# MITTAL CLASSES

**IIT-JEE | MEDICAL | FOUNDATION**

**Paper Code:11E-SP-1**

## SAMPLE PAPER

**Class – XI NM**          **Time:  2 Hour**          **M. Marks: 240**

*General Instructions:*

1.      Answers have to be marked on the OMR sheet.

2.      The question paper consists of 60 multiple choice questions (single correct option) divided into five sections.
      Section – A contains 20 questions (Q1 to Q20) of Physics.
      Section – B contains 20 questions (Q21 to Q40) of Chemistry.
      Section – C contains 20 questions (Q41 to Q60) of Mathematics.

3.      Each question carries **+4** marks for correct answer and **–1** mark for wrong answer.

4.      The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.

5.      Blank papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

6.      Write your Name, Father Name, Class, and Date in the space provided at the bottom of this sheet.

NAME:                _____

FATHER NAME: _____

CLASS:               _____

 DATE:                 _____

## PHYSICS

1. Which of the following does not have the dimensions of force ?
   (A) Potential gradient
   (B) Energy gradient
   (C) Weight
   (D) Rate of change of momentum

2. When a copper sphere is heated, maximum percentage change will be observed in –
   (A) radius
   (B) area
   (C) volume
   (D) none of these

3. If displacement of a particle is zero, the distance covered :
   (A) must be zero
   (B) may or may not be zero
   (C) cannot be zero
   (D) depends upon the particle

4. The velocity-time relation of an electron starting from rest is given by u = kt, where k = 2 m/s². The distance traversed in 3 sec is :
   (A) 9m
   (B) 16 m
   (C) 27 m
   (D) 36 m

5. If a train travelling at 72 km/h is to be brought to rest in a distance of 200 m, then its retardation should be
   (A) $20\,\mathrm{ms}^{-2}$
   (B) $2\,\mathrm{ms}^{-2}$
   (C) $10\,\mathrm{ms}^{-2}$
   (D) $1\,\mathrm{ms}^{-2}$

6. If a ball is thrown vertically upwards with 40 m/s, its velocity after two seconds will be
   (A) $10\,\mathrm{ms}^{-1}$     (B) $20\,\mathrm{ms}^{-1}$
   (C) $30\,\mathrm{ms}^{-1}$     (D) $40\,\mathrm{ms}^{-1}$

7. A shell is fired vertically upwards with a velocity $v_1$ from the deck of a ship moving with a speed $v_2$. A person on the shore observes the motion of the shell as a parabola. Its horizontal range is given by:
   (A) $\dfrac{2v_1^2 v_2}{g}$     (B) $\dfrac{2v_1 v_2^2}{g}$
   (C) $\dfrac{2v_1 v_2}{g}$     (D) $\dfrac{2v_1^2 v_2^2}{g}$

8. A ball is thrown at an angle $\theta$ to the horizontal and the range is maximum. The value of $\tan\theta$ is.
   (A) 1
   (B) $\sqrt{3}$
   (C) $\dfrac{1}{\sqrt{3}}$
   (D) 2

9. The equation of a projectile is $y = 16x - \dfrac{x^2}{4}$. The horizontal range is:
   (A) 16 m
   (B) 8 m
   (C) 64 m
   (D) 12.8 m

10. When a constant force is applied to a body, it moves with uniform:
    (A) Acceleration
    (B) Velocity
    (C) Speed
    (D) Momentum

11. When we kick a stone, we get hurt. Due to which of the following properties of stone does it happens?
    (A) Inertia
    (B) Velocity
    (C) Reaction
    (D) Momentum

*Space for rough work*

12. A person is standing in an elevator. In which situation he finds his weight less?
(A) when the elevator moves upward with constant acceleration
(B) when the elevator moves downward with constant acceleration
(C) when the elevator moves upward with uniform velocity
(D) when the elevator moves downward with uniform velocity

13. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. Force of 2.8 N is applied on the block. The force of friction between the block and the floor is
(A) 2.8 N        (B) 8.0 N
(C) 2.0 N        (D) zero

14. Which of the following statement is incorrect for a conservative field?
(A) Work done in going from initial to final position is equal to change in kinetic energy of the particle.
(B) Work done depends on path but not on initial and final positions.
(C) Work done does not depend on path but depends only on initial and final positions
(D) Work done on a particle in the field for a round trip is zero.

