VMC Vidyamandir Classes SINCE 1986

IIT JEE | MEDICAL | FOUNDATION

Sample Paper	1 Year (JEE)

Duration: 2 Hrs **Maximum Marks: 200**

For Students Presently in Class 11 (Stream: Engineering)

PAPER SCHEME:

- This paper contains **50 Objective Type Questions** divided into three sections: **Section - I (Physics), Section - II (Chemistry) and Section - III (Mathematics)**.
- **Section - I** contains **15 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE is correct**.
- **Section - II** contains **15 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE is correct**.
- **Section - III** contains **20 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE is correct**..

MARKING SCHEME:

- For each question in Section-I, II and III, **4 marks** will be awarded for correct answer and **–1 negative marking** for incorrect answer.

SECTION - I [PHYSICS]

1. $\vec{A}$ and $\vec{B}$ are two vectors such that their resultant is perpendicular to $\vec{A}$ and in magnitude equal to A. Find the magnitude of vector $\vec{B}$.

(A) $A\sqrt{4}$ **(B)** $A\sqrt{3}$ **(C)** $A\sqrt{2}$ **(D)** A

2. A particle moves with a deceleration proportional to $\sqrt{v}$. Initial velocity is v_0. Find the time after which it will stop. [Given 'k' is constant of proportionality]

(A) $\frac{\sqrt{v_0}}{k}$ **(B)** $\frac{\sqrt{v_0}}{2k}$ **(C)** $\frac{2\sqrt{v_0}}{k}$ **(D)** $\frac{v_0}{k}$

3. A particle is projected from a horizontal plane with speed u at some angle. At highest point its velocity is found to be $u/2$. The maximum height of the projectile will be:

(A) $\frac{u^2}{4g}$ **(B)** $\frac{3u^2}{4g}$ **(C)** $\frac{3u^2}{8g}$ **(D)** $\frac{u^2}{8g}$

4. Consider the following statement. When jumping from a height, you should bend your knees as you come to rest on ground, instead of keeping your legs stiff. Which of the following relations can be best used in explaining this statement?

(A) $\Delta p_1 = -\Delta p_2$ **(B)** $\Delta E = -\Delta(PE + KE) = 0$

(C) $F\Delta t = m\Delta v$ **(D)** $\Delta x \le \Delta F$

5. A block is placed in an elevator moving down with a constant speed. Work done by normal force on the block is:

(A) Zero **(B)** Positive **(C)** Negative **(D)** Cannot say

6. A particle is moving eastward with a velocity of $5\,ms^{-1}$. If in $10s$ the velocity changes to $5\,ms^{-1}$ northwards, what is the average acceleration in this time ?

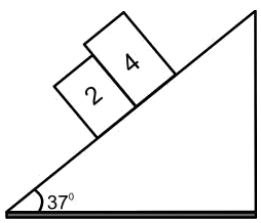
(A) $1/\sqrt{2}ms^{-2}$ North - West **(B)** $1/2ms^{-2}$ East - North

(C) $\sqrt{2}ms^{-2}$ North - West **(D)** $2\sqrt{2}ms^{-2}$ North - West

7. If the angle of projection of a particle from the horizontal is doubled keeping the speed of projection same, the particle strikes the same target on the ground, then the ratio of time of flight in the two cases will be:

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

8. In the figure shown, the wedge is fixed and the masses are released from rest. The coefficient of friction between 4 kg and wedge is 0.8 and between 2 kg and wedge is 0.6. Which of the following statement is(are) correct?



(A) $\vec{a}$ of blocks must be same **(B)** Friction force on 4 kg is 24 N

(C) Friction force on 2 kg is 12 N **(D)** Normal reactions between block is non-zero

9. The density of a material in SI unit is 128 $kg\,m^{-3}$. In certain units of length is 25 *cm* and the unit of mass is 50 *g*, the numerical value of density of the material is:

(A) 40 **(B)** 16 **(C)** 640 **(D)** 410

10. A particle has an initial velocity of 9 *m/s* due East and a constant acceleration of $2m/s^2$ due West. The distance covered by the particle in the 5th second of its motion is :

(A) Zero **(B)** 0.5 *m* **(C)** 2 *m* **(D)** None of these

11. Rain is falling vertically with a velocity of $25\,ms^{-1}$. A person rides a bicycle with a speed of $10\,ms^{-1}$ in the North to South direction. What is the direction (angle with vertical) in which he should hold his umbrella to save himself from the rain?

