{2}\left(3\sqrt{3}-2\right)$ (D) $\frac{\sqrt{3}mg}{2}$

51. One end of a string of length 50 cm is tied to a stone of mass 200 g and the other end is tied to a small pivot on a frictionless vertical board. It is to be whirled in a vertical circle with the pivot as the centre. If g = 10 ms^{-2}, what minimum horizontal velocity must be imparted to the stone hanging vertically to take it to the top of the circle, without the string becoming slack?

(A) $\sqrt{5}$ ms^{-1} (B) 5 ms^{-1} (C) $\sqrt{10}$ ms^{-1} (D) 10 ms^{-1}

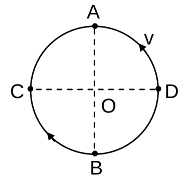
52. One end of a string of length 50 cm is tied to a stone of mass 200 g and the other end is tied to a small pivot on a frictionless vertical board. It is to be whirled in a vertical circle with the pivot as the centre. If g = 10 ms^{-2}, if the horizontal velocity of 5 ms^{-1} is imparted to the stone when it is hanging vertically, what will be the velocity of the stone when it is at the top of the circle?

(A) zero (B) $\sqrt{3}$ ms^{-1} (C) 2 ms^{-1} (D) $\sqrt{5}$ ms^{-1}

53. One end of a string of length 50 cm is tied to a stone of mass 200 g and the other end is tied to a small pivot on a frictionless vertical board. It is to be whirled in a vertical circle with the pivot as the centre. If g = 10 ms^{-2}, if it is imparted a velocity of 5 m/s at its lowest point, what is the tension in the string when the stone is at the top of the circle?

(A) zero (B) 6 N (C) 12 N (D) 18 N

54. One end of a string of length 1.0 m is tied to a body of mass 0.5 kg. It is whirled in a vertical circle as shown in figure. If the angular frequency of the body is 4 rad s^{-1}, what is the tension in the string when the body is at the topmost point A? (take g = 10 ms^{-2})



(A) 3 N (B) 8 N (C) 13 N (D) 18N

55. A bucket tied at the end of a 1.6 m long string is whirled in a vertical circle with constant speed. What should be the minimum speed so that the water from the bucket does not spill, when the bucket is at the highest position (Take $g = 10 m/\sec^2$)

(A) 4 *m/sec* (B) 6.25 *m/sec* (C) 16 *m/sec* (D) None of the above

56. A 1 *kg* stone at the end of 1 *m* long string is whirled in a vertical circle at constant speed of 4 *m/sec*. The tension in the string is 6 *N*, when the stone is at (g = 10 m/sec^2)

(A) Top of the circle (B) Bottom of the circle (C) Half way down (D) None of the above

Space for rough work

57. A body slides down a frictionless track which ends in a circular loop of diameter D, then the minimum height h of the body in term of D so that it may just complete the loop, is
(A) $h = \frac{5D}{2}$ (B) $h = \frac{5D}{4}$ (C) $h = \frac{3D}{4}$ (D) $h = \frac{D}{4}$

58. A particle is moving in a plane and whose acceleration and velocity are given by $\vec{a} = (\hat{i} + \hat{j}) m/s^2$ and $\vec{v} = (4\hat{i} + 3\hat{j}) m/s$ respectively. The tangential acceleration of the particle is
(A) 0 (B) $\frac{1}{5}(\hat{i} + \hat{j})$ (C) $\frac{7}{25}(4\hat{i} + 3\hat{j})$ (D) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

59. A stone of mass 1 kg tied to a light inextensible string of length L = 10/3 meter is whirled in circular path in a vertical plane. If the ratio of maximum to minimum tension is 4, the speed of the stone at the highest point of the circle will be:
(A) 20 m/s (B) $10\sqrt{3} m/s$ (C) $5\sqrt{2} /s$ (D) 10 m/s

60. A pendulum consists of a wooden bob of mass *m* and length *l*. A bullet of mass m_1 is fired towards the pendulum with a speed v_1. The bullet emerges out of the bob with a speed $\frac{v_1}{3}$, and the bob just completes motions along a vertical circle. Then v_1 is
(A) $\left(\frac{m}{m_1}\right) \sqrt{5gl}$ (B) $\frac{3}{2}\left(\frac{m}{m_1}\right) \sqrt{(5gl)}$ (C) $\frac{2}{3}\left(\frac{m_1}{m}\right)\sqrt{(5gl)}$ (D) $\left(\frac{m_1}{m}\right) \sqrt{(gl)}$

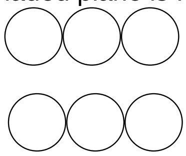
61. Tetragonal crystal system has the following unit cell dimensions
(A) $a = b = c$, $\alpha = \beta = \gamma = 90^0$ (B) $a = b \neq c$, $\alpha = \beta = \gamma = 90^0$
(C) $a \neq b \neq c$, $\alpha = \beta = \gamma = 90^0$ (D) $a = b \neq c$, $\alpha = \beta = 90^0$ $\gamma = 120^0$

