JEE Mains 2026 24 Jan Shift 1 Question Paper

Time Allowed :3 Hours	Maximum Marks :300	Total questions :75

Important Instructions

1. **The test is of 3 hours duration.**
2. **This test paper consists of 75 questions. Each subject (PCM) has 25 questions. The maximum marks are 300.**
3. **This question paper contains Three Parts. Part-A is Physics, Part-B is Chemistry, and Part-C is Mathematics. Each part has only two sections: Section-A and Section-B.**
4. **Section-A: Attempt all questions.**
5. **Section-B: Attempt all questions.**
6. **Section-A (01 – 20):** Contains 20 multiple choice questions which have only one correct answer. Each question carries +4 marks for the correct answer and –1 mark for the wrong answer.
7. **Section-B (21 – 25):** Contains 5 Numerical value-based questions. The answer to each question should be rounded off to the nearest integer. Each question carries +4 marks for the correct answer and –1 mark for the wrong answer.

Physics

Q1. Evaluate the limit:

$$\lim_{x\to 0} \frac{e^x\left(e^{\tan x - x} - 1\right) + \ell n(\sec x + \tan x) - x}{\tan x - x}$$

(1) $\frac{3}{2}$

(2) $\frac{3}{2}e$

(3) $\frac{5}{2}e$

(4) $\frac{5}{2}$

Q2. z is a complex number satisfying

$$\left|\frac{z-6i}{z-2i}\right| = 1 \quad \text{and} \quad \left|\frac{z-8+2i}{z+2i}\right| = \frac{3}{5}$$

then find $\sum |z|^2$.

(1) 225
(2) 321
(3) 284
(4) 385

Q3. There are 10 defective and 90 non-defective balls in a bag. 8 balls are taken one by one with replacement. Find the probability that at least 7 defective balls are selected.

(1) $\frac{73}{10^8}$
(2) $\frac{37}{10^8}$
(3) $\frac{105}{10^8}$
(4) $\frac{11}{10^8}$

Q4. Let

$$f(x) = \int \frac{1-\sin(\ell nt)}{1-\cos(\ell nt)}\,dt$$

and

$$f\left(e^{\pi/2}\right) = -e^{\pi/2}$$

then find $f\left(e^{\pi/4}\right)$.

(1) $e^{-\pi/4}(\sqrt{2}+1)$
(2) $-e^{\pi/4}(\sqrt{2}+1)$
(3) $e^{-\pi/4}(\sqrt{2}-1)$
(4) $e^{\pi/4}(\sqrt{2}-1)$

Q5. Given triangle OAB where O is the origin, $A = (0, -\sqrt{3}a)$ and $B = (-\sqrt{2}b, 0)$. Let the circumradius of $\triangle OAB$ be 4 units. If the locus of the centroid of $\triangle OAB$ is a circle, then its radius is:

(1) $\frac{8}{3}$
(2) $\frac{7}{3}$
(3) $\frac{11}{3}$

(4) $\frac{5}{3}$

Q6. Let the lines

$$L_1 : \ \vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 4\hat{k}), \ \lambda \in \mathbb{R}$$

$$L_2 : \ \vec{r} = (4\hat{i} + \hat{j}) + \mu(5\hat{i} + 2\hat{j} + \hat{k}), \ \mu \in \mathbb{R}$$

intersect at the point R. Let P and Q be the points lying on the lines L_1 and L_2 respectively, such that

$$|PR| = \sqrt{29} \quad \text{and} \quad |PQ| = \sqrt{\frac{47}{3}}.$$

If the point P lies in the first octant, then find $27(QR)^2$.

(1) 340
(2) 360
(3) 320
(4) 348

Q7. If $A = \{1, 2, 3, 4\}$. A relation from set A to A is defined as $(a, b)\, R\, (c, d)$ such that $2a + 3b = 3c + 4d$. Find the number of elements in the relation.

(1) 9
(2) 10
(3) 11
(4) 12

Q8. Find the number of real solutions of

$$x|x - 3| + |x - 1| + 3 = 0$$

(1) 1
(2) 2
(3) 3
(4) 4

Q9. If $\cot x = \dfrac{5}{12}$ for some $x \in \left(\pi, \dfrac{3\pi}{2}\right)$, then

$$\sin 7x \left(\cos\frac{13x}{2} + \sin\frac{13x}{2}\right) + \cos 7x \left(\cos\frac{13x}{2} - \sin\frac{13x}{2}\right)$$

is equal to:

(1) $\dfrac{1}{\sqrt{13}}$
(2) $\dfrac{5}{\sqrt{13}}$
(3) $-\dfrac{1}{\sqrt{13}}$
(4) $\dfrac{8}{\sqrt{13}}$

Q10. Consider an ellipse

$$E_1 : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \ (a > b) \quad \text{and} \quad E_2 : \frac{x^2}{A^2} + \frac{y^2}{B^2} = 1 \ (B > A),$$

where $e = \dfrac{4}{5}$ for both the curves and ℓ_1 is the length of latus rectum of E_1 and ℓ_2 is the length of latus rectum of E_2. Let the distance between the foci of the first curve be 8. Find the distance between the foci of the second curve. (Given $2\ell_1^2 = 9\ell_2$).

