

JEE MAIN 2020 · QUESTION PAPER

4 Sep 2020 **Shift 2**

69 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	20 Q1 to Q20	5 Q21 to Q25
● Chemistry	16 Q26 to Q41	5 Q42 to Q46
● Mathematics	18 Q47 to Q64	5 Q65 to Q69
In this PDF	69 questions · answer key at the end	

- 1 Set a 3 hour timer and attempt the paper in one sitting, like the real exam.
- 2 Check yourself against the answer key at the end. Every question names its chapter, so you can see where marks went.
- 3 Got one wrong? Tap “Step-by-step solution” at the top right of it for the full working, where available.

Attempt this paper online

The same questions in the same order, with instant answer checking and step-by-step solutions where available.

prepwise.in/pyqs/paper/2020-09-04-evening · Free, no signup needed to start

Answers follow NTA's final answer keys. Typing errors are possible, so check doubtful answers against the official key. Spotted a mistake? prepwise.in/feedback · Terms: prepwise.in/terms

Q1 Electromagnetic Induction

[Step-by-step solution](#) > prepwisar.in/questions/8OqT-TQRrx

A series L-R circuit is connected to a battery of emf V . If the circuit is switched on at $t = 0$, then the time at which the energy stored in the inductor reaches $\left(\frac{1}{n}\right)$ times of its maximum value, is:

- (A) $\frac{L}{R} \ln \left(\frac{\sqrt{n}}{\sqrt{n} + 1} \right)$ (B) $\frac{L}{R} \ln \left(\frac{\sqrt{n}}{\sqrt{n} - 1} \right)$ (C) $\frac{L}{R} \ln \left(\frac{\sqrt{n} + 1}{\sqrt{n} - 1} \right)$ (D) $\frac{L}{R} \ln \left(\frac{\sqrt{n} - 1}{\sqrt{n}} \right)$

Q2 Nuclear Physics

[Step-by-step solution](#) > prepwisar.in/questions/iNJuNDAm7K

Find the Binding energy per nucleon for ${}_{50}^{120}\text{Sn}$. Mass of proton $m_p = 1.00783 \text{ U}$, mass of neutron $m_n = 1.00867 \text{ U}$ and mass of tin nucleus $m_{\text{Sn}} = 119.902199 \text{ U}$. (take $1 \text{ U} = 931 \text{ MeV}$)

- (A) 9.0 MeV (B) 8.5 MeV (C) 8.0 MeV (D) 7.5 MeV

Q3 Electrostatics II: Potential & Capacitance

[Step-by-step solution](#) > prepwisar.in/questions/IkH25fD1vV

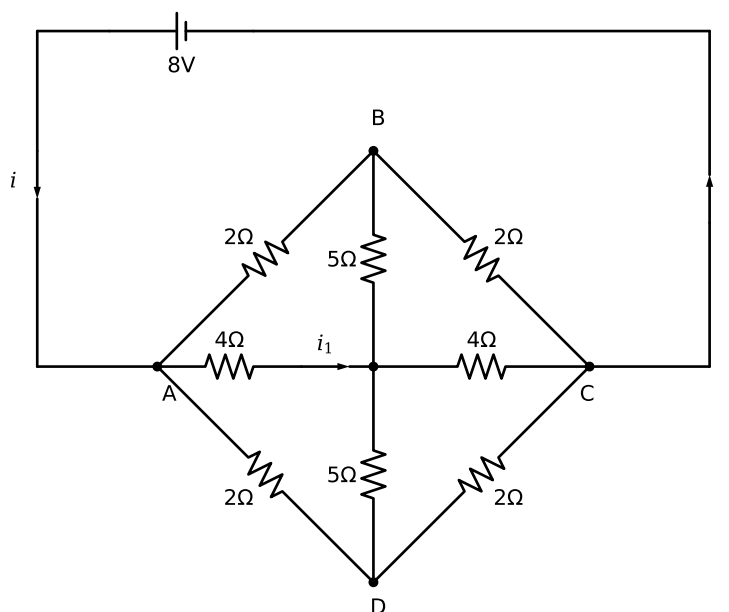
A capacitor C is fully charged with voltage V_0 . After disconnecting the voltage source, it is connected in parallel with another uncharged capacitor of capacitance $\frac{C}{2}$. The energy loss in the process after the charge is distributed between the two capacitors is:

- (A) $\frac{1}{2} CV_0^2$ (B) $\frac{1}{4} CV_0^2$ (C) $\frac{1}{3} CV_0^2$ (D) $\frac{1}{6} CV_0^2$

Q4 Current Electricity

[Step-by-step solution](#) > prepwisar.in/questions/t-OpYMeZ24

The value of current i_1 flowing from A to C in the circuit diagram is:

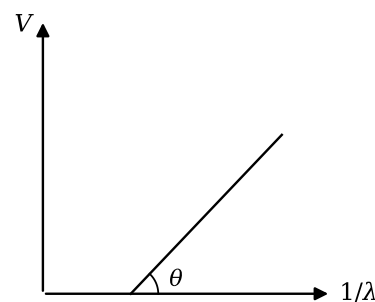


- (A) 1 A (B) 4 A (C) 5 A (D) 2 A

Attempt this paper online with instant answer checking > prepwisar.in/pyqs/paper/2020-09-04-evening

Q5 Dual Nature of Radiation & Matter[Step-by-step solution > prepwisar.in/questions/eNSyYEPm-5](https://www.prepwisar.in/questions/eNSyYEPm-5)

In a photoelectric effect experiment, the graph of stopping potential V versus reciprocal of wavelength obtained is shown in the figure. As the intensity of incident radiation is increased:



- (A) Slope of the straight line get more steep
- (B) Graph does not change
- (C) Straight line shifts to left
- (D) Straight line shifts to right

Q6 Electromagnetic Waves[Step-by-step solution > prepwisar.in/questions/soqNOOGohY](https://www.prepwisar.in/questions/soqNOOGohY)

The electric field of a plane electromagnetic wave is given by

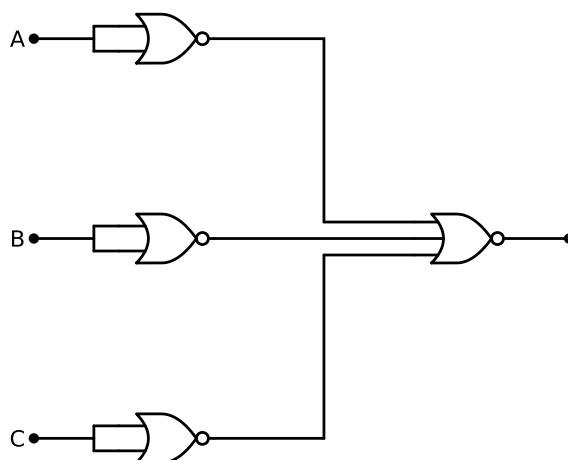
$$\vec{E} = E_0 (\hat{x} + \hat{y}) \sin(kz - \omega t)$$

Its magnetic field will be given by:

- (A) $\frac{E_0}{c} (\hat{x} + \hat{y}) \sin(kz - \omega t)$
- (B) $\frac{E_0}{c} (\hat{x} - \hat{y}) \sin(kz - \omega t)$
- (C) $\frac{E_0}{c} (\hat{x} - \hat{y}) \cos(kz - \omega t)$
- (D) $\frac{E_0}{c} (-\hat{x} + \hat{y}) \sin(kz - \omega t)$

Q7 Semiconductors & Electronic Devices[Step-by-step solution > prepwisar.in/questions/1kFi2t74hW](https://www.prepwisar.in/questions/1kFi2t74hW)

Identify the operation performed by the circuit given below:



- (A) AND
- (B) NAND
- (C) OR
- (D) NOT

Q8 Electrostatics II: Potential & Capacitance[Step-by-step solution > prepwisar.in/questions/bxOeAQqAMu](https://www.prepwisar.in/questions/bxOeAQqAMu)

A particle of charge q and mass m is subjected to an electric field

$E = E_0 (1 - ax^2)$ in the x -direction, where a and E_0 are constants. Initially the particle was at rest at $x = 0$. Other than the initial position the kinetic energy of the particle becomes zero when the distance of the particle from the origin is:

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

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Q9 Gravitation[Step-by-step solution](#) > [prepwiser.in/questions/ulubMqeeeky](https://www.prepwiser.in/questions/ulubMqeeeky)

A body is moving in a low circular orbit about a planet of mass M and radius R . The radius of the orbit can be taken to be R itself. Then the ratio of the speed of this body in the orbit to the escape velocity from the planet is:

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

Q10 Thermodynamics[Step-by-step solution](#) > [prepwiser.in/questions/83EO-W434o](https://www.prepwiser.in/questions/83EO-W434o)

Match the thermodynamic processes taking place in a system with the correct conditions. In the table: ΔQ is the heat supplied, ΔW is the work done and ΔU is change in internal energy of the system.

Process	Condition
(I) Adiabatic	(1) $\Delta W = 0$
(II) Isothermal	(2) $\Delta Q = 0$
(III) Isochoric	(3) $\Delta U \neq 0, \Delta W \neq 0, \Delta Q \neq 0$
(IV) Isobaric	(4) $\Delta U = 0$

- (A) (I) - (1), (II) - (1), (III) - (2), (IV) - (3) (B) (I) - (2), (II) - (4), (III) - (1), (IV) - (3)
 (C) (I) - (1), (II) - (2), (III) - (4), (IV) - (4) (D) (I) - (2), (II) - (1), (III) - (4), (IV) - (3)

