Time : 3 Hrs.   **MM : 360**

MOCK TEST
for
JEE (Main)

GENERAL INSTRUCTIONS :

(i) Duration of Test is 3 hrs.

(ii) The Test booklet consists of 90 questions. The maximum marks are 360.

(iii) There are **three** parts in the question paper A, B, C consisting of **Physics**, **Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each question is allotted 4 **(four)** marks for each correct response.

(iv) One fourth (¼) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

(v) **Pattern of the Questions :**

   Section – I : Straight Objective Questions; **Section – II : Assertion – Reason Type Questions**

[PART-A : PHYSICS]

SECTION - I

Straight Objective Questions

This section contains 25 multiple choice questions numbered 1 to 25. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

1. For a circular motion, select correct option.

   (1) $\vec{v} = \vec{\omega} \times \vec{r}$

   (2) $\vec{v} = \vec{r} \times \vec{\omega}$

   (3) $\vec{a}_T = \vec{r} \times \vec{\alpha}$

   (4) $\vec{a}_c = \dfrac{d}{dt}|\vec{v}|$

   (Where all the symbols have their usual meaning)

2. A particle is projected with velocity u at an angle with horizontal. After a time of $\dfrac{u}{g\sqrt{3}}$ (in seconds), the direction of motion makes an angle of 30° with the horizontal. Find the angle with horizontal at which particle is projected.

   (1) 75°   (2) 60°

   (3) 45°   (4) 30°

3. Find the acceleration of 1 kg block as shown in figure.
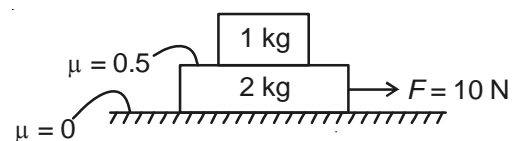
   (1) 5 ms^{-2} (2) $\dfrac{10}{3}$ ms^{-2}

   (3) 10 ms^{-2} (4) $\dfrac{5}{3}$ ms^{-2}

4. A block of mass m kg is placed in an elevator on a horizontal surface. The elevator is moving at an acceleration of $6\hat{i}+7\hat{j}$ (in m/s^2). Find the frictional force acting on the block. (g = 10 m/s^2 and μ = 0.5)

    (1) $6m$ newton (2) $7m$ newton

    (3) $8m$ newton (4) $8.5m$ newton

5. Block A of mass m can slide on rough surface of block B of same mass. The block B moves on a smooth horizontal surface. The coefficient of friction between A and B is μ. Find the required force in horizontal direction by which block A is pulled so that both the blocks move together.
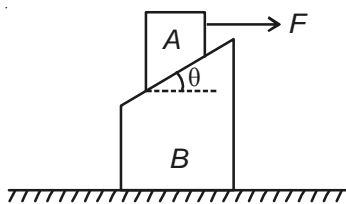

    (1) Any value

    (2) $\dfrac{1}{2}\mu\, mg\cos^2\theta$

    (3) $2\,\mu\, mg\cos^2\theta$

    (4) $2\,mg\cos\theta(\mu\cos\theta + \sin\theta)(\cos2\theta - \mu\sin2\theta)$

6. A particle is dropped from height H. At a point, its kinetic energy is x times of its potential energy. Find the speed of the particle at that point.

    (1) $[2gxH]^{1/2}$ (2) $\left[2g\dfrac{(x+1)H}{x}\right]^{1/2}$

    (3) $\left[\dfrac{2gH}{x+1}\right]^{1/2}$ (4) $\left[\dfrac{2gxH}{x+1}\right]^{1/2}$

7. A particle of mass m_1 collides head on with a stationary particle of mass m_2. If $\dfrac{m_1}{m_2} > e$, where e is the coefficient of restitution, then

    (1) m_1 will return back

    (2) m_1 will move in same direction

    (3) m_1 will stop

    (4) Unpredictable

8. A sphere of radius r starts pure rolling on a rough horizontal surface with translational velocity v_0, rotating with angular velocity ω in clockwise direction. A particle of mass m sticking with sphere at A with $OA = \dfrac{r}{2}$ in the start of the motion gets detached at position B. What will be velocity of particle at B?
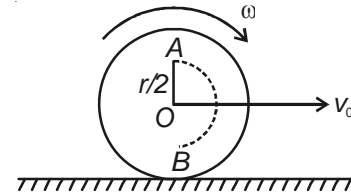
    (1) $\dfrac{v_0}{2}$ to the left (2) $\dfrac{v_0}{2}$ to the right

    (3) v_0 to the left (4) $\dfrac{\omega r}{2}$ to the left

9. On an inclined plane of angle 60° with horizontal, a rigid body rolls down the plane from the rest without slipping. It has a linear acceleration equal to $\dfrac{g}{\sqrt{3}}$. Find the rigid body.

