

JEE MAIN 2020 · QUESTION PAPER

2 Sep 2020 **Shift 2**

68 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	20 Q1 to Q20	4 Q21 to Q24
● Chemistry	16 Q25 to Q40	5 Q41 to Q45
● Mathematics	19 Q46 to Q64	4 Q65 to Q68
In this PDF	68 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.

prepwis.in/pyqs/paper/2020-09-02-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? prepwis.in/feedback · Terms: prepwis.in/terms

Q1 Alternating Current

[Step-by-step solution](#) › [prepwisar.in/questions/J7waYftmXz](https://www.prepwisar.in/questions/J7waYftmXz)

An inductance coil has a reactance of $100\ \Omega$. When an AC signal of frequency 1000 Hz is applied to the coil, the applied voltage leads the current by 45° . The self-inductance of the coil is

- (A) $6.7 \times 10^{-7}\text{ H}$ (B) $1.1 \times 10^{-1}\text{ H}$ (C) $5.5 \times 10^{-5}\text{ H}$ (D) $1.1 \times 10^{-2}\text{ H}$

Q2 Atomic Physics

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

In a hydrogen atom the electron makes a transition from $(n + 1)^{\text{th}}$ level to the n^{th} level. If $n \gg 1$, the frequency of radiation emitted is proportional to:

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

Q3 Electrostatics II: Potential & Capacitance

[Step-by-step solution](#) › [prepwisar.in/questions/c4ADRvo30h](https://www.prepwisar.in/questions/c4ADRvo30h)

A $10\ \mu\text{F}$ capacitor is fully charged to a potential difference of 50 V . After removing the source voltage it is connected to an uncharged capacitor in parallel. Now the potential difference across them becomes 20 V . The capacitance of the second capacitor is:

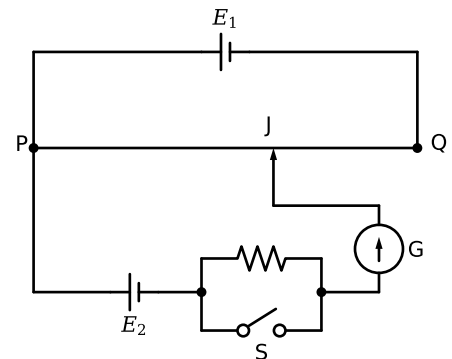
- (A) $20\ \mu\text{F}$ (B) $15\ \mu\text{F}$ (C) $10\ \mu\text{F}$ (D) $30\ \mu\text{F}$

Q4 Current Electricity

[Step-by-step solution](#) › [prepwisar.in/questions/EUOa6h1uuf](https://www.prepwisar.in/questions/EUOa6h1uuf)

A potentiometer wire PQ of 1 m length is connected to a standard cell E_1 . Another cell E_2 of emf 1.02 V is connected with a resistance 'r' and switch S (as shown in figure). With switch S open, the null position is obtained at a distance of 49 cm from Q. The potential gradient in the potentiometer wire is:

- (A) 0.04 V/cm (B) 0.01 V/cm (C) 0.02 V/cm (D) 0.03 V/cm



Q5 Dual Nature of Radiation & Matter

[Step-by-step solution](#) › [prepwisar.in/questions/Hn1GLWXrR2](https://www.prepwisar.in/questions/Hn1GLWXrR2)

A particle is moving 5 times as fast as an electron. The ratio of the de-Broglie wavelength of the particle to that of the electron is 1.878×10^{-4} . The mass of the particle is close to

- (A) $1.2 \times 10^{-28}\text{ kg}$ (B) $9.1 \times 10^{-31}\text{ kg}$ (C) $4.8 \times 10^{-27}\text{ kg}$ (D) $9.7 \times 10^{-28}\text{ kg}$

Q6 Electromagnetic Waves

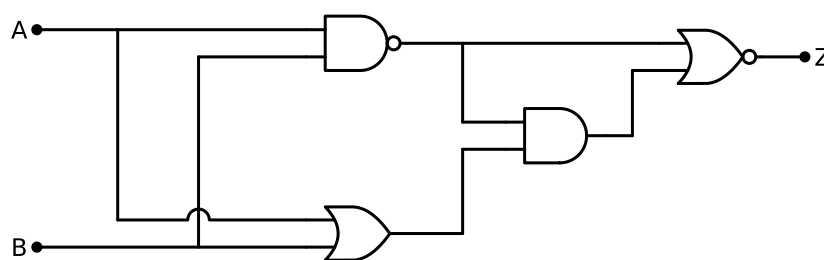
[Step-by-step solution](#) › [prepwisar.in/questions/F5x8uUZMs0](https://www.prepwisar.in/questions/F5x8uUZMs0)

In a plane electromagnetic wave, the directions of electric field and magnetic field are represented by $\hat{k}$ and $2\hat{i} - 2\hat{j}$, respectively. What is the unit vector along direction of propagation of the wave?

