

JEE Main 2020 Paper 1 (B.E./B.Tech) 2 September 2020 Shift 1 Question Paper



Conducted by the National Testing Agency (NTA)

Time Allowed: 3 Hours

Paper 1: B.E./B.Tech.

Maximum Marks: 300

General Instructions

- (i) This paper is **Paper 1 (B.E./B.Tech.)** of **JEE (Main) 2020 - Session 2**, conducted by the National Testing Agency (NTA) in Computer Based Test (CBT) mode on 2 September 2020, Shift 1. The total duration is **3 hours**.
- (ii) The paper has **75 questions** and a maximum of **300 marks**: Mathematics, Physics and Chemistry carry 25 questions (100 marks) each, in that order.
- (iii) Each subject has **two sections**. **Section A** has **20 multiple choice questions** (MCQs) with four options each. Select the most appropriate answer. **Section B** has **5 numerical value questions**.
- (iv) **All questions are compulsory**. For Section B, enter the numerical answer in the format requested in the question. Use only the constants given in the question while calculating.
- (v) **Marking scheme**: MCQs carry **+4** for a correct answer and **-1** for an incorrect answer. Numerical questions carry **+4** for a correct answer and **0** for an incorrect answer. Unanswered questions carry **0**.
- (vi) All calculations and rough work are to be done on the rough sheets only. Calculators, log tables, slide rules and electronic gadgets are not allowed.

1. The sum of the first three terms of a G.P. is S and their product is 27. Then all such S lie in :

- (A) $[-3, \infty)$ (B) $(-\infty, 9]$
(C) $(-\infty, -9] \cup [-3, \infty)$ (D) $(-\infty, -3] \cup [9, \infty)$

2. The value of

$$\left(\frac{1 + \sin \frac{2\pi}{9} + i \cos \frac{2\pi}{9}}{1 + \sin \frac{2\pi}{9} - i \cos \frac{2\pi}{9}} \right)^3$$

is :

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

3. Box I contains 30 cards numbered 1 to 30 and Box II contains 20 cards numbered 31 to 50. A box is selected at random and a card is drawn from it. The number on the card is found to be a non-prime number. The probability that the card was drawn from Box I is :

- (A) $\frac{8}{17}$
(B) $\frac{2}{3}$
(C) $\frac{2}{5}$
(D) $\frac{4}{17}$

4. Area (in sq. units) of the region outside

$$\frac{|x|}{2} + \frac{|y|}{3} = 1$$

and inside the ellipse

$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$

is :

- (A) $6(4 - \pi)$
(B) $3(4 - \pi)$
(C) $6(\pi - 2)$
(D) $3(\pi - 2)$

5. Let α and β be the roots of the equation

$5x^2 + 6x - 2 = 0$. If $S_n = \alpha^n + \beta^n$, $n = 1, 2, 3, \dots$, then :

- (A) $5S_6 + 6S_5 = 2S_4$ (B) $5S_6 + 6S_5 + 2S_4 = 0$
(C) $6S_6 + 5S_5 + 2S_4 = 0$ (D) $6S_6 + 5S_5 = 2S_4$

6. If a function $f(x)$ defined by

$$f(x) = \begin{cases} ae^x + be^{-x}, & -1 \leq x < 1 \\ cx^2, & 1 \leq x \leq 3 \\ ax^2 + 2cx, & 3 < x \leq 4 \end{cases}$$

be continuous for some $a, b, c \in \mathbb{R}$ and $f(0) + f(2) = e$, then the value of a is :

- (A) $\frac{e}{e^2 - 3e - 13}$
(B) $\frac{1}{e^2 - 3e + 13}$
(C) $\frac{e}{e^2 - 3e + 13}$
(D) $\frac{e}{e^2 + 3e + 13}$

7. Let $\alpha > 0, \beta > 0$ be such that $\alpha^3 + \beta^2 = 4$. If the maximum value of the term independent of x in the binomial expansion of

$$\left(\alpha x^{\frac{1}{9}} + \beta x^{-\frac{1}{6}}\right)^{10}$$

is $10k$, then k is equal to :

- (A) 176 (B) 336
(C) 352 (D) 84

8. If $R = \{(x, y) : x, y \in \mathbb{Z}, x^2 + 3y^2 \leq 8\}$ is a relation on the set of integers $\mathbb{Z}$, then the domain of R^{-1} is :

- (A) $\{0, 1\}$ (B) $\{-2, -1, 1, 2\}$
(C) $\{-1, 0, 1\}$ (D) $\{-2, -1, 0, 1, 2\}$

9. Let $y = y(x)$ be the solution of the differential equation,

$$\frac{2 + \sin x}{y + 1} \cdot \frac{dy}{dx} = -\cos x$$

, $y > 0, y(0) = 1$.

If $y(\pi) = a$ and $\frac{dy}{dx}$ at $x = \pi$ is b , then the ordered pair (a, b) is equal to :

- (A) $(2, 1)$
(B) $\left(2, \frac{3}{2}\right)$
(C) $(1, -1)$
(D) $(1, 1)$

10. Let $X = \{x \in \mathbb{N} : 1 \leq x \leq 17\}$ and $Y = \{ax + b : x \in X \text{ and } a, b \in \mathbb{R}, a > 0\}$. If mean and variance of elements of Y are 17 and 216 respectively then $a + b$ is equal to :

- (A) 7 (B) 9
(C) -7 (D) -27

11. Let S be the set of all $\lambda \in \mathbb{R}$ for which the system of linear equations

$$2x - y + 2z = 2$$

$$x - 2y + \lambda z = -4$$

$$x + \lambda y + z = 4$$

has no solution. Then the set S :

- (A) contains more than two elements. (B) contains exactly two elements.
(C) is a singleton. (D) is an empty set.

