

JEE Main 2020 Paper 1 (B.E./B.Tech) 5 September 2020 Shift 2 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 5 September 2020, Shift 2. 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. If

$$\int \frac{\cos \theta}{5 + 7 \sin \theta - 2 \cos^2 \theta} d\theta = A \log_e |B(\theta)| + C,$$

where C is a constant of integration, then $\frac{B(\theta)}{A}$

can be :

- (A) $\frac{2 \sin \theta + 1}{5(\sin \theta + 3)}$
 (B) $\frac{2 \sin \theta + 1}{\sin \theta + 3}$
 (C) $\frac{5(2 \sin \theta + 1)}{\sin \theta + 3}$
 (D) $\frac{5(\sin \theta + 3)}{2 \sin \theta + 1}$

2. If α and β are the roots of the equation, $7x^2 - 3x - 2 = 0$, then the value of

$$\frac{\alpha}{1 - \alpha^2} + \frac{\beta}{1 - \beta^2}$$

is equal to :

- (A) $\frac{1}{24}$
 (B) $\frac{27}{32}$
 (C) $\frac{27}{16}$
 (D) $\frac{3}{8}$

3. The value of

$$\left(\frac{-1 + i\sqrt{3}}{1 - i} \right)^{30}$$

is :

- (A) $-2^{15}i$ (B) -2^{15}
 (C) $2^{15}i$ (D) 6^5

4. If $L = \sin^2$

$$\left(\frac{\pi}{16} \right)$$

- $\sin^2$

$$\left(\frac{\pi}{8} \right)$$

and

$$M = \cos^2$$

$$\left(\frac{\pi}{16} \right)$$

- $\sin^2$

$$\left(\frac{\pi}{8} \right)$$

, then :

(A) $L =$

$$-\frac{1}{2\sqrt{2}} + \frac{1}{2} \cos \frac{\pi}{8}$$

(B) $M =$

$$\frac{1}{2\sqrt{2}} + \frac{1}{2} \cos \frac{\pi}{8}$$

(C) $M =$

$$\frac{1}{4\sqrt{2}} + \frac{1}{4} \cos \frac{\pi}{8}$$

(D) $L =$

$$\frac{1}{4\sqrt{2}} - \frac{1}{4} \cos \frac{\pi}{8}$$

5. If the sum of the second, third and fourth terms of a positive term G.P is 3 and the sum of its sixth, seventh and eighth terms is 243, then the sum of the first 50 terms of this G.P is :

- (A) $\frac{2}{13}(3^{50} - 1)$
 (B) $\frac{1}{13}(3^{50} - 1)$
 (C) $\frac{1}{26}(3^{49} - 1)$
 (D) $\frac{1}{26}(3^{50} - 1)$

6. If the system of linear equations
 $x + y + 3z = 0$
 $x + 3y + k^2z = 0$
 $3x + y + 3z = 0$
 has a non-zero solution (x, y, z) for some $k \in \mathbb{R}$,
 then $x +$

$$\left(\frac{y}{z}\right)$$

is equal to :

- (A) 9 (B) 3
 (C) -9 (D) -3

7. If $x = 1$ is a critical point of the function
 $f(x) = (3x^2 + ax - 2 - a)e^x$, then :

(A) $x = 1$ is a local maxima and $x =$
 $-\frac{2}{3}$

is a local minima of f .

(B) $x = 1$ and $x =$
 $-\frac{2}{3}$
 are local maxima of f .

(C) $x = 1$ and $x =$
 $-\frac{2}{3}$
 are local minima of f .

(D) $x = 1$ is a local minima and $x =$
 $-\frac{2}{3}$
 is a local maxima of f .

8. There are 3 sections in a question paper and each section contains 5 questions. A candidate has to answer a total of 5 questions, choosing at least one question from each section. Then the number of ways, in which the candidate can choose the questions, is :

- (A) 2250 (B) 2255
 (C) 3000 (D) 1500

9. If the length of the chord of the circle,
 $x^2 + y^2 = r^2$ ($r > 0$) along the line, $y - 2x = 3$ is
 r ,
 then r^2 is equal to :

- (A) $\frac{9}{5}$
 (B) $\frac{24}{5}$
 (C) $\frac{12}{5}$
 (D) 12

10. The area (in sq. units) of the region
 $A = \{(x, y) : (x - 1)[x] \leq y \leq 2\sqrt{x}, 0 \leq x \leq 2\}$,
 where $[t]$
 denotes the greatest integer function, is :

- (A) $\frac{8}{3}\sqrt{2} - 1$
 (B) $\frac{4}{3}\sqrt{2} + 1$
 (C) $\frac{8}{3}\sqrt{2} - \frac{1}{2}$
 (D) $\frac{4}{3}\sqrt{2} - \frac{1}{2}$

11.

$$\lim_{x \rightarrow 0} \frac{x \left(e^{(\sqrt{1+x^2+x^4}-1)/x} - 1 \right)}{\sqrt{1+x^2+x^4} - 1}$$

- (A) is equal to 0. (B) is equal to $\sqrt{e}$.
 (C) is equal to 1. (D) does not exist.

