

JEE MAIN 2022 · QUESTION PAPER

28 Jun 2022 **Shift 2**

82 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	17 Q29 to Q45	8 Q46 to Q53
● Mathematics	20 Q54 to Q73	9 Q74 to Q82
In this PDF	82 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/2022-06-28-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 Nuclear Physics

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

Following statements related to radioactivity are given below:

- (A) Radioactivity is a random and spontaneous process and is dependent on physical and chemical conditions.
- (B) The number of un-decayed nuclei in the radioactive sample decays exponentially with time.
- (C) Slope of the graph of $\log_e$ (no. of undecayed nuclei) Vs. time represents the reciprocal of mean life time (τ).
- (D) Product of decay constant (λ) and half-life time ($T_{1/2}$) is not constant.

Choose the most appropriate answer from the options given below:

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

Q2 Current Electricity

[Step-by-step solution](#) › [prepwisar.in/questions/AYLNx4fTUV](https://www.prepwisar.in/questions/AYLNx4fTUV)

Resistance of the wire is measured as $2\ \Omega$ and $3\ \Omega$ at 10°C and 30°C respectively. Temperature coefficient of resistance of the material of the wire is:

- (A) $0.033\ ^\circ\text{C}^{-1}$ (B) $-0.033\ ^\circ\text{C}^{-1}$ (C) $0.011\ ^\circ\text{C}^{-1}$ (D) $0.055\ ^\circ\text{C}^{-1}$

Q3 Dual Nature of Radiation & Matter

[Step-by-step solution](#) › [prepwisar.in/questions/VFZAjUVF15](https://www.prepwisar.in/questions/VFZAjUVF15)

Let K_1 and K_2 be the maximum kinetic energies of photo-electrons emitted when two monochromatic beams of wavelength λ_1 and λ_2 , respectively are incident on a metallic surface. If $\lambda_1 = 3\lambda_2$ then:

- (A) $K_1 > \frac{K_2}{3}$ (B) $K_1 < \frac{K_2}{3}$ (C) $K_1 = \frac{K_2}{3}$ (D) $K_2 = \frac{K_1}{3}$

Q4 Electromagnetic Induction

[Step-by-step solution](#) › [prepwisar.in/questions/INJPxZo6wR](https://www.prepwisar.in/questions/INJPxZo6wR)

A coil is placed in a time varying magnetic field. If the number of turns in the coil were to be halved and the radius of wire doubled, the electrical power dissipated due to the current induced in the coil would be:

(Assume the coil to be short circuited.)

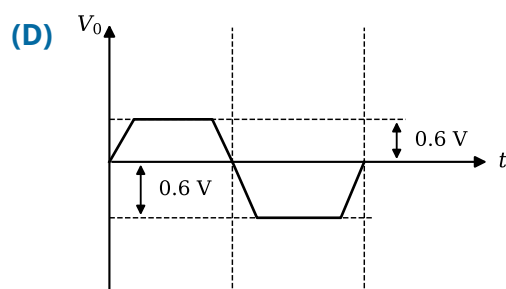
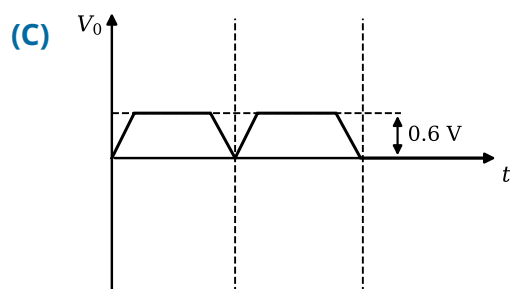
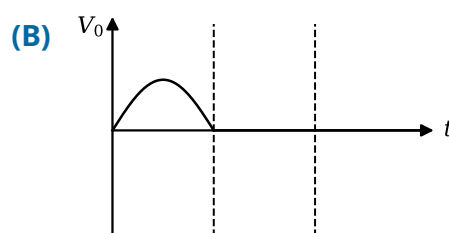
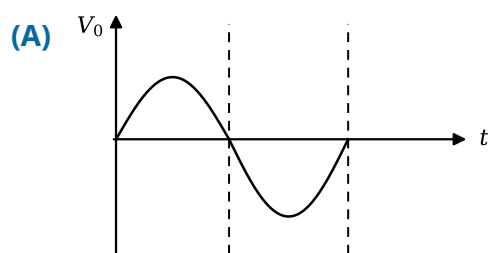
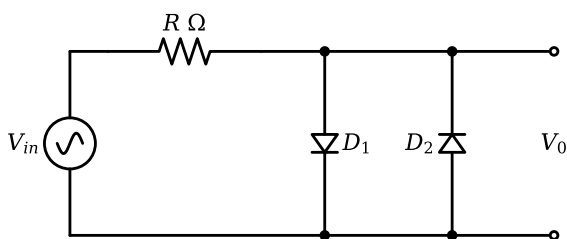
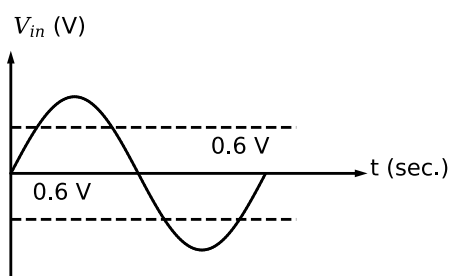
- (A) Halved (B) Quadrupled (C) The same (D) Doubled

Attempt this paper online with instant answer checking › [prepwisar.in/pyqs/paper/2022-06-28-evening](https://www.prepwisar.in/pyqs/paper/2022-06-28-evening)

An EM wave propagating in x-direction has a wavelength of 8 mm. The electric field vibrating y-direction has maximum magnitude of 60 Vm^{-1} . Choose the correct equations for electric and magnetic fields if the EM wave is propagating in vacuum:

- (A) $E_y = 60 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{j} \text{ Vm}^{-1}$
 $B_z = 2 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{k} \text{ T}$
- (B) $E_y = 60 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{j} \text{ Vm}^{-1}$
 $B_z = 2 \times 10^{-7} \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{k} \text{ T}$
- (C) $E_y = 2 \times 10^{-7} \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{j} \text{ Vm}^{-1}$
 $B_z = 60 \sin \left[\frac{\pi}{4} \times 10^3 (x - 3 \times 10^8 t) \right] \hat{k} \text{ T}$
- (D) $E_y = 2 \times 10^{-7} \sin \left[\frac{\pi}{4} \times 10^4 (x - 4 \times 10^8 t) \right] \hat{j} \text{ Vm}^{-1}$
 $B_z = 60 \sin \left[\frac{\pi}{4} \times 10^4 (x - 4 \times 10^8 t) \right] \hat{k} \text{ T}$

In the given circuit the input voltage V_{in} is shown in figure. The cut-in voltage of p-n junction diode (D_1 or D_2) is 0.6 V. Which of the following output voltage (V_0) waveform across the diode is correct?



Q7 Electrostatics I: Charges, Field & Gauss's Law[Step-by-step solution](https://www.prepwisar.in/questions/64ala814b9) > prepwisar.in/questions/64ala814b9

Two point charges A and B of magnitude $+8 \times 10^{-6}$ C and -8×10^{-6} C respectively are placed at a distance d apart. The electric field at the middle point O between the charges is 6.4×10^4 NC $^{-1}$. The distance ' d ' between the point charges A and B is:

- (A) 2.0 m (B) 3.0 m (C) 1.0 m (D) 4.0 m

Q8 Work, Energy & Power[Step-by-step solution](https://www.prepwisar.in/questions/Rg8kuByFIN) > prepwisar.in/questions/Rg8kuByFIN

Water falls from a 40 m high dam at the rate of 9×10^4 kg per hour. Fifty percentage of gravitational potential energy can be converted into electrical energy. Using this hydroelectric energy number of 100 W lamps, that can be lit, is:

(Take $g = 10$ ms $^{-2}$)

- (A) 25 (B) 50 (C) 100 (D) 18

Q9 Gravitation[Step-by-step solution](https://www.prepwisar.in/questions/c_8O9GRki3) > prepwisar.in/questions/c_8O9GRki3

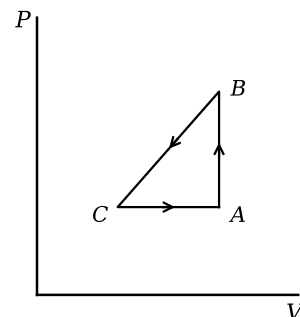
Two objects of equal masses placed at certain distance from each other attracts each other with a force of F . If one-third mass of one object is transferred to the other object, then the new force will be:

- (A) $\frac{2}{9} F$ (B) $\frac{16}{9} F$ (C) $\frac{8}{9} F$ (D) F

Q10 Thermodynamics[Step-by-step solution](https://www.prepwisar.in/questions/OjA7-raSB3) > prepwisar.in/questions/OjA7-raSB3

A sample of an ideal gas is taken through the cyclic process ABCA as shown in figure. It absorbs, 40 J of heat during the part AB, no heat during BC and rejects 60 J of heat during CA. A work of 50 J is done on the gas during the part BC. The internal energy of the gas at A is 1560 J. The workdone by the gas during the part CA is:

- (A) 20 J (B) 30 J (C) -30 J (D) -60 J

**Q11** Kinetic Theory of Gases[Step-by-step solution](https://www.prepwisar.in/questions/0p_OHXbN2) > prepwisar.in/questions/0p_OHXbN2

What will be the effect on the root mean square velocity of oxygen molecules if the temperature is doubled and oxygen molecule dissociates into atomic oxygen?

- (A) The velocity of atomic oxygen remains same
(B) The velocity of atomic oxygen doubles
(C) The velocity of atomic oxygen becomes half
(D) The velocity of atomic oxygen becomes four times

Q12 Work, Energy & Power[Step-by-step solution](https://www.prepwisar.in/questions/hZE5rbJN3d) > prepwisar.in/questions/hZE5rbJN3d

A block of mass 2 kg moving on a horizontal surface with speed of 4 ms $^{-1}$ enters a rough surface ranging from $x = 0.5$ m to $x = 1.5$ m. The retarding force in this range of rough surface is related to distance by $F = -kx$ where $k = 12$ Nm $^{-1}$. The speed of the block as it just crosses the rough surface will be:

- (A) zero (B) 1.5 ms $^{-1}$ (C) 2.0 ms $^{-1}$ (D) 2.5 ms $^{-1}$

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Q13 Magnetism & Matter[Step-by-step solution](https://www.prepwisar.in/questions/X0ZJwImdAW) > prepwisar.in/questions/X0ZJwImdAW

The space inside a straight current carrying solenoid is filled with a magnetic material having magnetic susceptibility equal to 1.2×10^{-5} . What is fractional increase in the magnetic field inside solenoid with respect to air as medium inside the solenoid?

- (A) 1.2×10^{-5} (B) 1.2×10^{-3} (C) 1.8×10^{-3} (D) 2.4×10^{-5}

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

Two parallel, long wires are kept 0.20 m apart in vacuum, each carrying current of x A in the same direction. If the force of attraction per meter of each wire is 2×10^{-6} N, then the value of x is approximately:

- (A) 1 (B) 2.4 (C) 1.4 (D) 2

Q15 Fluid Mechanics[Step-by-step solution](https://www.prepwisar.in/questions/-eQgsa4obX) > prepwisar.in/questions/-eQgsa4obX

A water drop of radius $1 \mu\text{m}$ falls in a situation where the effect of buoyant force is negligible. Coefficient of viscosity of air is $1.8 \times 10^{-5} \text{ Nsm}^{-2}$ and its density is negligible as compared to that of water 10^6 gm^{-3} . Terminal velocity of the water drop is:

(Take acceleration due to gravity = 10 ms^{-2})