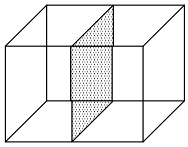
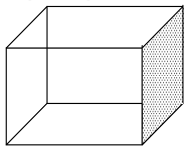
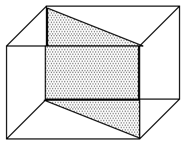
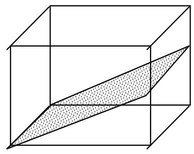
62. The radius of an atom of an element is 500 pm, if it crystallizes as a face–centred cubic lattice, the length of the side of unit cell is
(A) 176.8 pm (B) 1154.7 pm (C) 1414 pm (D) 1000 pm

63. Choose the correct statements regarding the defects in solid
(I) Frenkel defect decreases the density of solids
(II) Whatever is the defect in solid, the total positive and negative charges will be equal
(III) NaCl on strong heating with sodium forms a yellow coloured compound which is an example for the solids having F-centres
(IV) Schottky defect is a dislocation defect
(A) I & II (B) II & III (C) I & III (D) III & IV

Space for rough work

64 Which of the following shaded plane is fcc lattice contains arrangement of atoms as shown by circles



(A)

(B)

(C)

(D)


65. The fraction of the edge not covered in BCC structure is
(A) 0.134 (B) 0.268 (C) 0.866 (D) 0.66

66. Graphite has HCP arrangement of carbon atoms and parallel planar are 3.35Å apart from each other. The density of unit cell will be
(A) 0.4 gm/cm^3 (B) 0.8 gm/cm^3 (C) 1.2 gm/cm^3 (D) 1.6 gm/cm^3

67. A mineral having the formula AB_2 crystallises in the ccp, lattice, with A atoms occupied the lattice point. The CN of A is 8 and that of B is 4, what percentage of the tetrahedral sites is occupied by B atoms.
(A) 25% (B) 50% (C) 75% (D) 100%

68. The radius of Na^+ is 95 pm and that of Cl^- ion is 181 pm. Predict the C.N of Na^+
(A) 4 (B) 6 (C) 8 (D) Unpredictable

69. An alloy of copper, silver and gold is found to have copper constituting ccp lattice. If silver atoms occupy the edge centres and gold is present as body centre, the formula of the alloy is:
(A) Cu_4Ag_2Au (B) Cu_4Ag_4Au (C) Cu_4Ag_3Au (D) CuAgAu

70. In a face centered cubic arrangement of X and Y atoms, whose Y atoms are at the corner of the unit cell and X-atoms at the face centers. One of the X-atoms is missing from one of the faces in the unit cell. The simplest formula of the compound is
(A) X_5Y_2 (B) X_2Y_5 (C) XY_3 (D) X_3Y

71. CsCl has bcc structure with Cs^+ at the centre and Cl^- ion at each corner. If r_{Cs^+} = 1.69Å and r_{Cl^-} = 1.81Å, what is the edge length "a" of the cube?
(A) 3.50Å (B) 3.80Å (C) 4.04Å (D) 4.50Å

Space for rough work

72. A mineral having the formula AB_2 crystallizes in ccp lattice with A atoms occupying the lattice points. Pick out the correct statements of the following.
(A) 100% occupancy of tetrahedral voids, C.N. of B = 4
(B) 100% occupancy of octahedral voids, C.N. of B = 4
(C) 50% occupancy of tetrahedral voids, C.N. of A = 4
(D) 100% occupancy of octahedral voids, C.N. of A = 4

73. Which of the following is not a covalent crystal?
(A) Diamond (B) Solid CO_2 (C) Si (D) SiO_2

74. NH_4Cl crystallizes in a body–centred cubic lattice with edge length of unit cell equal to 387 pm. If the radius of the Cl^- ion is 181 pm, radius of NH_4^+ ion is
(A) 154.1 pm (B) 92.6 pm (C) 366.3 pm (D) none of these

75. Which of crystal systems contains the maximum number of Bravais lattices ?
(A) Cubic (B) Hexagonal (C) Triclinic (D) Orthorhombic

76. A gas cylinder withstands a pressure of 14.9 atm. Its pressure gauze indicates 12 atm at 27°C. If the building catches fire suddenly, at what temperature the cylinder explodes ?
(A) 9.95°C (B) 0.995°C (C) 1.990°C (D) 99.5°C

77. A car tyre has a volume of 10 litre when inflated. The tyre is inflated to a pressure of 3 atm at 17º C with air. Due to driving the temperature of the tyre increases to 47º C. How many litres of air measured at 47º C and pressure of 1 atm should be let out to restore the tyre to 3 atm at 47ºC?
A) 3.1 litre B) 6.2 litre C) 1.55 litre D) 9.3 litre

78. The pressure exerted by 12 g of an ideal gas at temperature tºC in a vessel of V litre is one atmosphere. When the temperature is increased by 10ºC at the same volume, the pressure increases by 10%. Calculate volume at same temperature tºC (Molecular mass of the gas = 120).
A) 0.82 litre B) 1.5 litre C) 8.2 litre D) 82.1 litre