(1) $\dfrac{64}{5}$
(2) $\dfrac{8}{5}$
(3) $\dfrac{32}{5}$
(4) $\dfrac{16}{5}$

Q11. Let the mean and variance of 10 numbers be 10 and 2 respectively. If one number α is replaced by another number β, then the new mean and variance are 10.1 and 1.99 respectively. Find $(\alpha + \beta)$.

(1) 20
(2) 19
(3) 18
(4) 17

Q12. The value of

$$\frac{\sqrt{3}\,20^\circ - \sec 20^\circ}{\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ}$$

is:

(1) 64
(2) 48
(3) 46
(4) 40

Q13. Find the number of matrices A of order 3×2 whose elements are from the set $\{\pm 2, \pm 1, 0\}$, if $\mathrm{Tr}(A^T A) = 5$.

(1) 310
(2) 312
(3) 320
(4) 325

Q14. A_1 is the area bounded by $y = x^2 + 2$, $x + y = 8$, and the y-axis in the first quadrant, and A_2 is the area bounded by $y = x^2 + 2$, $y^2 = x$, $x = 0$ and $x = 2$ in the first quadrant. Find $(A_1 - A_2)$.

(1) $\frac{2}{3} + \frac{4\sqrt{2}}{3}$
(2) $\frac{3}{2} + \frac{4\sqrt{2}}{3}$
(3) $\frac{3}{5} + \frac{4\sqrt{2}}{3}$
(4) None of these

Q15. Evaluate the series

$$\frac{1}{25!} + \frac{1}{3!\,23!} + \frac{1}{5!\,21!} + \cdots \text{ up to 13 terms.}$$

(1) $\frac{2^{26}}{26!}$
(2) $\frac{2^{25}}{26!}$

(3) $\frac{2^{26}}{25!}$
(4) $\frac{2^{25}}{25!}$

Q16. Consider a geometric sequence $729, 81, 9, 1, \ldots$ **If** P_n **denotes the product of first** n **terms of the G.P. such that**

$$\sum_{n=1}^{40}(P_n)^{\frac{1}{n}} = \frac{3^{\alpha}-1}{2\times 3^{\beta}},$$

then find the value of $(\alpha+\beta)$**.**

(1) 72
(2) 74
(3) 73
(4) 75

Q17. Consider an A.P. $a_1, a_2, \ldots, a_n$ **with** $a_1 > 0$**,** $a_2 - a_1 = -\frac{3}{4}$ **and** $a_n = \frac{a_1}{4}$**. If**

$$\sum_{i=1}^{n} a_i = \frac{525}{2},$$

then find $\sum_{i=1}^{17} a_i$**.**

(1) 231
(2) 234
(3) 236
(4) 238

Q18. If the domain of

$$f(x) = \log_{(10x^2-17x+7)}(18x^2 - 11x + 1)$$

is $(-\infty, a)\cup(b, c)\cup(d, \infty) - \{e\}$**, then find** $90(a+b+c+d+e)$**.**

(1) 316
(2) 320
(3) 163

(4) 631

Q19. Given that

$$\vec{a} = 2\hat{i} + \hat{j} - \hat{k}, \quad \vec{b} = \hat{i} + \hat{j}, \quad \vec{c} = \vec{a} \times \vec{b},$$
$$|\vec{d} \times \vec{c}| = 3, \quad \vec{d} \cdot \vec{c} = \frac{\pi}{4}, \quad |\vec{a} - \vec{d}| = \sqrt{11},$$

find $\vec{a} \cdot \vec{d}$**.**

(1) 2
(2) $\frac{3}{2}$
(3) $\frac{1}{2}$
(4) $-\frac{1}{4}$

Q20. Given

$$f(t) = \left|\frac{t+1}{t^2}\right|, \ (t < 0)$$

is strictly decreasing in the interval $(2\alpha, \alpha)$**, then the maximum value of**

$$g(x) = 2\log_e(x-2) + \alpha x^2 + 4x - \alpha$$

is:

Q21. Let $5000 < N < 9000$ **and** N **has digits from the set** $\{0, 1, 2, 5, 9\}$**. If digits can be repeated, then find the number of such numbers** N **which are divisible by** 3**.**

Chemistry

1. $x\&y$ **are the number of moles of electrons involved respectively during oxidation of** I^- **to** I_2 **&** S^{2-} **to S by acidified** $K_2Cr_2O_7$**. The value of** $x + y$ **is ?**
(A) 12
(B) 6
(C) 18
(D) 9