Q11 Rectilinear Motion[Step-by-step solution](#) > [prepwiser.in/questions/wRjk9ys-Rw](https://www.prepwiser.in/questions/wRjk9ys-Rw)

A small ball of mass m is thrown upward with velocity u from the ground. The ball experiences a resistive force mkv^2 where v is its speed. The maximum height attained by the ball is:

- (A) $\frac{1}{k} \tan^{-1} \frac{ku^2}{2g}$ (B) $\frac{1}{2k} \tan^{-1} \frac{ku^2}{g}$ (C) $\frac{1}{2k} \ln \left(1 + \frac{ku^2}{g} \right)$ (D) $\frac{1}{k} \ln \left(1 + \frac{ku^2}{2g} \right)$

Q12 Magnetism & Matter[Step-by-step solution](#) > [prepwiser.in/questions/DNdw45bigD](https://www.prepwiser.in/questions/DNdw45bigD)

A paramagnetic sample shows a net magnetisation of 6 A/m when it is placed in an external magnetic field of 0.4 T at a temperature of 4 K. When the sample is placed in an external magnetic field of 0.3 T at a temperature of 24 K, then the magnetisation will be:

- (A) 4 A/m (B) 1 A/m (C) 0.75 A/m (D) 2.25 A/m

Q13 Moving Charges & Magnetism[Step-by-step solution](#) > [prepwiser.in/questions/zM11UDvW6z](https://www.prepwiser.in/questions/zM11UDvW6z)

A circular coil has moment of inertia 0.8 kg m^2 around any diameter and is carrying current to produce a magnetic moment of 20 Am^2 . The coil is kept initially in a vertical position and it can rotate freely around a horizontal diameter. When a uniform magnetic field of 4 T is applied along the vertical, it starts rotating around its horizontal diameter. The angular speed the coil acquires after rotating by 60° will be:

- (A) $10 \pi \text{ rad s}^{-1}$ (B) $20 \pi \text{ rad s}^{-1}$ (C) $10(3)^{1/4} \text{ rad s}^{-1}$ (D) 20 rad s^{-1}

Q14 Fluid Mechanics[Step-by-step solution](#) > [prepwiser.in/questions/V7TgwTtwel](https://www.prepwiser.in/questions/V7TgwTtwel)

Two identical cylindrical vessels are kept on the ground and each contain the same liquid of density d . The area of the base of both vessels is S but the height of liquid in one vessel is x_1 and in the other, x_2 . When both cylinders are connected through a pipe of negligible volume very close to the bottom, the liquid flows from one vessel to the other until it comes to equilibrium at a new height. The change in energy of the system in the process is:

- (A) $gdS(x_2 + x_1)^2$ (B) $gdS(x_2^2 + x_1^2)$ (C) $\frac{1}{4}gdS(x_2 - x_1)^2$ (D) $\frac{3}{4}gdS(x_2 - x_1)^2$

Q15 Elasticity[Step-by-step solution](https://www.prepwiser.in/questions/mge_XtL7N0) > prepwiser.in/questions/mge_XtL7N0

A cube of metal is subjected to a hydrostatic pressure of 4 GPa. The percentage change in the length of the side of the cube is close to:

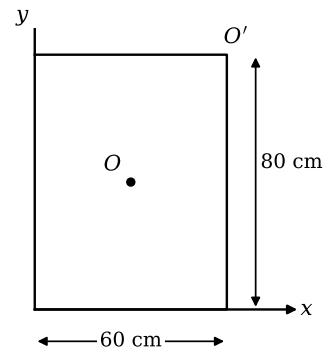
(Given bulk modulus of metal, $B = 8 \times 10^{10}$ Pa)

- (A) 0.6 (B) 20 (C) 1.67 (D) 5

Q16 Rotational Motion[Step-by-step solution](https://www.prepwiser.in/questions/Ydyv8tXtoK) > prepwiser.in/questions/Ydyv8tXtoK

For a uniform rectangular sheet shown in the figure, the ratio of moments of inertia about the axes perpendicular to the sheet and passing through O (the centre of mass) and O' (corner point) is:

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

**Q17** Rotational Motion[Step-by-step solution](https://www.prepwiser.in/questions/HtVfIAB4DF) > prepwiser.in/questions/HtVfIAB4DF

Consider two uniform discs of the same thickness and different radii $R_1 = R$ and $R_2 = \alpha R$ made of the same material. If the ratio of their moments of inertia I_1 and I_2 , respectively, about their axes is $I_1 : I_2 = 1 : 16$ then the value of α is:

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

Q18 Sound Waves[Step-by-step solution](https://www.prepwiser.in/questions/66WRvIX2L2) > prepwiser.in/questions/66WRvIX2L2

The driver of a bus approaching a big wall notices that the frequency of his bus's horn changes from 420 Hz to 490 Hz when he hears it after it gets reflected from the wall. Find the speed of the bus if speed of the sound is 330 ms^{-1} .