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

$$\cos x \frac{dy}{dx} + 2y \sin x = \sin 2x, x \in \left(0, \frac{\pi}{2}\right)$$

If y

$$\left(\frac{\pi}{3}\right)$$

= 0, then y

$$\left(\frac{\pi}{4}\right)$$

is equal to :

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

13. If $a + x = b + y = c + z + 1$, where a, b, c, x, y, z are non-zero distinct real numbers, then

$$\begin{vmatrix} x & a+y & x+a \\ y & b+y & y+b \\ z & c+y & z+c \end{vmatrix}$$

is equal to :

- (A) $y(b-a)$ (B) $y(a-b)$
(C) $y(a-c)$ (D) 0

14. If the mean and the standard deviation of the data 3, 5, 7, a, b are 5 and 2 respectively, then a and b are the roots of the equation :

- (A) $x^2 - 20x + 18 = 0$ (B) $2x^2 - 20x + 19 = 0$
(C) $x^2 - 10x + 18 = 0$ (D) $x^2 - 10x + 19 = 0$

15. The derivative of

$$\tan^{-1}\left(\frac{\sqrt{1+x^2} - 1}{x}\right)$$

with respect to

$$\tan^{-1}\left(\frac{2x\sqrt{1-x^2}}{1-2x^2}\right)$$

at $x = \frac{1}{2}$ is :

- (A) $\frac{2\sqrt{3}}{3}$
(B) $\frac{2\sqrt{3}}{5}$
(C) $\frac{\sqrt{3}}{10}$
(D) $\frac{\sqrt{3}}{12}$

16. The statement

$(p \rightarrow (q \rightarrow p)) \rightarrow (p \rightarrow (p \vee q))$ is :

- (A) a tautology (B) a contradiction
(C) equivalent to $(p \vee q) \wedge (\sim p)$ (D) equivalent to $(p \wedge q) \vee (\sim q)$

17. If the line $y = mx + c$ is a common tangent to the hyperbola

$$\frac{x^2}{100} - \frac{y^2}{64} = 1$$

and the circle $x^2 + y^2 = 36$, then which one of the following is true?

- (A) $5m = 4$ (B) $8m + 5 = 0$
(C) $c^2 = 369$ (D) $4c^2 = 369$

18. Which of the following points lies on the tangent to the curve

$$x^4 e^y + 2\sqrt{y+1} = 3 \text{ at the point } (1, 0)?$$

- (A) (2, 2) (B) (-2, 4)
(C) (2, 6) (D) (-2, 6)

19. If the sum of the first 20 terms of the series $\log_{(7^{1/2})} x + \log_{(7^{1/3})} x + \log_{(7^{1/4})} x + \dots$

is 460,

then x is equal to :

- (A) e^2 (B) $7^{1/2}$
(C) 7^2 (D) $7^{46/21}$

20. If for some $\alpha \in \mathbb{R}$, the lines

$L_1 :$

$$\frac{x+1}{2} = \frac{y-2}{-1} = \frac{z-1}{1}$$

and

$L_2 :$

$$\frac{x+2}{\alpha} = \frac{y+1}{5-\alpha} = \frac{z+1}{1}$$

are coplanar,

then the line L_2 passes through the point :

- (A) (10, 2, 2) (B) (2, -10, -2)
(C) (10, -2, -2) (D) (-2, 10, 2)

21. Let the vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ be such that

$$|\vec{a}| = 2$$

,

$$|\vec{b}| = 4$$

and

$$|\vec{c}| = 4$$

. If the projection of $\vec{b}$ on $\vec{a}$ is equal to the projection of $\vec{c}$ on $\vec{a}$ and $\vec{b}$ is perpendicular to $\vec{c}$, then the value of $|\vec{a} + \vec{b} - \vec{c}|$ is _____.

22. Let $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$. Then the number of elements in the set $C = \{f : A \rightarrow B \mid 2 \in f(A) \text{ and } f \text{ is not one-one}\}$ is _____.

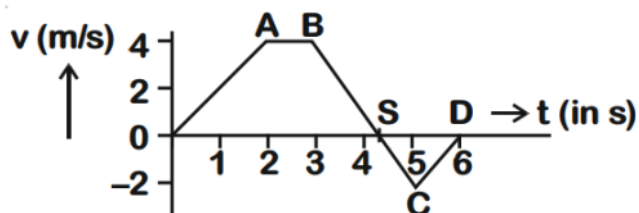
23. If the lines $x + y = a$ and $x - y = b$ touch the curve $y = x^2 - 3x + 2$ at the points where the curve intersects the x-axis, then

$\frac{a}{b}$
 is equal to _____.

24. The coefficient of x^4 in the expansion of $(1 + x + x^2 + x^3)^6$ in powers of x , is _____.

25. In a bombing attack, there is 50% chance that a bomb will hit the target. Atleast two independent hits are required to destroy the target completely. Then the minimum number of bombs, that must be dropped to ensure that there is at least 99% chance of completely destroying the target, is _____.

26. The velocity (v) and time (t) graph of a body in a straight line motion is shown in the figure. The point S is at 4.333 seconds. The total distance covered by the body in 6 s is :



- (A) 12 m (B) 11 m
(C) $\frac{49}{4}$ m (D) $\frac{37}{3}$ m

27. A galvanometer is used in laboratory for detecting the null point in electrical experiments. If, on passing a current of 6 mA it produces a deflection of 2° , its figure of merit is close to :

- (A) 6×10^{-3} A/div (B) 666° A/div
(C) 3×10^{-3} A/div (D) 333° A/div

28. The quantities $x =$

$$\frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

, $y =$

$$\frac{E}{B}$$

and $z = \frac{l}{CR}$ are

defined where C-capacitance, R-Resistance, l-length, E-Electric field, B-magnetic field and ϵ_0 , μ_0 , - free space permittivity and permeability respectively. Then :