2. 4 **kg of water is heated from** 4°**C to** 20°**C at constant pressure** 10^5 **Pa so that density changes from** 1000 **kg/m**^{3} **to** 998 **kg/m**^{3}**. Then find** ΔU **(in Joules) given** C_v **of** $\mathbf{H_2O} = 4.2$ **Joule/gm.K :**
(1) 268799.2 Joule
(2) 368900 Joule
(3) 168400 Joule
(4) 578876.8 Joule

---

3. Two solutes, 0.3 **gm of A (**$M_w = 60$ **gm/mol) &** 0.9 **gm of B (**$M_w = 180$ **gm/mol) are dissolved in** 100 **ml solution. Find osmotic pressure of solution at** 300 **K (in atm) (**$\mathbf{R} = 0.082$ **atm** $-$ **L/mol-K)**
(1) 1.23
(2) 2.46
(3) 4.92
(4) 3.69

---

4. For a reaction at 300 **K, on addition of catalyst, activation energy of reaction lowered by** 10 **kJ. Then calculate the value of** $\log \frac{K_{\text{catalysed}}}{K_{\text{uncatalysed}}}$
(1) 1.74
(2) 0.174
(3) 17.4
(4) 3.48

---

5. Line corresponding to lyman series are $\mathbf{L}_1, \mathbf{L}_2, \mathbf{L}_3, \mathbf{L}_4, \ldots$**, among these** $\mathbf{L}_1$ **line corresponds to lowest energy. Similarly lines corresponding to balmer series are** $\mathbf{B}_1, \mathbf{B}_2, \mathbf{B}_3, \mathbf{B}_4, \ldots$**, among these** $\mathbf{B}_1$ **line corresponds to lowest energy** $\Delta E_L =$ **Energy of** 1^{st} **line o** $\Delta E_B =$ **Energy of** 1^{st} **line of balmer series. If** $\Delta E_L = x \cdot \Delta E_B$**. Calculate** $(x \times 10^{-1})$
(A) 54
(B) 27
(C) 18
(D) 36

---

6. Match List-I (Isothermal Process) with List-II (work done)

List-I (Isothermal Process)		List-I (work done) ($V_f > V_i$)	
P.	Reversible expansion	1.	$w = 0$
Q.	Free expansion	2.	$w = -nRT \ln \frac{V_f}{V_i}$
R.	Irreversible expansion	3.	$w = -P_{ext}(V_f - V_i)$
S.	Irreversible Compression	4.	$w = -P_{ext}(V_i - V_f)$

(A) $4, 3, 2, 1$
(B) $2, 1, 3, 4$
(C) $1, 2, 3, 4$
(D) $3, 4, 1, 2$

---

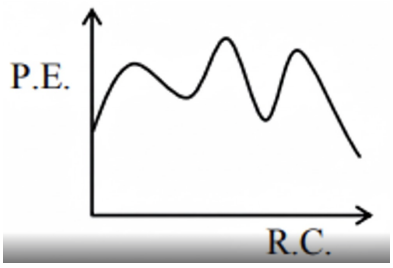
7. Electrolysis of aqueous solution of $CuSO_4$ is carried out, where 300 mg of copper is deposited (atomic mass of Cu $= 63.54$). After this 600 milli amp. current is further passed for 28 minutes. Calculate total volume of O_2 released (in ml). (Given 1 mole of gas occupy 22.4 litre)
(A) 111
(B) 100
(C) 90
(D) 122

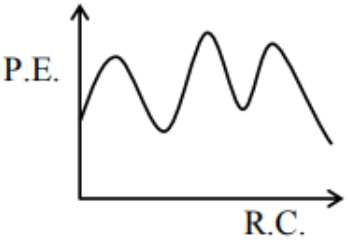
---

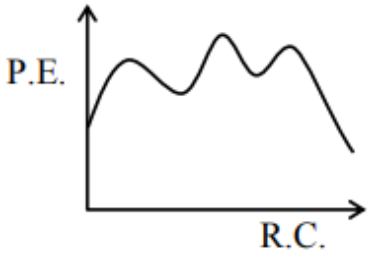
8. W gm of non-volatile electrolyte solute is added in 100 ml pure water ($P^\circ = 640$ mm Hg) showing vapour pressure of solution 600 mm Hg. This solution have b.p. of 375 K. Given K_b of $H_2O = 0.52 \frac{K \cdot kg}{mol}$. Molar mass of solute = M. Select the correct option about mole fraction of solute (X_{solute}).
(1) $\frac{1}{8}\frac{W}{M}$
(2) $\frac{2}{8}\frac{W}{M}$
(3) $\frac{2.6}{16}\frac{M}{W}$
(4) $\frac{1.3}{8}\frac{W}{M}$