    (1) Sphere (2) Spherical shell

    (3) Disc (4) Ring

10. The mass of a satellite is $\dfrac{M}{81}$ and radius is $\dfrac{R}{4}$ where M and R are the mass and radius of its planet. The distance between surface of planet and its satellite will be at least greater than

    (1) 1.25 R (2) 12.5 R

    (3) 10.5 R (4) 5 R

11. A shell loses its weight in water. If X is the fraction of its volume which is hollow and W is the weight of water displaced. Find the correct graph.
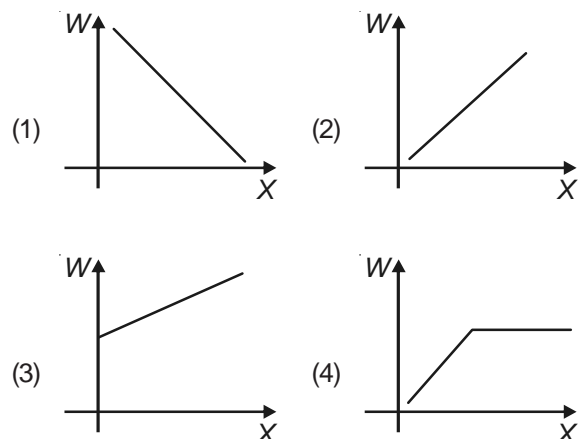
12. A mass m is undergoing SHM in vertical direction about the mean position with amplitude A and angular velocity ω. At a distance y from the mean position, the mass detaches from the spring. Assume that the spring contracts and does not obstruct the motion of m. Find the distance y_0 (measured from the mean position) such that the height attained by the block is maximum $(A\omega^2 > g)$

(1) $\dfrac{g}{\omega^2}$

(2) $\dfrac{2g}{\omega^2}$

(3) $\dfrac{g}{2\omega^2}$

(4) $\dfrac{2\sqrt{2}g}{\omega^2}$

13. A satellite in equitorial plane is rotating in the direction of earth's rotation with time interval between its two consecutive appearances overhead of an observer as time period of rotation of the earth, T_E. What is the time period of the satellite?

(1) T_E

(2) $2T_E$

(3) $\dfrac{T_E}{2}$

(4) $\dfrac{2T_E}{3}$

14. A particle executes S.H.M. between amplitude $+A$ and $-A$. Find the position $+x$ of particle such that time taken by it from 0 to $+x$ and to go from $+x$ to $+A$ is same. The time is considered from equilibrium position

(1) $\dfrac{A}{2}$

(2) $\dfrac{A}{\sqrt{2}}$

(3) $\dfrac{A}{2\sqrt{2}}$

(4) $\dfrac{A\sqrt{2}}{4}$

15. Phase difference between displacement and acceleration in SHM, is

(1) $\dfrac{\pi}{2}$

(2) π

(3) $\dfrac{3\pi}{2}$

(4) Zero

16. Which of the following graphs correctly represents the variation of $\beta = -\dfrac{(dV/dP)}{V}$ with P for an ideal gas at constant temperature?

