JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON FRIDAY 23rd JANUARY 2026) **TIME : 9:00 AM TO 12:00 NOON**

PHYSICS — TEST PAPER WITH SOLUTION

SECTION-A

26. A thin prism with angle 5° of refractive index 1.72 is combined with another prism of refractive index 1.9 to produce dispersion without deviation. The angle of second prism is ______.

(1) 4.5° (2) 6°

(3) 4° (4) 5°

Ans. (3)

Sol. $\delta_{net} = 0$

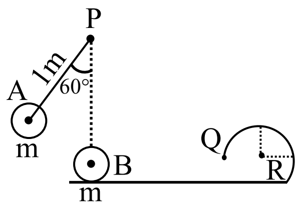
$\delta_1 + \delta_2 = 0$

$(\mu_1 - 1)A_1 + (\mu_2 - 1)A_2 = 0$

$$A_2 = \frac{(\mu_1 - 1)A_1}{(\mu_2 - 1)}$$

$$A_2 = \frac{(1.72 - 1)}{(1.9 - 1)} \times 5° = 4°$$

27. A small both A of mass m is attached to a massless rigid rod of length 1m pivoted at point P and kept at an angle of 60° with vertical as shown in figure. At distance of 1m below point P, an identical bob B is kept at rest on a smooth horizontal surface that extends to a circular track of radius R as shown in figure. If bob B just manages to complete the circular path of radius R upto a point Q after being hit elastically by bob A, then radius R is ______m.

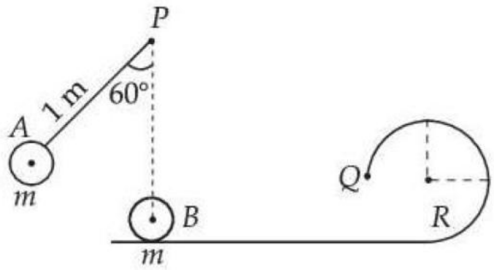


(1) $\frac{3}{5}$ (2) $\frac{1}{5}$

(3) $\frac{2+\sqrt{3}}{5}$ (4) $\frac{2-\sqrt{3}}{5}$

Ans. (2)

Sol.



V_A at lowest point

$$V_A = \sqrt{2g\ell(1-\cos\theta)}$$

$$V_A = \sqrt{2\times10\times1\left(1-\frac{1}{2}\right)} = \sqrt{10}$$

After collision velocity of B becomes,

$V_A = \sqrt{10} = V_B$ (Same mass)

Now to complete circular motion

$V_B = \sqrt{5gR}$

$$R = \frac{1}{5}$$

28. Match List-I with List-II.

List-I (Relation)		List-II (Law)	
A.	$\oint \vec{E}.\vec{dl} = -\frac{d}{dt}\oint \vec{B}\cdot\vec{da}$	I.	Ampere's circuital law.
B.	$\oint B.\vec{dl} = \mu_0\left(1+\in_0\frac{d\phi_E}{dt}\right)$	II.	Faraday's laws of electromagnetic induction.
(C)	$\oint \vec{E}.\vec{da} = \frac{1}{\in_0}\int \rho dv$	III.	Ampere-Maxwell law
(D)	$\oint \vec{B}\cdot\vec{dl} = \mu_0 I$	IV.	Gauss's law of electrostatics

Choose the **correct** answer from the options given below :

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

Ans. **(2)**

Sol. Theoretical

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

29. Four persons measure the length of a rod as 20.00 cm, 19.75 cm, 17.01 cm and 18.25 cm. The relative error in the measurement of average length of the rod is :

(1) 0.24 (2) 0.18
(3) 0.06 (4) 0.08

Ans. **(3)**

Sol. $\ell_{mean} = \frac{\ell_1 + \ell_2 + \ell_3 + \ell_4}{4}$

$\ell_{mean} = \frac{20.00+19.75+17.01+18.25}{4}$

$= 18.75$

$\Delta\ell_{mean} = \frac{|\Delta\ell_1| + |\Delta\ell_2| + |\Delta\ell_3| + |\Delta\ell_4|}{4}$

$= \frac{1.25+1+1.74+0.5}{4} = 1.12$

So, relative error

$= \frac{\Delta\ell_{mean}}{\ell_{mean}} = \frac{1.12}{18.75} = 0.06$

30. The de Broglie wavelength of an oxygen molecule at 27°C is x × 10^{-12} m. The value of x is (take Planck's constant = 6.63 × 10^{-34} J.s, Boltzmann constant = 1.38 × 10^{-23} J/K, mass of oxygen. Molecule = 5.31 × 10^{-26} kg).