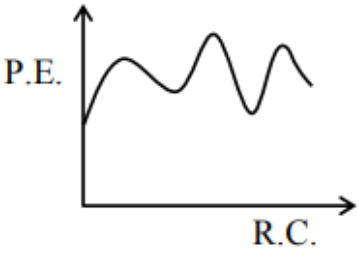
---

9. For a chemical reaction : A $\rightarrow$ D. Mechanism is Step-1: A $\rightarrow$ B : $\Delta H = +$ve. Step-2: B $\rightarrow$ C : $\Delta H = -$ve. Step-3: C $\rightarrow$ D : $\Delta H = -$ve. Select the correct energy plot

(1) 

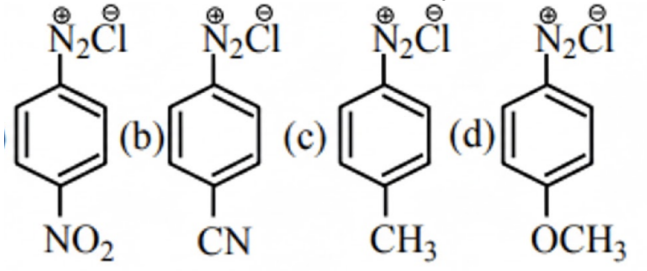
(2) 

(3) 

(4) 

---

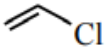
10. Correct order of stability is :



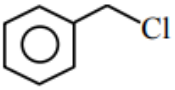
(1) a > b > c > d
(2) d > c > b > a
(3) b > a > c > d
(4) d > b > c > a

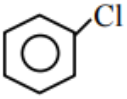
---

11. Match the List-I and List-II:

(1)  (I) Vinyl chloride

(2)  (II) Allyl chloride

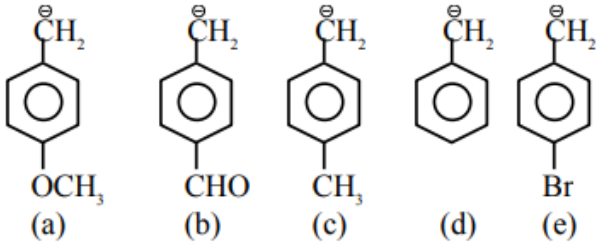
(3)  (III) Aryl chloride

(4)  (IV) Benzyl chloride

(1) A $\rightarrow$ I, B $\rightarrow$ II, C $\rightarrow$ III, D $\rightarrow$ IV
(2) A $\rightarrow$ I, B $\rightarrow$ II, C $\rightarrow$ IV, D $\rightarrow$ III
(3) A $\rightarrow$ III, B $\rightarrow$ II, C $\rightarrow$ I, D $\rightarrow$ IV
(4) A $\rightarrow$ III, B $\rightarrow$ II, C $\rightarrow$ IV, D $\rightarrow$ II

---

12. The correct order of stability of given carbanions is:



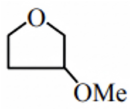
(1) a > b > c > d > e
(2) b > e > d > c > a
(3) b > a > c > d
(4) d > e > c > a > b

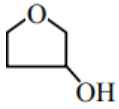
---

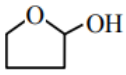
13. 0.5 **gm of unknown organic compound undergo Duma's method for estimation of nitrogen. Percentage of nitrogen gas collected over water at** $P = 715$ **mm and** 27°**C has volume** = 70 **ml. Calculate** % **N in the unknown organic compound. (aq. Tension** = 15 **mm)**
(A) 14.65%
(B) 15.50%
(C) 16.80%
(D) 13.20%

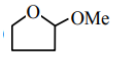
---

14. Which of the following gives positive Tollen's test ?

(1) 

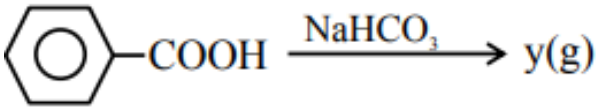
(2) 

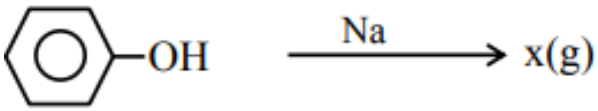
(3) 

(4) 

---

15. Sum of molar mass of gas $(x)\&(y)$ is :





(1) 44
(2) 88
(3) 46
(4) 160

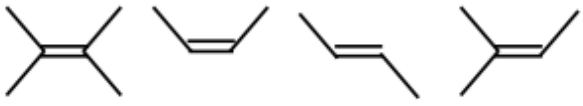
---

16. Statement-I : $CH_2 = CH - Cl$ is having stronger $C - Cl$ bond then $CH_3 - CH_2 - Cl$. Statement-II : $Ph - C(Et)(Me) - Cl$ will rotate the plane polarised light after solvation.

(1) Both statements-I and II are correct
(2) Both statements-I and II are incorrect
(3) Statement-I is correct and statement-II is incorrect
(4) Statement-I is incorrect and statement-II is correct.