(1)

(2)

(3)

(4)
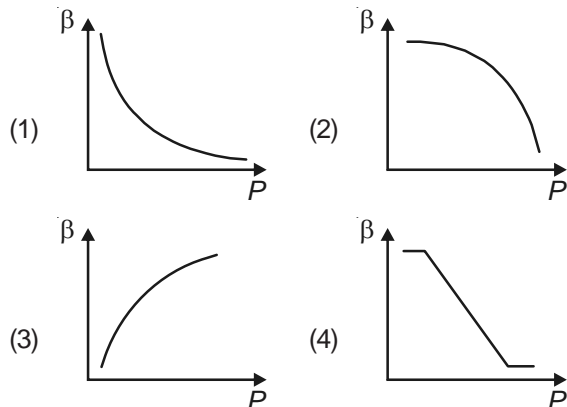
17. A hemispherical surface of radius R is placed with its cross section perpendicular to a uniform electric field $\vec{E}$ as shown. Flux linked with its curved surface is

(1) Zero

(2) $2\pi R^2 E$

(3) $\pi R^2 E$

(4) $\dfrac{E}{2\varepsilon_0}$

18. Two capacitors of capacitance C and $\dfrac{C}{2}$ are connected with a V volt battery, as shown
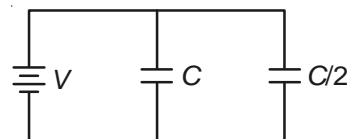
The work done in charging fully both the capacitors, is

(1) $2CV^2$

(2) $\dfrac{1}{4}CV^2$

(3) $\dfrac{3}{2}CV^2$

(4) $\dfrac{1}{2}Cv^2$

19. The electric potential at a point (x, y, z) is given by $V = -x^2y - xz^3 + 4$. The electric field at that point is

(1) $\vec{E} = (2xy - z^3)\hat{i} + xy^2\hat{j} + 3z^2x\hat{k}$

(2) $\vec{E} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$

(3) $\vec{E} = 2xy\hat{i} + (x^2 + y^2)\hat{j} + (3xz - y^2)\hat{k}$
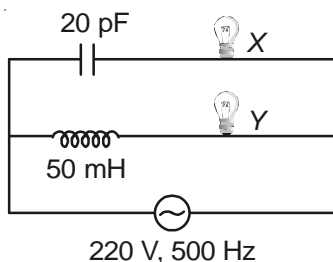
(4) $\vec{E} = 23\hat{i} + xyz\hat{j} + z^2\hat{k}$

20. Potentiometer wire of length 1 m is connected in series with 490 Ω resistance and 2 V battery. If 0.01 V/cm is the potential gradient, then resistance of potentiometer wire is

(1) 490 Ω

(2) 790 Ω

(3) 590 Ω

(4) 690 Ω

21. The angle of dip at the magnetic equator is

(1) 0°

(2) 90°

(3) 45°

(4) 180°

22. In the figure shown, *X* and *Y* are two identical bulbs then

(1) Bulb *X* glows brighter than *Y*

(2) Bulb *Y* glows brighter than *X*

(3) Both glow with equal brightness

(4) Which glows brighter cannot be predicted

23. A concave and a convex lens have the same focal length of 20 cm and are put in contact to form a lens combination. The combination is used to view an object of 5 cm length kept at 20 cm from the lens combination as compared to the object, the image will be

(1) Magnified and inverted

(2) Reduced and erect

(3) Of the same size as the object and would be erect

(4) Of the same size as the object but would be inverted

24. The wavelength of radiation emitted is λ_0 when an electron in hydrogen atom jumps from 3rd to 2nd orbit. If in the hydrogen atom itself, the electron jumps from 4th orbit to 2nd orbit, wavelength of emitted radiation will be

(1) $\dfrac{25}{16}\lambda_0$ (2) $\dfrac{17}{20}\lambda_0$

(3) $\dfrac{20}{27}\lambda_0$ (4) $\dfrac{16}{25}\lambda_0$

25. To use a transistor as an amplifier

(1) Both emitter-base and collector base junctions are forward biased

(2) Both emitter-base junction and collector base junction are reverse biased

(3) Emitter base junction is forward biased and collector base junction is reverse biased

(4) Collector base junction is forward biased and emitter-base junction is reverse biased

SECTION - II

Assertion – Reason Type Questions

Directions : Questions number 26 to 30 are Assertion-Reason type questions. Each of these questions contains two statements. Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

26. Statement-1 : In series LCR a.c. circuit, at resonance, current and voltage are in same phase.

and

Statement-2 : In series LCR circuit, resonance frequency does not depend on the value of resistance and hence current at resonance, does not depend on resistance.

