

JEE MAIN 2022 · QUESTION PAPER

27 Jun 2022 Shift 2

81 questions in exam order, with answer key

Subject	Section A multiple choice	Section B numerical value
● Physics	19 Q1 to Q19	9 Q20 to Q28
● Chemistry	15 Q29 to Q43	9 Q44 to Q52
● Mathematics	19 Q53 to Q71	10 Q72 to Q81
In this PDF	81 questions · answer key at the end	

- 1 Set a 3 hour timer and attempt the paper in one sitting, like the real exam.
- 2 In the 2021 to 2024 papers, Section B asked you to answer any 5 numerical questions per subject. Try each one here.
- 3 Check yourself against the answer key at the end. Every question names its chapter, so you can see where marks went.
- 4 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/2022-06-27-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 Units, Dimensions & Errors

[Step-by-step solution](#) › [prepwisar.in/questions/iwzvuy3Hok](https://www.prepwisar.in/questions/iwzvuy3Hok)

If L , C and R are the self inductance, capacitance and resistance respectively, which of the following does not have the dimension of time?

- (A) RC (B) $\frac{L}{R}$ (C) $\sqrt{LC}$ (D) $\frac{L}{C}$

Q2 Atomic Physics

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

Given below are two statements:

Statement I : In hydrogen atom, the frequency of radiation emitted when an electron jumps from lower energy orbit (E_1) to higher energy orbit (E_2), is given as $hf = E_1 - E_2$

Statement II : The jumping of electron from higher energy orbit (E_2) to lower energy orbit (E_1) is associated with frequency of radiation given as $f = (E_2 - E_1)/h$

This condition is Bohr's frequency condition.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Both Statement I and Statement II are true.
 (B) Both Statement I and Statement II are false.
 (C) Statement I is correct but Statement II is false.
 (D) Statement I is incorrect but Statement II is true.

Q3 Circular Motion

[Step-by-step solution](#) › [prepwisar.in/questions/gG7r9OVaoa](https://www.prepwisar.in/questions/gG7r9OVaoa)

A stone tied to a spring of length L is whirled in a vertical circle with the other end of the spring at the centre. At a certain instant of time, the stone is at its lowest position and has a speed u . The magnitude of change in its velocity, as it reaches a position where the string is horizontal, is $\sqrt{x(u^2 - gL)}$. The value of x is -

- (A) 3 (B) 2 (C) 1 (D) 5

Q4 Electromagnetic Waves

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

Given below are two statements:

Statement I : A time varying electric field is a source of changing magnetic field and vice-versa. Thus a disturbance in electric or magnetic field creates EM waves.

Statement II : In a material medium, the EM wave travels with speed $v = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$. In the light of the above statements, choose the correct answer from the options given below.

- (A) Both Statement I and Statement II are true
 (B) Both Statement I and Statement II are false
 (C) Statement I is correct but Statement II is false
 (D) Statement I is incorrect but Statement II is true

Q5 Semiconductors & Electronic Devices

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

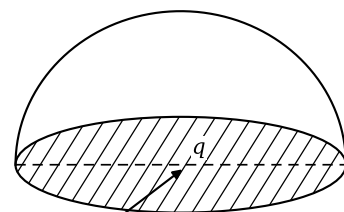
For a transistor to act as a switch, it must be operated in

- (A) Active region. (B) Saturation state only.
 (C) Cut-off state only. (D) Saturation and cut-off state.

Q6 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution > prepwisar.in/questions/hyY69YERqE](https://www.prepwisar.in/questions/hyY69YERqE)

If a charge q is placed at the centre of a closed hemispherical non-conducting surface, the total flux passing through the flat surface would be:

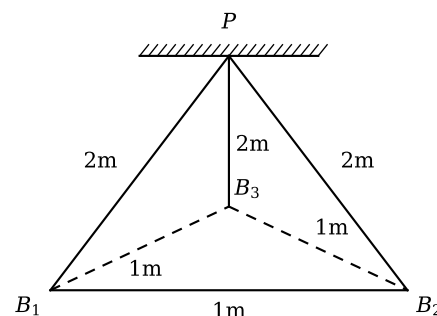
- (A) $\frac{q}{\epsilon_0}$ (B) $\frac{q}{2\epsilon_0}$ (C) $\frac{q}{4\epsilon_0}$ (D) $\frac{q}{2\pi\epsilon_0}$

**Q7** Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution > prepwisar.in/questions/tIhUM6ugZf](https://www.prepwisar.in/questions/tIhUM6ugZf)

Three identical charged balls each of charge 2 C are suspended from a common point P by silk threads of 2 m each (as shown in figure). They form an equilateral triangle of side 1 m .

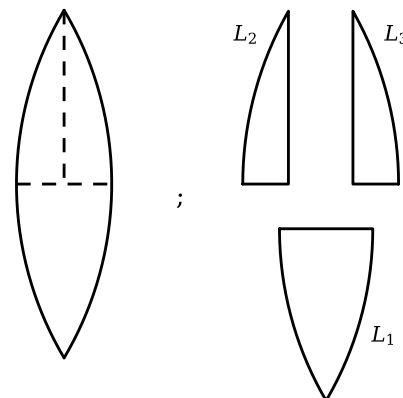
The ratio of net force on a charged ball to the force between any two charged balls will be:

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

**Q8** Ray Optics[Step-by-step solution > prepwisar.in/questions/akuYzSSAC9](https://www.prepwisar.in/questions/akuYzSSAC9)

A convex lens has power P . It is cut into two halves along its principal axis. Further one piece (out of the two halves) is cut into two halves perpendicular to the principal axis (as shown in figures). Choose the incorrect option for the reported pieces.