- (A) Only y and z have the same dimension (B) x, y and z have the same dimension
(C) Only x and y have the same dimension (D) Only x and z have the same dimension

29. In an experiment to verify Stokes law, a small spherical ball of radius r and density ρ falls under gravity through a distance h in air before entering a tank of water. If the terminal velocity of the ball inside water is same as its velocity just before entering the water surface, then the value of h is proportional to : (ignore viscosity of air)

- (A) r (B) r^4
(C) r^3 (D) r^2

30. Two different wires having lengths L_1 and L_2 , and respective temperature coefficient of linear expansion α_1 and α_2 , are joined end-to-end. Then the effective temperature coefficient of linear expansion is :

- (A) $2\sqrt{\alpha_1 \alpha_2}$
(B) $4 \frac{\alpha_1 \alpha_2}{\alpha_1 + \alpha_2} \frac{L_2 L_1}{(L_2 + L_1)^2}$
(C) $\frac{\alpha_1 + \alpha_2}{2}$
(D) $\frac{\alpha_1 L_1 + \alpha_2 L_2}{L_1 + L_2}$

31. A parallel plate capacitor has plate of length 'l', width 'w' and separation of plates is 'd'. It is connected to a battery of emf V. A dielectric slab of the same thickness 'd' and of dielectric constant $k = 4$ is being inserted between the plates of the capacitor. At what length of the slab inside plates, will the energy stored in the capacitor be two times the initial energy stored?

- (A) $\frac{l}{4}$
(B) $\frac{l}{2}$
(C) $\frac{2l}{3}$
(D) $\frac{l}{3}$

32. In an adiabatic process, the density of a diatomic gas becomes 32 times its initial value. The final pressure of the gas is found to be n times the initial pressure. The value of n is :

- (A) 128
(B) 32
(C) 326
(D) $\frac{1}{32}$

33. The acceleration due to gravity on the earth's surface at the poles is g and angular velocity of the earth about the axis passing through the pole is ω . An object is weighed at the equator and at a height h above the poles by using a spring balance. If the weights are found to be same, then h is ($h \ll R$, where R is the radius of the earth)

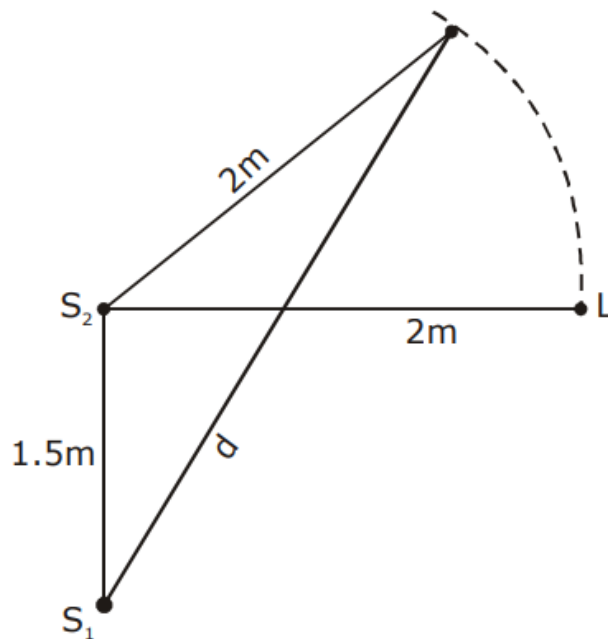
- (A) $\frac{R^2 \omega^2}{2g}$
(B) $\frac{R^2 \omega^2}{g}$
(C) $\frac{R^2 \omega^2}{8g}$
(D) $\frac{R^2 \omega^2}{4g}$

34. A ring is hung on a nail. It can oscillate, without slipping or sliding

- (i) in its plane with a time period T_1 and,
(ii) back and forth in a direction perpendicular to its plane,
with a period T_2 . The ratio $\frac{T_1}{T_2}$ will be :

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

35. Two coherent sources of sound, S_1 and S_2 , produce sound waves of the same wavelength, $\lambda = 1$ m, in phase. S_1 and S_2 are placed 1.5 m apart (see fig). A listener, located at L , directly in front of S_2 finds that the intensity is at a minimum when he is 2 m away from S_2 . The listener moves away from S_1 , keeping his distance from S_2 fixed. The adjacent maximum of intensity is observed when the listener is at a distance d from S_1 . Then, d is :