(1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

27. Statement-1 : When monochromatic light is incident on a metal, the kinetic energy of the emitted photoelectrons are different.

and

Statement-2 : Kinetic energy of emitted photoelectrons from inside the metallic surface, varies due to their collision with other atoms in the metal.

(1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

28. **Statement-1** : Electromagnetic waves with frequencies more than the critical frequency of ionosphere, cannot be used for communication, using sky wave propagation.

    and

    Statement-2 : The refractive index of the ionosphere becomes very high for frequencies higher than the critical frequency.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

29. **Statement-1** : Electric field strength due to symmetric charge distributions can be determined using Gauss' law.

    and

    Statement-2 : Gauss law is valid only for symmetric charge distributions.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

30. **Statement-1** : In adiabatic expansion, temperature of gas always decreases

    and

    Statement-2 : In adiabatic process, exchange of heat is zero.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

[PART-B : CHEMISTRY]

SECTION - I

Straight Objective Questions

This section contains 25 multiple choice questions numbered 31 to 55. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

31. K_{sp} of AgCl and AgBr is respectively 10^{-10} and 10^{-13} then what will be equilibrium constant of reaction given?

    $$Cl^-(aq) + AgBr(s) \rightleftharpoons Br^-(aq) + AgCl(s)$$
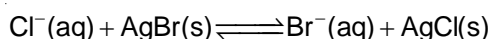
    (1) 10^{-3} (2) 10^3

    (3) 10^6 (4) 1

32. White $P \xrightarrow[\text{Combustion}]{\text{Air}} A \xrightarrow{H_2O} B$

    Basicity of acid will be

    (1) 2 only

    (2) 3 only

    (3) 1 only

    (4) 2 and 3 only

33. Which of the following have highest melting point? (All are dissolved in 1 kg solvent)

    (1) 1 mole CH_3COOH

    (2) 1 mole $\overset{|}{C}H_2 - COOH$
        $\quad\quad\quad\;\; |$
        $\quad\quad\quad\; Cl$
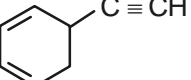
    (3) 1 mole $CCl_3 - COOH$

    (4) Equal in all of these

34. Choose correct statement regarding NaCl structure

    (1) Cl^- shows ccp packing

    (2) Na^+ shows ccp packing

    (3) Number of Cl^- per unit cell is 4

    (4) All of these

35. n factor of $KMnO_4$ as oxidizing agent in acidic medium will be

    (1) 0

    (2) 1

    (3) 3

    (4) 5

36. Choose the correct pair regarding entropy

    (1) H_2O_2 (gas) > H_2O_2 (liquid)

    (2) H_2O > H_2O_2 (gas)

    (3) H_2O > H_2O_2 (liquid)

    (4) CH_4 > C_2H_6

37. The quantum number can be used to calculate spherical node in an orbital

    (1) n and m (2) l and m

    (3) n and s (4) n and l

38. Correct sequence regarding energy of molecule orbital in CO is

    (1) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \pi 2p_x = \pi 2p_y$

    (2) $\sigma 1s < \sigma^* 1s < \sigma 2s < \pi 2p_x = \pi 2p_y < \sigma^* 2s$

    (3) $\sigma 1s < \sigma^* 1s < \sigma^* 2s < -2p_z < \pi 2p_x = \pi 2p_y$

    (4) $\sigma 1s < \sigma^* 1s < -2p_z < \sigma^* 2s < \pi 2p_x$

39. The most stable free radical is

    (1)   (2)

    (3)   (4)

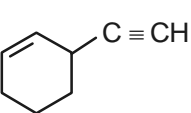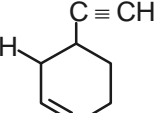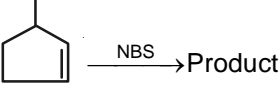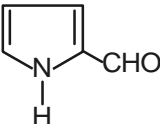40. Out of the following which complex is paramagnetic?

    (1) $[Co(NH_3)_6]^{+3}$ (2) $[Fe(CN)_6]^{-4}$

    (3) $[Cr(CN)_6]^{-3}$ (4) $V(CO)_6^-$

41. The compound which can exhibit geometrical isomerism?

    (1) N_2F_2

    (2) $CH_3 - CH = C = C = CH - CH_3$

    (3)

    (4) All of these

42.