- (A) $\frac{1}{\sqrt{5}} (\hat{i} + 2\hat{j})$ (B) $\frac{1}{\sqrt{5}} (2\hat{i} + \hat{j})$ (C) $\frac{1}{\sqrt{2}} (\hat{i} + \hat{j})$ (D) $\frac{1}{\sqrt{2}} (\hat{j} + \hat{k})$

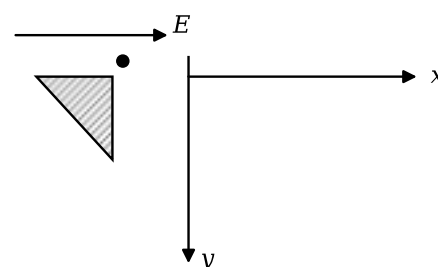
Attempt this paper online with instant answer checking › [prepwisar.in/pyqs/paper/2020-09-02-evening](https://www.prepwisar.in/pyqs/paper/2020-09-02-evening)

In the following digital circuit, what will be the output at 'Z', when the input (A, B) are (1, 0), (0, 0), (1, 1), (0, 1)



- (A) 1, 1, 0, 1 (B) 0, 1, 0, 0 (C) 1, 0, 1, 1 (D) 0, 0, 1, 0

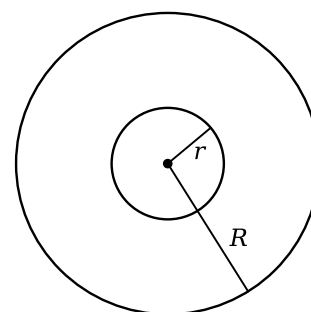
A small point mass carrying some positive charge on it, is released from the edge of a table. There is a uniform electric field in this region in the horizontal direction. Which of the following options then correctly describe the trajectory of the mass? (Curves are drawn schematically and are not to scale).



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

A charge Q is distributed over two concentric conducting thin spherical shells radii r and R ($R > r$). If the surface charge densities on the two shells are equal, the electric potential at the common centre is:

- (A) $\frac{1}{4\pi\epsilon_0} \frac{(R+r)}{(R^2+r^2)} Q$ (B) $\frac{1}{4\pi\epsilon_0} \frac{(R+r)}{2(R^2+r^2)} Q$
- (C) $\frac{1}{4\pi\epsilon_0} \frac{(R+2r)}{2(R^2+r^2)} Q$ (D) $\frac{1}{4\pi\epsilon_0} \frac{(2R+r)}{(R^2+r^2)} Q$



The height 'h' at which the weight of a body will be the same as that at the same depth 'h' from the surface of the earth is (Radius of the earth is R and effect of the rotation of the earth is neglected)

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

Q11 Thermodynamics[Step-by-step solution > prepwisar.in/questions/CEhD2hSjrv](https://www.prepwisar.in/questions/CEhD2hSjrv)

A heat engine is involved with exchange of heat of 1915 J, -40J, +125 J and -Q J, during one cycle achieving an efficiency of 50.0%. The value of Q is

- (A) 980 J (B) 40 J (C) 400 J (D) 640 J

Q12 Thermometry & Calorimetry[Step-by-step solution > prepwisar.in/questions/_LIrQyoUPK](https://www.prepwisar.in/questions/_LIrQyoUPK)

When the temperature of a metal wire is increased from 0°C to 10°C, its length increases by 0.02%. The percentage change in its mass density will be closest to:

- (A) 0.008 (B) 0.06 (C) 0.8 (D) 2.3

Q13 Kinetic Theory of Gases[Step-by-step solution > prepwisar.in/questions/9oBsTZpwWn](https://www.prepwisar.in/questions/9oBsTZpwWn)

An ideal gas in a closed container is slowly heated. As its temperature increases, which of the following statements are true?

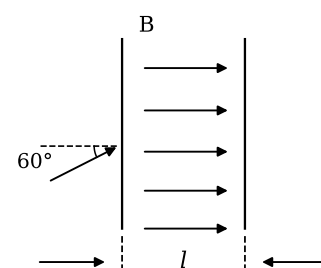
- (A) the mean free path of the molecules decreases.
 (B) the mean collision time between the molecules decreases.
 (C) the mean free path remains unchanged.
 (D) the mean collision time remains unchanged.