12. Let A be a 2×2 real matrix with entries from $\{0, 1\}$ and $|A| \neq 0$. Consider the following two statements :

(P) If $A \neq I_2$, then $|A| = -1$

(Q) If $|A| = 1$, then $\text{tr}(A) = 2$, where I_2 denotes 2×2 identity matrix and $\text{tr}(A)$ denotes the sum of the diagonal entries of A . Then :

- (A) (P) is true and (Q) is false (B) Both (P) and (Q) are false
(C) Both (P) and (Q) are true (D) (P) is false and (Q) is true

13. If $p(x)$ be a polynomial of degree three that has a local maximum value 8 at $x = 1$ and a local minimum value 4 at $x = 2$; then $p(0)$ is equal to :

- (A) 6 (B) 12
(C) -12 (D) -24

14. The domain of the function $f(x) =$

$$\sin^{-1}\left(\frac{|x| + 5}{x^2 + 1}\right)$$

is $(-\infty, -a] \cup [a, \infty)$. Then a is equal to :

- (A) $\frac{\sqrt{17} - 1}{2}$
(B) $\frac{1 + \sqrt{17}}{2}$
(C) $\frac{\sqrt{17}}{2} + 1$
(D) $\frac{\sqrt{17}}{2}$

15. The contrapositive of the statement "If I reach the station in time, then I will catch the train" is :

- (A) If I will catch the train, then I reach the station in time. (B) If I do not reach the station in time, then I will not catch the train.
- (C) If I will not catch the train, then I do not reach the station in time. (D) If I do not reach the station in time, then I will catch the train.

16. A line parallel to the straight line $2x - y = 0$ is tangent to the hyperbola

$$\frac{x^2}{4} - \frac{y^2}{2} = 1$$

at the point (x_1, y_1) . Then $x_1^2 + 5y_1^2$ is equal to :

- (A) 5 (B) 6
(C) 10 (D) 8

17. If the tangent to the curve $y = x + \sin y$ at a point

(a, b) is parallel to the line joining

$$\left(0, \frac{3}{2}\right)$$

and

$$\left(\frac{1}{2}, 2\right)$$

, then :

(A) $b = a$

(B) $|b - a| = 1$

(C) $b = \frac{\pi}{2} + a$

(D) $|a + b| = 1$

18. The plane passing through the points $(1, 2, 1)$,

$(2, 1, 2)$ and parallel to the line, $2x = 3y, z = 1$ also passes through the point :

- (A) $(0, 6, -2)$ (B) $(-2, 0, 1)$
(C) $(0, -6, 2)$ (D) $(2, 0, -1)$

19. If $|x| < 1, |y| < 1$ and $x \neq y$, then the sum to infinity of the following series

$$(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$$

- (A) $\frac{x + y - xy}{(1 + x)(1 + y)}$
(B) $\frac{x + y - xy}{(1 - x)(1 - y)}$
(C) $\frac{x + y + xy}{(1 + x)(1 + y)}$
(D) $\frac{x + y + xy}{(1 - x)(1 - y)}$

20. Let $P(h, k)$ be a point on the curve

$$y = x^2 + 7x + 2, \text{ nearest to the line, } y = 3x - 3.$$

Then the equation of the normal to the curve at P is :

- (A) $x - 3y - 11 = 0$ (B) $x - 3y + 22 = 0$
(C) $x + 3y - 62 = 0$ (D) $x + 3y + 26 = 0$

21. The integral

$$\int_0^2 ||x-1| - x| dx$$

is equal to _____.

22. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three unit vectors such that

$$|\vec{a} - \vec{b}|^2 + |\vec{a} - \vec{c}|^2 = 8.$$

Then $|\vec{a} + 2\vec{b}|^2 + |\vec{a} + 2\vec{c}|^2$ is equal to _____.

23. If

$$\lim_{x \rightarrow 1} \frac{x + x^2 + x^3 + \dots + x^n - n}{x - 1}$$

= 820,

($n \in \mathbb{N}$) then the value of n is equal to _____.

24. If the letters of the word 'MOTHER' be permuted and all the words so formed (with or without meaning) be listed as in a dictionary, then the position of the word 'MOTHER' is _____.

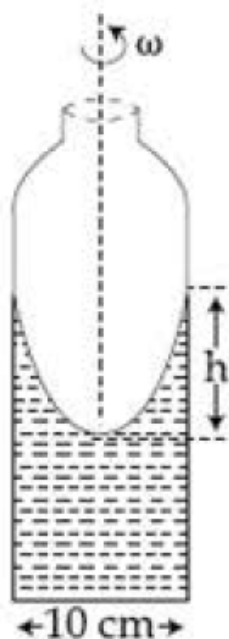
25. The number of integral values of k for which the line, $3x + 4y = k$ intersects the circle, $x^2 + y^2 - 2x - 4y + 4 = 0$ at two distinct points is _____.

