1. Let 'E' be the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ & 'C' be the circle $x^2+y^2=9$. Let P & Q be the points (1 , 2) and (2, 1) respectively. Then :

(A) Q lies inside C but outside E
(B) Q lies outside both C & E
(C) P lies inside both C & E
(D) P lies inside C but outside E.

2. The eccentricity of the ellipse $(x-3)^2+(y-4)^2=\frac{y^2}{9}$ is

(A) $\frac{\sqrt{3}}{2}$
(B) $\frac{1}{3}$
(C) $\frac{1}{3\sqrt{2}}$
(D) $\frac{1}{\sqrt{3}}$

3. The equation, $2x^2+3y^2-8x-18y+35=K$ represents

(A) no locus if $K>0$
(B) an ellipse if $K<0$
(C) a point if $K=0$
(D) a hyperbola if $K>0$

4. If the ellipse $\frac{(x-h)^2}{M}+\frac{(y-k)^2}{N}=1$ has major axis on the line $y=2$, minor axis on the line $x=-1$, major axis has length 10 and minor axis has length 4. The number h,k,M,N (in this order only) are -

(A) –1,2,5,2
(B) –1,2,10,4
(C) 1,–2,25,4
(D) –1,2,25,4

5. A circle has the same centre as an ellipse & passes through the foci F_1 & F_2 of the ellipse, such that the two curves intersect in 4 points. Let 'P' be any one of their point of intersection. If the major axis of the ellipse is 17 & the area of the triangle PF_1F_2 is 30, then the distance between the foci is :

(A) 11
(B) 12
(C) 13
(D) none

6. The latus rectum of a conic section is the width of the function through the focus. The positive difference between the length of the latus rectum of $3y=x^2+4x-9$ and $x^2+4y^2-6x+16y=24$ is-

(A) $\frac{1}{2}$
(B) 2
(C) $\frac{3}{2}$
(D) $\frac{5}{2}$

7. Imagine that you have two thumbtacks placed at two points, A and B. If the ends of a fixed length of string are fastened to the thumtacks and the string is drawn taut with a pencil, the path traced by the pencil will be an ellipse. The best way to maximise the area surrounded by the ellipse with a fixed length of string occurs when

I the two points A and B have the maximum distance between them.
II two points A and B coincide.
III A and B are placed vertically.
IV The area is always same regardless of the location of A and B .

(A) I
(B) II
(C) III
(D) IV

8. Let S(5,12) and S'(–12,5) are the foci of an ellipse passing through the origin. The eccentricity of ellipse equals -

(A) $\frac{1}{2}$
(B) $\frac{1}{\sqrt{3}}$
(C) $\frac{1}{\sqrt{2}}$
(D) $\frac{2}{3}$

9. The y-axis is the directrix of the ellipse with eccentricity $e=1/2$ and the corresponding focus is at (3, 0), equation to its auxiliary circle is

(A) $x^2+y^2-8x+12=0$
(B) $x^2+y^2-8x-12=0$
(C) $x^2+y^2-8x+9=0$
(D) $x^2+y^2=4$

10. Equation of the common tangent to the ellipses, $\frac{x^2}{a^2+b^2}+\frac{y^2}{b^2}=1$ and $\frac{x^2}{a^2}+\frac{y^2}{a^2+b^2}=1$ is -

(A) $ay = bx + \sqrt{a^4 - a^2b^2 + b^4}$ (B) $by = ax - \sqrt{a^4 + a^2b^2 + b^4}$

(C) $ay = bx - \sqrt{a^4 + a^2b^2 + b^4}$ (D) $by = ax + \sqrt{a^4 - a^2b^2 + b^4}$

11. $x - 2y + 4 = 0$ is a common tangent to $y^2 = 4x$ & $\frac{x^2}{4}+\frac{y^2}{b^2}=1$. Then the value of b and the other common tangent are given by :