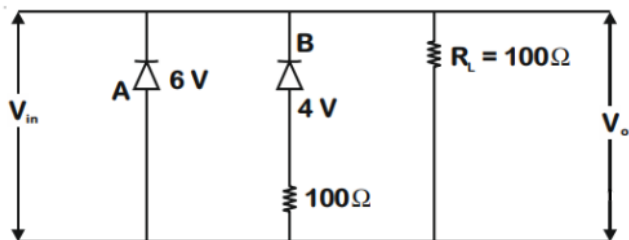


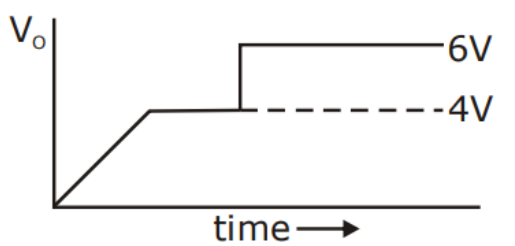
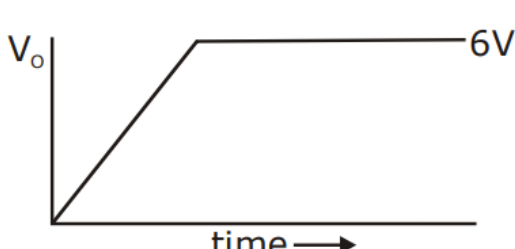
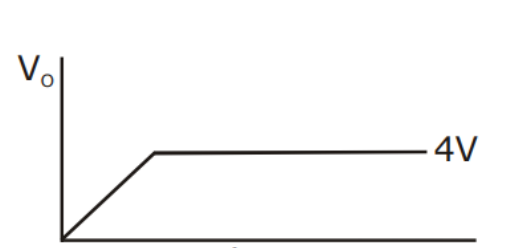
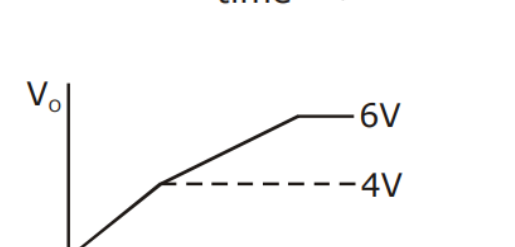
- (A) 12 m
(B) 2 m
(C) 3 m
(D) 5 m

36. Two Zener diodes (A and B) having breakdown voltages of 6 V and 4 V respectively, are connected as shown in the circuit below. The output voltage V_o variation with input voltage linearly increasing with time, is given by :

($V_{\text{input}} = 0 \text{ V}$ at $t = 0$)

(figures are qualitative)



- (A) 
- (B) 
- (C) 
- (D) 

37. A spaceship in space sweeps stationary inter-planetary dust. As a result, its mass increases at a rate

$$\frac{dM(t)}{dt}$$

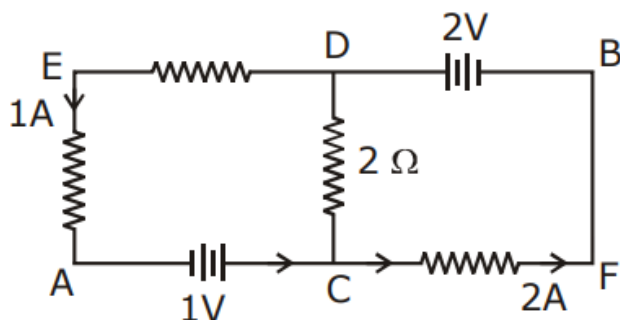
$= bv^2(t)$, where $v(t)$ is its instantaneous velocity. The instantaneous acceleration of the satellite is :

- (A) $-bv^3(t)$
- (B) $-\frac{2bv^3}{M(t)}$
- (C) $-\frac{bv^3}{M(t)}$
- (D) $-\frac{bv^3}{2M(t)}$

38. An iron rod of volume 10^{-3} m^3 and relative permeability 1000 is placed as core in a solenoid with 10 turns/cm. If a current of 0.5 A is passed through the solenoid, then the magnetic moment of the rod will be :

- (A) $5 \times 10^2 \text{ Am}^2$ (B) $0.5 \times 10^2 \text{ Am}^2$
- (C) $500 \times 10^2 \text{ Am}^2$ (D) $50 \times 10^2 \text{ Am}^2$

39. In the circuit, given in the figure currents in different branches and value of one resistor are shown. Then potential at point B with respect to the point A is :



- (A) +2 V (B) -2 V
(C) +1 V (D) -1 V

40. The correct match between the entries in column I and column II are :

I	II
Radiation	Wavelength
(a) Microwave	(i) 100 m
(b) Gamma rays	(ii) 10^{-15} m
(c) A.M. radio waves	(iii) 10^{-10} m
(d) X-rays	(iv) 10^{-3} m

- (A) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii) (B) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
(C) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv) (D) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

41. Ten charges are placed on the circumference of a circle of radius R with constant angular separation between successive charges. Alternate charges 1, 3, 5, 7, 9 have charge (+q) each, while 2, 4, 6, 8, 10 have charge (-q) each. The potential V and the electric field E at the centre of the circle are respectively.

(Take $V = 0$ at infinity)

- (A) $V = 0$; $E = 0$

(B) $V = \frac{10q}{4\pi\epsilon_0 R}$;

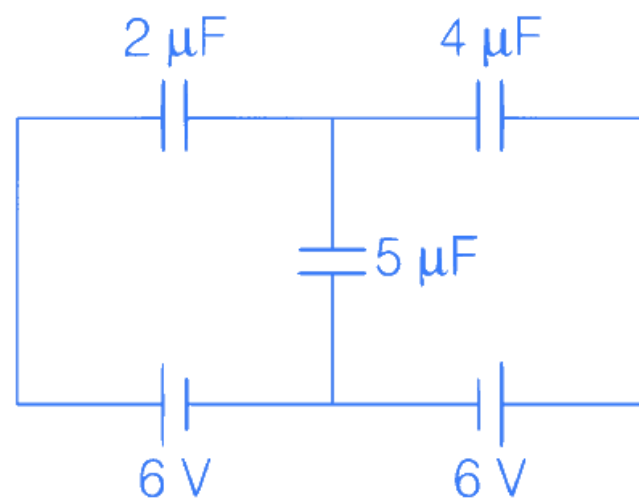
$$E = \frac{10q}{4\pi\epsilon_0 R^2}$$

- (C) $V = \frac{10q}{4\pi\epsilon_0 R}$; $E = 0$

- (D) $V = 0$;