Physics - Section A · Multiple Choice Questions

26. Two identical strings X and Z made of same material have tension T_X and T_Z in them. If their fundamental frequencies are 450 Hz and 300 Hz, respectively, then the ratio T_X/T_Z is

- (A) 2.25 (B) 0.44
(C) 1.25 (D) 1.5

27. A cylindrical vessel containing a liquid is rotated about its axis so that the liquid rises at its sides as shown in the figure. The radius of vessel is 5 cm and the angular speed of rotation is ω rad s^{-1} . The difference in the height, h (in cm) of liquid at the centre of vessel and at the side will be :



- (A) $\frac{2\omega^2}{25g}$
(B) $\frac{5\omega^2}{2g}$
(C) $\frac{25\omega^2}{2g}$
(D) $\frac{2\omega^2}{5g}$

28. If speed V , area A and force F are chosen as fundamental units, then the dimension of Young's modulus will be

- (A) $FA^{-1}V^0$ (B) FA^2V^{-1}
(C) FA^2V^{-2} (D) FA^2V^{-3}

29. A plane electromagnetic wave, has frequency of 2.0×10^{10} Hz and its energy density is 1.02×10^{-8} J/m³ in vacuum. The amplitude of the magnetic field of the wave is close to (

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \frac{Nm^2}{C^2}$$

and speed of light
= 3×10^8 ms⁻¹)

- (A) 190 nT (B) 150 nT
(C) 160 nT (D) 180 nT

30. Interference fringes are observed on a screen by illuminating two thin slits 1 mm apart with a light source ($\lambda = 632.8$ nm). The distance between the screen and the slits is 100 cm. If a bright fringe is observed on a screen at a distance of 1.27 mm from the central bright fringe, then the path difference between the waves, which are reaching this point from the slits is close is

- (A) 1.27 μ m (B) 2.05 μ m
(C) 2.87 nm (D) 2 nm

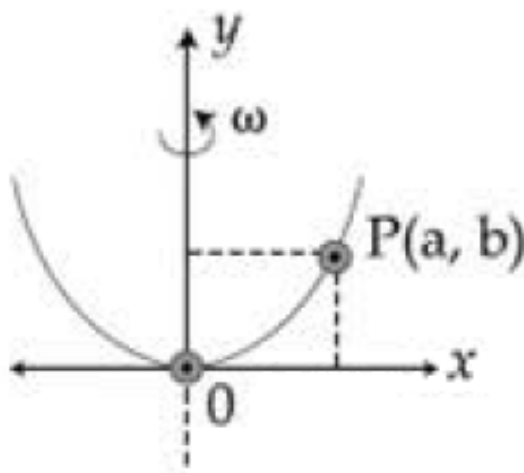
31. A particle of mass m with an initial velocity $u\hat{i}$ collides perfectly elastically with a mass $3m$ at rest. It moves with a velocity $v\hat{j}$ after collision, then, v is given by :

- (A) $v = \sqrt{\frac{2}{3}}u$
(B) $v = \frac{u}{\sqrt{3}}$
(C) $v = \frac{u}{\sqrt{2}}$
(D) $v = \frac{1}{\sqrt{6}}u$

32. A gas mixture consists of 3 moles of oxygen and 5 moles of argon at temperature T . Assuming the gases to be ideal and the oxygen bond to be rigid, the total internal energy (in units of RT) of the mixture is :

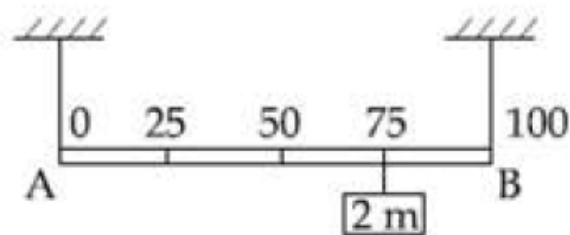
- (A) 11 (B) 20
(C) 15 (D) 13

33. A bead of mass m stays at point $P(a, b)$ on a wire bent in the shape of a parabola $y = 4Cx^2$ and rotating with angular speed ω (see figure). The value of ω is (neglect friction) :



- (A) $2\sqrt{2gC}$
(B) $2\sqrt{gC}$
(C) $\sqrt{\frac{2gC}{ab}}$
(D) $\sqrt{\frac{2g}{C}}$

34.



Shown in the figure is rigid and uniform one meter long rod AB held in horizontal position by two strings tied to its ends and attached to the ceiling. The rod is of mass ' m ' and has another weight of mass $2m$ hung at a distance of 75 cm from A . The tension in the string at A is :

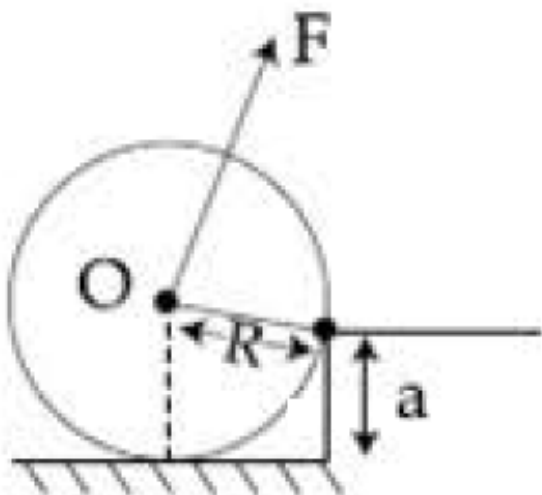
- (A) $0.5mg$ (B) $2mg$
(C) $0.75mg$ (D) $1mg$