- (A) 91 kmh^{-1} (B) 81 kmh^{-1} (C) 61 kmh^{-1} (D) 71 kmh^{-1}

Q19 Work, Energy & Power[Step-by-step solution](https://www.prepwiser.in/questions/FcfwSfSLck) > prepwiser.in/questions/FcfwSfSLck

A person pushes a box on a rough horizontal platform surface. He applies a force of 200 N over a distance of 15 m. Thereafter, he gets progressively tired and his applied force reduces linearly with distance to 100 N. The total distance through which the box has been moved is 30 m. What is the work done by the person during the total movement of the box?

- (A) 5690 J (B) 5250 J (C) 2780 J (D) 3280 J

Q20 Units, Dimensions & Errors[Step-by-step solution](https://www.prepwiser.in/questions/-to5Q0uFU7) > prepwiser.in/questions/-to5Q0uFU7

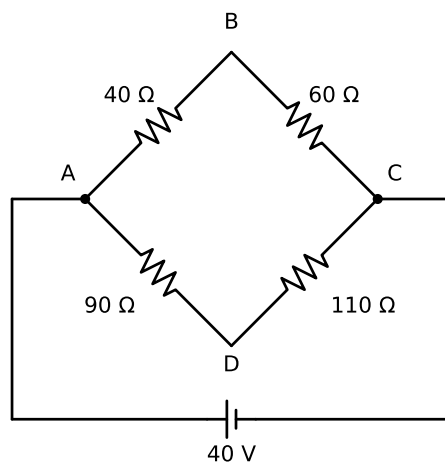
A quantity x is given by $\left(\frac{IFv^2}{WL^4}\right)$ in terms of moment of inertia I , force F , velocity v , work W and Length L . The dimensional formula for x is same as that of:

- (A) Coefficient of viscosity (B) Force constant
(C) Energy density (D) Planck's constant

Q21 Current Electricity **NUMERICAL**

[Step-by-step solution](#) > [prepwiser.in/questions/goKITYpK2h](https://www.prepwiser.in/questions/goKITYpK2h)

Four resistances $40\ \Omega$, $60\ \Omega$, $90\ \Omega$ and $110\ \Omega$ make the arms of a quadrilateral ABCD. Across AC is a battery of emf 40 V and internal resistance negligible. The potential difference across BD in V is _____.



Q22 Ray Optics **NUMERICAL**

[Step-by-step solution](#) > [prepwiser.in/questions/EkO3CDCntO](https://www.prepwiser.in/questions/EkO3CDCntO)

The distance between an object and a screen is 100 cm . A lens can produce real image of the object on the screen for two different positions between the screen and the object. The distance between these two positions is 40 cm . If the power of the lens is close to $\left(\frac{N}{100}\right) D$ where N is an integer, the value of N is _____.

Q23 Kinetic Theory of Gases **NUMERICAL**

[Step-by-step solution](#) > [prepwiser.in/questions/LSrRijSapX](https://www.prepwiser.in/questions/LSrRijSapX)

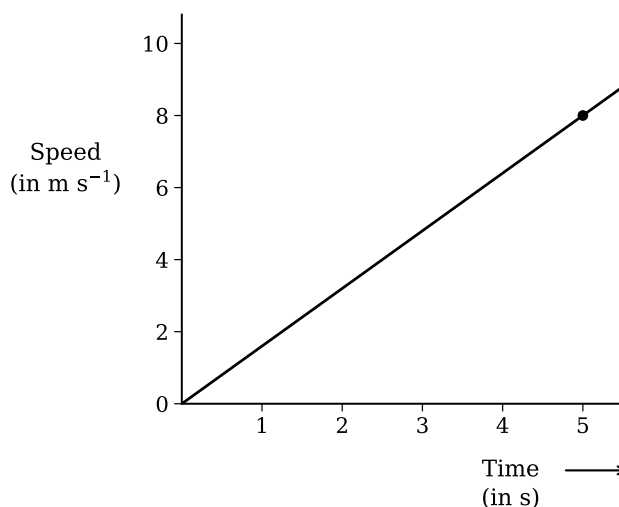
The change in the magnitude of the volume of an ideal gas when a small additional pressure ΔP is applied at a constant temperature, is the same as the change when the temperature is reduced by a small quantity ΔT at constant pressure. The initial temperature and pressure of the gas were 300 K and 2 atm . respectively.

If $|\Delta T| = C|\Delta P|$ then value of C in (K/atm.) is _____.

Q24 Rectilinear Motion **NUMERICAL**

[Step-by-step solution](#) > [prepwiser.in/questions/YnPOawc1cS](https://www.prepwiser.in/questions/YnPOawc1cS)

The speed versus time graph for a particle is shown in the figure. The distance travelled (in m) by the particle during the time interval $t = 0$ to $t = 5\text{ s}$ will be _____.



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Orange light of wavelength 6000×10^{-10} m illuminates a single slit of width 0.6×10^{-4} m. The maximum possible number of diffraction minima produced on both sides of the central maximum is _____.