(A) $b = \sqrt{3}$; $x + 2y + 4 = 0$ (B) $b = 3$; $x + 2y + 4 = 0$

(C) $b = \sqrt{3}$; $x + 2y - 4 = 0$ (D) $b = \sqrt{3}$; $x - 2y - 4 = 0$

12. If α & β are the eccentric angles of the extremities of a focal chord of an standard ellipse, then the eccentricity of the ellipse is :

(A) $\frac{\cos\alpha + \cos\beta}{\cos(\alpha+\beta)}$ (B) $\frac{\sin\alpha - \sin\beta}{\sin(\alpha-\beta)}$ (C) $\frac{\cos\alpha - \cos\beta}{\cos(\alpha-\beta)}$ (D) $\frac{\sin\alpha + \sin\beta}{\sin(\alpha+\beta)}$

13. An ellipse is inscribed in a circle and a point within the circle is chosen at random. If the probability that this point lies outside the ellipse is 2/3 then the eccentricity of the ellipse is :

(A) $\frac{2\sqrt{2}}{3}$ (B) $\frac{\sqrt{5}}{3}$ (C) $\frac{8}{9}$ (D) $\frac{2}{3}$

14. Consider the particle travelling clockwise on the elliptical path $\frac{x^2}{100}+\frac{y^2}{25}=1$. The particle leaves the orbit at the point (–8, 3) and travels in a straight line tangent to the ellipse. At what point will the particle cross the y-axis?

(A) $\left(0, \frac{25}{3}\right)$ (B) $\left(0, \frac{23}{3}\right)$ (C) (0,9) (D) $\left(0, \frac{26}{3}\right)$

15. The locus of the middle point of chords of an ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ passing through P(0, 5) is another ellipse E. The coordinates of the foci of the ellipse E, is

(A) $\left(0, \frac{3}{5}\right)$ and $\left(0, \frac{-3}{5}\right)$ (B) (0, – 4) and (0, 1)

(C) (0, 4) and (0, 1) (D) $\left(0, \frac{11}{2}\right)$ and $\left(0, \frac{-1}{2}\right)$

16. (a) Which of the following is an equation of the ellipse with centre (–2,1), major axis running from (–2,6) to (–2,–4) and focus at (–2,5) ?

(A) $\frac{(x-2)^2}{25}+\frac{(y+1)^2}{16}=1$ (B) $\frac{(x+2)^2}{25}+\frac{(y-1)^2}{9}=1$

(C) $\frac{(x-2)^2}{9}+\frac{(y+1)^2}{25}=1$ (D) $\frac{(x+2)^2}{9}+\frac{(y-1)^2}{25}=1$

(b) Which of the following statement(s) is/are correct for the ellipse of 8(a) ?

(A) auxiliary circle is $(x + 2)^2 + (y - 1)^2 = 25$

(B) director circle is $(x + 2)^2 + (y - 1)^2 = 34$

(C) Latus rectum $= \frac{18}{5}$ (D) eccentricity $= \frac{4}{5}$

17. The normal at a variable point P on an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ of eccentricity e meets the axes of the ellipse in Q and R then the locus of the mid-point of QR is a conic with an eccentricity e′ such that :

(A) e′ is independent of e (B) e′ = 1

(C) e′ = e (D) e′ = 1/e

18. The area of the rectangle formed by the perpendiculars from the centre of the standard ellipse to the tangent and normal at its point whose eccentric angle is π/4, is :

(A) $\frac{(a^2-b^2)ab}{a^2+b^2}$ (B) $\frac{(a^2-b^2)}{(a^2+b^2)ab}$ (C) $\frac{(a^2-b^2)}{ab(a^2+b^2)}$ (D) $\frac{a^2+b^2}{(a^2-b^2)ab}$

19. If P is any point on ellipse with foci S_1 & S_2 and eccentricity is $\frac{1}{2}$ such that $\angle PS_1S_2=\alpha$, $\angle PS_2S_1=\beta$, $\angle S_1PS_2=\gamma$, then $\cot\frac{\alpha}{2}$, $\cot\frac{\gamma}{2}$, $\cot\frac{\beta}{2}$ are in

(A) A.P. (B) G.P.

(C) H.P. (D) *NOT* A.P., G.P. & H.P.