(A) $\tan^{-1}0.4$ **(B)** $\tan^{-1}1$ **(C)** $\tan^{-1}\sqrt{3}$ **(D)** $\tan^{-1}2.6$

12. Kinetic energy of a particle moving in a straight line varies with time *t* as $K = 4t^2$. The force acting on the particle:

(A) is constant **(B)** is increasing

(C) is decreasing **(D)** first increases and then decreases

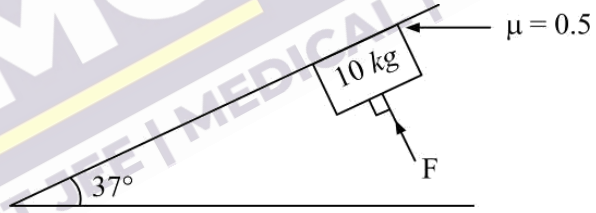
13. Natural length of a massless spring (of spring constant *k*) is *x*. It is slowly stretched by applying an external force. What is the work done in slowly stretching it from length 3*x* to 4*x*?

(A) $1.5kx^2$ **(B)** $2.5kx^2$ **(C)** $3.5kx^2$ **(D)** $4.5kx^2$

14. Two bodies of mass 10 *kg* and 5 *kg* moving in concentric orbits of radii *R* and *r* such that their periods are same. Then the ratio between their centripetal accelerations is :

(A) R/r **(B)** r/R **(C)** R^3/r^3 **(D)** r^3/R^3

15. In the figure shown, the minimum force *F* to be applied perpendicular to the incline so that the block does not slide is:



(A) 0 **(B)** 40 *N* **(C)** 120 *N* **(D)** 200 *N*

SECTION - II [CHEMISTRY]

16. Which of the following is hypovalent species?

(A) AlF_3 **(B)** $SiCl_4$ **(C)** SF_4 **(D)** $AlCl_3$

17. Which of the following contains ionic bond, covalent bond and a co-ordinate bond?

(A) Na_2O_2 **(B)** NH_4Cl **(C)** NaCl **(D)** CH_3COOH

18. 2 moles of an ideal gas at 27°C expands isothermally and reversibly from a volume of 4 litre to 40 litre. The work done (in kJ) by the gas is:

(A) w = –28.72 kJ **(B)** w = –11.488 kJ

(C) w = –5.736 kJ **(D)** w = –4.988 kJ

19. The elements X (atomic mass = 75) and Y (atomic mass = 16) combine to give a compound having 75.75% of X. The formula of the compound is:

(A) XY **(B)** X_2Y **(C)** X_2Y_2 **(D)** X_2Y_3

20. 0.1 M HCl and 0.2 M H_2SO_4 solutions are mixed in equal volume. This solution is diluted to double the volume. 20 mL of this diluted solution can neutralise *x* mL of 0.1 M NaOH solution. Find *x*.

(A) 20 mL **(B)** 40 mL **(C)** 50 mL **(D)** 25 mL

21. The entropy change involved in isothermal reversible expansion of 2 moles of an ideal gas from a volume of $10\ dm^3$ to a volume of $100\ dm^3$ at 27°C is:

(A) $42.3\,J\,mol^{-1}K^{-1}$ **(B)** $38.3\,J\,mol^{-1}\,K^{-1}$

(C) $35.8\,J\,mol^{-1}\,K^{-1}$ **(D)** $32.3\,J\,mol^{-1}\,K^{-1}$

22. O_2 is oxidised to $O_2^{\oplus}$. The change in bond order of $O-O$ bond is equal to:

(A) 2.5 **(B)** 0.5 **(C)** 1 **(D)** 2

23. Normality of 0.2 M $Ca_3(PO_4)_2$ solution is:

(A) 0.2 N **(B)** 0.6 N **(C)** 0.8 N **(D)** 1.2 N

24. In which of the following case, would the probability of finding an electron residing in a d_{xy} orbital be zero?

(A) xy and yz planes **(B)** xy and xz planes

(C) xz and yz planes **(D)** z-direction, yz and xz planes

25. Suppose 10^{-17} J of energy is needed by interior of human eye to see an object. How many photons of green light (λ = 550 nm) are needed to generate this minimum amount of energy?