Chemistry Section A · Multiple choice

Q26 to Q41

Q26 Chemical Bonding & Molecular Structure

Step-by-step solution > [prepwiser.in/questions/5sOATzA-G_](https://www.prepwiser.in/questions/5sOATzA-G_)

The reaction in which the hybridisation of the underlined atom is affected is:



Q27 Chemistry in Everyday Life

Step-by-step solution > [prepwiser.in/questions/qSpC16khJQ](https://www.prepwiser.in/questions/qSpC16khJQ)

The mechanism of action of "Terfenadine" (Seldane) is:

(A) Activates the histamine receptor

(B) Helps in the secretion of histamine

(C) Inhibits the secretion of histamine

(D) Inhibits the action of histamine receptor

Q28 Coordination Compounds

Step-by-step solution > [prepwiser.in/questions/X59uPbwpoE](https://www.prepwiser.in/questions/X59uPbwpoE)

The Crystal Field Stabilization Energy (CFSE) of $[\text{CoF}_3(\text{H}_2\text{O})_3]$ ($\Delta_0 < P$) is:

(A) $-0.8 \Delta_0$

(B) $-0.4 \Delta_0$

(C) $-0.8 \Delta_0 + 2P$

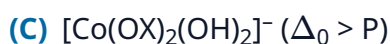
(D) $-0.4 \Delta_0 + P$

Q29 Coordination Compounds

Step-by-step solution > [prepwiser.in/questions/B50a-IDFtj](https://www.prepwiser.in/questions/B50a-IDFtj)

The one that can exhibit highest paramagnetic behaviour among the following is:

gly = glycinate; bpy = 2, 2'-bipyridine



Q30 Chemical Bonding & Molecular Structure

Step-by-step solution > [prepwiser.in/questions/IN-6mlsjo5](https://www.prepwiser.in/questions/IN-6mlsjo5)

The molecule in which hybrid MOs involve only one d-orbital of the central atom is:



Q31 d & f Block Elements

Step-by-step solution > [prepwiser.in/questions/_aItDrq0E](https://www.prepwiser.in/questions/_aItDrq0E)

The incorrect statement(s) among (a) - (c) is (are)

(a) W(VI) is more stable than Cr(VI).

(b) In the presence of HCl, permanganate titrations provide satisfactory results.

(c) Some lanthanoid oxides can be used as phosphors.

(A) (a) and (b) only

(B) (a) only

(C) (b) only

(D) (b) and (c) only

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Q32 Electrochemistry[Step-by-step solution](https://www.prepwisar.in/questions/zoHNe8TAFY)

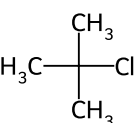
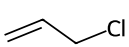
250 mL of a waste solution obtained from the workshop of a goldsmith contains 0.1 M AgNO_3 and 0.1 M AuCl . The solution was electrolyzed at 2V by passing a current of 1A for 15 minutes. The metal/metals electrodeposited will be

$$[E_{\text{Ag}^+/\text{Ag}}^0 = 0.80 \text{ V}, E_{\text{Au}^+/\text{Au}}^0 = 1.69 \text{ V}]$$

- (A) Silver and gold in equal mass proportion
(B) Silver and gold in proportion to their atomic weights
(C) Only gold
(D) Only silver

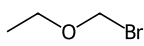
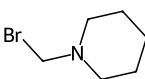
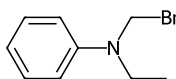
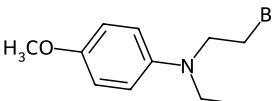
Q33 Chemical Bonding & Molecular Structure[Step-by-step solution](https://www.prepwisar.in/questions/qijaKO0BQE)

Among the following compounds, which one has the shortest C – Cl bond?

- (A) $\text{H}_3\text{C} - \text{Cl}$ (B)  (C)  (D) $\text{H}_2\text{C}=\text{CH}-\text{Cl}$

Q34 Halogen Derivatives: Haloalkanes & Haloarenes[Step-by-step solution](https://www.prepwisar.in/questions/nVio220H7X)

Which of the following compounds will form the precipitate with aq. AgNO_3 solution most readily?