- (A) $145.4 \times 10^{-6} \text{ ms}^{-1}$ (B) $118.0 \times 10^{-6} \text{ ms}^{-1}$ (C) $132.6 \times 10^{-6} \text{ ms}^{-1}$ (D) $123.4 \times 10^{-6} \text{ ms}^{-1}$

Q16 Rotational Motion[Step-by-step solution](https://www.prepwisar.in/questions/UsGAs1NxDt) > prepwisar.in/questions/UsGAs1NxDt

A ball is spun with angular acceleration $\alpha = 6t^2 - 2t$ where t is in second and α is in rads^{-2} . At $t = 0$, the ball has angular velocity of 10 rads^{-1} and angular position of 4 rad. The most appropriate expression for the angular position of the ball is:

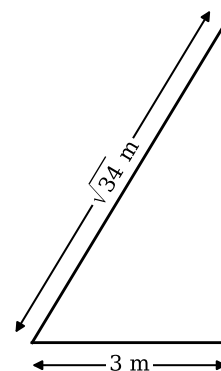
- (A) $\frac{3}{2}t^4 - t^2 + 10t$ (B) $\frac{t^4}{2} - \frac{t^3}{3} + 10t + 4$
(C) $\frac{2t^4}{3} - \frac{t^3}{6} + 10t + 12$ (D) $2t^4 - \frac{t^3}{2} + 5t + 4$

Q17 Rotational Motion[Step-by-step solution](https://www.prepwisar.in/questions/T4mYGrCdFO) > prepwisar.in/questions/T4mYGrCdFO

A $\sqrt{34}$ m long ladder weighing 10 kg leans on a frictionless wall. Its feet rest on the floor 3 m away from the wall as shown in the figure. If E_f and F_w are the reaction forces of the floor and the wall, then ratio of F_w/F_f will be:

(Use $g = 10 \text{ m/s}^2$.)

- (A) $\frac{6}{\sqrt{110}}$ (B) $\frac{3}{\sqrt{113}}$ (C) $\frac{3}{\sqrt{109}}$ (D) $\frac{2}{\sqrt{109}}$

**Q18** Wave Optics[Step-by-step solution](https://www.prepwisar.in/questions/NirWC6HdVO) > prepwisar.in/questions/NirWC6HdVO

In Young's double slit experiment performed using a monochromatic light of wavelength λ , when a glass plate ($\mu = 1.5$) of thickness $x\lambda$ is introduced in the path of the one of the interfering beams, the intensity at the position where the central maximum occurred previously remains unchanged. The value of x will be:

- (A) 3 (B) 2 (C) 1.5 (D) 0.5

Velocity (v) and acceleration (a) in two systems of units 1 and 2 are related as $v_2 = \frac{n}{m^2} v_1$ and $a_2 = \frac{a_1}{mn}$ respectively. Here m and n are constants. The relations for distance and time in two systems respectively are:

(A) $\frac{n^3}{m^3} L_1 = L_2$ and $\frac{n^2}{m} T_1 = T_2$

(B) $L_1 = \frac{n^4}{m^2} L_2$ and $T_1 = \frac{n^2}{m} T_2$

(C) $L_1 = \frac{n^2}{m} L_2$ and $T_1 = \frac{n^4}{m^2} T_2$

(D) $\frac{n^2}{m} L_1 = L_2$ and $\frac{n^4}{m^2} T_1 = T_2$

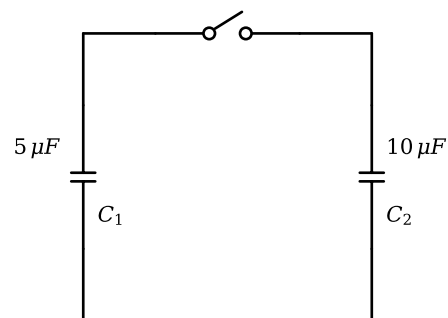
Physics Section B · Numerical value

Q20 to Q28

Q20 Electrostatics II: Potential & Capacitance NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/iOSvUs1PAd) > prepwiser.in/questions/iOSvUs1PAd

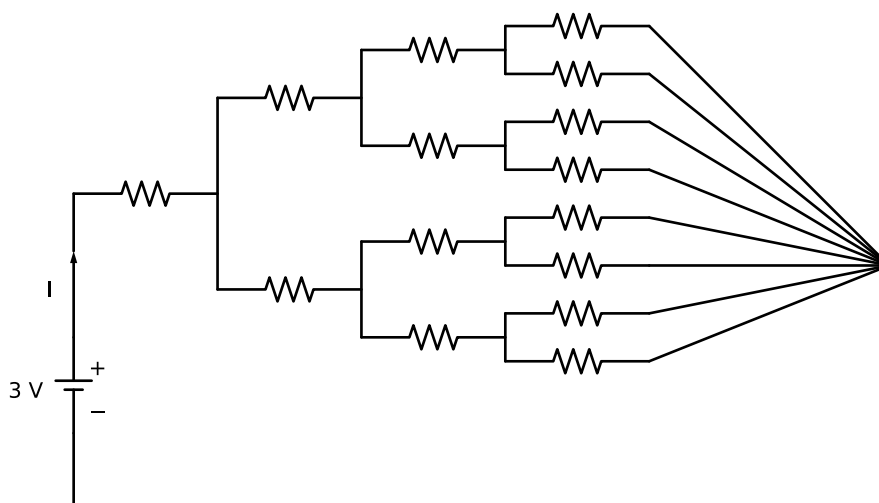
A capacitor C_1 of capacitance $5 \mu\text{F}$ is charged to a potential of 30 V using a battery. The battery is then removed and the charged capacitor is connected to an uncharged capacitor C_2 of capacitance $10 \mu\text{F}$ as shown in figure. When the switch is closed charge flows between the capacitors. At equilibrium, the charge on the capacitor C_2 is _____ μC .