- (A) Power of $L_1 = \frac{P}{2}$ (B) Power of $L_2 = \frac{P}{2}$
 (C) Power of $L_3 = \frac{P}{2}$ (D) Power of $L_1 = P$

**Q9** Basic Mathematics for Physics[Step-by-step solution > prepwisar.in/questions/L3-0OPuqWe](https://www.prepwisar.in/questions/L3-0OPuqWe)

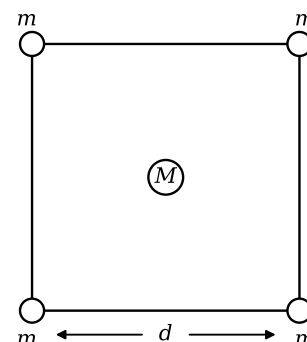
The distance of the Sun from earth is $1.5 \times 10^{11}\text{ m}$ and its angular diameter is $(2000)''$ when observed from the earth. The diameter of the Sun will be:

- (A) $2.45 \times 10^{10}\text{ m}$ (B) $1.45 \times 10^{10}\text{ m}$ (C) $1.45 \times 10^9\text{ m}$ (D) $0.14 \times 10^9\text{ m}$

Q10 Gravitation[Step-by-step solution > prepwisar.in/questions/eZ1fBZYs-Q](https://www.prepwisar.in/questions/eZ1fBZYs-Q)

Four spheres each of mass m from a square of side d (as shown in figure). A fifth sphere of mass M is situated at the centre of square. The total gravitational potential energy of the system is:

- (A) $-\frac{Gm}{d} [(4 + \sqrt{2})m + 4\sqrt{2}M]$ (B) $-\frac{Gm}{d} [(4 + \sqrt{2})M + 4\sqrt{2}m]$
 (C) $-\frac{Gm}{d} [3m^2 + 4\sqrt{2}M]$ (D) $-\frac{Gm}{d} [6m^2 + 4\sqrt{2}M]$

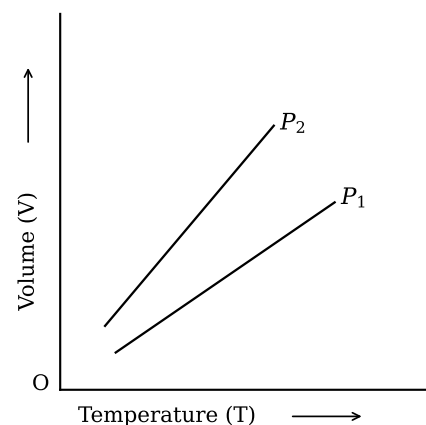


Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2022-06-27-evening](https://www.prepwisar.in/pyqs/paper/2022-06-27-evening)

Q11 Kinetic Theory of Gases[Step-by-step solution > prepwiser.in/questions/QvRkonJRvB](https://www.prepwiser.in/questions/QvRkonJRvB)

For a perfect gas, two pressures P_1 and P_2 are shown in figure. The graph shows:

- (A) $P_1 > P_2$
 (B) $P_1 < P_2$
 (C) $P_1 = P_2$
 (D) Insufficient data to draw any conclusion

**Q12** Kinetic Theory of Gases[Step-by-step solution > prepwiser.in/questions/FmfCLjkhiQ](https://www.prepwiser.in/questions/FmfCLjkhiQ)

According to kinetic theory of gases,

- A. The motion of the gas molecules freezes at 0°C .
 B. The mean free path of gas molecules decreases if the density of molecules is increased.
 C. The mean free path of gas molecules increases if temperature is increased keeping pressure constant.
 D. Average kinetic energy per molecule per degree of freedom is $\frac{3}{2}k_B T$ (for monoatomic gases).

Choose the most appropriate answer from the options given below:

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

Q13 Thermometry & Calorimetry[Step-by-step solution > prepwiser.in/questions/hNtYO9jbkm](https://www.prepwiser.in/questions/hNtYO9jbkm)

A lead bullet penetrates into a solid object and melts. Assuming that 40% of its kinetic energy is used to heat it, the initial speed of bullet is:

(Given : initial temperature of the bullet = 127°C , Melting point of the bullet = 327°C , Latent heat of fusion of lead = $2.5 \times 10^4 \text{ J kg}^{-1}$, Specific heat capacity of lead = 125 J/kg K)

- (A) 125 ms^{-1} (B) 500 ms^{-1} (C) 250 ms^{-1} (D) 600 ms^{-1}

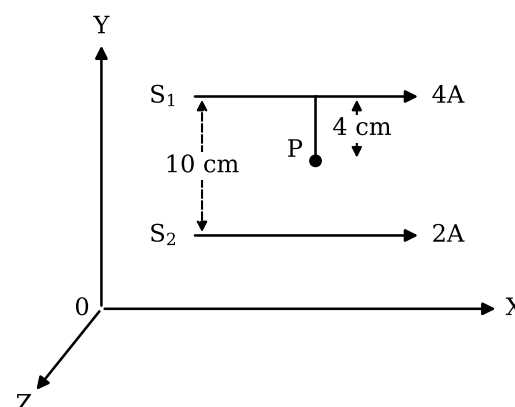
Q14 Moving Charges & Magnetism[Step-by-step solution > prepwiser.in/questions/vnjpN6b3Ej](https://www.prepwiser.in/questions/vnjpN6b3Ej)

Two long parallel conductors S_1 and S_2 are separated by a distance 10 cm and carrying currents of 4A and 2A respectively. The conductors are placed along x-axis in X-Y plane. There is a point P located between the conductors (as shown in figure).