(A) 14 **(B)** 28 **(C)** 39 **(D)** 42

26. Of the following transition in hydrogen atom the one which gives an absorption line of lowest frequency is:

(A) n = 1 to n = 2 **(B)** n = 3 to n = 8 **(C)** n = 2 to n = 1 **(D)** n = 8 to n = 3

27. Orbital angular momentum for an electron in 2s orbital is:

(A) 0 **(B)** $\frac{h}{2\pi}$ **(C)** $\sqrt{6}\frac{h}{2\pi}$ **(D)** $\sqrt{2}\frac{h}{2\pi}$

28. The shape of $XeOF_2$ is:

(A) Trigonal planar **(B)** Trigonal pyramidal

(C) T-shaped **(D)** Square planar

29. The bond dissociation enthalpies of $H_2(g)$, $Cl_2(g)$ and HCl(g) are 435, 243 and $431\ kJ\ mol^{-1}$ respectively. The enthalpy of formation of HCl will be:

(A) $247\,kJ\ mol^{-1}$ **(B)** $770\,kJ\ mol^{-1}$

(C) $-1109\,kJ\ mol^{-1}$ **(D)** $-92\,kJ\ mol^{-1}$

30. The electronegativity of the following elements increase in the order:

(A) C, N, Si, P **(B)** N, Si, C, P **(C)** Si, P, C, N **(D)** P, Si, N, C

SECTION - III [MATHEMATICS]

31. If $Z_1 \neq 0$ and Z_2 be two complex numbers such that $\frac{Z_2}{Z_1}$ is a purely imaginary number, then $\left|\frac{2Z_1+3Z_2}{2Z_1-3Z_2}\right|$ is equal to :

(A) 2 **(B)** 5 **(C)** 3 **(D)** 1

32. If $z_r = \cos\frac{r\alpha}{n^2} + i\sin\frac{r\alpha}{n^2}$, where $r = 1, 2, 3, \ldots, n$, then $\lim_{n\to\infty} z_1.z_2.\ldots\ldots z_n$ is equal to:

(A) $\cos\alpha + i\sin\alpha$ **(B)** $\cos\left(\frac{\alpha}{2}\right) - i\sin\left(\frac{\alpha}{2}\right)$

(C) $e^{i\alpha/2}$ **(D)** $3\sqrt{e^{i\alpha}}$

33. Given that, $(1+\tan 1°)(1+\tan 2°)\ldots\ldots(1+\tan 45°) = 2^{\lambda}$, then $(\lambda+1)$ is divisible by :

(A) 2 **(B)** 5 **(C)** 7 **(D)** 9

34. Let α, β be the roots of the quadratic equation $ax^2+bx+c=0$, then the roots of the equation $a(x+1)^2+b(x+1)(x-2)+c(x-2)^2=0$ are :

(A) $\frac{2\alpha+1}{\alpha-1}, \frac{2\beta+1}{\beta-1}$ **(B)** $\frac{2\alpha-1}{\alpha+1}, \frac{2\beta-1}{\beta+1}$ **(C)** $\frac{\alpha+1}{\alpha-2}, \frac{\beta+1}{\beta-2}$ **(D)** $\frac{2\alpha+3}{\alpha-1}, \frac{2\beta+3}{\beta-1}$

35. The value of $x^{1/2}.x^{1/4}.x^{1/8}\ldots\ldots$ upto infinity is:

(A) x^3 **(B)** x^2 **(C)** x **(D)** x^{-1}

36. $\sum_{i=1}^{\infty}\sum_{j=1}^{\infty}\sum_{k=1}^{\infty}\frac{1}{a^{i+j+k}}$ is equal to, where $|a|>1$.

(A) $(a-1)^{-3}$ **(B)** $\frac{3}{a-1}$ **(C)** $\frac{1}{a^3-1}$ **(D)** 0

37. If A and G are arithmetic mean (AM) and geometric mean (GM) between two numbers a and b, then roots of the equation $x^2-2Ax+G^2=0$ are:

(A) $a, 2b$ **(B)** $2a, b$ **(C)** a, b **(D)** $2a, 2b$

38. The sum of the series $\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+\ldots\ldots$ to n terms is:

(A) $\frac{1}{3n-1}$ **(B)** $\frac{n}{3n+1}$ **(C)** $\frac{n}{3n-1}$ **(D)** $\frac{1}{3n+1}$

39. The number of solutions of $\cos x+\cos 2x+\cos 4x=0$, where $0\le x\le\pi$ are:

(A) 2 **(B)** 3 **(C)** 4 **(D)** 5

40. If the difference between the number of subsets of the sets A and B is 120, then choose the INCORRECT option.

(A) Maximum value of $n(A \cap B) = 3$ **(B)** Minimum value of $n(A \cap B) = 0$