Q21 Current Electricity NUMERICAL

[Step-by-step solution](https://www.prepwiser.in/questions/OyxsfL3rpM) > prepwiser.in/questions/OyxsfL3rpM

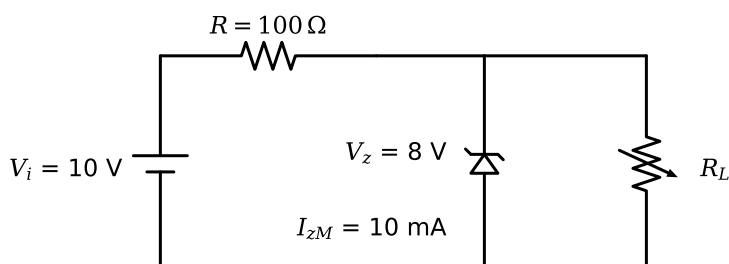
All resistances in figure are 1Ω each. The value of current ' I ' is $\frac{a}{5} \text{ A}$. The value of a is _____.



Q22 Semiconductors & Electronic Devices NUMERICAL

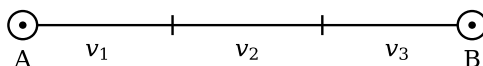
[Step-by-step solution](https://www.prepwiser.in/questions/G6aDWQ81hM) > prepwiser.in/questions/G6aDWQ81hM

A zener of breakdown voltage $V_z = 8 \text{ V}$ and maximum zener current, $I_{zM} = 10 \text{ mA}$ is subjected to an input voltage $V_i = 10 \text{ V}$ with series resistance $R = 100 \Omega$. In the given circuit R_L represents the variable load resistance. The ratio of maximum and minimum value of R_L is _____.



Q23 Rectilinear Motion **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/o7I0sjEn6X)

A car covers AB distance with first one-third at velocity $v_1 \text{ ms}^{-1}$, second one-third at $v_2 \text{ ms}^{-1}$ and last one-third at $v_3 \text{ ms}^{-1}$. If $v_3 = 3v_1$, $v_2 = 2v_1$ and $v_1 = 11 \text{ ms}^{-1}$ then the average velocity of the car is _____ ms^{-1} .

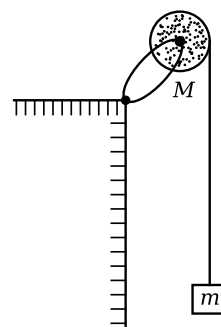
**Q24** Fluid Mechanics **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/NIA3cvQams)

A liquid of density 750 kg m^{-3} flows smoothly through a horizontal pipe that tapers in cross-sectional area from $A_1 = 1.2 \times 10^{-2} \text{ m}^2$ to $A_2 = \frac{A_1}{2}$. The pressure difference between the wide and narrow sections of the pipe is 4500 Pa . The rate of flow of liquid is _____ $\times 10^{-3} \text{ m}^3 \text{ s}^{-1}$.

Q25 Rotational Motion **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/Ka_UM21hyh)

A uniform disc with mass $M = 4 \text{ kg}$ and radius $R = 10 \text{ cm}$ is mounted on a fixed horizontal axle as shown in figure. A block with mass $m = 2 \text{ kg}$ hangs from a massless cord that is wrapped around the rim of the disc. During the fall of the block, the cord does not slip and there is no friction at the axle. The tension in the cord is _____ N.

(Take $g = 10 \text{ ms}^{-2}$)

**Q26** Wave Optics **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/9ffOVUdf4e)

In a Young's double slit experiment, an angular width of the fringe is 0.35° on a screen placed at 2 m away for particular wavelength of 450 nm . The angular width of the fringe, when whole system is immersed in a medium of refractive index $7/5$, is $\frac{1}{\alpha}$. The value of α is _____.

Q27 Sound Waves **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/gShiPeWoFz)

A tuning fork of frequency 340 Hz resonates in the fundamental mode with an air column of length 125 cm in a cylindrical tube closed at one end. When water is slowly poured in it, the minimum height of water required for observing resonance once again is _____ cm.

(Velocity of sound in air is 340 ms^{-1})

Q28 Units, Dimensions & Errors **NUMERICAL**[Step-by-step solution](https://www.prepwisar.in/questions/jT1Z-luZxc)

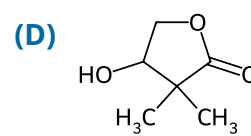
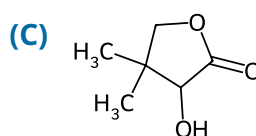
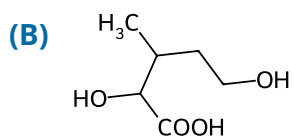
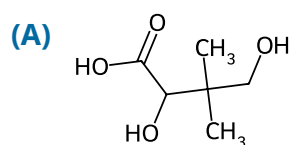
A student in the laboratory measures thickness of a wire using screw gauge. The readings are 1.22 mm , 1.23 mm , 1.19 mm and 1.20 mm . The percentage error is $\frac{x}{121}\%$. The value of x is _____.

Chemistry Section A · Multiple choice

Q29 to Q45

Q29 Aldehydes & Ketones[Step-by-step solution](https://www.prepwisar.in/questions/NQwjBpmwsS)

Isobutyraldehyde on reaction with formaldehyde and K_2CO_3 gives compound 'A'. Compound 'A' reacts with KCN and yields compound 'B', which on hydrolysis gives a stable compound 'C'. The compound 'C' is



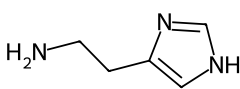
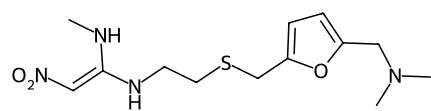
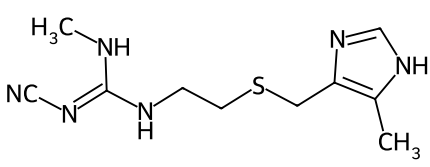
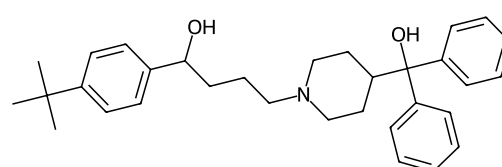
When sugar 'X' is boiled with dilute H_2SO_4 in alcoholic solution, two isomers 'A' and 'B' are formed. 'A' on oxidation with HNO_3 yields saccharic acid whereas 'B' is laevorotatory. The compound 'X' is:

- (A) Maltose (B) Sucrose (C) Lactose (D) Starch

In the structure of SF_4 , the lone pair of electrons on S is in.