A charge particle of 3π coulomb is passing through the point P with velocity $\vec{v} = (2\hat{i} + 3\hat{j}) \text{ m/s}$; where $\hat{i}$ and $\hat{j}$ represents unit vector along x & y axis respectively.

The force acting on the charge particle is $4\pi \times 10^{-5}(-x\hat{i} + 2\hat{j}) \text{ N}$. The value of x is:

- (A) 2 (B) 1 (C) 3 (D) -3



Attempt this paper online with instant answer checking > [prepwiser.in/pyqs/paper/2022-06-27-evening](https://www.prepwiser.in/pyqs/paper/2022-06-27-evening)

Q15 Rectilinear Motion[Step-by-step solution](https://www.prepwiser.in/questions/ajo8UqbDQA) › prepwiser.in/questions/ajo8UqbDQA

When a ball is dropped into a lake from a height 4.9 m above the water level, it hits the water with a velocity v and then sinks to the bottom with the constant velocity v . It reaches the bottom of the lake 4.0 s after it is dropped. The approximate depth of the lake is:

- (A) 19.6 m (B) 29.4 m (C) 39.2 m (D) 73.5 m

Q16 Circular Motion[Step-by-step solution](https://www.prepwiser.in/questions/0Euzg5873z) › prepwiser.in/questions/0Euzg5873z

One end of a massless spring of spring constant k and natural length l_0 is fixed while the other end is connected to a small object of mass m lying on a frictionless table. The spring remains horizontal on the table. If the object is made to rotate at an angular velocity ω about an axis passing through fixed end, then the elongation of the spring will be:

- (A) $\frac{k - m\omega^2 l_0}{m\omega^2}$ (B) $\frac{m\omega^2 l_0}{k + m\omega^2}$ (C) $\frac{m\omega^2 l_0}{k - m\omega^2}$ (D) $\frac{k + m\omega^2 l_0}{m\omega^2}$

Q17 Simple Harmonic Motion[Step-by-step solution](https://www.prepwiser.in/questions/SbAToZAcY2) › prepwiser.in/questions/SbAToZAcY2

The equation of a particle executing simple harmonic motion is given by $x = \sin \pi \left(t + \frac{1}{3} \right) m$. At $t = 1s$, the speed of particle will be

(Given: $\pi = 3.14$)

- (A) 0 cm s^{-1} (B) 157 cm s^{-1} (C) 272 cm s^{-1} (D) 314 cm s^{-1}

Q18 Ray Optics[Step-by-step solution](https://www.prepwiser.in/questions/2jpG3GqKov) › prepwiser.in/questions/2jpG3GqKov

If a wave gets refracted into a denser medium, then which of the following is true?

- (A) wavelength, speed and frequency decreases.
(B) wavelength increases, speed decreases and frequency remains constant.
(C) wavelength and speed decreases but frequency remains constant.
(D) wavelength, speed and frequency increases.

Q19 Units, Dimensions & Errors[Step-by-step solution](https://www.prepwiser.in/questions/Wx4Y75svgF) › prepwiser.in/questions/Wx4Y75svgF

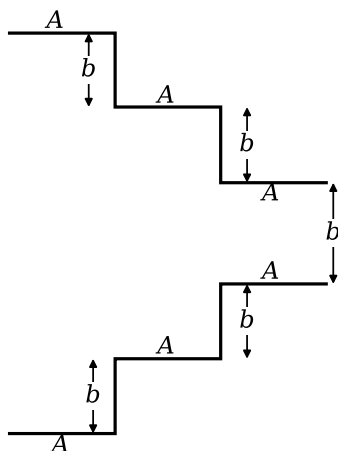
The SI unit of a physical quantity is pascal-second. The dimensional formula of this quantity will be:

- (A) $[ML^{-1}T^{-1}]$ (B) $[ML^{-1}T^{-2}]$ (C) $[ML^2T^{-1}]$ (D) $[M^{-1}L^3T^0]$

Q20 Electrostatics II: Potential & Capacitance **NUMERICAL**

[Step-by-step solution](#) > [prepwisar.in/questions/ZGI3PRKvKF](https://www.prepwisar.in/questions/ZGI3PRKvKF)

A parallel plate capacitor is made up of stair like structure with a plate area A of each stair and that is connected with a wire of length b , as shown in the figure. The capacitance of the arrangement is $\frac{x}{15} \frac{\epsilon_0 A}{b}$. The value of x is _____.



Q21 Current Electricity **NUMERICAL**

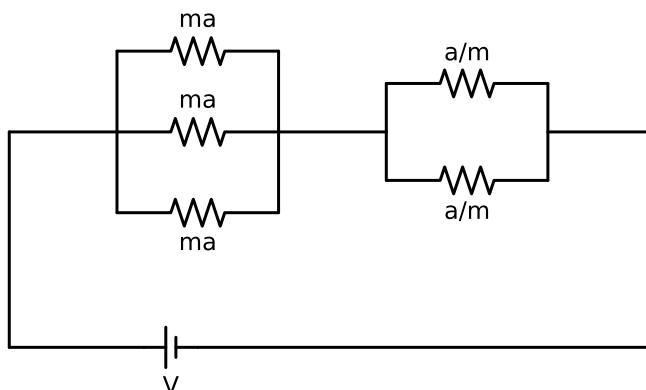
[Step-by-step solution](#) > [prepwisar.in/questions/vcBI4e3IIu](https://www.prepwisar.in/questions/vcBI4e3IIu)

The current density in a cylindrical wire of radius $r = 4.0$ mm is 1.0×10^6 A/m². The current through the outer portion of the wire between radial distances $\frac{r}{2}$ and r is $x\pi$ A; where x is _____.