79. One mole of nitrogen gas at 0.8 atm takes 38 second to diffuse through a pin hole whereas one mole of an unknown compound of xenon with fluorine at 1.6 atm takes 57 second to diffuse through the same hole. The molecular formula of the compound is (A. wt of Xe = 131)
(A) XeF_6 (B) XeF_4 (C) XeF_2 (D) XeF_8

Space for rough work

80. 2 L of SO_2 gas at 760 mm Hg are transferred to 10 L flask containing oxygen at a particular temperature, the partial pressure of SO_2 in the flask is
(A) 63.33 mm Hg (B) 152 mm Hg (C) 760 mm Hg (D) 1330 mm Hg

81. The density of a gas A is twice that of a gas B at the same temperature. The molecule mass of gas B is thrice that of A. The ratio of the pressure acting on A and B will be
(A) 6 : 1 (B) 7 : 8 (C) 2 : 5 (D) 1 : 4

82. For a given mass of an ideal gas, pV is plotted against T. The graph shows a
(A) straight line passing through the origin (B) straight the intercepting both axes
(C) straight line parallel to the T–axis (D) rectangular hyperbola

83. At a constant pressure, what should be the percentage increase in the temperature in Kelvin for a 10% increase in volume ?
(A) 10% (B) 20% (C) 5% (D) 50%

84. The compressibility factor of a gas is less than unity at STP. Therefore molar volume (V_m)
a) $V_m > 22.4lit$ b) $V_m < 22.4lit$ c) $V_m = 22.4lit$ d) $V_m = 44.8lit$

85. Van der Waal's constants of two gases X and Y are as given :

	a (litre – atm mol^{-2})	b (litre mol^{-1})
Gas X	5.6	0.065
Gas Y	5.1	0.012

What is correct about the two gases ?
(A) $T_c(X) > T_c(Y)$ (B) $T_c(X) = T_c(Y)$
(C) $V_c(X) > V_c(Y)$ (D) $V_c(Y) > V_c(X)$

86. Select the correct statements about van der Waal's constant 'b'.
1. It is excluded volume
2. Its unit is mol litre^{-1}
3. It depends on intermolecular force
4. Its value depends on molecular size
(A) 2, 3 (B) 1, 2, 4 (C) 2, 3, 4 (D) 3, 4

Space for rough work

87. When 100 ml ozonised oxygen is passed through turpentine oil, there was a reduction of volume by 20 ml. If 100 ml of such mixture is heated what will be the increase in volume.
(A) 10 ml (B) 20 ml (C) 40 ml (D) No change in volume

88. Compressibility factor for a gas under critical condition is :
(A) 3/8 (B) 8/3 (C) 1 (D) ¼

89. A balloon filled with N_2O is pricked with a sharper point and plunged into a tank of CO_2 under the same pressure and temperature. The balloon will :
(A) be enlarged (B) shrink
(C) collapse completely (D) remain unchanged in size

90. Which of the following statement is true?
(A) If $Z > 1$, the forces dominating among the gas molecules are attractive and gas is more compressible.
(B) If $Z > 1$, the forces dominating among the gas molecules are repulsive and gas is more compressible.
(C) If $Z > 1$, the forces dominating among the gas molecules are repulsive and gas is less compressible.
(D) If $Z > 1$, the forces dominating among the molecules are attractive and gas is less compressible.

Space for rough work

FIITJEE PET – V (EXTENDED)
MAINS_ANSWERS
DATE: 08.09.2018

MATHEMATICS

1.	**C**	2.	**C**	3.	**C**	4.	**D**
5.	**C**	6.	**A**	7.	**B**	8.	**C**
9.	**C**	10.	**C**	11.	**A**	12.	**Bonus**
13.	**D**	14.	**D**	15.	**B**	16.	**A**
17.	**C**	18.	**D**	19.	**Bonus**	20.	**B**
21.	**C**	22.	**D**	23.	**A**	24.	**B**
25.	**Bonus**	26.	**D**	27.	**B**	28.	**C**
29.	**C**	30.	**C**				

PHYSICS

31.	**A**	32.	**A**	33.	**B**	34.	**C**
35.	**C**	36.	**Bonus**	37.	**C**	38.	**C**
39.	**Bonus**	40.	**C**	41.	**D**	42.	**D**
43.	**Bonus**	44.	**C**	45.	**A**	46.	**A**
47.	**C**	48.	**D**	49.	**A**	50.	**C**
51.	**B**	52.	**D**	53.	**A**	54.	**A**
55.	**A**	56.	**A**	57.	**B**	58.	**C**
59.	**D**	60.	**B**				

CHEMISTRY

61.	**B**	62.	**C**	63.	**B**	64.	**C**
65.	**A**	66.	**A**	67.	**D**	68.	**B**
69.	**C**	70.	**A**	71.	**C**	72.	**A**
73.	**B**	74.	**A**	75.	**D**	76.	**D**
77.	**A**	78.	**A**	79.	**A**	80.	**Bonus**
81.	**A**	82.	**A**	83.	**A**	84.	**B**
85.	**C**	86.	**Bonus**	87.	**A**	88.	**A**
89.	**C or D**	90.	**C**				