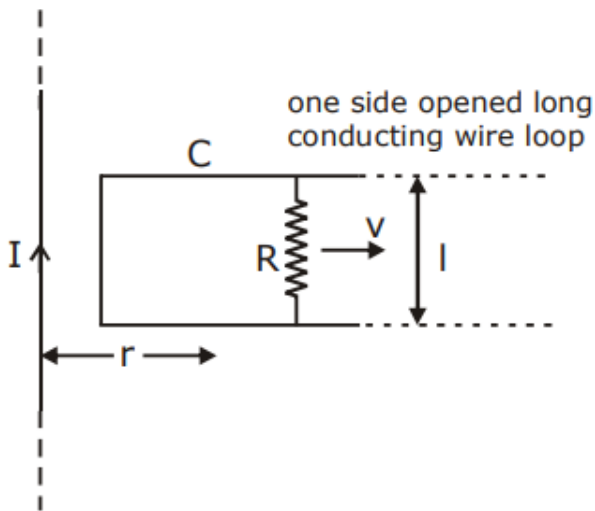
$$E = \frac{10q}{4\pi\epsilon_0 R^2}$$

42. In the circuit shown, charge on the $5 \mu\text{F}$ capacitor is :



- (A) $5.45 \mu\text{C}$ (B) $18.00 \mu\text{C}$
(C) $10.90 \mu\text{C}$ (D) $16.36 \mu\text{C}$

43. An infinitely long, straight wire carrying current I , one side opened rectangular loop and a conductor C with a sliding connector are located in the same plane, as shown, in the figure. The connector has length l and resistance R . It slides to the right with a velocity v . The resistance of the conductor and the self inductance of the loop are negligible. The induced current in the loop, as a function of separation r , between the connector and the straight wire is :



- (A) $\frac{\mu_0 I v l}{4\pi R r}$
 (B) $\frac{\mu_0 I v l}{\pi R r}$
 (C) $\frac{\mu_0 I v l}{2\pi R r}$
 (D) $\frac{2\mu_0 I v l}{\pi R r}$

44. A radioactive nucleus decays by two different processes. The half life for the first process is 10 s and that for the second is 100 s. The effective half life of the nucleus is close to :

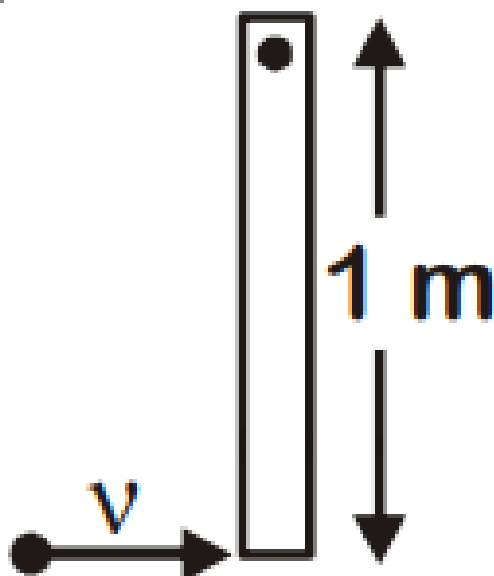
- (A) 12 sec (B) 9 sec
 (C) 55 sec (D) 6 sec

45. A driver in a car, approaching a vertical wall notices that the frequency of his car horn, has changed from 440 Hz to 480 Hz, when it gets reflected from the wall. If the speed of sound in air is 345 m/s, then the speed of the car is :

- (A) 36 km/hr (B) 54 km/hr
 (C) 24 km/hr (D) 18 km/hr

46. A prism of angle $A = 1^\circ$ has a refractive index $\mu = 1.5$. A good estimate for the minimum angle of deviation (in degrees) is close to $\frac{N}{10}$. Value of N is ____.

47. A thin rod of mass 0.9 kg and length 1 m is suspended, at rest, from one end so that it can freely oscillate in the vertical plane. A particle of mass 0.1 kg moving in a straight line with velocity 80 m/s hits the rod at its bottom most point and sticks to it (see figure). The angular speed (in rad/s) of the rod immediately after the collision will be ____.



48. A body of mass 2 kg is driven by an engine delivering a constant power of 1 J/s. The body starts from rest and moves in a straight line. After 9 seconds, the body has moved a distance (in m) ____.

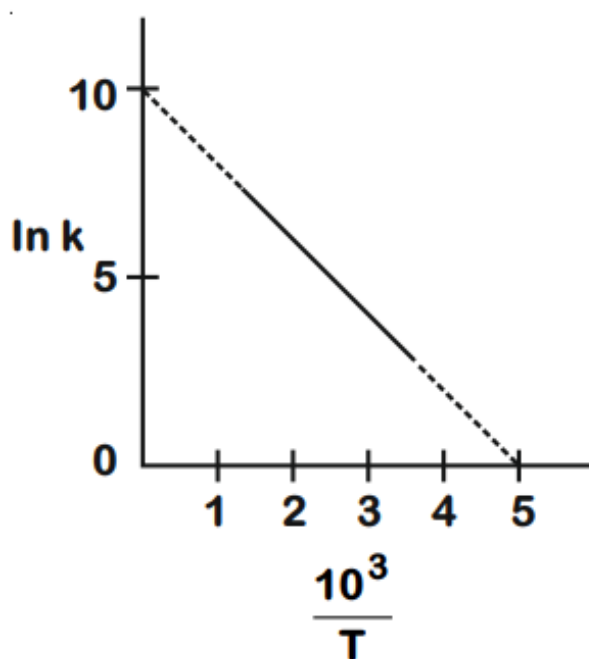
49. The surface of a metal is illuminated alternately with photons of energies $E_1 = 4$ eV and $E_2 = 2.5$ eV respectively. The ratio of maximum speeds of the photoelectrons emitted in the two cases is 2. The work function of the metal (in eV) is ____.