(1) 26 (2) 24
(3) 30 (4) 20

Ans. **(1)**

Sol. $\lambda = \frac{h}{\sqrt{2mK}} = \frac{h}{\sqrt{2m\left(\frac{3}{2}kT\right)}}$

$\lambda = \frac{h}{\sqrt{3mkT}}$

$= \frac{6.63\times10^{-34}}{\sqrt{3\times5.31\times10^{-26}\times1.38\times10^{-23}\times300}}$

$= 2.58 \times 10^{-11} = 25.8 \times 10^{-12}$

So, x = 26

31. A simple pendulum of string length 30 cm performs 20 oscillations in 10s. The length of the string required for the pendulum to perform 40 oscillations in the same time duration is _____cm. [Assume that the mass of the pendulum remains same.]

(1) 120 (2) 0.75
(3) 7.5 (4) 15

Ans. **(3)**

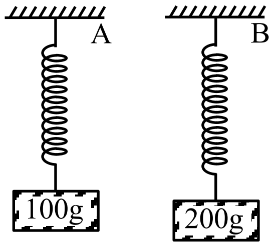
Sol. Time period becomes half

and $T \propto \sqrt{\ell}$

So, length ℓ beocmes $\frac{\ell}{4}$

So, $\frac{\ell}{4} = \frac{30}{4} = 7.5$

32. Two blocks with masses 100g and 200g are attached to the ends of springs A and B as shown in figure. The energy stored in A is E. The energy stored in B, when spring constants k_A, k_B of A and B, respectively satisfy the relation $4k_A = 3k_B$, is :



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

Ans. **(3)**

Sol. For equilibrium kx = mg

$$U = \frac{1}{2}kx^2 = \frac{1}{2}\frac{m^2g^2}{k}$$

$$U \propto \frac{m^2}{k}$$

$$\frac{U_A}{U_B} = \left(\frac{m_A}{m_B}\right)^2 \frac{k_B}{k_A} = \left(\frac{1}{2}\right)^2\left(\frac{4}{3}\right) = \frac{1}{3}$$

$$\frac{E}{U_B} = \frac{1}{3} \Rightarrow U_B = 3E$$

33. The moment of inertia of a square loop made of four uniform solid cylinders, each having radius R and length L (R < L) about an axis passing through the mid points of opposite sides, is (Take the mass of the entire loop as M) :

(1) $\frac{3}{8}MR^2 + \frac{7}{12}ML^2$

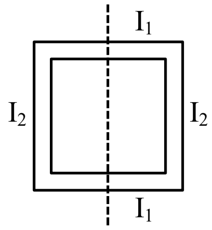
(2) $\frac{3}{4}MR^2 + \frac{1}{6}ML^2$

(3) $\frac{3}{4}MR^2 + \frac{7}{12}ML^2$

(4) $\frac{3}{8}MR^2 + \frac{1}{6}ML^2$

Ans. **(4)**

Sol.



$I_{net} = 2(I_1 + I_2)$

$$= 2\left(\frac{M'R^2}{4} + \frac{M'\ell^2}{12}\right) + 2\left(\frac{M'R^2}{2} + M'\left(\frac{\ell}{2}\right)^2\right)$$

$$= \frac{M'R^2}{2} + \frac{M'R^2}{6} + M'R^2 + \frac{M'\ell^2}{2}$$

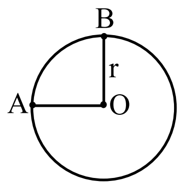
$$= \frac{3M'R^2}{2} + \frac{2M'\ell^2}{3}$$

Given masses $M' = \frac{M}{4}$

So, $I = \frac{3(M/4)R^2}{2} + 2\frac{(M/4)\ell^2}{3}$

$$I = \frac{3}{8}MR^2 + \frac{M\ell^2}{6}$$

34. A wire of uniform resistance λΩ/m is bent into a circle of radius r and another piece of wire with length 2r is connected between points A and B (AOB) as shown in figure. The equivalent resistance between points A and B is ______Ω.



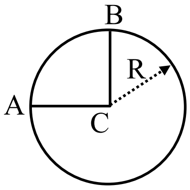
(1) $\frac{3\pi\lambda r}{8}$

(2) $(\pi + 1)\, 2r\lambda$

(3) $\frac{6\pi\lambda r}{3\pi + 16}$

(4) $2\pi\lambda r$

Ans. **(3)**

Sol. 

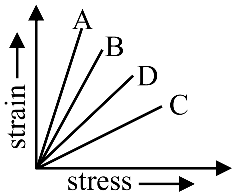
$$\frac{1}{R_{AB}} = \frac{2}{\lambda\pi r} + \frac{1}{\lambda.2r} + \frac{2}{\lambda.3\pi r}$$

$$= \frac{1}{\lambda r}\left[\frac{2}{\pi} + \frac{1}{2} + \frac{2}{3\pi}\right]$$

$$= \frac{1}{\lambda r}\left(\frac{12+3\pi+4}{6\pi}\right) = \frac{1}{\lambda r}.\left(\frac{16+3\pi}{6\pi}\right)$$

$$R_{AB} = \lambda r\left(\frac{6\pi}{16+3\pi}\right)$$

35. The strain-stress plot for materials A,B,C and D is shown in the figure. Which material has the largest Young's modulus ?