- (A) equatorial position and there are two lone pair - bond pair repulsions at 90° .
(B) equatorial position and there are three lone pair - bond pair repulsions at 90° .
(C) axial position and there are three lone pair - bond pair repulsion at 90° .
(D) axial position and there are two lone pair - bond pair repulsion at 90° .

The drug tegamet is:

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

Hydrogen has three isotopes : protium (^1H), deuterium (^2H or D) and tritium (^3H or T). They have nearly same chemical properties but different physical properties. They differ in:

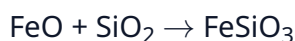
- (A) number of protons. (B) atomic number.
(C) electronic configuration. (D) atomic mass.

A student needs to prepare a buffer solution of propanoic acid and its sodium salt with pH 4. The ratio of $\frac{[\text{CH}_3\text{CH}_2\text{COO}^-]}{[\text{CH}_3\text{CH}_2\text{COOH}]}$ required to make buffer is _____.

Given: $K_a(\text{CH}_3\text{CH}_2\text{COOH}) = 1.3 \times 10^{-5}$

- (A) 0.03 (B) 0.13 (C) 0.23 (D) 0.33

In the metallurgical extraction of copper, following reaction is used:



FeO and FeSiO_3 respectively are.

- (A) gangue and flux. (B) flux and slag. (C) slag and flux. (D) gangue and slag.

Among the given oxides of nitrogen; N_2O , N_2O_3 , N_2O_4 and N_2O_5 , the number of compound/(s) having N - N bond is:

- (A) 1 (B) 2 (C) 3 (D) 4

Which of the following oxoacids of sulphur contains "S" in two different oxidation states?

- (A) $\text{H}_2\text{S}_2\text{O}_3$ (B) $\text{H}_2\text{S}_2\text{O}_6$ (C) $\text{H}_2\text{S}_2\text{O}_7$ (D) $\text{H}_2\text{S}_2\text{O}_8$

Match List - I with List - II:

	List-I (Oxide)		List-II (Nature)
(A)	Cl_2O_7	(I)	Amphoteric
(B)	Na_2O	(II)	Basic
(C)	Al_2O_3	(III)	Neutral
(D)	N_2O	(IV)	Acidic

Choose the correct answer from the options given below:

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

Among the following, basic oxide is:

- (A) SO_3 (B) SiO_2 (C) CaO (D) Al_2O_3

Given below are two statements, one is Assertion (A) and other is Reason (R).

Assertion (A) : Natural rubber is a linear polymer of isoprene called cis-polyisoprene with elastic properties.

Reason (R) : The cis-polyisoprene molecules consist of various chains held together by strong polar interactions with coiled structure.

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

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

Compound A contains 8.7% Hydrogen, 74% Carbon and 17.3% Nitrogen. The molecular formula of the compound is,

Given : Atomic masses of C, H and N are 12, 1 and 14 amu respectively.

The molar mass of the compound A is 162 g mol^{-1} .

- (A) $\text{C}_4\text{H}_6\text{N}_2$ (B) $\text{C}_2\text{H}_3\text{N}$ (C) $\text{C}_5\text{H}_7\text{N}$ (D) $\text{C}_{10}\text{H}_{14}\text{N}_2$

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Consider the following statements:

- (A) The principal quantum number 'n' is a positive integer with values of 'n' = 1, 2, 3, ...
 (B) The azimuthal quantum number 'l' for a given 'n' (principal quantum number) can have values as 'l' = 0, 1, 2, ... n
 (C) Magnetic orbital quantum number 'm_l' for a particular 'l' (azimuthal quantum number) has (2l + 1) values.
 (D) $\pm 1/2$ are the two possible orientations of electron spin.
 (E) For l = 5, there will be a total of 9 orbital
- Which of the above statements are correct?

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

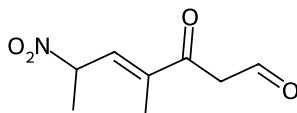
Match List - I with List - II:

	List-I		List-II
(A)	negatively charged sol	(I)	$Fe_2O_3 \cdot xH_2O$
(B)	macromolecular colloid	(II)	CdS sol
(C)	positively charged sol	(III)	Starch
(D)	Cheese	(IV)	a gel

Choose the correct answer from the options given below:

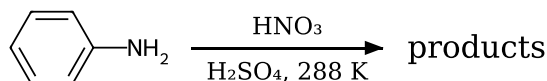
- (A) (A) - (II), (B) - (III), (C) - (IV), (D) - (I) (B) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
 (C) (A) - (II), (B) - (III), (C) - (I), (D) - (IV) (D) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)

The correct IUPAC name of the following compound is:



- (A) 4-methyl-2-nitro-5-oxohept-3-enal (B) 4-methyl-5-oxo-2-nitrohept-3-enal
 (C) 4-methyl-6-nitro-3-oxohept-4-enal (D) 6-formyl-4-methyl-2-nitrohex-3-enal

With respect to the following reaction, consider the given statements:



- (A) o-Nitroaniline and p-nitroaniline are the predominant products.
 (B) p-Nitroaniline and m-nitroaniline are the predominant products.
 (C) HNO_3 acts as an acid.
 (D) H_2SO_4 acts as an acid.

Choose the correct option.

- (A) (A) and (C) are correct statements. (B) (A) and (D) are correct statements.
 (C) (B) and (D) are correct statements. (D) (B) and (C) are correct statements.