35. Train A and train B are running on parallel tracks in the opposite directions with speeds of 36 km/hour and 72 km/hour, respectively. A person is walking in train A in the direction opposite to its motion with a speed of 1.8 km/hour. Speed (in ms^{-1}) of this person as observed from train B will be close to :

(take the distance between the tracks as negligible)

- (A) 30.5 ms^{-1} (B) 29.5 ms^{-1}
(C) 31.5 ms^{-1} (D) 28.5 ms^{-1}

36. A uniform cylinder of mass M and radius R is to be pulled over a step of height a ($a < R$) by applying a force F at its centre 'O' perpendicular to the plane through the axes of the cylinder on the edge of the step (see figure). The minimum value of F required is :

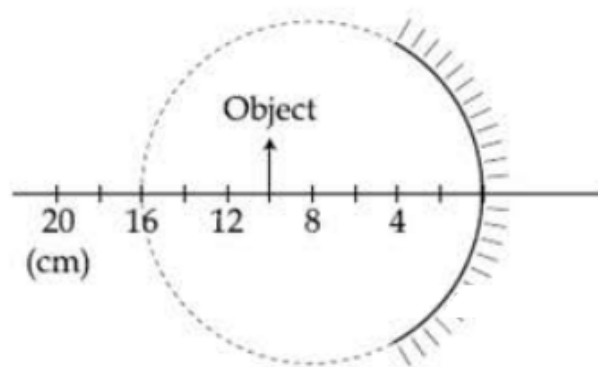


- (A) $Mg\sqrt{1 - \left(\frac{R-a}{R}\right)^2}$
 (B) $Mg\sqrt{1 - \frac{a^2}{R^2}}$
 (C) $Mg\frac{a}{R}$
 (D) $Mg\sqrt{\left(\frac{R}{R-a}\right)^2 - 1}$

37. A beam of protons with speed $4 \times 10^5 \text{ ms}^{-1}$ enters a uniform magnetic field of 0.3 T at an angle of 60° to the magnetic field. The pitch of the resulting helical path of protons is close to :
 (Mass of the proton = $1.67 \times 10^{-27} \text{ kg}$, charge of the proton = $1.69 \times 10^{-19} \text{ C}$)

- (A) 2 cm (B) 12 cm
 (C) 5 cm (D) 4 cm

38.



A spherical mirror is obtained as shown in the figure from a hollow glass sphere. If an object is positioned in front of the mirror, what will be the nature and magnification of the image of the object?

(Figure drawn as schematic and not to scale)

- (A) Inverted, real and unmagnified (B) Inverted, real and magnified
 (C) Erect, virtual and magnified (D) Erect, virtual and unmagnified

39. Consider four conducting materials copper, tungsten, mercury and aluminium with resistivity ρ_C , ρ_T , ρ_M and ρ_A respectively. Then :

- (A) $\rho_C > \rho_A > \rho_T$ (B) $\rho_M > \rho_A > \rho_C$
 (C) $\rho_A > \rho_T > \rho_C$ (D) $\rho_A > \rho_M > \rho_C$

40. The mass density of a spherical galaxy varies as

$$\frac{K}{r}$$

over a large distance 'r' from its centre. In that region, a small star is in a circular orbit of radius R . Then the period of revolution, T depends on R as :

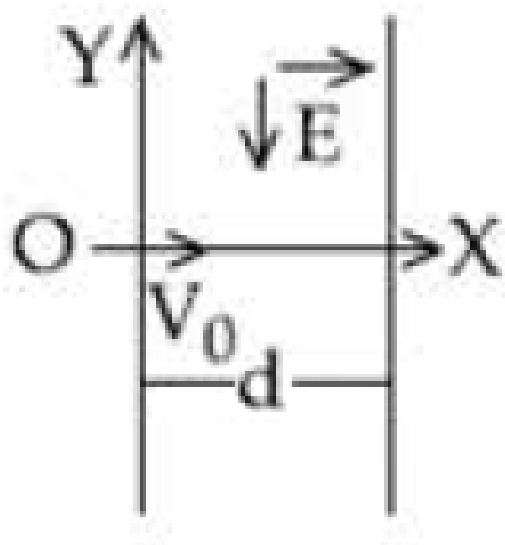
- (A) $T^2 \propto R$ (B) $T^2 \propto R^3$
 (C) $T \propto R$ (D) $T^2 \propto \frac{1}{R^3}$

41. A charged particle (mass m and charge q) moves along X-axis with velocity V_0 . When it passes through the origin it enters a region having uniform electric field

$$\vec{E} = -E\hat{j}$$

which extends upto $x = d$.