Q22 Current Electricity **NUMERICAL**

[Step-by-step solution](#) > [prepwisar.in/questions/4nz_aMDen6](https://www.prepwisar.in/questions/4nz_aMDen6)

In the given circuit 'a' is an arbitrary constant. The value of m for which the equivalent circuit resistance is minimum, will be $\sqrt{\frac{x}{2}}$. The value of x is _____.



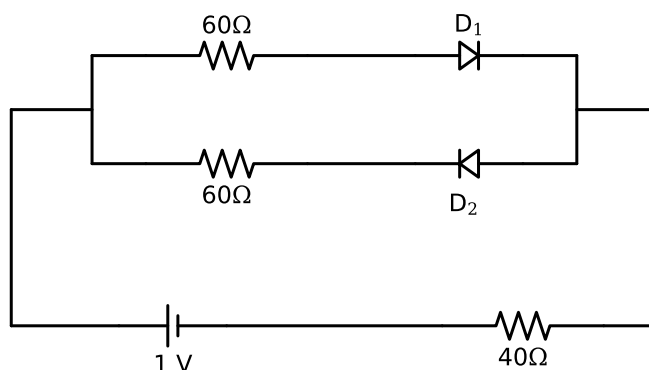
Q23 Electromagnetic Induction **NUMERICAL**

[Step-by-step solution](#) > [prepwisar.in/questions/N1p7qWcpJ_](https://www.prepwisar.in/questions/N1p7qWcpJ_)

A metallic rod of length 20 cm is placed in North-South direction and is moved at a constant speed of 20 m/s towards East. The horizontal component of the Earth's magnetic field at that place is 4×10^{-3} T and the angle of dip is 45° . The emf induced in the rod is _____ mV.

Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2022-06-27-evening](https://www.prepwisar.in/pyqs/paper/2022-06-27-evening)

The cut-off voltage of the diodes (shown in figure) in forward bias is 0.6 V. The current through the resistor of $40\ \Omega$ is _____ mA.



A diatomic gas ($\gamma = 1.4$) does 400J of work when it is expanded isobarically. The heat given to the gas in the process is _____ J.

A mass of 10 kg is suspended vertically by a rope of length 5 m from the roof. A force of 30 N is applied at the middle point of rope in horizontal direction. The angle made by upper half of the rope with vertical is $\theta = \tan^{-1}(x \times 10^{-1})$. The value of x is _____.

(Given, $g = 10\text{ m/s}^2$)

A deuteron and a proton moving with equal kinetic energy enter into a uniform magnetic field at right angle to the field. If r_d and r_p are the radii of their circular paths respectively, then the ratio $\frac{r_d}{r_p}$ will be $\sqrt{x}:1$ where x is _____.

A particle executes simple harmonic motion. Its amplitude is 8 cm and time period is 6 s. The time it will take to travel from its position of maximum displacement to the point corresponding to half of its amplitude, is _____ s.

Chemistry Section A · Multiple choice

Q29 to Q43

Given below are two statements.

Statement I : Maltose has two α -D-glucose units linked at C_1 and C_4 and is a reducing sugar.

Statement II : Maltose has two monosaccharides: α -D-glucose and β -D-glucose linked at C_1 and C_6 and it is a non-reducing sugar.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Both Statement I and Statement II are true. (B) Both Statement I and Statement II are false.
 (C) Statement I is true but Statement II is false. (D) Statement I is false but Statement II is true.

Identify the incorrect statement for PCl_5 from the following.

- (A) In this molecule, orbitals of phosphorous are assumed to undergo sp^3d hybridization.
 (B) The geometry of PCl_5 is trigonal bipyramidal.
 (C) PCl_5 has two axial bonds stronger than three equatorial bonds.
 (D) The three equatorial bonds of PCl_5 lie in a plane.

The correct order of increasing intermolecular hydrogen bond strength is:

- (A) $\text{HCN} < \text{H}_2\text{O} < \text{NH}_3$ (B) $\text{HCN} < \text{CH}_4 < \text{NH}_3$ (C) $\text{CH}_4 < \text{HCN} < \text{NH}_3$ (D) $\text{CH}_4 < \text{NH}_3 < \text{HCN}$

Match List-I with List-II

	List-I		List-II
(A)	Antipyretic	I.	Reduces pain
(B)	Analgesic	II.	Reduces stress
(C)	Tranquilizer	III.	Reduces fever
(D)	Antacid	IV.	Reduces acidity (stomach)

Choose the correct answer from the options given below:

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

Arrange the following coordination compounds in the increasing order of magnetic moments. (Atomic numbers : Mn = 25; Fe = 26)

- A. $[\text{FeF}_6]^{3-}$
 B. $[\text{Fe}(\text{CN})_6]^{3-}$
 C. $[\text{MnCl}_6]^{3-}$ (high spin)
 D. $[\text{Mn}(\text{CN})_6]^{3-}$

Choose the correct answer from the options given below:

- (A) $\text{A} < \text{B} < \text{D} < \text{C}$ (B) $\text{B} < \text{D} < \text{C} < \text{A}$ (C) $\text{A} < \text{C} < \text{D} < \text{B}$ (D) $\text{B} < \text{D} < \text{A} < \text{C}$

The 'f' orbitals are half and completely filled, respectively in lanthanide ions:

[Given : Atomic no. Eu, 63; Sm, 62; Tm, 69; Tb, 65; Yb, 70; Dy, 66]

- (A) Eu^{2+} and Tm^{2+} (B) Sm^{2+} and Tm^{3+} (C) Tb^{4+} and Yb^{2+} (D) Dy^{3+} and Yb^{3+}

In 3d series, the metal having the highest M^{2+}/M standard electrode potential is:

- (A) Cr (B) Fe (C) Cu (D) Zn

Attempt this paper online with instant answer checking › [prepwiser.in/pyqs/paper/2022-06-27-evening](https://www.prepwiser.in/pyqs/paper/2022-06-27-evening)

Q36 Metallurgy[Step-by-step solution](https://www.prepwiser.in/questions/IILMEXhfht) > prepwiser.in/questions/IILMEXhfht

Statement I : Leaching of gold with cyanide ion in absence of air / O_2 leads to cyano complex of Au(III).