50. Nitrogen gas is at 300°C temperature. The temperature (in K) at which the rms speed of a H_2 molecule would be equal to the rms speed of a nitrogen molecule, is ____.
(Molar mass of N_2 gas 28 g).

51. The correct statement about probability density (except at infinite distance from nucleus) is :

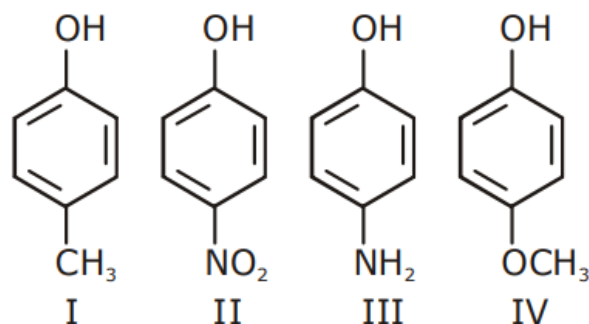
- (A) It can be zero for 1s orbital (B) It can be zero for 3p orbital
(C) It can never be zero for 2s orbital (D) It can be negative for 2p orbital

52. The rate constant (k) of a reaction is measured at different temperatures (T), and the data are plotted in the given figure. The activation energy of the reaction in kJ mol^{-1} is :
(R is gas constant)



- (A) R
(B) $2R$
(C) $\frac{1}{R}$
(D) $\frac{1}{2R}$

53. The increasing order of boiling points of the following compounds is :



- (A) $I < III < IV < II$ (B) $IV < I < II < III$
(C) $I < IV < III < II$ (D) $III < I < II < IV$

54. The correct order of the ionic radii of O^{2-} , N^{3-} , F^- , Mg^{2+} , Na^+ and Al^{3+} is :

- (A) $\text{N}^{3-} < \text{O}^{2-} < \text{F}^- < \text{Na}^+ < \text{Mg}^{2+} < \text{Al}^{3+}$ (B) $\text{N}^{3-} < \text{F}^- < \text{O}^{2-} < \text{Mg}^{2+} < \text{Na}^+ < \text{Al}^{3+}$
(C) $\text{Al}^{3+} < \text{Na}^+ < \text{Mg}^{2+} < \text{O}^{2-} < \text{F}^- < \text{N}^{3-}$ (D) $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^- < \text{O}^{2-} < \text{N}^{3-}$

55. Consider the complex ions, $\text{trans}[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (A) and $\text{cis}[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (B).

The correct statement regarding them is :

- (A) both (A) and (B) can be optically active. (B) both (A) and (B) can not be optically active.
(C) (A) can not be optically active, but (B) can be optically active. (D) (A) can be optically active, but (B) can not be optically active.

56. Lattice enthalpy and enthalpy of solution of NaCl are 788 kJ mol^{-1} , and 4 kJ mol^{-1} , respectively.

The hydration enthalpy of NaCl is :

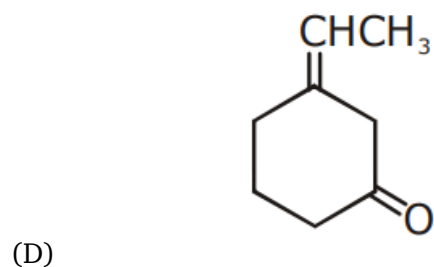
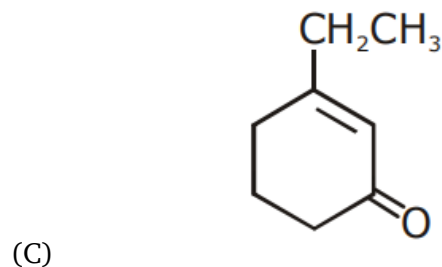
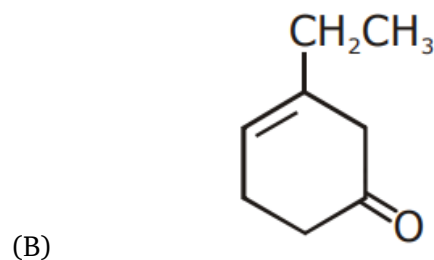
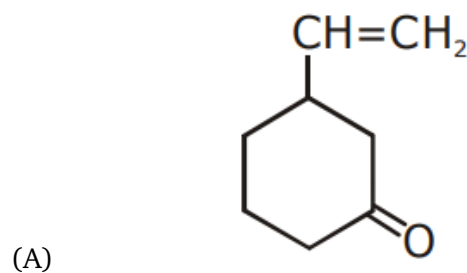
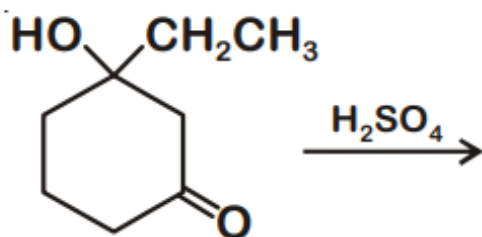
- (A) -780 kJ mol^{-1} (B) -784 kJ mol^{-1}
(C) 780 kJ mol^{-1} (D) 784 kJ mol^{-1}