Equation of path of electron in the region $x > d$ is



(A) $y =$

$$\frac{qEd}{mV_0^2}(x - d)$$

(B) $y =$

$$\frac{qEd}{mV_0^2}\left(\frac{d}{2} - x\right)$$

(C) $y = \frac{qEd}{mV_0^2}x$

(D) $y = \frac{qEd^2}{mV_0^2}x$

42. The least count of the main scale of a vernier callipers is 1 mm. Its vernier scale is divided into 10 divisions and coincide with 9 divisions of the main scale. When jaws are touching each other, the 7th division of vernier scale coincides with a division of main scale and the zero of vernier scale is lying right side of the zero of main scale. When this vernier is used to measure length of a cylinder the zero of the vernier scale between 3.1 cm and 3.2 cm and 4th VSD coincides with a main scale division. The length of the cylinder is : (VSD is vernier scale division)

(A) 3.21 cm

(B) 2.99 cm

(C) 3.07 cm

(D) 3.2 cm

43. In a reactor, 2 kg of ${}_{92}\text{U}^{235}$ fuel is fully used up in 30 days. The energy released per fission is 200 MeV. Given that the Avogadro number, $N = 6.023 \times 10^{26}$ per kilo mole and $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$. The power output of the reactor is close to

(A) 125 MW

(B) 60 MW

(C) 54 MW

(D) 35 MW

44. Magnetic materials used for making permanent magnets (P) and magnets in a transformer (T) have different properties of the following, which property best matches for the type of magnet required?

(A) T : Large retentivity, small coercivity

(B) P : Large retentivity, large coercivity

(C) P : Small retentivity, large coercivity

(D) T : Large retentivity, large coercivity

45. An amplitude modulated wave is represented by the expression

$v_m = 5(1 + 0.6 \cos 6280t) \sin(211 \times 10^4 t)$ volts
The minimum and maximum amplitudes of the amplitude modulated wave are, respectively

(A) $\frac{3}{2} \text{ V}, 5 \text{ V}$

(B) $\frac{5}{2} \text{ V}, 8 \text{ V}$

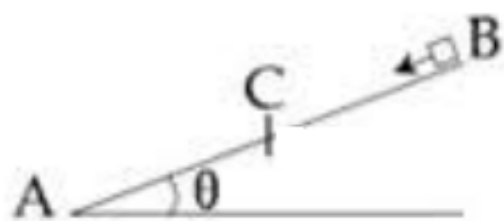
(C) $5 \text{ V}, 8 \text{ V}$

(D) $3 \text{ V}, 5 \text{ V}$

46. A $5\ \mu\text{F}$ capacitor is charged fully by a $220\ \text{V}$ supply. It is then disconnected from the supply and is connected in series to another uncharged $2.5\ \mu\text{F}$ capacitor. If the energy change during the charge redistribution is $\frac{X}{100}\text{J}$ then value of X to the nearest integer is _____.

47. An engine takes in 5 moles of air at 20°C and 1 atm, and compresses it adiabatically to $1/10^{\text{th}}$ of the original volume. Assuming air to be a diatomic ideal gas made up of rigid molecules, the change in its internal energy during this process comes out to be $X\ \text{kJ}$. The value of X to the nearest integer is _____.

48.

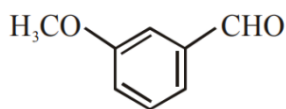


A small block starts slipping down from a point B on an inclined plane AB, which is making an angle θ with the horizontal. Section BC is smooth and the remaining section CA is rough with a coefficient of friction μ . It is found that the block comes to rest as it reaches the bottom (point A) of the inclined plane. If $BC = 2AC$, the coefficient of friction is given by $\mu = k \tan \theta$. The value of k is _____.

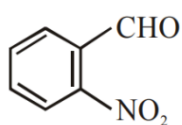
49. When radiation of wavelength λ is used to illuminate a metallic surface, the stopping potential is V . When the same surface is illuminated with radiation of wavelength 3λ , the stopping potential is $\frac{V}{4}$. If the threshold wavelength for the metallic surface is $n\lambda$ then value of n will be _____.

50. A circular coil of radius $10\ \text{cm}$ is placed in a uniform magnetic field of $3.0 \times 10^{-5}\ \text{T}$ with its plane perpendicular to the field initially. It is rotated at constant angular speed about an axis along the diameter of coil and perpendicular to magnetic field so that it undergoes half of rotation in $0.2\ \text{s}$. The maximum value of EMF induced (in μV) in the coil will be close to the integer _____.

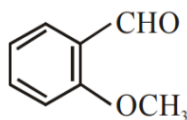
51. The increasing order of the following compounds towards HCN addition is :



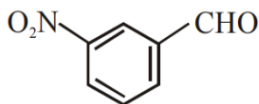
(i)



(ii)



(iii)



(iv)

- (A) (iii) < (iv) < (ii) < (i) (B) (i) < (iii) < (iv) < (ii)
 (C) (iii) < (i) < (iv) < (ii) (D) (iii) < (iv) < (i) < (ii)

52. Consider that a d^6 metal ion (M^{2+}) forms a complex with aqua ligands, and the spin only magnetic moment of the complex is 4.90 BM. The geometry and the crystal field stabilization energy of the complex is

- (A) tetrahedral and $-1.6 \Delta_t + 1P$ (B) octahedral and $-2.4 \Delta_0 + 2P$
 (C) tetrahedral and $-0.6 \Delta_t$ (D) octahedral and $-1.6 \Delta_0$

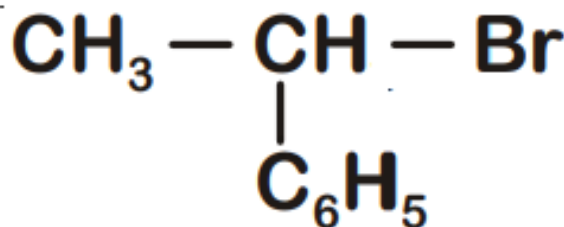
53. For the following **Assertion** and **Reason**, the correct option is

Assertion (A): When Cu (II) and sulphide ions are mixed, they react together extremely quickly to give a solid.