Statement II : Zinc is oxidized during the displacement reaction carried out for gold extraction.

In the light of the above statements, choose the correct answer from the options given below.

- (A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

Q37 p-Block Elements: Part II (Group 15-18)[Step-by-step solution](https://www.prepwiser.in/questions/r8nqZQq7r) > prepwiser.in/questions/r8nqZQq7r

The gas produced by treating an aqueous solution of ammonium chloride with sodium nitrite is:

- (A) NH_3 (B) N_2 (C) N_2O (D) Cl_2

Q38 p-Block Elements: Part II (Group 15-18)[Step-by-step solution](https://www.prepwiser.in/questions/91BJZUL_kv) > prepwiser.in/questions/91BJZUL_kv

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Fluorine forms one oxoacid.

Reason R : Fluorine has smallest size amongst all halogens and is highly electronegative.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Both A and R are correct and R is the correct explanation of A.
(B) Both A and R are correct but R is NOT the correct explanation of A.
(C) A is correct but R is not correct.
(D) A is not correct but R is correct.

Q39 Periodic Table & Periodicity[Step-by-step solution](https://www.prepwiser.in/questions/Bt8VL6Y7jx) > prepwiser.in/questions/Bt8VL6Y7jx

The correct order of increasing ionic radii is

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

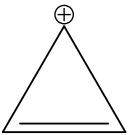
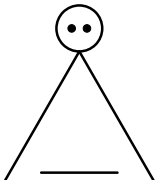
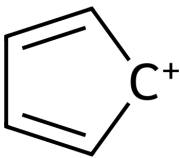
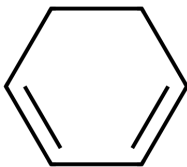
Q40 Polymers[Step-by-step solution](https://www.prepwiser.in/questions/5SkxpZ1tsm) > prepwiser.in/questions/5SkxpZ1tsm

Which is true about Buna-N?

- (A) It is a linear polymer of 1, 3-butadiene.
(B) It is obtained by copolymerization of 1, 3-butadiene and styrene.
(C) It is obtained by copolymerization of 1, 3-butadiene and acrylonitrile.
(D) The suffix N in Buna-N stands for its natural occurrence.

Q41 General Organic Chemistry (GOC)[Step-by-step solution](https://www.prepwiser.in/questions/Jen182AI3x) > prepwiser.in/questions/Jen182AI3x

Which of the following is most stable?

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

Decarboxylation of all six possible forms of diaminobenzoic acids $C_6H_3(NH_2)_2COOH$ yields three products A, B and C. Three acids give a product 'A', two acids give a product 'B' and one acid give a product 'C'. The melting point of product 'C' is

- (A) $63^\circ C$ (B) $90^\circ C$ (C) $104^\circ C$ (D) $142^\circ C$

Match List I with List II.

	List-I (Anion)		List-II (gas evolved on reaction with $dil.H_2SO_4$)
(A)	CO_3^{2-}	I.	Colourless gas which turns lead acetate paper black.
(B)	S^{2-}	II.	Colourless gas which turns acidified potassium dichromate solution green.
(C)	SO_3^{2-}	III.	Brown fumes which turns acidified KI solution containing starch blue.
(D)	NO_2^-	IV.	Colourless gas evolved with brisk effervescence, which turns lime water milky.

Choose the correct answer from the options given below:

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

Chemistry Section B · Numerical value

Q44 to Q52

It has been found that for a chemical reaction with rise in temperature by 9 K the rate constant gets doubled. Assuming a reaction to be occurring at 300 K, the value of activation energy is found to be _____ $kJ\ mol^{-1}$. [nearest integer]

(Given $\ln 10 = 2.3$, $R = 8.3\ J\ K^{-1}\ mol^{-1}$, $\log 2 = 0.30$)

pH value of 0.001 M NaOH solution is _____.

BeO reacts with HF in presence of ammonia to give [A] which on thermal decomposition produces [B] and ammonium fluoride. Oxidation state of Be in [A] is _____.

A solution containing $2.5 \times 10^{-3}\ kg$ of a solute dissolved in $75 \times 10^{-3}\ kg$ of water boils at 373.535 K. The molar mass of the solute is _____ $g\ mol^{-1}$. [nearest integer] (Given : $K_b(H_2O) = 0.52\ K\ kg\ mol^{-1}$ and boiling point of water = 373.15 K)

116 g of a substance upon dissociation reaction, yields 7.5 g of hydrogen, 60 g of oxygen and 48.5 g of carbon. Given that the atomic masses of H, O and C are 1, 16 and 12, respectively. The data agrees with how many formulae of the following?