    Product B in this reaction is

    (1)   (2)

    (3)   (4)

43. Wilkinson catalyst is

    (1) $PtCl_3(C_2H_4)^-$ (2) $[Rh(PPh_3)_3Cl]$

    (3) $Pt(NH_3)_2Cl_2$ (4) $Fe_4[Fe(CN)_6]_3$

44. Which of the following is a polymer of β glucose?

    (1) Cellulose   (2) Starch

    (3) Maltose   (4) Glactose

45. In given, which compounds can act as Lewis acid?

    a. BCl_3 , $BeCl_2$

    b. PCl_3 , XeF_2 , $AlBr_3$

    c. $B(OH)_3$, XeF_4 , PCl_5

    (1) a & b   (2) a & c

    (3) a, b & c   (4) b & c

46. $\xrightarrow{\text{NBS}}$ Product

    Total number of expected product (excluding stereo-isomer) formed in this reaction

    (1) 2   (2) 1

    (3) 4   (4) 3

47. Which of the following undergo/goes Cannizzaro reaction?

    (1) $CH_3 - CHO$ (2)

    (3)   (4) Both (2) & (3)

48. In zero order, 1st order and 2nd order reactions the initial half life periods are same for all these reactions, then which show(s) 99.99% completion in minimum time?

    (1) 1st order   (2) 2nd order

    (3) Zero order   (4) Equal in all these

49. Which one of the following shows highest solubility in hot conc. NaOH?

    (1) $La(OH)_3$ (2) $Nb(OH)_3$

    (3) $Sm(OH)_3$ (4) $Lu(OH)_3$

50. Kohlrausch's law is applicable to a dilute solution of

    (1) KCl in hexane

    (2) Acetic acid in hexane

    (3) HCl in water

    (4) Benzoic acid in benzene

51. A dilute silver nitrate solution is added to a slight excess of NaI, a solution of AgI is formed whose surface absorb

    (1) I^-

    (2) NO_3^-

    (3) Na^+
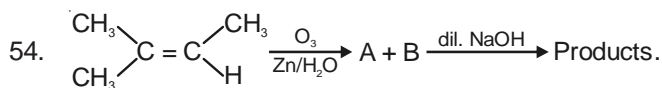
    (4) Ag^+

52. The correct order of acidity of the compounds is

    I.

    II.

    III.
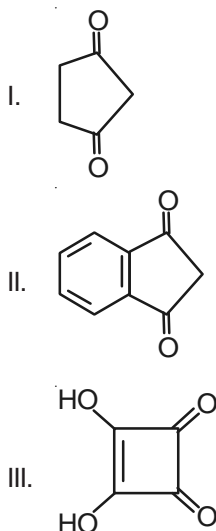
    (1) I > II > III (2) II > III > I

    (3) III > I > II (4) II > I > III

53. Out of following most soluble compound

    (1) $NaHCO_3$

    (2) $KHCO_3$

    (3) $RbHCO_3$

    (4) $CsHCO_3$

54.
$$\underset{CH_3}{\overset{CH_3}{C}} = \underset{H}{\overset{CH_3}{C}} \xrightarrow[Zn/H_2O]{O_3} A + B \xrightarrow{dil.\ NaOH} Products.$$

    How many different products expected in this reaction?

    (1) 1 (2) 3

    (3) 2 (4) 4

55. Biodegradable polyamide polymer is

    (1) Nylon 2 nylon 6

    (2) PHBV

    (3) Teflon

    (4) Both (1) & (2)

SECTION - II

Assertion – Reason Type Questions

Directions : Questions number 56 to 60 are Assertion-Reason type questions. Each of these questions contains two statements. Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

56. Statement-1 : When KCl is heated, lilae (blue colour) appear.

    and

    Statement-2 : On heating, ZnO becomes yellow.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

57. Statement-1 : For the detection of nitrogen in pyridine Duma method can be used.

    and

    Statement-2 : Pyridine is aromatic.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

58. Statement-1 : 1° amine and 2° amine can be distinguished by carbylamine reaction.

    and

    Statement-2 : In carbylamine reaction, carbene is reaction intermediate.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

59. Statement-1 : BF_3 is more acidic than BCl_3.

and

Statement-2 : F is more electronegative than Cl.