---

17. Correct stability order of alkene ::



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

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

---

18. Hydroxy compound (A) with molecular mass = 122 react with excess of acetic anhydride and gives compound (X) with molecular mass = 290, then find the no. of hydroxy groups in given compound (A).
(A) 2
(B) 3
(C) 4
(D) 5

---

19. Statement-I Among $V_2O_5, [TiF_6]^{2-}, [Fe(CN)_6]^{3-}, [CoF_6]^{3-}$ paramagnetic species are three in number. Statement-II Increasing number of unpaired electrons in the following: $[Fe(CN)_6]^{4-} < [Fe(CN)_6]^{3-} < [Fe(H_2O)_6]^{2+}$.
(1) Both statements are correct
(2) Statement-I is correct ; statement-II is incorrect
(3) Statement-I is incorrect statement-II is correct
(4) Both statements are incorrect

---

20. Match the List-I and List-II name of species, hybridization and shape.

List-I	List-II	List-III
Species	Hybridization	Shape
IF_3	sp^3	T-shape
IF_7	sp^3d^3	P.B.P
IF_5	sp^3d^2	square pyramidal
ClO_4^-	sp^2d	square planar

(1) A, B, C are incorrect
(2) A, B, C, D are incorrect
(3) B, C, D are incorrect
(4) A, B, D are incorrect

---

21. Statement-I $[Co(C_2O_4)_3]^{3-}$ has magnetic moment of 4.9 BM & hybridization is sp^3d^2. Statement-II $[Ni(CN)_4]^{2-}, [Cr(H_2O)_6]^{2+}$ and $[MnF_6]^{4-}$ have square planar, octahedral and octahedral geometry respectively and dsp^2, sp^3d^2, d^2sp^3 hybridization

respectively and $\mu = 0, 4.9$ BM, 5.9 BM respectively.
(1) Both statements are correct
(2) Statement-I is correct & statement-II is incorrect
(3) Statement-I is incorrect & statement-II is correct
(4) Both statements are incorrect.

---

22. Select correct statements(s) (A) NF_3 has more dipole moment than NH_3 (B) O_2^{2-} and F_2 both have same bond order (C) In O_3 central oxygen atom has +1 formal charge (D) In NO_2 all the atoms follow octet rule, so it is stable. (E) BeH_2 is planar
(1) B, C
(2) A, B, C
(3) C, D, E
(4) B, E

---

23. Salt (X) is soluble in water. Salt (Y) is sparingly soluble in water. Salt (Z) is soluble only in hot water. X, Y, Z respectively are.
(1) $AgCl, Hg_2Cl_2, PbCl_2$
(2) $AlCl_3, AgCl, PbCl_2$
(3) $BaCl_2, PbCl_2, Hg_2Cl_2$
(4) $MgCl_2, Hg_2Cl_2, CaCl_2$

---

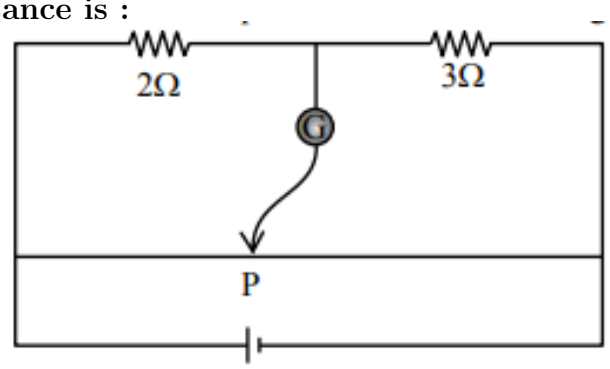
24. Select correct statements. (I) Hybridisation of ClO_4^- is dsp^3 (II) $[Ni(CN)_4]^{2-}$ is tetrahedral (III) $[Co(H_2O)_6]^{2+}$ has sp^3d^2 hybridisation (IV) $[Mn(CN)_6]^{4-}$ has sp^3d^2 hybridisation
(1) II and III and
(2) III only
(3) II, III and IV only
(4) I, II, III and IV

---

25. Statement-I : K > Mg > Al > B metallic character order. Statement-II: Ionic radius of any element is less than its atomic radius.
(1) Both statements are true
(2) Statement I is false but statement II is true.
(3) Both statements are False.
(4) Statement I is true but statement II is false.

Physics

1. Figure shows a meter-bridge. Initially null point was achieved at point P as shown in the figure. When an unknown resistance "R" is connected in parallel with 3Ω the null point was shifted by 22.5 cm. Then the value of unknown resistance is :



(A) 2Ω
(B) 3Ω
(C) 2.5 Ω
(D) 5Ω

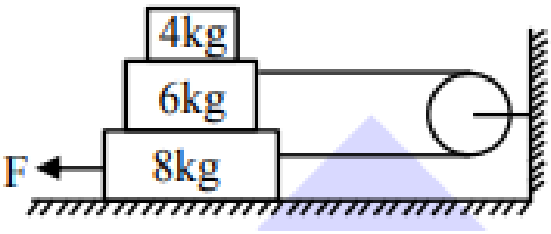
---

2. A spring of spring constant K = 15 N/m is cut into two parts of ratio of length 3 : 1. Find the spring constant of spring with smaller length (in N/m).