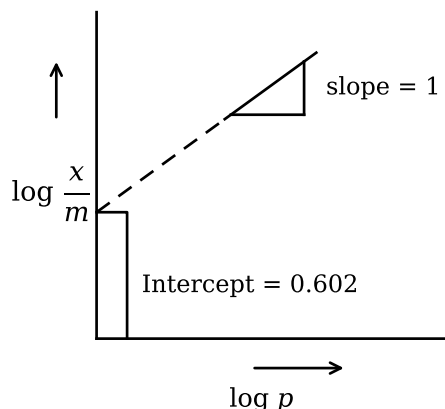
A. CH_3COOH , B. $HCHO$, C. CH_3OOCH_3 , D. CH_3CHO

Attempt this paper online with instant answer checking > [prepwisar.in/pyqs/paper/2022-06-27-evening](https://www.prepwisar.in/pyqs/paper/2022-06-27-evening)

Q49 Atomic Structure **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/yHw2SVfO_U)

Consider the following set of quantum numbers.
The number of correct sets of quantum numbers is _____.

	n	l	m_l
A.	3	3	-3
B.	3	2	-2
C.	2	1	+1
D.	2	2	+2

Q50 Surface Chemistry **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/Y0wyEmreY9)

If the initial pressure of a gas is 0.03 atm, the mass of the gas adsorbed per gram of the adsorbent is _____ $\times 10^{-2}$ g.

Q51 Chemical Thermodynamics **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/h1GhtqL7yU)

When 5 moles of He gas expand isothermally and reversibly at 300 K from 10 litre to 20 litre, the magnitude of the maximum work obtained is _____ J. [nearest integer] (Given : $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ and $\log 2 = 0.3010$)

Q52 Purification & Characterisation of Organic Compounds **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/VvYz0q1V7r)

0.25 g of an organic compound containing chlorine gave 0.40 g of silver chloride in Carius estimation. The percentage of chlorine present in the compound is _____. [in nearest integer]
(Given : Molar mass of Ag is 108 g mol^{-1} and that of Cl is 35.5 g mol^{-1})

Mathematics Section A · Multiple choice

Q53 to Q71

Q53 Three Dimensional Geometry[Step-by-step solution](https://www.prepwisar.in/questions/VeOBHF76Nf)

Let the foot of the perpendicular from the point (1, 2, 4) on the line $\frac{x+2}{4} = \frac{y-1}{2} = \frac{z+1}{3}$ be P. Then the distance of P from the plane $3x + 4y + 12z + 23 = 0$ is:

- (A) 5 (B) $\frac{50}{13}$ (C) 4 (D) $\frac{63}{13}$

Q54 Three Dimensional Geometry[Step-by-step solution](https://www.prepwisar.in/questions/pFRGSNTX9i)

The shortest distance between the lines $\frac{x-3}{2} = \frac{y-2}{3} = \frac{z-1}{-1}$ and $\frac{x+3}{2} = \frac{y-6}{1} = \frac{z-5}{3}$, is:

- (A) $\frac{18}{\sqrt{5}}$ (B) $\frac{22}{3\sqrt{5}}$ (C) $\frac{46}{3\sqrt{5}}$ (D) $6\sqrt{3}$

Q55 Circles[Step-by-step solution](https://www.prepwiser.in/questions/IJD9g53r1M) > prepwiser.in/questions/IJD9g53r1M

The set of values of k , for which the circle $C : 4x^2 + 4y^2 - 12x + 8y + k = 0$ lies inside the fourth quadrant and the point $(1, -\frac{1}{3})$ lies on or inside the circle C , is:

- (A) an empty set (B) $\left(6, \frac{65}{9}\right]$ (C) $\left[\frac{80}{9}, 10\right)$ (D) $\left(9, \frac{92}{9}\right]$

Q56 Complex Numbers[Step-by-step solution](https://www.prepwiser.in/questions/wjo-VIPM1U) > prepwiser.in/questions/wjo-VIPM1U

The number of points of intersection of $|z - (4 + 3i)| = 2$ and $|z| + |z - 4| = 6$, $z \in \mathbb{C}$, is:

- (A) 0 (B) 1 (C) 2 (D) 3

Q57 Applications of Derivatives[Step-by-step solution](https://www.prepwiser.in/questions/f5tpqdhRLM) > prepwiser.in/questions/f5tpqdhRLM

If m and n respectively are the number of local maximum and local minimum points of the function

$f(x) = \int_0^{x^2} \frac{t^2 - 5t + 4}{2 + e^t} dt$, then the ordered pair (m, n) is equal to

- (A) (3, 2) (B) (2, 3) (C) (2, 2) (D) (3, 4)

Q58 Definite Integration[Step-by-step solution](https://www.prepwiser.in/questions/ILRKUVx5CD) > prepwiser.in/questions/ILRKUVx5CD

Let f be a differentiable function in $(0, \frac{\pi}{2})$. If $\int_{\cos x}^1 t^2 f(t) dt = \sin^3 x + \cos x$, then $\frac{1}{\sqrt{3}} f' \left(\frac{1}{\sqrt{3}} \right)$ is equal to

- (A) $6 - 9\sqrt{2}$ (B) $6 - \frac{9}{\sqrt{2}}$ (C) $\frac{9}{2} - 6\sqrt{2}$ (D) $\frac{9}{\sqrt{2}} - 6$

Q59 Definite Integration[Step-by-step solution](https://www.prepwiser.in/questions/owbVeQFYPR) > prepwiser.in/questions/owbVeQFYPR

The integral $\int_0^1 \frac{1}{7^{\left[\frac{1}{x}\right]}} dx$, where $[\cdot]$ denotes the greatest integer function, is equal to

- (A) $1 + 6\log_e \left(\frac{6}{7} \right)$ (B) $1 - 6\log_e \left(\frac{6}{7} \right)$ (C) $\log_e \left(\frac{7}{6} \right)$ (D) $1 - 7\log_e \left(\frac{6}{7} \right)$