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

Q14 Moving Charges & Magnetism[Step-by-step solution > prepwisar.in/questions/dBDHKqWBaE](https://www.prepwisar.in/questions/dBDHKqWBaE)

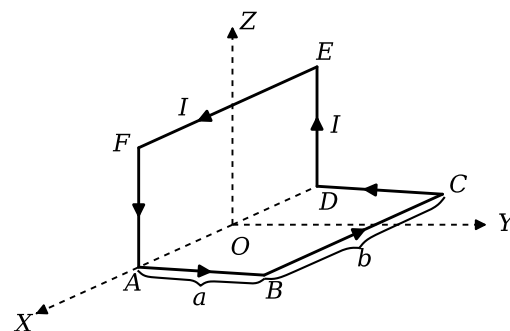
The figure shows a region of length 'l' with a uniform magnetic field of 0.3 T in it and a proton entering the region with velocity $4 \times 10^5 \text{ ms}^{-1}$ making an angle 60° with the field. If the proton completes 10 revolution by the time it cross the region shown, 'l' is close to
 (mass of proton = $1.67 \times 10^{-27} \text{ kg}$, charge of the proton = $1.6 \times 10^{-19} \text{ C}$)

- (A) 0.22 m (B) 0.11 m (C) 0.88 m (D) 0.44 m

**Q15** Moving Charges & Magnetism[Step-by-step solution > prepwisar.in/questions/sArTIVKzJE](https://www.prepwisar.in/questions/sArTIVKzJE)

A wire carrying current I is bent in the shape ABCDEFA as shown, where rectangle ABCDA and ADEFA are perpendicular to each other. If the sides of the rectangles are of lengths a and b, then the magnitude and direction of magnetic moment of the loop ABCDEFA is

- (A) $\sqrt{2}abI$, along $\left(\frac{\hat{j}}{\sqrt{5}} + \frac{2\hat{k}}{\sqrt{5}}\right)$ (B) abI , along $\left(\frac{\hat{j}}{\sqrt{5}} + \frac{2\hat{k}}{\sqrt{5}}\right)$
 (C) $\sqrt{2}abI$, along $\left(\frac{\hat{j}}{\sqrt{2}} + \frac{\hat{k}}{\sqrt{2}}\right)$ (D) abI , along $\left(\frac{\hat{j}}{\sqrt{2}} + \frac{\hat{k}}{\sqrt{2}}\right)$



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Q16 Surface Tension[Step-by-step solution > prepwiser.in/questions/7WLVfdapKF](https://www.prepwiser.in/questions/7WLVfdapKF)

A capillary tube made of glass of radius 0.15 mm is dipped vertically in a beaker filled with methylene iodide (surface tension = 0.05 Nm^{-1} , density = 667 kg m^{-3}) which rises to height h in the tube. It is observed that the two tangents drawn from liquid-glass interfaces (from opp. sides of the capillary) make an angle of 60° with one another. Then h is close to ($g = 10 \text{ ms}^{-2}$)

- (A) 0.049 m (B) 0.087 m (C) 0.137 m (D) 0.172 m

Q17 Rotational Motion[Step-by-step solution > prepwiser.in/questions/RDjtOC0Q88](https://www.prepwiser.in/questions/RDjtOC0Q88)

Two uniform circular discs are rotating independently in the same direction around their common axis passing through their centres. The moment of inertia and angular velocity of the first disc are 0.1 kg-m^2 and 10 rad s^{-1} respectively while those for the second one are 0.2 kg-m^2 and 5 rad s^{-1} respectively. At some instant they get stuck together and start rotating as a single system about their common axis with some angular speed. The kinetic energy of the combined system is:

- (A) $\frac{20}{3} J$ (B) $\frac{5}{3} J$ (C) $\frac{10}{3} J$ (D) $\frac{2}{3} J$

Q18 Simple Harmonic Motion[Step-by-step solution > prepwiser.in/questions/l8e6hwLSU2](https://www.prepwiser.in/questions/l8e6hwLSU2)

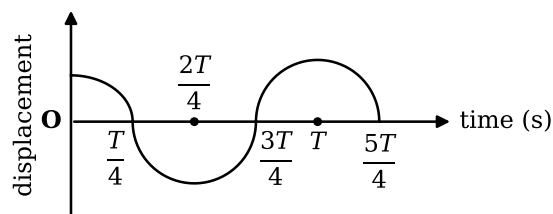
The displacement time graph of a particle executing S.H.M is given in figure:

(sketch is schematic and not to scale)

Which of the following statements is/are true for this motion?

- (A) The force is zero at $t = \frac{3T}{4}$
(B) The acceleration is maximum at $t = T$
(C) The speed is maximum at $t = \frac{T}{4}$
(D) The P.E. is equal to K.E. of the oscillation at $t = \frac{T}{2}$

- (A) (B), (C) and (D) (B) (A), (B) and (C) (C) (A) and (D) (D) (A), (B) and (D)

**Q19** Wave Optics[Step-by-step solution > prepwiser.in/questions/P7Twb98Qer](https://www.prepwiser.in/questions/P7Twb98Qer)

In a Young's double slit experiment, 16 fringes are observed in a certain segment of the screen when light of a wavelength 700 nm is used. If the wavelength of light is changed to 400 nm, the number of fringes observed in the same segment of the screen would be