(1) C (2) D

(3) A (4) B

Ans. (1)

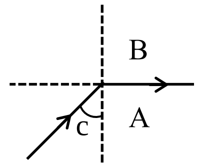
Sol. $\frac{\text{Strain}}{\text{Stress}} = \frac{1}{Y} = \text{Slope}$

36. Consider light travelling from a medium A to medium B separated by a plane interface. If the light undergoes total internal reflection during its travel from medium A to B and the speed of light in media A and B are 2.4×10^8 m/s and 2.7×10^8 m/s respectively, then the value of critical angle is :

(1) $\cot^{-1}\left(\frac{3}{\sqrt{13}}\right)$ (2) $\sin^{-1}\left(\frac{9}{8}\right)$

(3) $\tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$ (4) $\cos^{-1}\left(\frac{8}{9}\right)$

Ans. (3)

Sol. 

$$\mu_A \sin c = \mu_B \sin 90$$

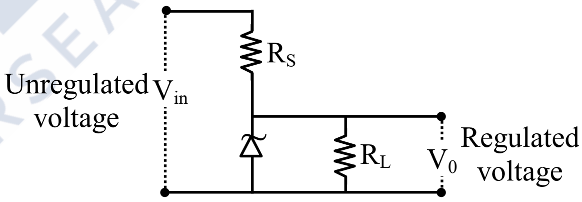
$$\Rightarrow \sin c = \frac{\mu_B}{\mu_A} = \frac{v_A}{v_B}$$

$$\therefore \sin c = \frac{2.4\times10^8}{2.7\times10^8} = \frac{8}{9}$$

$$\Rightarrow \tan c = \frac{8}{\sqrt{81-64}} = \frac{8}{\sqrt{17}}$$

$$c = \tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$$

37. The following diagram shows a Zener diode as a voltage regulator. The Zener diode is rated at V_Z = 5V and the desired current in load is 5 mA. The unregulated voltage source can supply upto 25V. Considering the Zener diode can withstand four times of the load current, the value of resistor R_S (shown in circuit) should be _____Ω.



(1) 4000 (2) 10

(3) 100 (4) 1000

Ans. (Dropped)

38. In hydrogen atom spectrum, (R → Rydberg's constant)

A. the maximum wavelength of the radiation of Lyman series is $\frac{4}{3R}$

B. the Balmer series lies in the visible region of the spectrum

C. the minimum wavelength of the radiation of Paschen series is $\frac{9}{R}$

D. the minimum wavelength of Lyman series is $\frac{5}{4R}$

Choose the **correct** answer from the options given below :

(1) B, D Only (2) A, B and C Only

(3) A, B and D Only (4) A, B Only

Ans. (2)

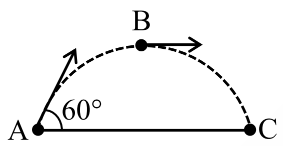
Sol. $\frac{1}{\lambda} = R\left(1-\frac{1}{4}\right)$

$\lambda = \frac{4}{3R}$

$\frac{1}{\lambda'} = R\left(\frac{1}{9}\right)$

$\lambda' = \frac{9}{R}$

39. An object is projected with kinetic energy K from a point A at an angle 60° with the horizontal. The ratio of the difference in kinetic energies points B and C to that at point A (see figure), in the absence of air friction is :



(1) 1 : 2 (2) 2 : 3

(3) 1 : 4 (4) 3 : 4

Ans. (4)

Sol. $(KE)_A = K = \frac{1}{2}mu^2$

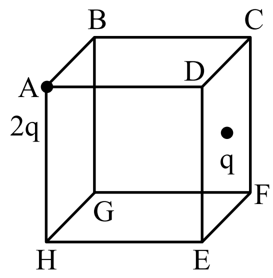
$(KE)_B = \frac{K}{4} = \frac{1}{2}m\left(\frac{u}{2}\right)^2 = \frac{K}{4}\ \left(u_B = u\cos 60° = \frac{u}{2}\right)$

$(KE)_C = K$

$\text{Ratio} = \frac{K - K/4}{K}$

$= \frac{3K/4}{K} = \frac{3}{4}$

40. Two point charges 2q and q are placed at vertex A and centre of face CDEF of the cube as shown in figure. The electric flux passing through the cube is :



(1) $\frac{3q}{\varepsilon_0}$ (2) $\frac{q}{\varepsilon_0}$ (3) $\frac{3q}{2\varepsilon_0}$ (4) $\frac{3q}{4\varepsilon_0}$

Ans. (4)

Sol. $\phi = \frac{Q_{in}}{\varepsilon_0}$

$\phi = \frac{\frac{q}{4}+\frac{q}{2}}{\varepsilon_0} = \frac{3q}{4\varepsilon_0}$

41. A 20 m long uniform copper wire held horizontally is allowed to fall under the gravity (g = 10 m/s^2) through a uniform horizontal magnetic field of 0.5 Gauss perpendicular to the length of the wire. The induced EMF across the wire it travells a vertical distance of 200 m is _____ mV.

