MHT CET 2021 Mathematics Memory Based Question Paper PDF

1. Find $\frac{dy}{dx}$ if $x = \frac{1-t^2}{1+t^2}$ and $y = \frac{2at}{1+t^2}$.

(1) $\frac{-a^2x}{y}$

(2) $\frac{a^2x}{y}$

(3) $\frac{-x}{ay}$

(4) $\frac{x}{ay}$

2. Evaluate the integral: $\int \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right) dx$

(1) $\frac{\pi x}{4} + \frac{x^2}{4} + C$

(2) $\frac{\pi x}{4} - \frac{x^2}{4} + C$

(3) $\frac{\pi x}{2} + \frac{x^2}{2} + C$

(4) $\frac{x^2}{4} + C$

3. If a polygon has 44 diagonals, then the number of its sides are:

(1) 10

(2) 11

(3) 12

(4) 8

4. The trigonometric expression $\tan A \cdot \tan 2A \cdot \tan 3A$ is equivalent to:

(1) $\tan 3A - \tan 2A - \tan A$

(2) $\tan 3A + \tan 2A + \tan A$

(3) $\tan 3A - \tan 2A + \tan A$

(4) $\tan 3A + \tan 2A - \tan A$

5. The escape velocity of a planet whose mass is 6 times that of Earth and radius is (1/2) times that of Earth is:

(1) $\sqrt{3}v_e$

(2) $2\sqrt{3}v_e$

(3) $\sqrt{12}v_e$

(4) $2\sqrt{2}v_e$

6. Bismuth has a half-life period of 5 days. If the initial mass is 1000 mg, what mass remains after 30 days?

(1) 31.25 mg

(2) 15.625 mg

(3) 62.5 mg

(4) 7.8125 mg

7. If the unit of the rate constant of a reaction is L^2 mol^{-2} s^{-1}, the order of the reaction is:

(1) 1

(2) 2

(3) 3

(4) 0

8. Which of the following elements belongs to the oxygen family (Chalcogens)?

(1) Phosphorus

(2) Selenium

(3) Antimony

(4) Iodine

9. Which of the following compounds is considered highly acidic?

(1) $HClO$

(2) $HClO_2$

(3) $HClO_3$

(4) $HClO_4$

10. Which material is commonly used to make floor tiles?

(1) LDPE

(2) HDPE

(3) Nylon-6

(4) Terylene

11. Benzene-1,2-diol is commonly known as:

(1) Quinol
(2) Resorcinol
(3) Catechol
(4) Phloroglucinol

12. The dimensions of a rectangle of maximum area inscribed in the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ are:

(1) $5\sqrt{2}, 4\sqrt{2}$
(2) $10\sqrt{2}, 8\sqrt{2}$
(3) $5, 4$
(4) $2.5, 2$

13. Which of the following blocks of elements are known as transition elements?

(1) s-block
(2) p-block
(3) d-block
(4) f-block

14. The difference in the molecular mass between any two successive members of a homologous series is:

(1) 12 u
(2) 14 u
(3) 16 u
(4) 8 u

15. The value of the integral $\int_{-\pi}^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$ is:

(1) $\frac{\pi^2}{4}$
(2) $\frac{\pi^2}{2}$
(3) π^2
(4) 0

16. Which groups of the periodic table contain the transition elements?

(1) Groups 1 and 2

(2) Groups 13 to 18

(3) Groups 3 to 12

(4) Groups 1 to 18

17. The shortest distance between two skew lines $\vec{r} = \vec{a}_1 + \lambda\vec{b}_1$ and $\vec{r} = \vec{a}_2 + \mu\vec{b}_2$ is given by:

(1) $\frac{|(\vec{a}_2 - \vec{a}_1)\cdot(\vec{b}_1 \times \vec{b}_2)|}{|\vec{b}_1 \times \vec{b}_2|}$

(2) $\frac{|(\vec{a}_2 - \vec{a}_1)\times(\vec{b}_1 \cdot \vec{b}_2)|}{|\vec{b}_1 \times \vec{b}_2|}$

(3) $|(\vec{a}_2 - \vec{a}_1)\cdot(\vec{b}_1 \times \vec{b}_2)|$

(4) None of these

18. Find n if mean $= 18$ and $Var(X) = 12$ for a binomial distribution:

(1) 48

(2) 54

(3) 36

(4) 60

19. What is the formula for percentage atom economy?

(1) $\frac{\text{Mass of desired product}}{\text{Total mass of all products}} \times 100$

(2) $\frac{\text{Mass of reactants}}{\text{Mass of products}} \times 100$

(3) $\frac{\text{Mass of desired product}}{\text{Mass of all reactants}} \times 100$

(4) None of these

20. What is the acceleration due to gravity of an object at a distance R above the surface of earth (where R is the radius of earth)?

(1) g

(2) $g/2$

(3) $g/4$

(4) $g/9$