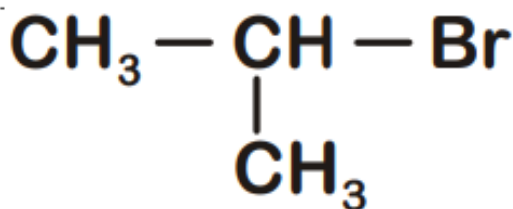
Reason (R): The equilibrium constant of $\text{Cu}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightleftharpoons \text{CuS}(\text{s})$ is high because the solubility product is low.

- (A) (A) is false and (R) is true. (B) Both (A) and (R) are true but (R) is not the explanation for (A).
 (C) Both (A) and (R) are true and (R) is the explanation for (A). (D) Both (A) and (R) are false.

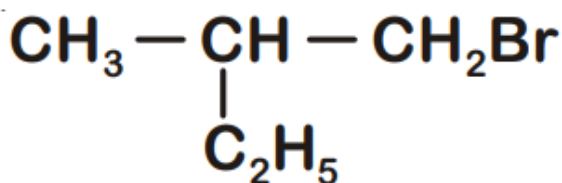
54. Which of the following compounds will show retention in configuration on nucleophilic substitution by OH^- ion?



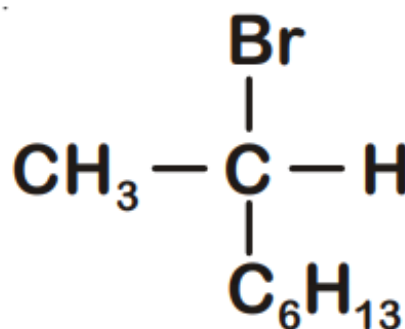
(A)



(B)



(C)



(D)

55. For octahedral Mn(II) and tetrahedral Ni(II) complexes, consider the following statements:
 (I) both the complexes can be high spin.
 (II) Ni(II) complex can very rarely be low spin.
 (III) with strong field ligands, Mn(II) complexes can be low spin.
 (IV) aqueous solution of Mn(II) ions is yellow in colour.

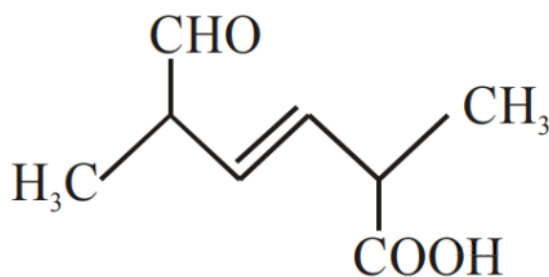
The **correct** statements are :

- (A) (I), (III) and (IV) only (B) (I) and (II) only
 (C) (II), (III) and (IV) only (D) (I), (II) and (III) only

56. In general the property (magnitudes only) that show an opposite trend in comparison to other properties across a period is

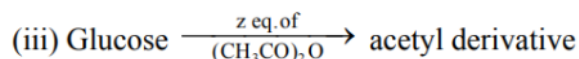
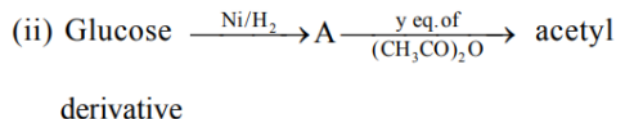
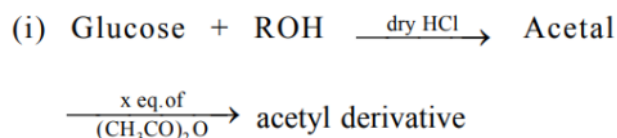
- (A) Electron gain enthalpy (B) Electronegativity
 (C) Ionization enthalpy (D) Atomic radius

57. The IUPAC name for the following compound is



- (A) 2, 5-dimethyl-6-carboxy-hex-3-enal (B) 6-formyl-2-methyl-hex-3-enoic acid
 (C) 2, 5-dimethyl-5-carboxy-hex-3-enal (D) 2, 5-dimethyl-6-oxo-hex-3-enoic acid

58. Consider the following reactions:



'x', 'y' and 'z' in these reactions are respectively.

- (A) 5, 6, & 5 (B) 4, 5 & 5
 (C) 4, 6 & 5 (D) 5, 4 & 5

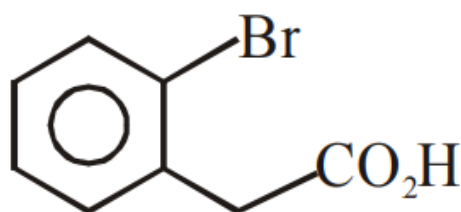
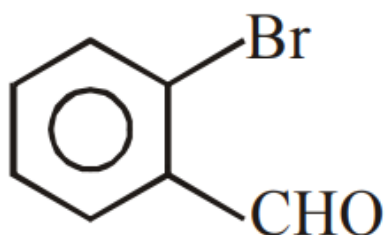
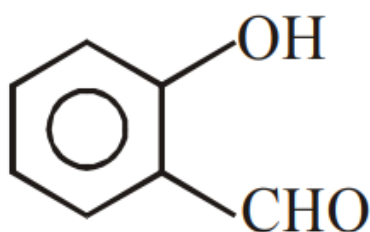
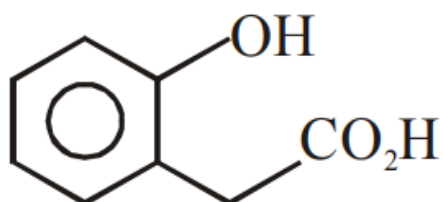
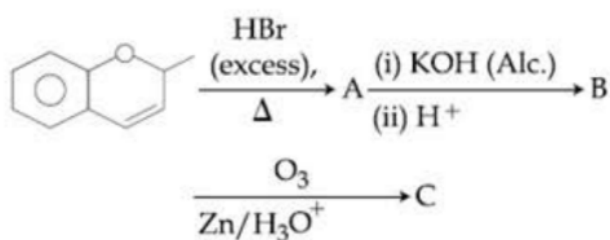
59. An open beaker of water in equilibrium with water vapour is in a sealed container. When a few grams of glucose are added to the beaker of water, the rate at which water molecules :