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

Q35 Hydrogen & s-Block Elements[Step-by-step solution](https://www.prepwisar.in/questions/7NO9Ueste-)

An alkaline earth metal 'M' readily forms water soluble sulphate and water insoluble hydroxide. Its oxide MO is very stable to heat and does not have rock-salt structure. M is:

- (A) Ca (B) Mg (C) Sr (D) Be

Q36 Atomic Structure[Step-by-step solution](https://www.prepwisar.in/questions/kOp0yNOUdu)

The shortest wavelength of H atom in the Lyman series is λ_1 . The longest wavelength in the Balmer series of He^+ is:

- (A) $\frac{5\lambda_1}{9}$ (B) $\frac{36\lambda_1}{5}$ (C) $\frac{27\lambda_1}{5}$ (D) $\frac{9\lambda_1}{5}$

Q37 Surface Chemistry[Step-by-step solution](https://www.prepwisar.in/questions/i-LyooHU8Y)

A sample of red ink (a colloidal suspension) is prepared by mixing eosin dye, egg white, HCHO and water. The component which ensures stability of the ink sample is:

- (A) HCHO (B) Water (C) Eosin dye (D) Egg white

Q38 Chemical Thermodynamics[Step-by-step solution](https://www.prepwisar.in/questions/50YqttB791)

Five moles of an ideal gas at 1 bar and 298 K is expanded into vacuum to double the volume. The work done is:

- (A) Zero (B) $-RT \ln \frac{V_2}{V_1}$ (C) $C_V (T_2 - T_1)$ (D) $-RT (V_2 - V_1)$

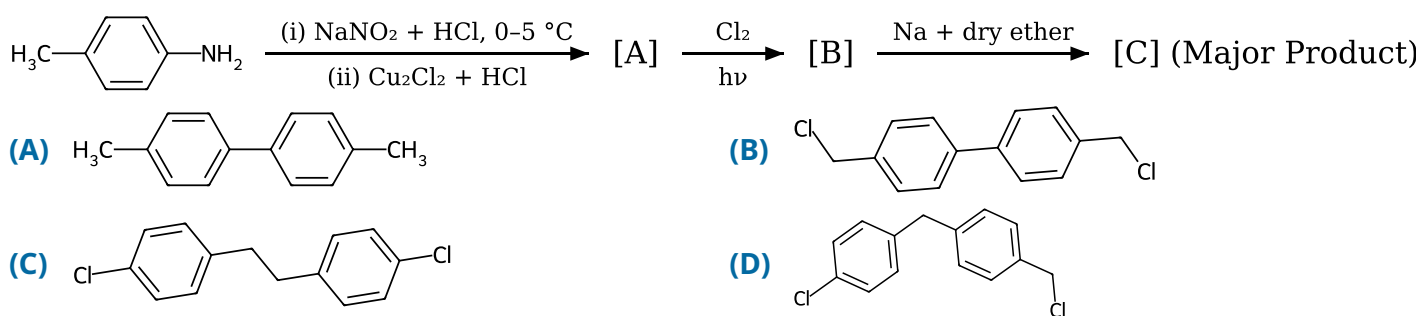
The process that is NOT endothermic in nature is:

- (A) $\text{Ar(g)} + \text{e}^- \rightarrow \text{Ar}^-(\text{g})$ (B) $\text{H(g)} + \text{e}^- \rightarrow \text{H}^-(\text{g})$ (C) $\text{Na(g)} \rightarrow \text{Na}^+(\text{g}) + \text{e}^-$ (D) $\text{O}^-(\text{g}) + \text{e}^- \rightarrow \text{O}^{2-}(\text{g})$

If the equilibrium constant for $\text{A} \rightleftharpoons \text{B} + \text{C}$ is $K_{eq}^{(1)}$ and that of $\text{B} + \text{C} \rightleftharpoons \text{P}$ is $K_{eq}^{(2)}$, the equilibrium constant for $\text{A} \rightleftharpoons \text{P}$ is:

- (A) $\frac{K_{eq}^{(1)}}{K_{eq}^{(2)}}$ (B) $K_{eq}^{(1)} + K_{eq}^{(2)}$ (C) $K_{eq}^{(2)} - K_{eq}^{(1)}$ (D) $K_{eq}^{(1)} K_{eq}^{(2)}$

In the following reaction sequence, [C] is:



Chemistry Section B · Numerical value

Q42 to Q46

The number of chiral centres present in threonine is ____.

The number of molecules with energy greater than the threshold energy for a reaction increases five fold by a rise of temperature from 27°C to 42°C . Its energy of activation in J/mol is _____. (Round off to the nearest integer)

(Take $\ln 5 = 1.6094$; $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

A 100 mL solution was made by adding 1.43 g of $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$. The normality of the solution is 0.1 N. The value of x is ____.

(The atomic mass of Na is 23 g/mol)

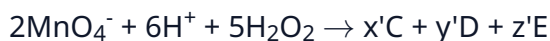
The osmotic pressure of a solution of NaCl is 0.10 atm and that of a glucose solution is 0.20 atm. The osmotic pressure of a solution formed by mixing 1 L of the sodium chloride solution with 2 L of the glucose solution is $x \times 10^{-3} \text{ atm}$. x is _____. (nearest integer)

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Consider the following equations:



(in basic medium)



(in acidic medium)

The sum of the stoichiometric coefficients x , y , x' , y' , and z' for products A, B, C, D and E, respectively, is _____.