Q60 Differential Equations[Step-by-step solution](https://www.prepwiser.in/questions/_rjXIk0AaO) > prepwiser.in/questions/_rjXIk0AaO

If the solution curve of the differential equation

$((\tan^{-1} y) - x) dy = (1 + y^2) dx$ passes through the point $(1, 0)$, then the abscissa of the point on the curve whose ordinate is $\tan(1)$, is

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

Q61 Inverse Trigonometric Functions[Step-by-step solution](https://www.prepwiser.in/questions/PcYduYJzvA) > prepwiser.in/questions/PcYduYJzvA

The value of

$$\cot \left(\sum_{n=1}^{50} \tan^{-1} \left(\frac{1}{1+n+n^2} \right) \right)$$

is:

- (A) $\frac{26}{25}$ (B) $\frac{25}{26}$ (C) $\frac{50}{51}$ (D) $\frac{52}{51}$

Let

$$f(x) = \begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}, a \in R$$

. Then the sum of the squares of all the values of a , for which $2f'(10) - f'(5) + 100 = 0$, is

- (A) 117 (B) 106 (C) 125 (D) 136

Let A and B be two 3×3 matrices such that $AB = I$ and $|A| = \frac{1}{8}$. Then $|adj(B adj(2A))|$ is equal to

- (A) 16 (B) 32 (C) 64 (D) 128

If the equation of the parabola, whose vertex is at $(5, 4)$ and the directrix is $3x + y - 29 = 0$, is $x^2 + ay^2 + bxy + cx + dy + k = 0$, then $a + b + c + d + k$ is equal to:

- (A) 575 (B) -575 (C) 576 (D) -576

If a point $A(x, y)$ lies in the region bounded by the y -axis, straight lines $2y + x = 6$ and $5x - 6y = 30$, then the probability that $y < 1$ is:

- (A) $\frac{1}{6}$ (B) $\frac{5}{6}$ (C) $\frac{2}{3}$ (D) $\frac{6}{7}$

Let

$$S = 2 + \frac{6}{7} + \frac{12}{7^2} + \frac{20}{7^3} + \frac{30}{7^4} + \dots$$

. Then $4S$ is equal to

- (A) $\left(\frac{7}{3}\right)^2$ (B) $\frac{7^3}{3^2}$ (C) $\left(\frac{7}{3}\right)^3$ (D) $\frac{7^2}{3^3}$

If $a_1, a_2, a_3, \dots$ and $b_1, b_2, b_3, \dots$ are A.P., and $a_1 = 2, a_{10} = 3, a_1 b_1 = 1 = a_{10} b_{10}$, then $a_4 b_4$ is equal to -

- (A) $\frac{35}{27}$ (B) 1 (C) $\frac{27}{28}$ (D) $\frac{28}{27}$

The mean and variance of the data 4, 5, 6, 6, 7, 8, x , y , where $x < y$, are 6 and $\frac{9}{4}$ respectively. Then $x^4 + y^2$ is equal to:

- (A) 162 (B) 320 (C) 674 (D) 420

Attempt this paper online with instant answer checking › [prepwisar.in/pyqs/paper/2022-06-27-evening](https://www.prepwisar.in/pyqs/paper/2022-06-27-evening)

Q69 Determinants[Step-by-step solution](#) › [prepwiser.in/questions/xLZXNqhPNB](https://www.prepwiser.in/questions/xLZXNqhPNB)

Let for some real numbers α and β , $a = \alpha - i\beta$. If the system of equations $4ix + (1+i)y = 0$ and

$$8 \left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right) x + \bar{a}y = 0$$

has more than one solution, then $\frac{\alpha}{\beta}$ is equal to

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

Q70 Vectors[Step-by-step solution](#) › [prepwiser.in/questions/Hj76ERkYLI](https://www.prepwiser.in/questions/Hj76ERkYLI)

Let $\vec{a}$ and $\vec{b}$ be the vectors along the diagonals of a parallelogram having area $2\sqrt{2}$. Let the angle between $\vec{a}$ and $\vec{b}$ be acute, $|\vec{a}| = 1$, and

$$|\vec{a} \cdot \vec{b}| = |\vec{a} \times \vec{b}|$$

. If

$$\vec{c} = 2\sqrt{2}(\vec{a} \times \vec{b}) - 2\vec{b}$$

, then an angle between $\vec{b}$ and $\vec{c}$ is:

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

Q71 Trigonometric Ratios & Identities[Step-by-step solution](#) › [prepwiser.in/questions/H1G61oXjVv](https://www.prepwiser.in/questions/H1G61oXjVv)

$\alpha = \sin 36^\circ$ is a root of which of the following equation?

- (A) $16x^4 - 10x^2 - 5 = 0$ (B) $16x^4 + 20x^2 - 5 = 0$
(C) $16x^4 - 20x^2 + 5 = 0$ (D) $4x^4 - 10x^2 + 5 = 0$

Mathematics Section B · Numerical value

Q72 to Q81

Q72 Binomial Theorem **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/U_nuSJAeAa](https://www.prepwiser.in/questions/U_nuSJAeAa)

If the sum of the coefficients of all the positive powers of x , in the Binomial expansion of $(x^n + \frac{2}{x^5})^7$ is 939, then the sum of all the possible integral values of n is _____.

Q73 Circles **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/ljh-lWfno3](https://www.prepwiser.in/questions/ljh-lWfno3)

Let a circle C of radius 5 lie below the x -axis. The line $L_1: 4x + 3y + 2 = 0$ passes through the centre P of the circle C and intersects the line $L_2: 3x - 4y - 11 = 0$ at Q . The line L_2 touches C at the point Q . Then the distance of P from the line $5x - 12y + 51 = 0$ is _____.