15. A constant force $\vec{F}$ is acting on a body of mass m with constant velocity $\vec{v}$ as shown in the figure. The power P exerted is



(A) $Fv\cos\theta$       (B) $\dfrac{F\cos\theta}{mg}$

(C) $\dfrac{Fmg\cos\theta}{v}$       (D) $\dfrac{mg\sin\theta}{F}$

16. The centre of mass of a system of particles does not depend on
(A) masses of the particles
(B) internal forces of the particles
(C) position of the particles
(D) relative distance between the particles

17. A person of mass m is standing on one end of a plank of mass M and length L and floating in water. The person moves from one end to another and stops. The displacement of the plank is
(A) $\dfrac{Lm}{(m+M)}$
(B) $Lm(M+m)$
(C) $\dfrac{(M+m)}{Lm}$
(D) $\dfrac{LM}{(m+M)}$

18. Which of the following pairs do not match:
(A) rotational power-Joule/sec
(B) torque-Newton meter
(C) angular displacement-radian
(D) angular acceleration – radian/sec

19. The moment of inertia of a disc of radius 0.5 m about its geometric axis is 2 kg-m$^2$. If a single is tied to its circumference and a force of 10 Newton is applied, the value of torque with respect to this axis will be:
(A) 2.5 N-m
(B) 5 N-m
(C) 10 N-m
(D) 20 N-m

*Space for rough work*

20. A small steel sphere of mass m is tied to a string of length r and is whirled in a horizontal circle with a uniform angular velocity $2\omega$. The string is suddenly pulled, so that radius of the circle is halved. The new angular velocity will be
    (A) $2\omega$
    (B) $4\omega$
    (C) $6\omega$
    (D) $8\omega$

## CHEMISTRY

21. The number of atoms present in 16 g of oxygen is
    (A) $6.02 \times 10^{11.5}$
    (B) $3.01 \times 10^{23}$
    (C) $3.01 \times 10^{11.5}$
    (D) $6.02 \times 10^{23}$

22. What is the mass of a molecule of $CH_4$ :-
    (A) 16 g
    (B) $26.6 \times 10^{22}$ g
    (C) $2.66 \times 10^{-23}$ g
    (D) $16\ N_A$ g

23. The number of carbon atoms present in a signature, if a signature written by carbon pencil, weighing $1.2 \times 10^{-3}$ g is
    (A) $12.04 \times 10^{20}$  (B) $6.02 \times 10^{19}$
    (C) $3.01 \times 10^{19}$  (D) $6.02 \times 10^{20}$

24. An organic compound contains carbon, hydrogen and oxygen. Its elemental analysis gives 38.71% of C and 9.67% of H. The empirical formula of the compound would be
    (A) CHO       (B) $CH_4O$
    (C) $CH_3O$   (D) $CH_2O$

25. An orbital with $l = 0$ is symmetrical about the:
    (A) x-axis only
    (B) y-axis only
    (C) z-axis only
    (D) nucleus

26. Which one of the following species will give a series of spectral lines similar to that of $Mg^{2+}$:
    (A) $Al^{3+}$
    (B) Na
    (C) $Mg^+$
    (D) F

27. Going from K-shell to N-shell in case of H-atom:
    (A) Kinetic energy decreases
    (B) Total energy decreases
    (C) Potential energy decreases
    (D) None of these

28. For $Li^{+2}$ ion, $r_2 : r_5$ will be:
    (A) 9 : 25          (B) 4 : 25
    (C) 25 : 4          (D) 25 : 9

29. Mendeleev's periodic table is based on:-
    (A) Atomic number
    (B) Increasing order of number of protons
    (C) Electronic configuration
    (D) None of the above

30. Which of the following electronic configuration belongs to inert gas elements :-
    (A) $ns^2 (n - 1)d^{10}$
    (B) $ns^2 (n - 1)s^2p^6$
    (C) $ns^2 np^6$
    (D) None of these

*Space for rough work*

31. $S^{-2}$ is not isoelectronic with :-
(A) Ar
(B) $Cl^-$
(C) $HS^-$
(D) $Ti^{+3}$

32. As we proceed across the period in periodic table, we find there is a decrease in :-
(A) Ionisation energy
(B) Electron affinity
(C) Electronegativity
(D) Atomic radii

33. Which of the following is an example of expanded octet?
(A) $SF_6$
(B) $PF_5$
(C) $H_2SO_4$
(D) All of these

34. Maximum no. of hydrogen bonds formed by a water molecule in ice is
(A) 4
(B) 3
(C) 2
(D) 1

35. Which of the following compound possess dipole moment:-
(A) Water
(B) Boron trifluoride
(C) Benzene
(D) Carbon tetra chloride

36. The molecule does not have bent shape: -
(A) $SO_2$ (B) $O_3$
(C) $H_2O$ (D) $NH_4^+$

37. Of the following elements, which one has the same oxidation state in all of its compounds?
(A) Hydrogen
(B) Fluorine
(C) Carbon
(D) Oxygen

38. Select the example of disproportionation reaction
(A) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$
(B) $NH_4NO_3 \rightarrow N_2O + 2H_2O$
(C) $4H_3PO_3 \rightarrow PH_3 + 3H_3PO_4$
(D) $AgCl + 2NH_3 \rightarrow Ag(NH_3)_2Cl$

39. The reaction
$2K_2MnO_4 + Cl_2 \rightarrow 2KMnO_4 + 2KCl$ is an example of
(A) Redox
(B) Reduction only
(C) Neutralization
(D) Disproportionation