- (A) 28 (B) 24 (C) 30 (D) 18

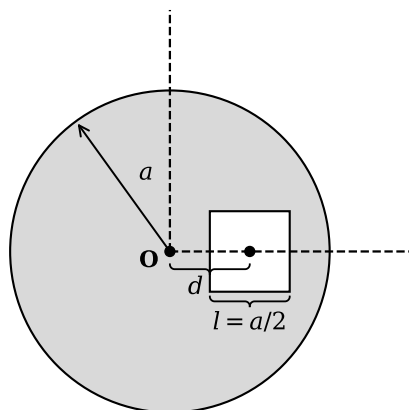
Q20 Units, Dimensions & Errors[Step-by-step solution > prepwiser.in/questions/B_wyAJ43WN](https://www.prepwiser.in/questions/B_wyAJ43WN)

If momentum (P), area (A) and time (T) are taken to be the fundamental quantities then the dimensional formula for energy is

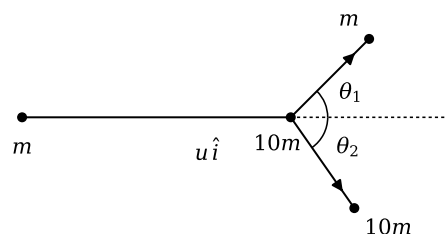
- (A) $[P^2AT^{-2}]$ (B) $[P^{\frac{1}{2}}AT^{-1}]$ (C) $[PA^{\frac{1}{2}}T^{-1}]$ (D) $[PA^{-1}T^{-2}]$

Q21 Centre of Mass & Linear Momentum **NUMERICAL**
[Step-by-step solution](https://www.prepwise.in/questions/oz7ZhzC3-b)

A square shaped hole of side $l = \frac{a}{2}$ is carved out at a distance $d = \frac{a}{2}$ from the centre 'O' of a uniform circular disk of radius a . If the distance of the centre of mass of the remaining portion from O is $-\frac{a}{X}$, value of X (to the nearest integer) is:


Q22 Collision **NUMERICAL**
[Step-by-step solution](https://www.prepwise.in/questions/DQ5LKJc3JL)

A particle of mass m is moving along the x-axis with initial velocity $u\hat{i}$. It collides elastically with a particle of mass $10m$ at rest and then moves with half its initial kinetic energy (see figure). If $\sin \theta_1 = \sqrt{n} \sin \theta_2$ then value of n is _____.


Q23 Ray Optics **NUMERICAL**
[Step-by-step solution](https://www.prepwise.in/questions/mnEympjksX)

A light ray enters a solid glass sphere of refractive index $\mu = \sqrt{3}$ at an angle of incidence 60° . The ray is both reflected and refracted at the farther surface of the sphere. The angle (in degrees) between the reflected and refracted rays at this surface is _____.

Q24 Mechanical Waves **NUMERICAL**
[Step-by-step solution](https://www.prepwise.in/questions/pkkMt3jfdJ)

A wire of density $9 \times 10^{-3} \text{ kg cm}^{-3}$ is stretched between two clamps 1 m apart. The resulting strain in the wire is 4.9×10^{-4} . The lowest frequency of the transverse vibrations in the wire is : (Young's modulus of wire $Y = 9 \times 10^{10} \text{ Nm}^{-2}$), (to the nearest integer), _____

Chemistry Section A · Multiple choice

Q25 Alcohols, Phenols & Ethers

[Step-by-step solution](https://www.prepwise.in/questions/bM0Qf-Qo1g)

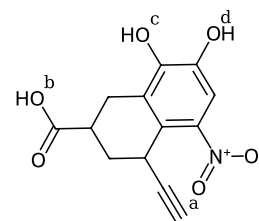
An organic compound 'A' ($\text{C}_9\text{H}_{10}\text{O}$) when treated with conc. HI undergoes cleavage to yield compounds 'B' and 'C'. 'B' gives yellow precipitate with AgNO_3 where as 'C' tautomerizes to 'D'. 'D' gives positive iodoform test. 'A' could be



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Arrange the following labelled hydrogens in decreasing order of acidity:

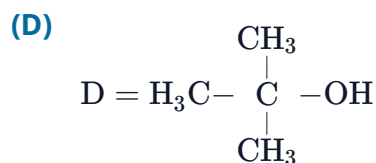
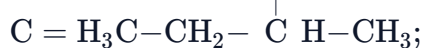
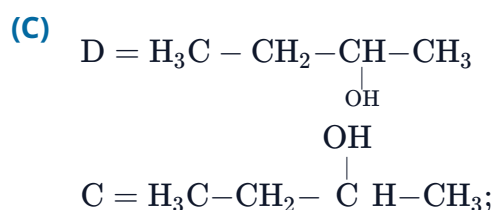
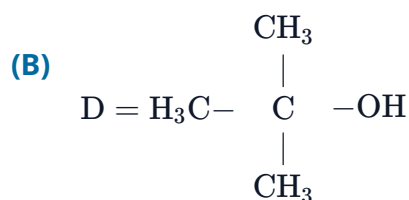
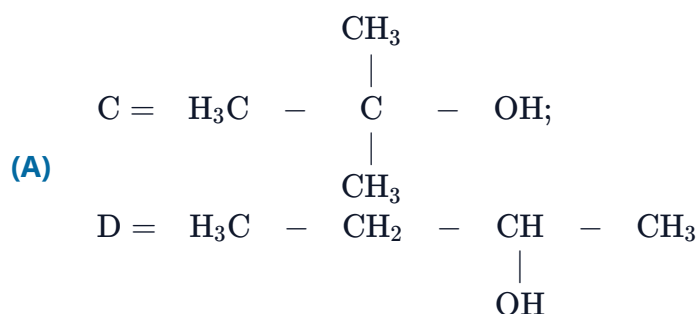
- (A) $b > c > d > a$ (B) $b > a > c > d$ (C) $c > b > d > a$ (D) $c > b > a > d$