(A) 60
(B) 40
(C) 30
(D) 70

---

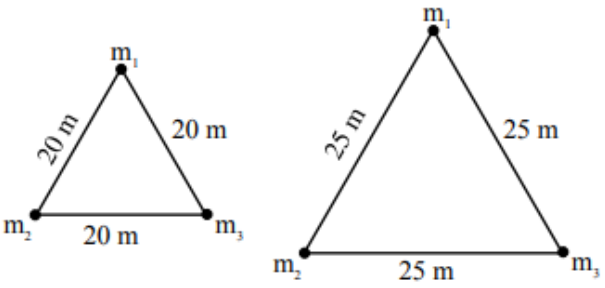
3. Figure shows three block with masses 8kg, 6kg and 4 kg. Friction coefficient between each surface is $\frac{1}{2}$. The maximum value of force 'F' such that 8kg block moves with constant velocity will be :



(A) 210 N
(B) 400 N
(C) 110 N
(D) 300 N

---

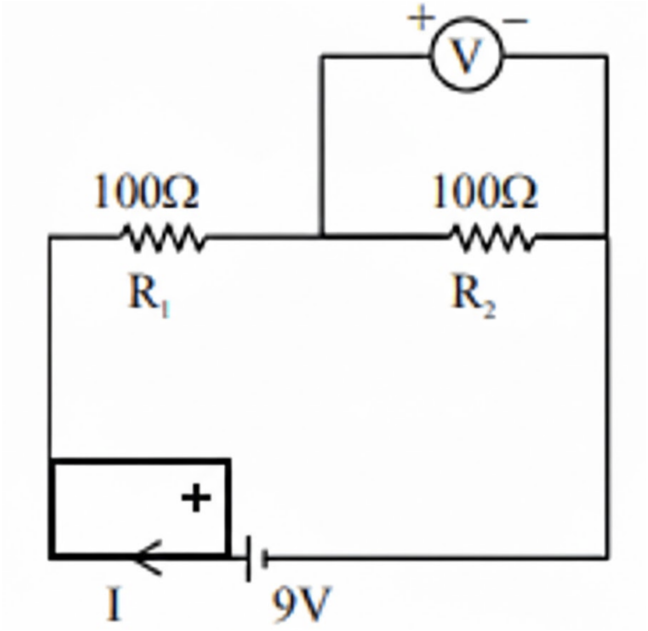
4. Three masses $m_1 = 200$ kg, $m_2 = 300$ kg and $m_3 = 400$ kg are kept at the vertices of on equilateral triangle of side 20 m. If the masses are shifted to new configuration such that they are at the vertices of an equilateral triangle of 25 m now. Find the work done in this process :



(A) 1.735×10^{-7}J
(B) 17.35×10^{-7}J
(C) 173.5×10^{-7}J
(D) 1735×10^{-7}J

---

5. Two resistors of resistances $R_1 = 100\Omega$ and $R_2 = 100\Omega$ are connected in series. A voltmeter of resistance 400Ω is connected in parallel to one of the resistance. Find the reading of voltmeter. The emf of battery is 9V. :



(A) 3 V
(B) 4 V
(C) 2 V
(D) 5 V

---

6. A brass rod is fixed rigidly at two ends at 27°C. If it is cooled to temperature -43°C, tension in rod becomes T_0. Find temperature (in °C) at which tension will be 1.4 T_0 :

(A) -71°C
(B) -65°C
(C) -50°C
(D) -82°C

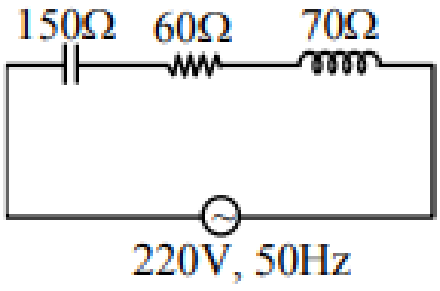
---

7. Electric potential at a point is $V = Ar^3 + B$. Find charge enclosed in a sphere of radius 1m, centered at r = 0

(A) $-4\pi\epsilon_0 A$
(B) $-8\pi\epsilon_0 A$
(C) $-12\pi\epsilon_0 A$
(D) $-16\pi\epsilon_0 A$

---

8. Figure shows a circuit consisting capacitor, inductor and a resistor connected in series with an AC source. Find the power factor of the circuit.
(Given R = 60Ω, X_L = 150Ω, X_C = 70Ω)



(A) 0.2
(B) 0.4
(C) 0.6
(D) 0.8

9. Following are two lists, list-I contains the types of electromagnetic waves and list-II contains theirs source. Match the entries from list-I to appropriate entries from list-II.