Q74 Differential Equations **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/0LMDSrQb2k](https://www.prepwiser.in/questions/0LMDSrQb2k)

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

$$(1 - x^2)dy = (xy + (x^3 + 2)\sqrt{1 - x^2})dx, -1 < x < 1$$

, and $y(0) = 0$. If $\int_{-\frac{1}{2}}^{\frac{1}{2}} \sqrt{1 - x^2}y(x)dx = k$, then k^{-1} is equal to _____.

Q75 Differentiation **NUMERICAL**[Step-by-step solution](#) › [prepwiser.in/questions/jDuNYY-f2r](https://www.prepwiser.in/questions/jDuNYY-f2r)

If $y(x) = (x^x)^x$, $x > 0$, then $\frac{d^2y}{dy^2} + 20$ at $x = 1$ is equal to _____.

Attempt this paper online with instant answer checking › [prepwiser.in/pyqs/paper/2022-06-27-evening](https://www.prepwiser.in/pyqs/paper/2022-06-27-evening)

Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Define $f : S \rightarrow S$ as

$$f(n) = \begin{cases} 2n & , \quad \text{if } n = 1, 2, 3, 4, 5 \\ 2n - 11 & , \quad \text{if } n = 6, 7, 8, 9, 10 \end{cases}$$

Let $g : S \rightarrow S$ be a function such that

$$f \circ g(n) = \begin{cases} n + 1 & , \quad \text{if } n \text{ is odd} \\ n - 1 & , \quad \text{if } n \text{ is even} \end{cases}$$

Then $g(10)g(1) + g(2) + g(3) + g(4) + g(5)$ is equal to _____.

Let $[t]$ denote the greatest integer $\leq t$ and $\{t\}$ denote the fractional part of t . The integral value of α for which the left hand limit of the function

$$f(x) = [1 + x] + \frac{\alpha^{2[x] + \{x\}} + [x] - 1}{2[x] + \{x\}}$$
 at $x = 0$ is equal to $\alpha - \frac{4}{3}$, is _____.

Let A be a matrix of order 2×2 , whose entries are from the set $\{0, 1, 2, 3, 4, 5\}$. If the sum of all the entries of A is a prime number p , $2 < p < 8$, then the number of such matrices A is _____.

Let $S = \{E_1, E_2, \dots, E_8\}$ be a sample space of a random experiment such that $P(E_n) = \frac{n}{36}$ for every $n = 1, 2, \dots, 8$. Then the number of elements in the set $\{A \subseteq S : P(A) \geq \frac{4}{5}\}$ is _____.

Let α, β be the roots of the equation $x^2 - 4\lambda x + 5 = 0$ and α, γ be the roots of the equation $x^2 - (3\sqrt{2} + 2\sqrt{3})x + 7 + 3\lambda\sqrt{3} = 0$, $\lambda > 0$. If $\beta + \gamma = 3\sqrt{2}$, then $(\alpha + 2\beta + \gamma)^2$ is equal to _____.

If the area of the region $\{(x, y) : x^{\frac{2}{3}} + y^{\frac{2}{3}} \leq 1, x + y \geq 0, y \geq 0\}$ is A , then $\frac{256A}{\pi}$ is equal to _____.

Answer key: JEE Main 2022 · 27 Jun · Shift 2

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

Numbers match the question numbers above. For full working, open the solution link at the top right of each question.

Attempt this paper online with instant answer checking › prepwiser.in/pyqs/paper/2022-06-27-evening

Physics

1.	D	2.	D	3.	B	4.	C	5.	D	6.	B	7.	D	8.	A
9.	C	10.	A	11.	A	12.	B	13.	B	14.	C	15.	B	16.	C
17.	B	18.	C	19.	A	20.	23	21.	12	22.	3	23.	16	24.	4
25.	1400	26.	3	27.	2	28.	1								

Chemistry

29.	C	30.	C	31.	C	32.	A	33.	B	34.	C	35.	C	36.	D
37.	B	38.	A	39.	A	40.	C	41.	A	42.	D	43.	D	44.	59
45.	11	46.	2	47.	45	48.	2	49.	2	50.	12	51.	8630	52.	40

Mathematics

53.	A	54.	A	55.	D	56.	C	57.	B	58.	B	59.	A	60.	B
61.	A	62.	C	63.	C	64.	D	65.	B	66.	C	67.	D	68.	B
69.	B	70.	D	71.	C	72.	57	73.	11	74.	320	75.	16	76.	190
77.	3	78.	180	79.	19	80.	98	81.	36						

PrepWiser is an independent practice platform and is not affiliated with the National Testing Agency (NTA). Questions are from official JEE Main papers; answers follow NTA's final answer keys.



Attempt this paper online

Done with the paper version? Take the same paper online: check each answer instantly and read step-by-step solutions where available. It is free, and you can start without signing up.



- 1 Scan the code to open this paper online, or go to prepwisar.in/pyqs/paper/2022-06-27-evening.
- 2 Mark the questions you got wrong. Each one names its chapter at the top left.
- 3 Practise those chapters next with the free chapter-wise PYQ PDFs at prepwisar.in/pyq-pdfs.

Also free on PrepWiser

All JEE Main 2022 papers

Every shift of 2022 as a PDF, and the year's questions chapter-wise: prepwisar.in/pyq-pdfs/jee-main/2022/

Chapter-wise PYQ PDFs

Every chapter with answer keys, 2020 to 2026: prepwisar.in/pyq-pdfs/

Daily Arena

10 questions from one chapter, every day: prepwisar.in/arena

Spotted a mistake in this PDF? Tell us at prepwisar.in/feedback.