(1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

60. Statement-1 : Solid PBr_5 is ionic compound.

and

Statement-2 : In solid state of PBr_5, hybridization of P is sp^3d.

(1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

[PART-C : MATHEMATICS]

SECTION - I

Straight Objective Questions

This section contains 25 multiple choice questions numbered 61 to 85. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

61. Let p be the statement, "x is an irrational number", q be the statement, "y is a prime number" and r be the statement, "x is a rational iff y is not a prime number", then r is equivalent to

(1) $\sim(p \leftrightarrow q)$

(2) $p \leftrightarrow q$

(3) $\sim p \leftrightarrow q$

(4) $p \leftrightarrow \sim q$

62. If ω is a non-real cube root of unity, then the value of the expression

$$(1-\omega)(1-\omega^2) + 2(2-\omega)(2-\omega^2)$$
$$+ 3(3-\omega)(3-\omega^2) + ... \; n \text{ times,}$$

is

(1) $\dfrac{n(n+1)(3n^2+7n+8)}{12}$

(2) $\dfrac{1}{4}n^2(n+1)^2 + n$

(3) $\dfrac{1}{4}n(n+1)^2 - n$

(4) $\dfrac{1}{4}n(n+1)^2 + n$

63. The number of real values of x which satisfy the equation $\left|\dfrac{x}{x+1}\right| + x = \left|\dfrac{x^2}{x+1}\right|$ is

(1) 0

(2) 1

(3) 2

(4) 3

64. The value of the series $5 \times 1^4 + 5 \times 2^4 + 5 \times 3^4 + ... + 5 \times n^4$ is equal to

(1) $\dfrac{1}{6}n(n+1)(2n+1)(3n^2+1)$

(2) $\dfrac{1}{6}n(n+1)(2n+1)(3n^2-1)$

(3) $\dfrac{1}{6}n(n+1)(2n+1)(3n^2+3n-1)$

(4) $\dfrac{1}{6}n(n+1)(2n+1)(3n^2+2n-1)$

65. The sum of all real roots of the equation

$$\log_2(3^{2x-2}+7) = 2 + \log_4(3^{2x-2} + 2.3^{x-1} + 1)$$

is

(1) 0

(2) 1

(3) 2

(4) 3

66. The number of real values of x of the equation $x^2 = [x^2] + [x]$ is

(1) 0

(2) 1

(3) 2

(4) Infinite

67. If m and n are two integers lying between 1 and 200, then how many different numbers of the form $7^m + 7^n$ is divisible by 10?

    (1) 2000   (2) 20000

    (3) 40000   (4) 10000

68. The value of n for which coefficients of x^7 and x^8 are equal in the expansion of $\left(3 + \dfrac{x}{2}\right)^n$ is

    (1) 45   (2) 35

    (3) 55   (4) 65

69. Let S denotes the set of all different values of α for which the system of equations, $\alpha x + y + z = 0$, $x + \alpha y + z = 0$ and $x + y + \alpha z = 0$ has infinite number of solutions, then $\displaystyle\sum_{i \in S} \alpha_i$ is equal to

    (1) 1   (2) 3

    (3) 2   (4) −1

70. A bag contains three tickets numbered 1, 2 and 3. A ticket is drawn at random and put back in the bag and this is done four times. The probability that the sum of the numbers drawn is odd, is

    (1) $\dfrac{40}{81}$ (2) $\dfrac{41}{81}$

    (3) $\dfrac{14}{27}$ (4) $\dfrac{13}{81}$

71. If $\vec{a}$ and $\vec{b}$ are two unit vectors inclined at an angle θ to each other and $\left|\vec{a} - \vec{b}\right| < \sqrt{2}$, then θ lies between