Two compounds A and B with same molecular formula (C_3H_6O) undergo Grignard's reaction with methylmagnesium bromide to give products C and D. Products C and D show following chemical tests.

Test	C	D
Ceric ammonium nitrate Test	Positive	Positive
Lucas Test	Turbidity obtained after five minutes	Turbidity obtained immediately
Iodoform Test	Positive	Negative

C and D respectively are:



Q28 Gaseous State[Step-by-step solution > prepwise.in/questions/vQIBICR0VI](https://www.prepwise.in/questions/vQIBICR0VI)

Match the type of interaction in column A with the distance dependence of their interaction energy in column B

- (A) (I)-(a), (II)-(b), (III)-(d) (B) (I)-(b), (II)-(d), (III)-(c)
 (C) (I)-(a), (II)-(b), (III)-(c) (D) (I)-(a), (II)-(c), (III)-(d)

A	B
(i) ion-ion	(a) $\frac{1}{r}$
(ii) dipole-dipole	(b) $\frac{1}{r^2}$
(iii) London dispersion	(c) $\frac{1}{r^3}$
	(d) $\frac{1}{r^6}$

Q29 Chemical Bonding & Molecular Structure[Step-by-step solution > prepwise.in/questions/93dXZIKu-V](https://www.prepwise.in/questions/93dXZIKu-V)

The shape / structure of $[\text{XeF}_5]^-$ and XeO_3F_2 , respectively, are

- (A) Pentagonal planar and trigonal bipyramidal (B) Trigonal bipyramidal and pentagonal planar
 (C) Octahedral and square pyramidal (D) Trigonal bipyramidal and trigonal bipyramidal

Q30 Chemical Bonding & Molecular Structure[Step-by-step solution > prepwise.in/questions/gCdGRuQ0n-](https://www.prepwise.in/questions/gCdGRuQ0n-)

The molecular geometry of SF_6 is octahedral. What is the geometry of SF_4 (including lone pair(s) of electrons, if any)?

- (A) Tetrahedral (B) Trigonal bipyramidal
 (C) Square planar (D) Pyramidal

Q31 Chemical Kinetics[Step-by-step solution > prepwise.in/questions/UuZ539RUJX](https://www.prepwise.in/questions/UuZ539RUJX)

The results given in the below table were obtained during kinetic studies of the following reaction
 $2\text{A} + \text{B} \rightarrow \text{C} + \text{D}$

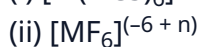
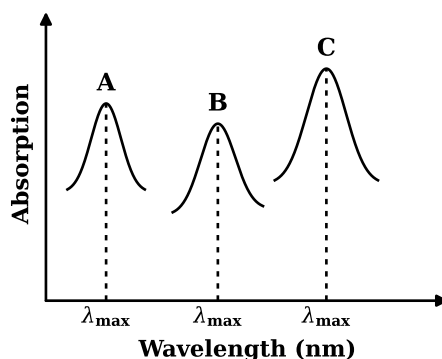
Experiment	[A]/molL ⁻¹	[B]/molL ⁻¹	Initial rate/molL ⁻¹ min ⁻¹
I	0.1	0.1	6.00×10^{-3}
II	0.1	0.2	2.40×10^{-2}
III	0.2	0.1	1.20×10^{-2}
IV	X	0.2	7.20×10^{-2}
V	0.3	Y	2.88×10^{-1}

X and Y in the given table are respectively:

- (A) 0.3, 0.4 (B) 0.4, 0.3 (C) 0.4, 0.4 (D) 0.3, 0.3

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Simplified absorption spectra of three complexes ((i), (ii) and (iii)) of Mn^{+} ion are provided below; their λ_{max} values are marked as A, B and C respectively. The correct match between the complexes and their λ_{max} values is



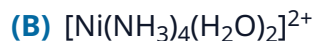
(A) A-(i), B-(ii), C-(iii)

(B) A-(ii), B-(iii), C-(i)

(C) A-(ii), B-(i), C-(iii)

(D) A-(iii), B-(i), C-(ii)

The one that is not expected to show isomerism is:



Cast iron is used for the manufacture of:

(A) wrought iron, pig iron and steel

(B) wrought iron and pig iron

(C) wrought iron and steel

(D) pig iron, scrap iron and steel

Three elements X, Y and Z are in the 3rd period of the periodic table. The oxides of X, Y and Z, respectively, are basic, amphoteric and acidic. The correct order of the atomic numbers of X, Y and Z is:

(A) $X < Z < Y$ (B) $Y < X < Z$ (C) $Z < Y < X$ (D) $X < Y < Z$

Two elements A and B have similar chemical properties. They don't form solid hydrogencarbonates, but react with nitrogen to form nitrides. A and B, respectively, are:

(A) Li and Mg

(B) Cs and Ba

(C) Na and Rb

(D) Na and Ca

The size of a raw mango shrinks to a much smaller size when kept in a concentrated salt solution. Which one of the following processes can explain this?

(A) Osmosis

(B) Reverse osmosis

(C) Diffusion

(D) Dialysis

The number of subshells associated with $n = 4$ and $m = -2$ quantum numbers is

- (A) 8 (B) 2 (C) 16 (D) 4

Amongst the following statements regarding adsorption, those that are valid are

- (a) ΔH becomes less negative as adsorption proceeds
(b) On a given adsorbent, ammonia is adsorbed more than nitrogen gas
(c) On adsorption, the residual force acting along the surface of the adsorbent increases
(d) With increase in temperature, the equilibrium concentration of adsorbate increases

- (A) (c) and (d) (B) (a) and (b) (C) (d) and (a) (D) (b) and (c)

If you spill a chemical toilet cleaning liquid on your hand, your first aid would be

- (A) aqueous NaOH (B) aqueous NaHCO_3 (C) aqueous NH_3 (D) vinegar

Chemistry Section B · Numerical value

Q41 to Q45

For the disproportionation reaction



(where K is the equilibrium constant) is

$$\text{_____} \times 10^{-1}.$$

Given:

$$E^0_{\text{Cu}^{2+}/\text{Cu}^+} = 0.16\text{V}$$

$$E^0_{\text{Cu}^+/\text{Cu}} = 0.52\text{V}$$

$$\frac{RT}{F} = 0.025$$

The oxidation states of transition metal atoms in $\text{K}_2\text{Cr}_2\text{O}_7$, KMnO_4 and K_2FeO_4 , respectively, are x, y and z. The sum of x, y and z is _____.

The ratio of the mass percentages of 'C & H' and 'C & O' of a saturated acyclic organic compound 'X' are 4 : 1 and 3 : 4 respectively. Then, the moles of oxygen gas required for complete combustion of two moles of organic compound 'X' is _____.

The work function of sodium metal is $4.41 \times 10^{-19} \text{ J}$. If photons of wavelength 300 nm are incident on the metal, the kinetic energy of the ejected electrons will be ($h = 6.63 \times 10^{-34} \text{ J s}$; $c = 3 \times 10^8 \text{ m/s}$) $\text{_____} \times 10^{-21} \text{ J}$.

The heat of combustion of ethanol into carbon dioxide and water is -327 kcal at constant pressure. The heat evolved (in cal) at constant volume and 27°C (if all gases behave ideally) is ($R = 2 \text{ cal mol}^{-1} \text{ K}^{-1}$) _____.

Q46 Three Dimensional Geometry

[Step-by-step solution](#) › [prepwisar.in/questions/2WtqJzhiDO](https://www.prepwisar.in/questions/2WtqJzhiDO)

A plane passing through the point (3, 1, 1) contains two lines whose direction ratios are 1, -2, 2 and 2, 3, -1 respectively. If this plane also passes through the point (α , -3, 5), then α is equal to:

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

Q47 Applications of Derivatives

[Step-by-step solution](#) › [prepwisar.in/questions/2uXAti7119](https://www.prepwisar.in/questions/2uXAti7119)

The equation of the normal to the curve $y = (1+x)^{2y} + \cos^2(\sin^{-1}x)$ at $x = 0$ is:

- (A) $y = 4x + 2$ (B) $x + 4y = 8$ (C) $y + 4x = 2$ (D) $2y + x = 4$

Q48 Applications of Derivatives

[Step-by-step solution](#) › [prepwisar.in/questions/IPLLDHLe7X](https://www.prepwisar.in/questions/IPLLDHLe7X)

Let $f : (-1, \infty) \rightarrow \mathbb{R}$ be defined by $f(0) = 1$ and $f(x) = \frac{1}{x} \log_e(1+x)$, $x \neq 0$. Then the function f :

- (A) decreases in $(-1, \infty)$ (B) decreases in $(-1, 0)$ and increases in $(0, \infty)$
(C) increases in $(-1, \infty)$ (D) increases in $(-1, 0)$ and decreases in $(0, \infty)$

Q49 Complex Numbers

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

The imaginary part of

$$(3 + 2\sqrt{-54})^{\frac{1}{2}} - (3 - 2\sqrt{-54})^{\frac{1}{2}}$$

can be:

- (A) $-2\sqrt{6}$ (B) 6 (C) $\sqrt{6}$ (D) $-\sqrt{6}$

Q50 Differential Equations

[Step-by-step solution](#) › [prepwisar.in/questions/R7Ld_zkEt4](https://www.prepwisar.in/questions/R7Ld_zkEt4)

If a curve $y = f(x)$, passing through the point (1, 2), is the solution of the differential equation, $2x^2 dy = (2xy + y^2) dx$, then $f\left(\frac{1}{2}\right)$ is equal to:

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

Q51 Functions (Advanced)

[Step-by-step solution](#) › [prepwisar.in/questions/wAG8fu5hoZ](https://www.prepwisar.in/questions/wAG8fu5hoZ)

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function which satisfies $f(x+y) = f(x) + f(y) \forall x, y \in \mathbb{R}$. If $f(1) = 2$ and

$g(n) = \sum_{k=1}^{(n-1)} f(k)$, $n \in \mathbb{N}$ then the value of n , for which $g(n) = 20$, is:

- (A) 20 (B) 9 (C) 5 (D) 4

Q52 Ellipse

[Step-by-step solution](#) › [prepwisar.in/questions/iiBm-YLiw2](https://www.prepwisar.in/questions/iiBm-YLiw2)

For some $\theta \in (0, \frac{\pi}{2})$, if the eccentricity of the hyperbola, $x^2 - y^2 \sec^2 \theta = 10$ is $\sqrt{5}$ times the eccentricity of the ellipse, $x^2 \sec^2 \theta + y^2 = 5$, then the length of the latus rectum of the ellipse, is:

- (A) $\sqrt{30}$ (B) $2\sqrt{6}$ (C) $\frac{4\sqrt{5}}{3}$ (D) $\frac{2\sqrt{5}}{3}$

Q53 Limits[Step-by-step solution](#) › [prepwiser.in/questions/DYIJBsoYm1](https://www.prepwiser.in/questions/DYIJBsoYm1)

$$\lim_{x \rightarrow 0} \left(\tan \left(\frac{\pi}{4} + x \right) \right)^{\frac{1}{x}}$$

is equal to:

- (A) 2 (B) 1 (C) e (D) e^2

Q54 Matrices[Step-by-step solution](#) › [prepwiser.in/questions/weMMb8P5Qq](https://www.prepwiser.in/questions/weMMb8P5Qq)

Let $a, b, c \in \mathbb{R}$ be all non-zero and satisfy $a^3 + b^3 + c^3 = 2$. If the matrix $A =$

$$\begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$$

satisfies $A^T A = I$, then a value of $\mathbf{abc}$ can be:

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

Q55 Determinants[Step-by-step solution](#) › [prepwiser.in/questions/zCnme7aSBc](https://www.prepwiser.in/questions/zCnme7aSBc)

Let $A = \{X = (x, y, z)^T : PX = 0 \text{ and } x^2 + y^2 + z^2 = 1\}$ where

$$P = \begin{bmatrix} 1 & 2 & 1 \\ -2 & 3 & -4 \\ 1 & 9 & -1 \end{bmatrix}$$

, then the set A:

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

Q56 Parabola[Step-by-step solution](#) › [prepwiser.in/questions/hyCkCQXQIB](https://www.prepwiser.in/questions/hyCkCQXQIB)

The area (in sq. units) of an equilateral triangle inscribed in the parabola $y^2 = 8x$, with one of its vertices on the vertex of this parabola, is:

- (A) $256\sqrt{3}$ (B) $64\sqrt{3}$ (C) $128\sqrt{3}$ (D) $192\sqrt{3}$

Q57 Permutations & Combinations[Step-by-step solution](#) › [prepwiser.in/questions/JPUvPZ33IO](https://www.prepwiser.in/questions/JPUvPZ33IO)

Let $n > 2$ be an integer. Suppose that there are n Metro stations in a city located along a circular path. Each pair of stations is connected by a straight track only. Further, each pair of nearest stations is connected by blue line, whereas all remaining pairs of stations are connected by red line. If the number of red lines is 99 times the number of blue lines, then the value of n is:

- (A) 201 (B) 199 (C) 101 (D) 200

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Q58 Probability: Advanced[Step-by-step solution](https://www.prepwisar.in/questions/5niKU_9nPk)

Let E^C denote the complement of an event E . Let E_1, E_2 and E_3 be any pairwise independent events with $P(E_1) > 0$

and $P(E_1 \cap E_2 \cap E_3) = 0$.