	List-I		List-II
(a)	x-rays	(p)	Hot bodies and molecules
(b)	Infrared rays	(q)	Oscillatory current in antennas
(c)	Microwaves	(r)	Magnetron
(d)	Radio waves	(s)	Fast moving electrons striking a metal plate

(A) (a)→(r), (b)→(q), (c)→(s), (d)→(q)
(B) (a)→(p), (b)→(s), (c)→(r), (d)→(q)
(C) (a)→(s), (b)→(p), (c)→(q), (d)→(s)
(D) (a)→(s), (b)→(p), (c)→(r), (d)→(q)

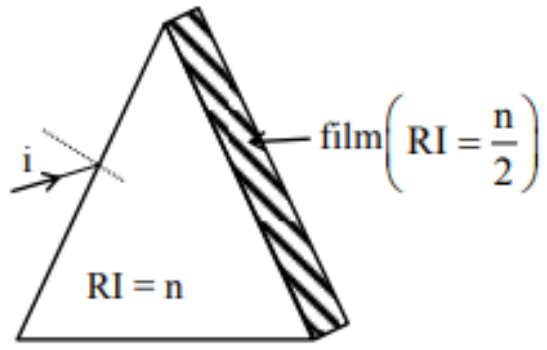
---

10. Terminal velocity of drop of radius 1 cm is 10 cm/sec. 64 such balls are combined to make a large drop. Find terminal velocity of this larger drop. :

(A) 160 cm/sec
(B) 140 cm/sec
(C) 180 cm/sec
(D) 150 cm/sec

---

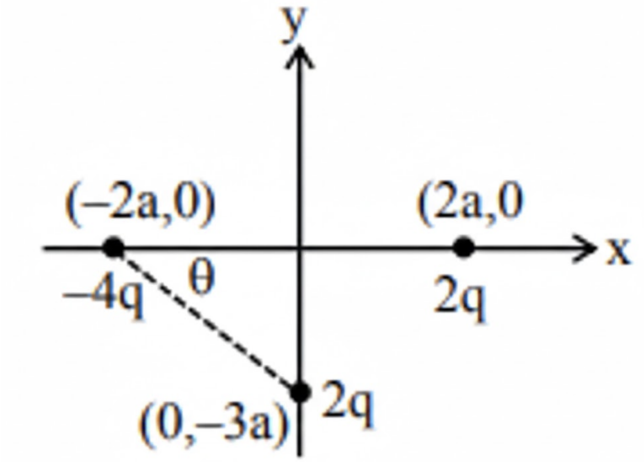
11. Light is incident at such an angle so that minimum deviation takes place. Now a film of refractive index RI = $n/2$ is stick on other face such that total internal reflection takes place on second surface. Find angle of prism :



(A) 60°
(B) 50°
(C) 90°
(D) 30°

---

12. In the following configuration of charges. Find the net dipole moment of the system :



(A) $\sqrt{180}$ qa
(B) $\sqrt{150}$ qa
(C) $\sqrt{200}$ qa
(D) $\sqrt{140}$ qa

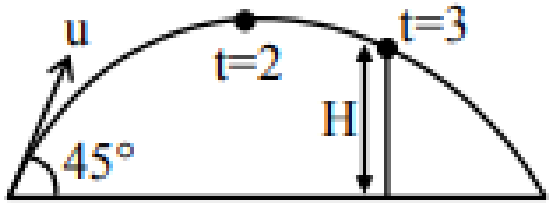
---

13. Density of water at 4°C is 1000 kg/m^3 and at 20°C it is 998 kg/m^3. If 4kg of water is heated from 4°C to 20°C, the change in internal energy of water is : (Given : specific heat capacity of water = 4200 J/kg K, Atmospheric pressure P = 10^5 Pa).

(A) 268799.2 J
(B) 268800.8 J
(C) 268800.0 J
(D) 267765.2 J

---

14. A projectile is projected with certain speed at an angle of 45° with horizontal as shown. At t = 2s, projectile is at maximum height and at t = 3s, it just touches a wall at a height H above horizontal. Find H in meters:
(Assume g = 10 m/s^2)



(A) 20 m
(B) 10 m
(C) 15 m
(D) 25 m

---

15. Column-I gives physical quantities and Column-II represent their dimensions. Choose the option representing correct matching.