Q46 Nuclear & Radiochemistry **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/A6nblpt_Dn

A radioactive element has a half life of 200 days. The percentage of original activity remaining after 83 days is _____. (Nearest integer)

(Given : antilog 0.125 = 1.333, antilog 0.693 = 4.93)

Q47 Coordination Compounds **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/fdJV9SG3yP

Among the given complexes, number of paramagnetic complexes is _____.

Q48 Coordination Compounds **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/UwzKnHC9mQ

(a) $CoCl_3 \cdot 4NH_3$, (b) $CoCl_3 \cdot 5NH_3$, (c) $CoCl_3 \cdot 6NH_3$ and (d) $CoCl(NO_3)_2 \cdot 5NH_3$.

Number of complex(es) which will exist in cis-trans form is/are _____.

Q49 Electrochemistry **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/ZqDHyyLjzT

For the given reactions



the electrode potentials are; $E_{Sn^{2+}/Sn}^o = -0.140$ V and $E_{Sn^{4+}/Sn}^o = +0.010$ V. The magnitude of standard electrode potential for Sn^{4+}/Sn^{2+} i.e. $E_{Sn^{4+}/Sn^{2+}}^o$ is _____ $\times 10^{-2}$ V. (Nearest integer)

Q50 Redox Reactions **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/IqqjUpWa0Z

0.01 M $KMnO_4$ solution was added to 20.0 mL of 0.05 M Mohr's salt solution through a burette. The initial reading of 50 mL burette is zero. The volume of $KMnO_4$ solution left in the burette after the end point is _____ mL. (nearest integer)

Q51 Solutions & Colligative Properties **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/TBzuT2DR46

2.5 g of protein containing only glycine ($C_2H_5NO_2$) is dissolved in water to make 500 mL of solution. The osmotic pressure of this solution at 300 K is found to be 5.03×10^{-3} bar. The total number of glycine units present in the protein is _____.

(Given : $R = 0.083$ L bar K^{-1} mol $^{-1}$)

Q52 Mole Concept & Stoichiometry **NUMERICAL**[Step-by-step solution](#) › prepwiser.in/questions/J5Hhi4ELmr

The complete combustion of 0.492 g of an organic compound containing 'C', 'H' and 'O' gives 0.793 g of CO_2 and 0.442 g of H_2O . The percentage of oxygen composition in the organic compound is _____. (nearest integer)

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For combustion of one mole of magnesium in an open container at 300 K and 1 bar pressure, $\Delta_c H^\ominus = -601.70 \text{ kJ mol}^{-1}$, the magnitude of change in internal energy for the reaction is _____ kJ. (Nearest integer)

(Given : $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$)

Mathematics Section A · Multiple choice

Q54 to Q73

Q54 Three Dimensional Geometry

Step-by-step solution > prepwiser.in/questions/At4gRqhKar

Let the plane $ax + by + cz = d$ pass through $(2, 3, -5)$ and is perpendicular to the planes $2x + y - 5z = 10$ and $3x + 5y - 7z = 12$. If a, b, c, d are integers $d > 0$ and $\gcd(|a|, |b|, |c|, d) = 1$, then the value of $a + 7b + c + 20d$ is equal to:

- (A) 18 (B) 20 (C) 24 (D) 22

Q55 Binomial Theorem

Step-by-step solution > prepwiser.in/questions/u6C3W0ZUaO

The term independent of x in the expansion of

$$(1 - x^2 + 3x^3) \left(\frac{5}{2}x^3 - \frac{1}{5x^2} \right)^{11}, x \neq 0$$

is:

- (A) $\frac{7}{40}$ (B) $\frac{33}{200}$ (C) $\frac{39}{200}$ (D) $\frac{11}{50}$

Q56 Definite Integration

Step-by-step solution > prepwiser.in/questions/_QZb-j1YEA

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function such that

$$f\left(\frac{\pi}{4}\right) = \sqrt{2}, f\left(\frac{\pi}{2}\right) = 0$$

and $f'\left(\frac{\pi}{2}\right) = 1$ and

let $g(x) = \int_x^{\pi/4} (f'(t) \sec t + \tan t \sec t f(t)) dt$ for $x \in [\frac{\pi}{4}, \frac{\pi}{2}]$. Then $\lim_{x \rightarrow (\frac{\pi}{2})^-} g(x)$ is equal to:

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

Q57 Definite Integration

Step-by-step solution > prepwiser.in/questions/6LAgaY6hp2

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function satisfying $f(x) + f(x+k) = n$, for all $x \in \mathbb{R}$ where $k > 0$ and n is a positive integer. If $I_1 = \int_0^{4nk} f(x) dx$ and $I_2 = \int_{-k}^{3k} f(x) dx$, then:

- (A) $I_1 + 2I_2 = 4nk$ (B) $I_1 + 2I_2 = 2nk$ (C) $I_1 + nI_2 = 4n^2k$ (D) $I_1 + nI_2 = 6n^2k$

Q58 Differential Equations

Step-by-step solution > prepwiser.in/questions/7t_FqPUyW4

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

$2y e^{x/y^2} dx + (y^2 - 4x e^{x/y^2}) dy = 0$ such that $x(1) = 0$. Then, $x(e)$ is equal to:

- (A) $e \log_e(2)$ (B) $-e \log_e(2)$ (C) $e^2 \log_e(2)$ (D) $-e^2 \log_e(2)$

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Q59 Differential Equations[Step-by-step solution > prepwisar.in/questions/tYkwoa2722](https://www.prepwisar.in/questions/tYkwoa2722)

Let the slope of the tangent to a curve $y = f(x)$ at (x, y) be given by $2 \tan x (\cos x - y)$. If the curve passes through the point $(\frac{\pi}{4}, 0)$, then the value of $\int_0^{\pi/2} y \, dx$ is equal to:

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

Q60 Hyperbola[Step-by-step solution > prepwisar.in/questions/1Ko9FdBmu6](https://www.prepwisar.in/questions/1Ko9FdBmu6)