Then $P(E_2^C \cap E_3^C / E_1)$ is equal to:

- (A) $P(E_3^C) - P(E_2)$ (B) $P(E_2^C) + P(E_3)$ (C) $P(E_3^C) - P(E_2^C)$ (D) $P(E_3) - P(E_2^C)$

Q59 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwisar.in/questions/P61cqxi7dZ)

Let $f(x)$ be a quadratic polynomial such that $f(-1) + f(2) = 0$. If one of the roots of $f(x) = 0$ is 3, then its other root lies in:

- (A) $(-3, -1)$ (B) $(1, 3)$ (C) $(-1, 0)$ (D) $(0, 1)$

Q60 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/TtzL0JNP8H)

If the sum of first 11 terms of an A.P., $a_1, a_2, a_3, \dots$ is 0 ($a \neq 0$), then the sum of the A.P., $a_1, a_3, a_5, \dots, a_{23}$ is ka_1 , where k is equal to:

- (A) $\frac{121}{10}$ (B) $-\frac{121}{10}$ (C) $\frac{72}{5}$ (D) $-\frac{72}{5}$

Q61 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/XKq31eDvVn)

Let S be the sum of the first 9 terms of the series:

$\{x + ka\} + \{x^2 + (k+2)a\} + \{x^3 + (k+4)a\} + \{x^4 + (k+6)a\} + \dots$ where $a \neq 0$ and $x \neq 1$.

If $S = \frac{x^{10} - x + 45a(x-1)}{x-1}$, then k is equal to:

- (A) -3 (B) 1 (C) -5 (D) 3

Q62 Area Under Curves[Step-by-step solution](https://www.prepwisar.in/questions/EF9lv-sTDE)

Consider a region $R = \{(x, y) \in \mathbb{R} : x^2 \leq y \leq 2x\}$. if a line $y = \alpha$ divides the area of region R into two equal parts, then which of the following is true?

- (A) $3\alpha^2 - 8\alpha + 8 = 0$ (B) $\alpha^3 - 6\alpha^{3/2} - 16 = 0$ (C) $3\alpha^2 - 8\alpha^{3/2} + 8 = 0$ (D) $\alpha^3 - 6\alpha^2 + 16 = 0$

Q63 Straight Lines[Step-by-step solution](https://www.prepwisar.in/questions/QVCUA4sC5i)

The set of all possible values of θ in the interval $(0, \pi)$ for which the points $(1, 2)$ and $(\sin \theta, \cos \theta)$ lie on the same side of the line $x + y = 1$ is:

- (A) $(0, \frac{\pi}{4})$ (B) $(0, \frac{3\pi}{4})$ (C) $(\frac{\pi}{4}, \frac{3\pi}{4})$ (D) $(0, \frac{\pi}{2})$

Q64 Trigonometric Ratios & Identities[Step-by-step solution](https://www.prepwisar.in/questions/qFeBr0LI_R)

If the equation $\cos^4 \theta + \sin^4 \theta + \lambda = 0$ has real solutions for θ , then λ lies in the interval:

- (A) $[-\frac{3}{2}, -\frac{5}{4}]$ (B) $(-\frac{1}{2}, -\frac{1}{4}]$ (C) $(-\frac{5}{4}, -1]$ (D) $[-1, -\frac{1}{2}]$

Q65 Binomial Theorem **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/mv_8MMAZwW

For a positive integer n ,
 $\left(1 + \frac{1}{x}\right)^n$ is expanded
 in increasing powers of x . If three consecutive
 coefficients in this expansion are in the ratio,
 $2 : 5 : 12$, then n is equal to _____.

Q66 Definite Integration **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/yYiCJsN_2o

Let $[t]$ denote the greatest integer less than or equal to t .
 Then the value of $\int_1^2 |2x - [3x]| dx$ is _____.

Q67 Inverse Trigonometric Functions **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/xi7Qh9t7Lx

If $y =$

$$\sum_{k=1}^6 k \cos^{-1} \left\{ \frac{3}{5} \cos kx - \frac{4}{5} \sin kx \right\}$$

,
 then $\frac{dy}{dx}$ at $x = 0$ is _____.

Q68 Statistics **NUMERICAL**

[Step-by-step solution](#) › prepwiser.in/questions/zhhRpCy9vu

If the variance of the terms in an increasing A.P.,
 $b_1, b_2, b_3, \dots, b_{11}$ is 90, then the common difference of this A.P. is _____.

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

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Physics

1.	D	2.	C	3.	B	4.	C	5.	D	6.	C	7.	D	8.	A
9.	A	10.	B	11.	A	12.	B	13.	C	14.	D	15.	C	16.	B
17.	A	18.	B	19.	A	20.	C	21.	23	22.	10	23.	90	24.	35

Chemistry

25.	C	26.	A	27.	D	28.	D	29.	A	30.	B	31.	A	32.	D
33.	D	34.	C	35.	D	36.	A	37.	A	38.	B	39.	B	40.	B
41.	144	42.	19	43.	5	44.	222	45.	326400						

Mathematics

46.	C	47.	B	48.	A	49.	A	50.	B	51.	C	52.	C	53.	D
54.	B	55.	C	56.	D	57.	A	58.	A	59.	C	60.	D	61.	A
62.	C	63.	D	64.	D	65.	118	66.	1	67.	91	68.	3		

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