    (1) $\left[0, \dfrac{\pi}{2}\right)$ (2) $\left(\dfrac{\pi}{2}, \pi\right]$

    (3) $\left(\dfrac{2\pi}{3}, \pi\right)$ (4) $\dfrac{\pi}{2}$

72. If $f(x) = g^{-1}(x)$ and $g(x) = x^3 + \sqrt{e^x}$, then the value of $f'(1)$ is equal to

    (1) 1   (2) 2

    (3) 3   (4) 0

73. The number of points, where the function $f(x) = x|x|$ is not differentiable, is/are

    (1) 0   (2) 1

    (3) 2   (4) Infinite

74. The value of $\displaystyle\int_0^{\pi/2} \dfrac{\sin 8x . \log(\cot x)}{\cos 2x} dx$ is equal to

    (1) π (2) 2π

    (3) 0   (4) $\dfrac{\pi}{2}$

75. The value of $\displaystyle\int_4^8 \dfrac{\log x}{x} dx$ is

    (1) log 2   (2) $\dfrac{1}{2}$ (log 2) (log 32)

    (3) log 32   (4) $\dfrac{\log 32}{\log 2}$

76. The solution of the differential equation $x^2 \dfrac{dy}{dx} + xy = \sin x$ is

    (1) $y = \dfrac{1}{x}\displaystyle\int \dfrac{\sin x}{x} dx + c$ (2) $y = \dfrac{c}{x} + \displaystyle\int \dfrac{\sin x}{x} dx$

    (3) $y = \dfrac{c}{x} + \dfrac{2}{x}\displaystyle\int \dfrac{\sin x}{x} dx$ (4) $y = \dfrac{c}{x} + \dfrac{1}{x}\displaystyle\int \dfrac{\sin x}{x} dx$

77. If $I = \displaystyle\int \operatorname{cosec}^4 x . \sec^2 x \, dx$

    $= \alpha \tan x + \beta \cot^3 x - \gamma \cot x + c$,

    then the value of $\alpha + 3\beta + \gamma$ is

    (1) 2   (2) −2

    (3) 0   (4) 1

78. If the tangent at $P(1, 1)$ on $y^2 = x(x - 2)^2$ meets the curve again at Q, then the distance between P and Q is

    (1) $\dfrac{5\sqrt{5}}{4}$ (2) $\dfrac{5\sqrt{5}}{8}$

    (3) $\dfrac{5\sqrt{5}}{16}$ (4) $\dfrac{5\sqrt{5}}{2}$

79. If $f(x) = |x+3| - |x| + |x-1|$, then which one of the following option is not true?

    (1) $f(x) > 0$ for all real values of x

    (2) $f(x)$ has a local maximum at $x = 0$

    (3) $f(x)$ has a local maximum at $x = -3$

    (4) $f(x)$ has a local minimum at $x = 1$

80. A natural number x is chosen at random from the first hundred natural numbers, then the probability that x satisfies $\dfrac{(x^2+1)(x-10)(x-40)}{(x^2+9)^{100}(x-30)^2(x-20)^{201}} \geq 0$ is

   (1) $\dfrac{61}{100}$

   (2) $\dfrac{11}{100}$

   (3) $\dfrac{70}{100}$

   (4) $\dfrac{71}{100}$

81. If $f(x) = \begin{cases} \dfrac{A\sin x + B\sin 2x + \sin 3x}{x^5} & ,x \neq 0 \\ 1 & ,x = 0 \end{cases}$

   is continuous at $x = 0$, then the value of $A + B$ is

   (1) 0
   (2) 1
   (3) 2
   (4) 3

82. The function $f : R \to R$ given by $f(x) = 3x - 2\sin x$ is

   (1) Bijective
   (2) Into
   (3) Even
   (4) Many one

83. The equation of tangents to the hyperbola $3x^2 - y^2 = 3$ which are parallel to the line $y = 2x$ are

   (1) $y = 2x + 3$ and $y = 2x + 2$
   (2) $y = 2x + 1$ and $y = 2x - 1$
   (3) $y = 2x + 3$ and $y = 2x + 1$
   (4) $y = 2x + 2$ and $y = 2x - 1$

84. A circle C_1 of radius 2 units rolls on the outside of the circle $C_2 : x^2 + y^2 + 4x = 0$, touching it externally, if C_3 is the locus of centre of outer circle C_1, then the area of the quadrilateral formed by a pair of tangents from a point on C_3 to the circle C_2 with a pair of radii at the points of contact of tangent is