Let $a > 0, b > 0$. Let e and l respectively be the eccentricity and length of the latus rectum of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. Let e' and l' respectively be the eccentricity and length of the latus rectum of its conjugate hyperbola. If $e^2 = \frac{11}{14}l$ and $(e')^2 = \frac{11}{8}l'$, then the value of $77a + 44b$ is equal to:

- (A) 100 (B) 110 (C) 120 (D) 130

Q61 Continuity & Differentiability[Step-by-step solution > prepwisar.in/questions/h4p0wSdvHo](https://www.prepwisar.in/questions/h4p0wSdvHo)

Let $f, g : \mathbb{R} \rightarrow \mathbb{R}$ be functions defined by

$$f(x) = \begin{cases} [x] & , \quad x < 0 \\ |1 - x| & , \quad x \geq 0 \end{cases}$$

and

$$g(x) = \begin{cases} e^x - x & , \quad x < 0 \\ (x - 1)^2 - 1 & , \quad x \geq 0 \end{cases}$$

where $[x]$ denote the greatest integer less than or equal to x . Then, the function fg is discontinuous at exactly:

- (A) one point (B) two points (C) three points (D) four points

Q62 Inverse Trigonometric Functions[Step-by-step solution > prepwisar.in/questions/UX94D_ej-c](https://www.prepwisar.in/questions/UX94D_ej-c)

The value of

$$\lim_{n \rightarrow \infty} 6 \tan \left\{ \sum_{r=1}^n \tan^{-1} \left(\frac{1}{r^2 + 3r + 3} \right) \right\}$$

is equal to:

- (A) 1 (B) 2 (C) 3 (D) 6

Q63 Parabola[Step-by-step solution > prepwisar.in/questions/bl0Q9UevUU](https://www.prepwisar.in/questions/bl0Q9UevUU)

If vertex of a parabola is $(2, -1)$ and the equation of its directrix is $4x - 3y = 21$, then the length of its latus rectum is:

- (A) 2 (B) 8 (C) 12 (D) 16

Q64 Permutations & Combinations[Step-by-step solution > prepwisar.in/questions/0ObDicFEtw](https://www.prepwisar.in/questions/0ObDicFEtw)

The number of ways to distribute 30 identical candies among four children C_1, C_2, C_3 and C_4 so that C_2 receives at least 4 and at most 7 candies, C_3 receives at least 2 and at most 6 candies, is equal to:

- (A) 205 (B) 615 (C) 510 (D) 430

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Q65 Probability: Basic[Step-by-step solution](https://www.prepwisar.in/questions/Bwqc-WV2xH) › prepwisar.in/questions/Bwqc-WV2xH

The probability that a randomly chosen one-one function from the set $\{a, b, c, d\}$ to the set $\{1, 2, 3, 4, 5\}$ satisfies $f(a) + 2f(b) - f(c) = f(d)$ is:

- (A) $\frac{1}{24}$ (B) $\frac{1}{40}$ (C) $\frac{1}{30}$ (D) $\frac{1}{20}$

Q66 Quadratic Equations & Polynomial Inequalities[Step-by-step solution](https://www.prepwisar.in/questions/g4uAoE6oDM) › prepwisar.in/questions/g4uAoE6oDM

Let $f(x)$ be a quadratic polynomial such that $f(-2) + f(3) = 0$. If one of the roots of $f(x) = 0$ is -1 , then the sum of the roots of $f(x) = 0$ is equal to:

- (A) $\frac{11}{3}$ (B) $\frac{7}{3}$ (C) $\frac{13}{3}$ (D) $\frac{14}{3}$

Q67 Sequences & Series[Step-by-step solution](https://www.prepwisar.in/questions/TYblgDmqFT) › prepwisar.in/questions/TYblgDmqFT

If n arithmetic means are inserted between a and 100 such that the ratio of the first mean to the last mean is $1 : 7$ and $a + n = 33$, then the value of n is:

- (A) 21 (B) 22 (C) 23 (D) 24

Q68 Relations & Functions (Basic)[Step-by-step solution](https://www.prepwisar.in/questions/jhDvsDa7FU) › prepwisar.in/questions/jhDvsDa7FU

Let $R_1 = \{(a, b) \in \mathbb{N} \times \mathbb{N} : |a - b| \leq 13\}$ and
 $R_2 = \{(a, b) \in \mathbb{N} \times \mathbb{N} : |a - b| \neq 13\}$. Then on $\mathbb{N}$:

- (A) Both R_1 and R_2 are equivalence relations (B) Neither R_1 nor R_2 is an equivalence relation
 (C) R_1 is an equivalence relation but R_2 is not (D) R_2 is an equivalence relation but R_1 is not

Q69 Vectors[Step-by-step solution](https://www.prepwisar.in/questions/y7vsHTLYxk) › prepwisar.in/questions/y7vsHTLYxk

Let $\vec{a} = \alpha\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = -2\hat{i} + \alpha\hat{j} + \hat{k}$, where $\alpha \in \mathbb{R}$. If the area of the parallelogram whose adjacent sides are represented by the vectors $\vec{a}$ and $\vec{b}$ is $\sqrt{15(\alpha^2 + 4)}$, then the value of

$$2|\vec{a}|^2 + (\vec{a} \cdot \vec{b})|\vec{b}|^2$$

is equal to:

- (A) 10 (B) 7 (C) 9 (D) 14

Q70 Vectors[Step-by-step solution](https://www.prepwisar.in/questions/Z_xhr8t0wY) › prepwisar.in/questions/Z_xhr8t0wY

Let $\vec{a}$ be a vector which is perpendicular to the vector $3\hat{i} + \frac{1}{2}\hat{j} + 2\hat{k}$. If

$$\vec{a} \times (2\hat{i} + \hat{k}) = 2\hat{i} - 13\hat{j} - 4\hat{k}$$

, then the projection of the vector $\vec{a}$ on the vector $2\hat{i} + 2\hat{j} + \hat{k}$ is:

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

Q71 Area Under Curves[Step-by-step solution](https://www.prepwisar.in/questions/ij0ekEujPI) › prepwisar.in/questions/ij0ekEujPI