- (A) leaves the solution increases (B) leaves the vapour increases
 (C) leaves the vapour decreases (D) leaves the solution decreases

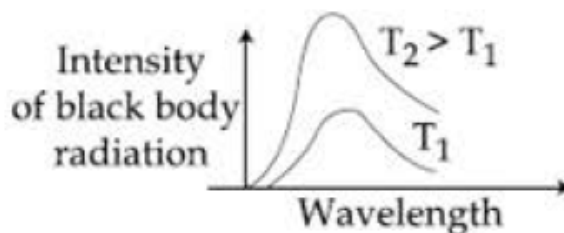
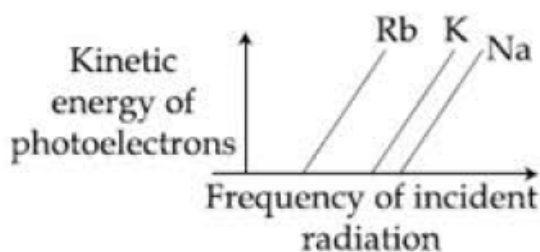
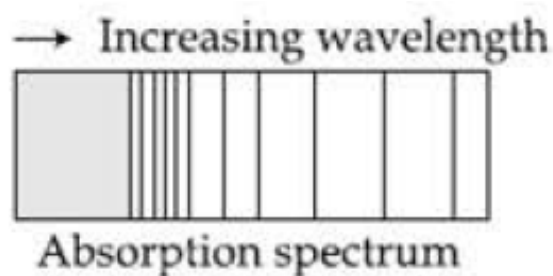
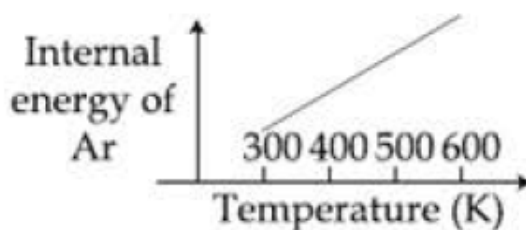
60. While titrating dilute HCl solution with aqueous NaOH, which of the following will not be required?

- (A) Pipette and distilled water (B) Clamp and phenolphthalein
 (C) Burette and porcelain tile (D) Bunsen burner and measuring cylinder

61. The major aromatic product C in the following reaction sequence will be :



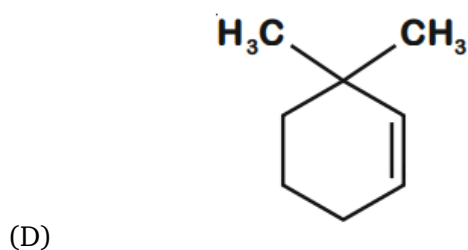
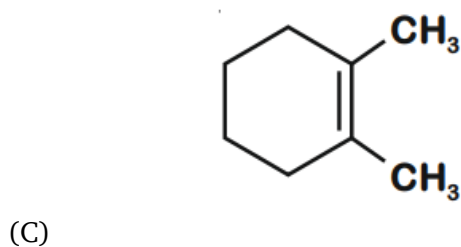
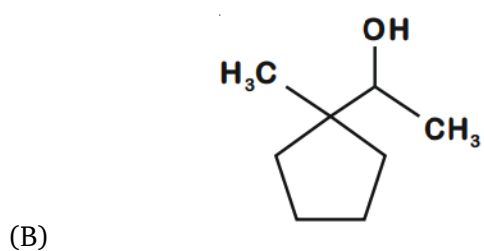
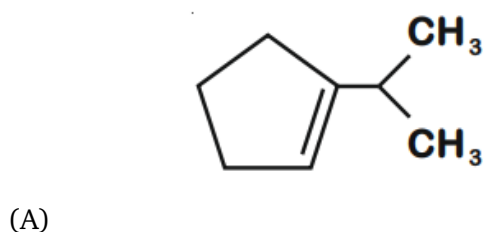
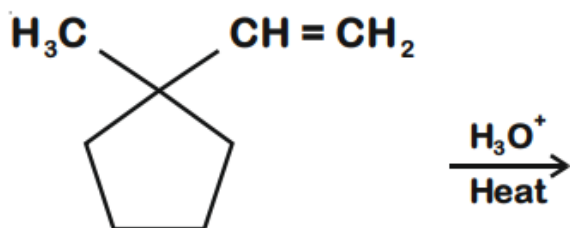
62. The figure that is not a direct manifestation of the quantum nature of atoms is :