57. The major product formed in the following reaction is :

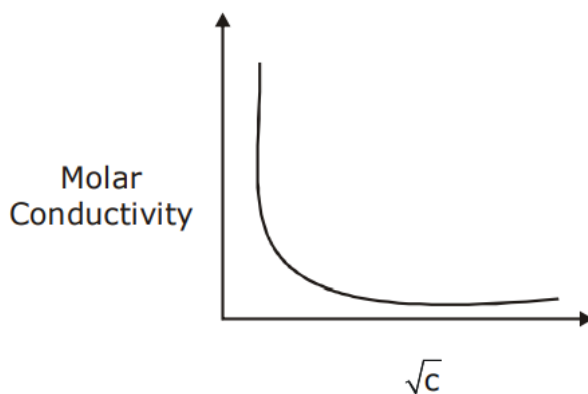


- (A) $\text{Br}(\text{CH}_2)_3\text{CH}(\text{CH}_3)_2$
 (B) $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{CH}(\text{CH}_3)_2$
 (C) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{CH}(\text{CH}_3)_2$
 (D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}(\text{Br})(\text{CH}_3)_2$

58. The major product of the following reaction is :



59. The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the given figure.



The electrolyte X is :

- (A) HCl (B) CH_3COOH
 (C) NaCl (D) KNO_3

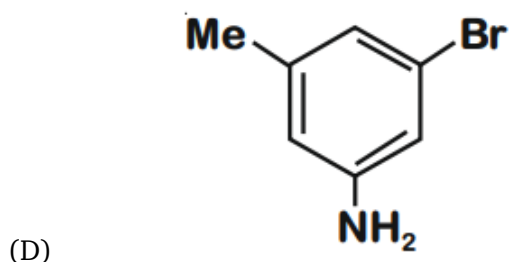
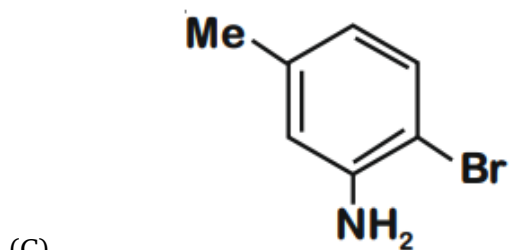
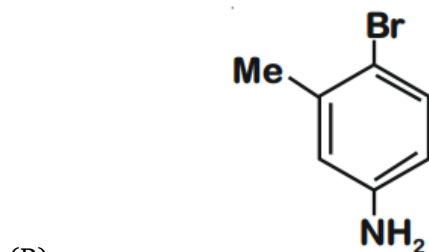
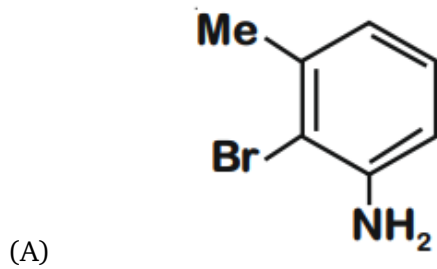
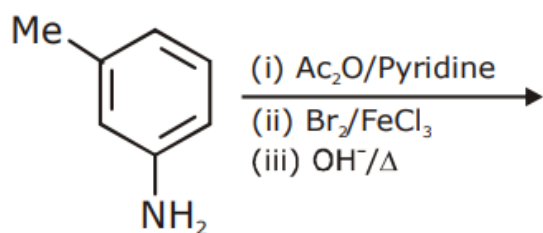
60. The compound that has the largest H-M-H bond angle (M = N, O, S, C) is :

- (A) CH_4 (B) H_2S
 (C) NH_3 (D) H_2O

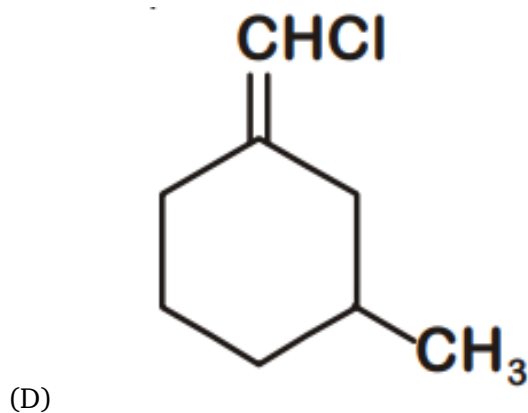
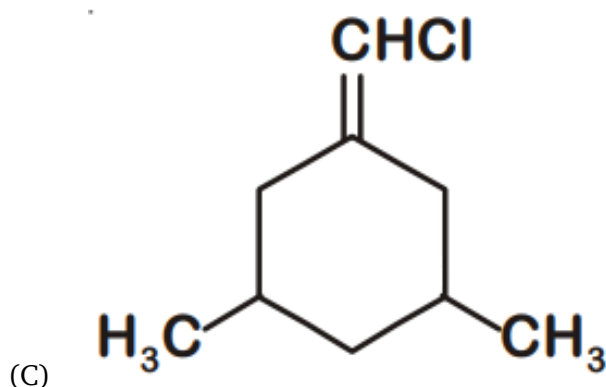
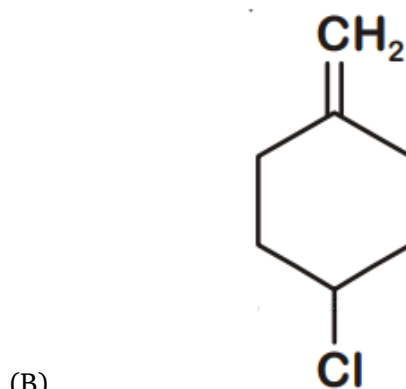
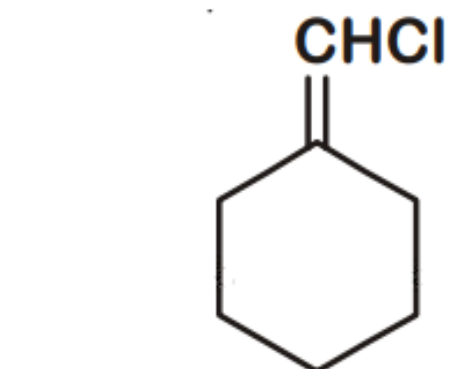
61. Boron and silicon of very high purity can be obtained through :