40. $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
Zn undergoes –
(A) Reduction
(B) Oxidation
(C) Both oxidation and reduction
(D) Neither oxidation nor reduction

*Space for rough work*

## MATHEMATICS

41. If the line segment joining (2, 3) and (-1, 2) is divided internally in the ratio 3 : 4 by the line x + 2y = k then k is

(A) $\dfrac{41}{7}$

(B) $\dfrac{5}{7}$

(C) $\dfrac{36}{7}$

(D) $\dfrac{31}{7}$

42. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. The PQRS must be a
(A) rectangle
(B) square
(C) cyclic quadrilateral
(D) rhombus

43. The graph of the function y=cos x . cos(x + 2) – cos²(x + 1) is a
(A) straight line passing through the point (0, -sin²1) with slope 2
(B) straight line passing through the origin
(C) parabola with vertex (1, -sin² 1)
(D) straight line passing through the point (π/2, -sin²1) and parallel to the x-axis

44. The coordinate of the point on the x-axis which is equidistant from the points (-3, 4) and (2, 5) are
(A) (20, 0)
(B) (-23, 0)
(C) $\left(\dfrac{4}{5}, 0\right)$

(D) none of these

45. Let $t_r$ denote the rth term of an AP. If $t_m = \dfrac{1}{n}$ and $t_n = \dfrac{1}{m}$ then $t_{mn}$ equals

(A) $\dfrac{1}{mn}$

(B) $\dfrac{1}{m} + \dfrac{1}{n}$

(C) 1
(D) 0

46. In an AP, the pth term is q and the (p + q)th term is 0. Then the qth term is
(A) –p
(B) p
(C) p + q
(D) p – q

47. In the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, ......., where n consecutive terms have the value n, the 150th term is
(A) 17
(B) 16
(C) 18
(D) none of these

48. Let $\{t_n\}$ be a sequence of integers in GP in which $t_4 : t_6 = 1 : 4$ and $t_2 + t_5 = 216$. Then $t_1$ is
(A) 12           (B) 14
(C) 16           (D) none of these

49. If on root of the equation (k² + 1)x² + 13x + 4k = 0 is reciprocal of the other then k has the value
(A) $-2 + \sqrt{3}$           (B) $2 - \sqrt{3}$
(C) 1           (D) none of these

50. The harmonic mean of the roots of the equation

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$(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$ is

(A) 2        (B) 4
(C) 6        (D) 8

51. If $\alpha$, $\beta$ are the roots of $x^2 - px + q = 0$ then the product of the roots of the quadratic equation whose roots are $\alpha^2 - \beta^2$ and $\alpha^3 - \beta^3$ is
(A) $p(p^2 - q)^2$
(B) $p(p^2 - q)(p^2 - 4q)$
(C) $p(p^2 - 4q)(p^2 + q)$
(D) none of these

52. The quadratic equation whose roots are the AM and HM of the roots of the equation $x^2 + 7x - 1 = 0$ is
(A) $14x^2 + 14x - 45 = 0$
(B) $45x^2 - 14x + 14 = 0$
(C) $14x^2 + 45x - 14 = 0$
(D) none of these

53. The value of the sum $\sum_{n=1}^{13}(i^n + i^{n+1})$, where $i = \sqrt{-1}$, is
(A) $i$        (B) $i - 1$
(C) $-i$        (D) 0

54. Im(z) is equal to
(A) $\frac{1}{2}(z + \bar{z})i$        (B) $\frac{1}{2}(z - \bar{z})$
(C) $\frac{1}{2}(\bar{z} - z)i$        (D) none of these

55. If $z_1 = 9y^2 - 4 - 10ix$, $z_2 = 8y^2 - 20i$, where $z_1 = \bar{z_2}$, then $z = x + iy$ is equal to
(A) $-2 + 2i$        (B) $-2 \pm 2i$
(C) $-2 \pm i$        (D) none of these

56. Let A and B be two sets such that A $\cup$ B = A. Then A $\cap$ B is equal to
(A) $\phi$
(B) B
(C) A
(D) none of these

57. 20 teachers of a school either teach mathematics or physics. 12 of them teach mathematics while 4 teach both the subjects. Then the number of teachers teaching only physics is
(A) 12
(B) 8
(C) 16
(D) none of these

58. Let A = {1,2,3}. The total number of distinct relations that can be defined
(A) $2^9$
(B) 6
(C) 8
(D) none of these

59. If $f(x) = \frac{x-1}{x+1}$ then f(ax) in term of f(x) is equal to
(A) $\frac{f(x)+a}{1+af(x)}$        (B) $\frac{(a-1)f(x)+a+1}{(a+1)f(x)+a-1}$

(C) $\frac{(a+1)f(x)+a-1}{(a-1)f(x)+a+1}$        (D) none of these

60. Let f be a function satisfying f(x + y) = f(x) + f(y) for all x, y $\in$ R. If f(1) = k then f(n), n $\in$ N, is equal to
(A) $k^n$        (B) nk
(C) $n^k$        (D) none of these

*Space for rough work*