63. If AB_4 molecule is a polar molecule, a possible geometry of AB_4 is

- (A) Tetrahedral (B) see-saw
(C) Square pyramidal (D) Square planar

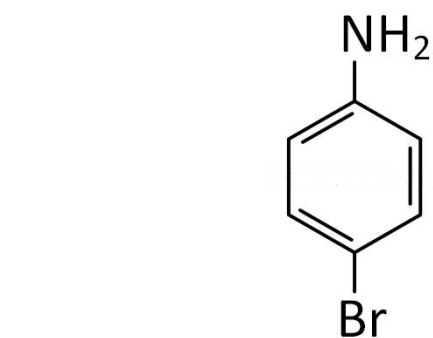
64. The major product in the following reaction is :



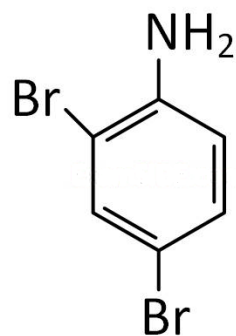
65. In Carius method of estimation of halogen, 0.172 g of an organic compound showed presence of 0.08 g of bromine. Which of these is the correct structure of the compound?

(A) $\text{H}_3\text{C} - \text{CH}_2 - \text{Br}$

(B) $\text{H}_3\text{C} - \text{Br}$



(C)

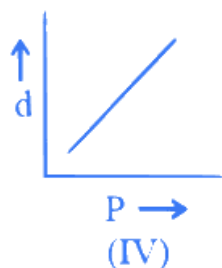
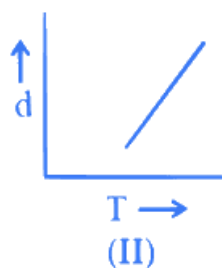
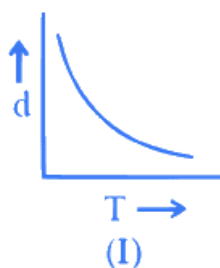


(D)

66. The statement that is not true about ozone is :

- | | |
|---|--|
| (A) In the stratosphere, CFCs release chlorine free radicals (Cl) which reacts with O_3 to give chlorine dioxide radicals | (B) It is a toxic gas and its reaction with NO gives NO_2 . |
| (C) In the atmosphere, it is depleted by CFCs | (D) In the stratosphere, it forms a protective shield against UV radiation |

67. Which one of the following graphs is **not correct** for ideal gas?



d = Density, P = Pressure, T = Temperature

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

68. Which of the following is used for the preparation of colloids?

- | | |
|----------------------|-------------------------|
| (A) Van Arkel Method | (B) Bredig's Arc Method |
| (C) Mond Process | (D) Ostwald Process |

69. On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with H_2 in the presence of a catalyst gives another gas (C) which is basic in nature. (A) should **not** be :

- | | |
|------------------|-----------------------|
| (A) $Pb(NO_3)_2$ | (B) $(NH_4)_2Cr_2O_7$ |
| (C) NH_4NO_2 | (D) NaN_3 |

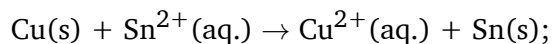
70. The metal mainly used in devising photoelectric cells is :

- | | |
|--------|--------|
| (A) Na | (B) Rb |
| (C) Li | (D) Cs |

Chemistry - Section B · Numerical Value Questions

71. The Gibbs change (in J) for the given reaction at

$[\text{Cu}^{2+}] = [\text{Sn}^{2+}] = 1 \text{ M}$ and 298K is :



(

$$E_{\text{Sn}^{2+}|\text{Sn}}^0 = -0.16 \text{ V}$$

,

$$E_{\text{Cu}^{2+}|\text{Cu}}^0 = 0.34 \text{ V}$$

)

Take $F = 96500 \text{ C mol}^{-1}$)

72. The internal energy change (in J) When 90 g of water undergoes complete evaporation at 100°C is _____.

(Given :

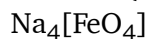
H_{vap} for water at $373 \text{ K} = 41 \text{ kJ/mol}$,

$R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)

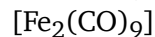
73. The oxidation states of iron atoms in compounds (A), (B) and (C), respectively, are x, y and z. The sum of x, y and z is _____.



(A)

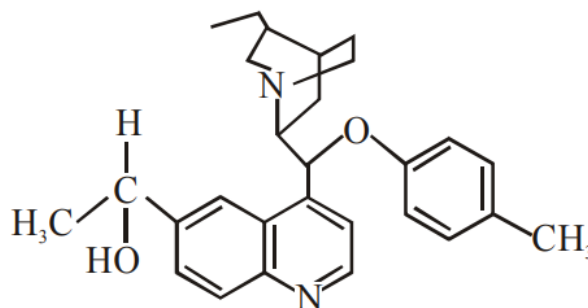


(B)



(C)

74. The number of chiral carbons present in the molecule given below is _____.



75. The mass of gas adsorbed, x, per unit mass of adsorbate, m, was measured at various pressures, p. A graph between

$$\log \frac{x}{m}$$

and $\log p$ gives a straight line with slope equal to 2 and the intercept equal to 0.4771. The value of

$$\frac{x}{m}$$

at a pressure of 4 atm is :

(Given $\log 3 = 0.4771$)

- End of Question Paper -