- (A) Liquation (B) Electrolytic refining
 (C) Zone refining (D) Vapour phase refining

62. The final major product of the following reaction is :



63. Among the following compounds, geometrical isomerism is exhibited by :



64. Which one of the following polymers is not obtained by condensation polymerisation?

- (A) Bakelite (B) Nylon 6
(C) Buna-N (D) Nylon 6, 6

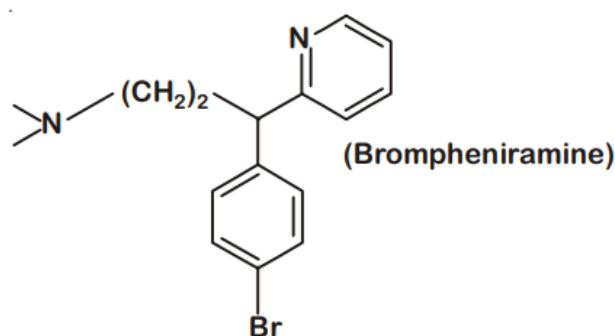
65. Hydrogen peroxide, in the pure state, is :

- (A) Linear and blue in color (B) Linear and almost colorless
(C) Non-planar and almost colorless (D) Planar and blue in color

66. An element crystallises in a face-centred cubic (fcc) unit cell with cell edge a . The distance between the centres of two nearest octahedral voids in the crystal lattice is :

- (A) a
(B) $\frac{a}{2}$
(C) $\frac{a}{\sqrt{2}}$
(D) $\sqrt{2} a$

67. The following molecule acts as an :



- (A) Anti-depressant (B) Antiseptic
(C) Anti-bacterial (D) Anti-histamine

68. Reaction of ammonia with excess Cl_2 gives :

- (A) NH_4Cl and N_2 (B) NH_4Cl and HCl
(C) NCl_3 and HCl (D) NCl_3 and NH_4Cl

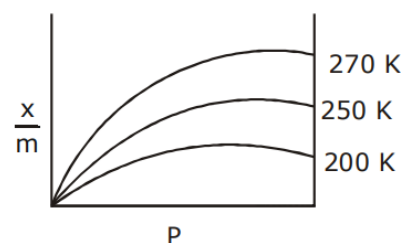
69. The one that is NOT suitable for the removal of permanent hardness of water is :

- (A) Ion-exchange method (B) Calgon's method
(C) Treatment with sodium carbonate (D) Clark's method

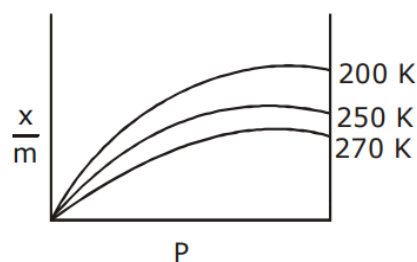
70. Adsorption of a gas follows Freundlich adsorption isotherm. If x is the mass of the gas adsorbed on mass m of the adsorbent, the correct plot of

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

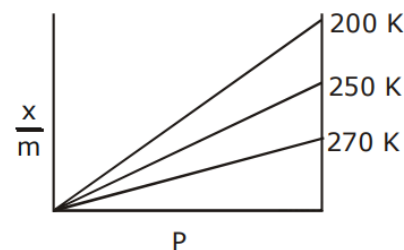
versus p is :



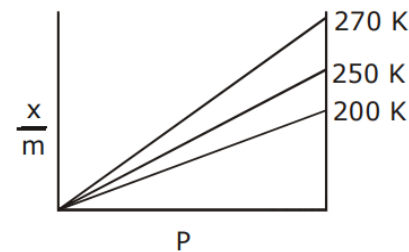
(A)



(B)



(C)



(D)

Chemistry - Section B · Numerical Value Questions

71. The volume, in mL, of 0.02 M $\text{K}_2\text{Cr}_2\text{O}_7$ solution required to react with 0.288 g of ferrous oxalate in acidic medium is _____.

(Molar mass of Fe = 56 g mol^{-1})

72. Considering that $\Delta_0 > P$, the magnetic moment

(in BM) of $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$ would be _____.

73. The number of chiral carbons present in sucrose is _____.

74. For a reaction $\text{X} + \text{Y} \rightleftharpoons 2\text{Z}$, 1.0 mol of X, 1.5 mol of Y and 0.5 mol of Z were taken in a 1 L vessel and allowed to react. At equilibrium, the concentration

of Z was 1.0 mol L^{-1} . The equilibrium constant of reaction is $\frac{x}{15}$. The value of x is _____.

75. For a dimerization reaction,
 $2\text{A}(\text{g}) \rightarrow \text{A}_2(\text{g})$

at 298 K, $\Delta U^\circ = -20 \text{ kJ mol}^{-1}$, $\Delta S^\circ = -30 \text{ JK}^{-1} \text{ mol}^{-1}$,

then the ΔG° will be _____ J.

- End of Question Paper -