Mathematics Section A · Multiple choice

Q47 to Q64

Q47 Three Dimensional Geometry

[Step-by-step solution](#) > [prepwisar.in/questions/1GwFEsoDy-](https://www.prepwisar.in/questions/1GwFEsoDy-)

The distance of the point $(1, -2, 3)$ from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is:

- (A) 7 (B) 1 (C) $\frac{1}{7}$ (D) $\frac{7}{5}$

Q48 Applications of Derivatives

[Step-by-step solution](#) > [prepwisar.in/questions/xZusZtBsY3](https://www.prepwisar.in/questions/xZusZtBsY3)

The area (in sq. units) of the largest rectangle ABCD whose vertices A and B lie on the x-axis and vertices C and D lie on the parabola, $y = x^2 - 1$ below the x-axis, is:

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

Q49 Binomial Theorem

[Step-by-step solution](#) > [prepwisar.in/questions/GTGAH6V9Ib](https://www.prepwisar.in/questions/GTGAH6V9Ib)

If for some positive integer n , the coefficients of three consecutive terms in the binomial expansion of $(1 + x)^{n+5}$ are in the ratio 5 : 10 : 14, then the largest coefficient in this expansion is:

- (A) 330 (B) 792 (C) 252 (D) 462

Q50 Circles

[Step-by-step solution](#) > [prepwisar.in/questions/X-Tg9D391d](https://www.prepwisar.in/questions/X-Tg9D391d)

The circle passing through the intersection of the circles, $x^2 + y^2 - 6x = 0$ and $x^2 + y^2 - 4y = 0$, having its centre on the line, $2x - 3y + 12 = 0$, also passes through the point:

- (A) $(-3, 1)$ (B) $(1, -3)$ (C) $(-1, 3)$ (D) $(-3, 6)$

Q51 Complex Numbers

[Step-by-step solution](#) > [prepwisar.in/questions/AjQtwnSOEb](https://www.prepwisar.in/questions/AjQtwnSOEb)

If a and b are real numbers such that

$$(2 + \alpha)^4 = a + b\alpha$$

where $\alpha = \frac{-1+i\sqrt{3}}{2}$ then $a + b$ is equal to:

- (A) 33 (B) 9 (C) 24 (D) 57

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The integral

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \tan^3 x \cdot \sin^2 3x (2 \sec^2 x \cdot \sin^2 3x + 3 \tan x \cdot \sin 6x) dx$$

is equal to:

- (A) $-\frac{1}{9}$ (B) $-\frac{1}{18}$ (C) $\frac{7}{18}$ (D) $\frac{9}{2}$

The solution of the differential equation

$$\frac{dy}{dx} - \frac{y + 3x}{\log_e(y + 3x)} + 3 = 0$$

is:

(where c is a constant of integration)

- (A) $x - \frac{1}{2}(\log_e(y + 3x))^2 = C$ (B) $y + 3x - \frac{1}{2}(\log_e x)^2 = C$
 (C) $x - \log_e(y + 3x) = C$ (D) $x - 2\log_e(y + 3x) = C$

Let $x = 4$ be a directrix to an ellipse whose centre is at the origin and its eccentricity is $\frac{1}{2}$. If $P(1, \beta)$, $\beta > 0$ is a point on this ellipse, then the equation of the normal to it at P is:

- (A) $4x - 3y = 2$ (B) $8x - 2y = 5$ (C) $7x - 4y = 1$ (D) $4x - 2y = 1$

Let $f : (0, \infty) \rightarrow (0, \infty)$ be a differentiable function such that $f(1) = e$ and

$$\lim_{t \rightarrow x} \frac{t^2 f^2(x) - x^2 f^2(t)}{t - x} = 0$$

. If $f(x) = 1$, then x is equal to:

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

The function

$$f(x) = \begin{cases} \frac{\pi}{4} + \tan^{-1}x, & |x| \leq 1 \\ \frac{1}{2}(|x| - 1), & |x| > 1 \end{cases}$$

is:

- (A) continuous on $\mathbb{R} - \{-1\}$ and differentiable on $\mathbb{R} - \{-1, 1\}$
 (B) both continuous and differentiable on $\mathbb{R} - \{1\}$
 (C) both continuous and differentiable on $\mathbb{R} - \{-1\}$
 (D) continuous on $\mathbb{R} - \{1\}$ and differentiable on $\mathbb{R} - \{-1, 1\}$

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Q57 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/uOyDijT7NX)

Suppose the vectors x_1, x_2 and x_3 are the solutions of the system of linear equations,

$Ax = b$ when the vector b on the right side is equal to b_1, b_2 and b_3 respectively. if

$$x_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, x_2 = \begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix}, x_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

$$b_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, b_2 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \text{ and } b_3 = \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix},$$

then the determinant of A is equal to:

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

Q58 Determinants[Step-by-step solution](https://www.prepwiser.in/questions/k0qYVoRCx3)