The area of the bounded region enclosed by the curve

$y = 3 - |x - \frac{1}{2}| - |x + 1|$ and the x-axis is:

- (A) $\frac{9}{4}$ (B) $\frac{45}{16}$ (C) $\frac{27}{8}$ (D) $\frac{63}{16}$

Q72 Straight Lines[Step-by-step solution](#) › [prepwisar.in/questions/hZnUvj0me0](https://www.prepwisar.in/questions/hZnUvj0me0)

Let a triangle be bounded by the lines $L_1: 2x + 5y = 10$; $L_2: -4x + 3y = 12$ and the line L_3 , which passes through the point $P(2, 3)$, intersects L_2 at A and L_1 at B. If the point P divides the line-segment AB, internally in the ratio 1 : 3, then the area of the triangle is equal to:

- (A) $\frac{110}{13}$ (B) $\frac{132}{13}$ (C) $\frac{142}{13}$ (D) $\frac{151}{13}$

Q73 Trigonometric Ratios & Identities[Step-by-step solution](#) › [prepwisar.in/questions/TdKUKVf_Dz](https://www.prepwisar.in/questions/TdKUKVf_Dz)

If $\cot \alpha = 1$ and $\sec \beta = -\frac{5}{3}$, where $\pi < \alpha < \frac{3\pi}{2}$ and $\frac{\pi}{2} < \beta < \pi$, then the value of $\tan(\alpha + \beta)$ and the quadrant in which $\alpha + \beta$ lies, respectively are:

- (A) $-\frac{1}{7}$ and IVth quadrant (B) 7 and Ist quadrant
(C) -7 and IVth quadrant (D) $\frac{1}{7}$ and Ist quadrant

Mathematics Section B · Numerical value

Q74 to Q82

Q74 Three Dimensional Geometry **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/Uw0-XvQB29](https://www.prepwisar.in/questions/Uw0-XvQB29)

Let the image of the point $P(1, 2, 3)$ in the line $L: \frac{x-6}{3} = \frac{y-1}{2} = \frac{z-2}{3}$ be Q. Let $R(\alpha, \beta, \gamma)$ be a point that divides internally the line segment PQ in the ratio 1 : 3. Then the value of $22(\alpha + \beta + \gamma)$ is equal to _____.

Q75 Circles **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/DKCbTQWP5J](https://www.prepwisar.in/questions/DKCbTQWP5J)

If one of the diameters of the circle $x^2 + y^2 - 2\sqrt{2}x - 6\sqrt{2}y + 14 = 0$ is a chord of the circle $(x - 2\sqrt{2})^2 + (y - 2\sqrt{2})^2 = r^2$, then the value of r^2 is equal to _____.

Q76 Complex Numbers **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/COK6bNpHzK](https://www.prepwisar.in/questions/COK6bNpHzK)

Sum of squares of modulus of all the complex numbers z satisfying $\bar{z} = iz^2 + z^2 - z$ is equal to _____.

Q77 Relations & Functions (Basic) **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/a80C9DxXj1](https://www.prepwisar.in/questions/a80C9DxXj1)

Let $S = \{1, 2, 3, 4\}$. Then the number of elements in the set $\{f: S \times S \rightarrow S : f \text{ is onto and } f(a, b) = f(b, a) \geq a \forall (a, b) \in S \times S\}$ is _____.

Q78 Limits **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/iiDI-dlFXm](https://www.prepwisar.in/questions/iiDI-dlFXm)

If

$$\lim_{x \rightarrow 1} \frac{\sin(3x^2 - 4x + 1) - x^2 + 1}{2x^3 - 7x^2 + ax + b} = -2$$

, then the value of $(a - b)$ is equal to _____.

Q79 Determinants **NUMERICAL**[Step-by-step solution](#) › [prepwisar.in/questions/CSsVI5Dvpz](https://www.prepwisar.in/questions/CSsVI5Dvpz)

If the system of linear equations

$$2x - 3y = \gamma + 5,$$

$\alpha x + 5y = \beta + 1$, where $\alpha, \beta, \gamma \in \mathbb{R}$ has infinitely many solutions then the value of $|9\alpha + 3\beta + 5\gamma|$ is equal to _____.

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Let $A = \begin{pmatrix} 1+i & 1 \\ -i & 0 \end{pmatrix}$ where $i = \sqrt{-1}$. Then, the number of elements in the set $\{n \in \{1, 2, \dots, 100\} : A^n = A\}$ is _____.

Let for $n = 1, 2, \dots, 50$, S_n be the sum of the infinite geometric progression whose first term is n^2 and whose common ratio is $\frac{1}{(n+1)^2}$. Then the value of

$$\frac{1}{26} + \sum_{n=1}^{50} \left(S_n + \frac{2}{n+1} - n - 1 \right)$$

is equal to _____.

Suppose a class has 7 students. The average marks of these students in the mathematics examination is 62, and their variance is 20. A student fails in the examination if he/she gets less than 50 marks, then in worst case, the number of students can fail is _____.

Answer key: JEE Main 2022 · 28 Jun · Shift 2

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Physics

1. C	2. A	3. B	4. D	5. B	6. D	7. B	8. B
9. C	10. B	11. B	12. C	13. A	14. C	15. D	16. B
17. C	18. B	19. A	20. 100	21. 8	22. 2	23. 18	24. 24
25. 10	26. 4	27. 50	28. 150				

Chemistry

29. C	30. B	31. A	32. C	33. D	34. B	35. D	36. C
37. A	38. B	39. C	40. C	41. D	42. C	43. C	44. C
45. C	46. 75	47. 2	48. 1	49. 16	50. 30	51. 330	52. 46
53. 600							

Mathematics

54. D	55. B	56. B	57. C	58. D	59. B	60. D	61. B
62. C	63. B	64. D	65. D	66. A	67. C	68. B	69. D
70. C	71. C	72. B	73. A	74. 125	75. 10	76. 2	77. 37
78. 11	79. 58	80. 25	81. 41651	82. 0			



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