(C) Maximum value of $n(A \cup B) = 21$ **(D)** Minimum value of $n(A \cup B) = 7$

41. A relation on the set $A = \{x : |x| < 3,\ x \in Z\}$, where Z is the set of integers is defined by $R = \{(x,\ y) : y = |x|,\ x \neq -1\}$. Then the number of elements in the power set of R is :

(A) 64 **(B)** 8 **(C)** 16 **(D)** 32

42. If $3p^2 = 5p + 2$ and $3q^2 = 5q + 2$, then the equation whose roots are $3p - 2q$ and $3q - 2p$ is:

(A) $x^2 - 5x + 100 = 0$ **(B)** $3x^2 - 5x - 100 = 0$

(C) $3x^2 + 5x + 100 = 0$ **(D)** $5x^2 - x + 7 = 0$

43. Let α and β are roots of $x^2 - 3x + 5 = 0$, then the value of $\dfrac{5\alpha \cdot \beta^{2016} + 3\alpha^{2017} \cdot \beta + \alpha \cdot \beta^{2018}}{\alpha^{2016} + \beta^{2016}}$ is:

(A) 5 **(B)** 15 **(C)** 40 **(D)** 25

44. If $X = \{(4^n - 3n - 1 : n \in N)\}$ and $Y = \{9(n-1) : n \in N\}$, when N is the set of natural numbers, then $X \cup Y$ is equal to :

(A) $Y - X$ **(B)** X **(C)** Y **(D)** N

45. If sum of an infinite GP is S_1 and sum of the squares of the infinite terms of same G.P. is S_2 then common ratio is given by:

(A) $\dfrac{S_1 - S_2}{S_1 + S_2}$ **(B)** $\dfrac{S_1^2 + S_2}{S_1^2 - S_2}$ **(C)** $\dfrac{S_1^2 - S_2}{S_1^2 + S_2}$ **(D)** $\dfrac{S_1^2 - S_2^2}{S_1^2 + S_2^2}$

46. $2 + 5x + 10x^2 + 17x^3 + 26x^4 + \ldots.$ upto infinite terms is: $(-1 < x < 1,\ x \neq 0)$

(A) $\dfrac{1 - x + x^2}{(1-x)^3}$ **(B)** $\dfrac{2 + x + x^2}{(1-x)^3}$ **(C)** $\dfrac{2 - x - x^2}{(1-x)^3}$ **(D)** $\dfrac{2 - x + x^2}{(1-x)^3}$

47. If $\dfrac{\sin^4 x}{2} + \dfrac{\cos^4 x}{3} = \dfrac{1}{5}$ then which of the following is not true?

(A) $\tan^2 x = \dfrac{2}{3}$ **(B)** $\dfrac{\sin^8 x}{8} + \dfrac{\cos^8 x}{27} = \dfrac{1}{125}$

(C) $\cos 2x = \dfrac{5}{13}$ **(D)** $\sin^2 3x = \dfrac{98}{125}$

48. Let $f_k(x) = \dfrac{1}{k}(\sin^k x + \cos^k x)$ where $x \in R,\ k \geq 1$ then $f_4(x) - f_6(x) =$

(A) $\dfrac{1}{4}$ **(B)** $\dfrac{1}{12}$ **(C)** $\dfrac{1}{6}$ **(D)** $\dfrac{1}{3}$

49. Complete general solution of the equation $\sin(2x).\sec(3x)=1$ is:

(A) $\frac{2n\pi}{5}+\frac{\pi}{10}$ or $(4n-1)\frac{\pi}{2}$, $n\in I$ **(B)** $\frac{2n\pi}{5}+\frac{\pi}{10}$, $n\in I$

(C) $\frac{2n\pi}{5}+\frac{\pi}{10}$, $n\in I-\{5k+1:k\in I\}$ **(D)** $\frac{2n\pi}{5}+\frac{\pi}{10}$ or $2n\pi$, $n\in I$

50. Sum of values of p such that $3x^2-2x+p=0$ and $6x^2-17x+12=0$ have a common root is:

(A) $\frac{77}{12}$ **(B)** $-\frac{77}{12}$ **(C)** $\frac{13}{12}$ **(D)** $-\frac{13}{12}$

End of Sample Paper | 1 Year (JEE)