If the system of equations

$$x+y+z=2$$

$$2x+4y-z=6$$

$$3x+2y+\lambda z=\mu$$

has infinitely many solutions, then

- (A) $2\lambda - \mu = 5$ (B) $\lambda - 2\mu = -5$ (C) $2\lambda + \mu = 14$ (D) $\lambda + 2\mu = 14$

Q59 Probability: Basic[Step-by-step solution](https://www.prepwiser.in/questions/4pp1viYH9j)

In a game two players A and B take turns in throwing a pair of fair dice starting with player A and total of scores on the two dice, in each throw is noted. A wins the game if he throws total a of 6 before B throws a total of 7 and B wins the game if he throws a total of 7 before A throws a total of six. The game stops as soon as either of the players wins. The probability of A winning the game is:

- (A) $\frac{5}{6}$ (B) $\frac{5}{31}$ (C) $\frac{31}{61}$ (D) $\frac{30}{61}$

Q60 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwiser.in/questions/2figlFFR1o)

Let $\lambda \neq 0$ be in $\mathbb{R}$. If α and β are the roots of the equation, $x^2 - x + 2\lambda = 0$ and α and γ are the roots of the equation, $3x^2 - 10x + 27\lambda = 0$, then $\frac{\beta\gamma}{\lambda}$ is equal to:

- (A) 36 (B) 9 (C) 27 (D) 18

Q61 Sequences & Series[Step-by-step solution](https://www.prepwiser.in/questions/uqlV4cd3hk)

Let $a_1, a_2, \dots, a_n$ be a given A.P. whose common difference is an integer and

$S_n = a_1 + a_2 + \dots + a_n$. If $a_1 = 1$, $a_n = 300$ and $15 \leq n \leq 50$, then the ordered pair (S_{n-4}, a_{n-4}) is equal to:

- (A) (2480, 249) (B) (2480, 248) (C) (2490, 248) (D) (2490, 249)

Q62 Trigonometric Ratios & Identities[Step-by-step solution](https://www.prepwiser.in/questions/OZv31awAoy)

The minimum value of $2^{\sin x} + 2^{\cos x}$ is:

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

Let

$$\bigcup_{i=1}^{50} X_i = \bigcup_{i=1}^n Y_i = T$$

where each X_i contains 10 elements and each Y_i contains 5 elements. If each element of the set T is an element of exactly 20 of sets X_i 's and exactly 6 of sets Y_i 's, then n is equal to:

(A) 30

(B) 50

(C) 15

(D) 45

If the perpendicular bisector of the line segment joining the points $P(1, 4)$ and $Q(k, 3)$ has y-intercept equal to -4 , then a value of k is:

(A) $\sqrt{14}$ (B) -4 (C) -2 (D) $\sqrt{15}$

Mathematics Section B · Numerical value

Q65 to Q69

Let PQ be a diameter of the circle $x^2 + y^2 = 9$. If α and β are the lengths of the perpendiculars from P and Q on the straight line, $x + y = 2$ respectively, then the maximum value of $\alpha\beta$ is ____.

Let $\{x\}$ and $[x]$ denote the fractional part of x and the greatest integer $\leq x$ respectively of a real number x . If $\int_0^n \{x\} dx$, $\int_0^n [x] dx$ and $10(n^2 - n)$, $(n \in \mathbb{N}, n > 1)$ are three consecutive terms of a G.P., then n is equal to ____.

A test consists of 6 multiple choice questions, each having 4 alternative answers of which only one is correct. The number of ways, in which a candidate answers all six questions such that exactly four of the answers are correct, is ____.

If the variance of the following frequency distribution:

Class : 10–20 20–30 30–40

Frequency : 2 x 2

is 50, then x is equal to ____

If $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$, then the value of

$$|\hat{i} \times (\vec{a} \times \hat{i})|^2 + |\hat{j} \times (\vec{a} \times \hat{j})|^2 + |\hat{k} \times (\vec{a} \times \hat{k})|^2$$

is equal to ____

Answer key: JEE Main 2020 · 4 Sep · Shift 2

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Physics

1.	B	2.	B	3.	D	4.	A	5.	B	6.	D	7.	A	8.	C
9.	D	10.	B	11.	C	12.	C	13.	C	14.	C	15.	C	16.	B
17.	B	18.	A	19.	B	20.	C	21.	2	22.	476	23.	150	24.	20
25.	200														

Chemistry

26.	A	27.	D	28.	B	29.	C	30.	B	31.	C	32.	C	33.	D
34.	B	35.	D	36.	D	37.	D	38.	A	39.	B	40.	D	41.	C
42.	2	43.	84297	44.	10	45.	167	46.	19						

Mathematics

47.	B	48.	C	49.	D	50.	D	51.	B	52.	B	53.	A	54.	D
55.	A	56.	D	57.	C	58.	C	59.	D	60.	D	61.	C	62.	B
63.	A	64.	B	65.	7	66.	21	67.	135	68.	4	69.	18		

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