   (1) $4\sqrt{3}$ square units

   (2) $3\sqrt{3}$ square units

   (3) $2\sqrt{3}$ square units

   (4) $\sqrt{3}$ square units

85. If one of the lines given by the equation $2x^2 + \alpha xy + 3y^2 = 0$ coincide with one of the lines given by $2x^2 + \beta xy - 3y^2 = 0$ and other lines represented by them be perpendicular, then the value of $\alpha + \beta$ is

   (1) –4

   (2) 4

   (3) 6

   (4) –2

SECTION - II

Assertion – Reason Type Questions

Directions : Questions number 86 to 90 are Assertion-Reason type questions. Each of these questions contains two statements. Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

86. Statement-1 : The variance of the first n natural numbers is $\dfrac{n^2-1}{12}$.

   and

   Statement-2 : The sum of first n natural numbers is $\dfrac{n(n+1)}{2}$ and the sum of squares of first n natural numbers is $\dfrac{n(n+1)(2n+1)}{6}$.

   (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

   (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

   (3) Statement-1 is True, Statement-2 is False

   (4) Statement-1 is False, Statement-2 is True

87. Statement-1 : $(p \vee \sim q) \vee (\sim p \vee q)$ is a tautology.

    and

    Statement-2 : $(p \wedge \sim q) \wedge (\sim p \wedge q)$ is a contradiction.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

88. Statement-1 : $3\sin^{-1}\left(\dfrac{1}{3}\right) + \sin^{-1}\left(\dfrac{3}{5}\right) < \dfrac{2\pi}{3}$ and

    $\tan^{-1}(2\sqrt{3} - 1) > \dfrac{\pi}{3}$.

    and

    Statement-2: $2\cos^{-1} x = \cos^{-1}(2x^2 - 1)$ if $0 \le x \le 1$.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

89. Statement-1 : If $\dfrac{\sin^4 x}{2} + \dfrac{\cos^4 x}{3} = \dfrac{1}{5}$, then $\tan^2 x = \dfrac{1}{3}$.

    and

    Statement-2 : $\sin^2 x + \cos^2 x = 1$, for all $x \in R$.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

90. Statement-1 : In a ΔABC, if

    $$\dfrac{2\cos A}{a} + \dfrac{\cos B}{b} + \dfrac{2\cos C}{c} = \dfrac{a^2 + b^2}{abc},$$

    then angle B is 90°.

    and

    Statement-2 : In a ΔABC, $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$.

    (1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

    (2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

    (3) Statement-1 is True, Statement-2 is False

    (4) Statement-1 is False, Statement-2 is True

❑   ❑   ❑

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MOCK TEST
for
JEE (MAIN)
ANSWERS

Physics		Chemistry		Mathematics	
1.	(1)	31.	(1)	61.	(2)
2.	(2)	32.	(1)	62.	(1)
3.	(2)	33.	(3)	63.	(2)
4.	(1)	34.	(4)	64.	(3)
5.	(4)	35.	(4)	65.	(4)
6.	(4)	36.	(1)	66.	(2)
7.	(2)	37.	(4)	67.	(4)
8.	(2)	38.	(2)	68.	(3)
9.	(3)	39.	(4)	69.	(4)
10.	(1)	40.	(3)	70.	(1)
11.	(1)	41.	(4)	71.	(1)
12.	(1)	42.	(1)	72.	(2)
13.	(3)	43.	(2)	73.	(1)
14.	(2)	44.	(1)	74.	(3)
15.	(2)	45.	(3)	75.	(2)
16.	(1)	46.	(3)	76.	(4)
17.	(3)	47.	(4)	77.	(1)
18.	(3)	48.	(3)	78.	(2)
19.	(2)	49.	(4)	79.	(3)
20.	(1)	50.	(3)	80.	(4)
21.	(1)	51.	(1)	81.	(2)
22.	(2)	52.	(3)	82.	(1)
23.	(3)	53.	(4)	83.	(2)
24.	(3)	54.	(4)	84.	(1)
25.	(3)	55.	(1)	85.	(3)
26.	(3)	56.	(2)	86.	(1)
27.	(1)	57.	(4)	87.	(2)
28.	(1)	58.	(4)	88.	(2)
29.	(3)	59.	(4)	89.	(4)
30.	(2)	60.	(3)	90.	(4)