Column-I			Column-II
(I)	Magnetic field intensity	(P)	$MLT^{-2}A^{-2}$
(II)	Magnetic flux	(Q)	$ML^{2}T^{-2}A^{-2}$
(III)	Magnetic permeability	(R)	$ML^{2}T^{-2}A^{-1}$
(IV)	Magnetic inductance	(S)	$MT^{-2}A^{-1}$

(A) I-S, II-R, III-P, IV-Q
(B) I-Q, II-R, III-P, IV-S
(C) I-R, II-S, III-P, IV-Q
(D) I-S, II-P, III-R, IV-Q

---

16. A cylindrical body of mass m and cross section A is floating in a liquid of density ρ_L such that its axis is vertical. If body is displaced by a small displacement 'x' vertically, find the time period of oscillation of the body :

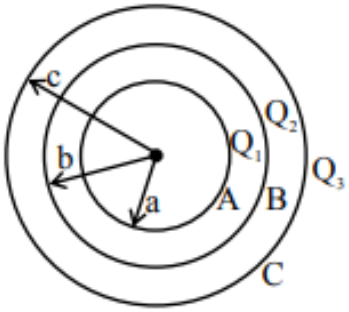
(A) $2\pi\sqrt{\frac{m}{\rho_L Ag}}$
(B) $3\pi\sqrt{\frac{m}{\rho_L Ag}}$
(C) $4\pi\sqrt{\frac{m}{\rho_L Ag}}$
(D) $5\pi\sqrt{\frac{m}{\rho_L Ag}}$

17. A zener diode of breakdown voltage 10 V is connected to an external voltage of 15 V and a resistance R in series. If power of zener diode is 0.4 W. Find value of unknown resistance R :

(A) 125 Ω
(B) 105 Ω
(C) 130 Ω
(D) 115 Ω

---

18. Three uniformly charged concentric shells are kept as shown in the diagram. Charges on individual shells are as shown. Find the final potential on each shell :



(A) $V_A = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$, $V_B = \frac{K(Q_1+Q_2+Q_3)}{c}$, $V_C = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

(B) $V_A = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$, $V_B = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$, $V_C = \frac{K(Q_1+Q_2+Q_3)}{c}$

(C) $V_A = \frac{K(Q_1+Q_2+Q_3)}{c}$, $V_B = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$, $V_C = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

(D) $V_A = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$, $V_B = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$, $V_C = \frac{K(Q_1+Q_2+Q_3)}{c}$

---

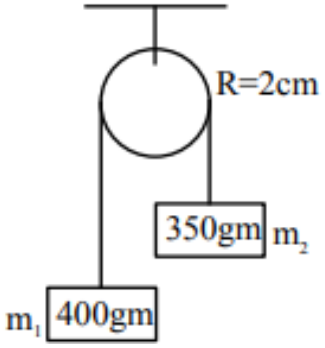
19. An ideal gas in a closed rigid container is at 50°C and pressure 3.23 kPa. If temperature is doubled, find new pressure in Pa :

(A) 3730 Pa
(B) 3230 Pa
(C) 6460 Pa
(D) 6430 Pa

---

20. After release, the blocks moves 81 cm in 9 seconds. Find moment of inertia of the pulley :

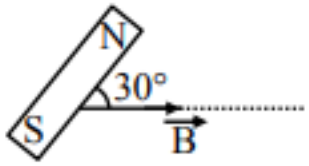
(Given $m_1 = 400$ gm, $m_2 = 350$ gm, R = 2 cm, g = 10 m/s^2)



(A) 97×10^{-4} Kg-m^2
(B) 100×10^{-4} Kg-m^2
(C) 21×10^{-4} Kg-m^2
(D) 87×10^{-4} Kg-m^2

---

21. A bar magnet is kept such that it is making an angle of 30° with the magnetic field. The torque acting on the magnet is 0.016 N-m. Find the amount of work done by external agent in rotating the magnet from most stable position to most unstable position.



(A) 0.064 J
(B) 0.020 J
(C) 0.034 J
(D) 0.055 J

---

22. Statement - I : Greater is the mass of nucleus, more will be its binding energy.
Statement - II : Nucleus with less $\frac{BE}{A}$ (Binding energy/nucleon) breaks into nucleus with higher $\frac{BE}{A}$.
Choose the correct option :

(A) Statement I is true statement II is false
(B) Statement I is false statement II is true
(C) Both are true
(D) Both are false

---

23. Light wave are incident from a medium of refractive index 2 making an angle θ with normal on to a medium of refractive index $2\sqrt{3}$. What should be the value of θ for which reflected wave and refracted wave will be perpendicular to each other.

(A) 60°
(B) 30°
(C) 53°
(D) 45°

---

24. In a H-like ion, ratio of speed of electron in two orbit is 3 : 2, then ratio of energies in these orbits should be :

(A) $\frac{3}{5}$

(B) $\frac{9}{4}$

(C) $\frac{1}{4}$

(D) $\frac{3}{4}$

---

25. There is a compound microscope of lenses having focal lengths 2 cm and 5 cm and tube length 10 cm. Find magnifying power in normal adjustment. If your answer is 5^α, find 'α' :