(1) $0.2\sqrt{10}$ (2) $20\sqrt{10}$

(3) $2\sqrt{10}$ (4) $200\sqrt{10}$

Ans. (2)

Sol. $\varepsilon = vB\ell$

$v = \sqrt{2gh} = \sqrt{2\times10\times200} = 20\sqrt{10}$

$\varepsilon = (20\sqrt{10})(0.5\times10^{-4})20$

$= 20\sqrt{10}\times10^{-3} = 20\sqrt{10}\ \text{mV}$

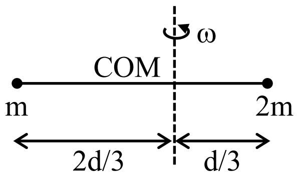
42. Two small balls with masses m and 2m are attached to both ends of a rigid rod of length d and negligible mass. If angular momentum of this system is L about an axis (A) passing through its centre of mass and perpendicular to the rod then angular velocity of the system about A is :

(1) $\frac{3}{2}\frac{L}{md^2}$ (2) $\frac{2L}{md^2}$

(3) $\frac{4}{3}\frac{L}{md^2}$ (4) $\frac{2L}{5md^2}$

Ans. (1)

Sol.



$L = I\omega$ and $\omega = \frac{L}{I}$

$$\omega = \frac{L}{m\left(\frac{2d}{3}\right)^2 + 2m\left(\frac{d}{3}\right)^2} = \frac{L}{\frac{4}{9}md^2 + \frac{2}{9}md^2} = \frac{L}{\frac{6md^2}{9}}$$

$$\omega = \frac{3L}{2md^2}$$

43. In a perfectly inelastic collision, two spheres made of the same material with masses 15 kg and 25 kg, moving in opposite directions with speeds of 10 m/s and 30 m/s, respectively, strike each other and stick together. The rise in temperature (in °C), if all the heat produced during the collision is retained by these spheres, is :

(specific heat of sphere material 31 cal/kg. °C and 1 cal = 4.2 J)

(1) 1.75 (2) 1.44

(3) 1.15 (4) 1.95

Ans. (2)

Sol. $(K.E)_{lost} = \frac{1}{2}\mu V_{rel}^2 (1-e^2)$

$$= \frac{1}{2}\left(\frac{m_1 m_2}{m_1 + m_2}\right)(10+30)^2(1-0)$$

$$= \frac{1}{2}\left[\frac{(15)(25)}{40}\right][40]^2$$

$= 7500$ J

$(K.E)_{loss} = (m_1 + m_2)(S)(\Delta T)$

[S = 31 × 4.2J/kg-°C]

$7500 = (40)(31)(\Delta T)$

$$\Delta T = \frac{7500}{40 \times 31 \times 4.2} = 1.44°C$$

44. In a screw gauge, the zero of the circular scale lies 3 divisions above the horizontal pitch line when their metallic studs are brought in contact. Using this instrument thickness of a sheet is measured. If pitch scale reading is 1 mm and the circular scale reading is 51 then the correct thickness of the sheet is ______ mm.

[Assume least count is 0.01 mm]

(1) 1.50 (2) 1.48

(3) 1.54 (4) 1.51

Ans. (3)

Sol. Zero error e = –3 × LC = – 0.03 mm

Reading taken = 1mm + 51(0.01 mm)

= 1.51 mm

So, correct reading = 1.51 – (– 0.03)

= 1.54 mm

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

Consider a ferromagnetic material :

Assertion (A) : The individual atoms in a ferromagnetic material possess a magnetic dipole moment and interact with one another in such a way that they spontaneously align themselves forming domains.

Reason (R) : At high enough temperature, the domain structure of ferromagnetic material disintegrates. Thus, magnetization will disappear at high enough temperature known as Curie temperature.

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

(1) **(A)** is true but **(R)** is false

(2) Both **(A)** and **(R)** are true but **(R)** is **not** the correct explanation of **(A)**

(3) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(4) **(A)** is false but **(R)** is true

Ans. **(2)**

Sol. Conceptual

SECTION-B

46. A simple pendulum made of mass 10 g and a metallic wire of length 10 cm is suspended vertically in a uniform magnetic field of 2 T. The magnetic field direction is perpendicular to the plane of oscillations of the pendulum. If the pendulum is released from an angle of 60° with vertical, then maximum induced EMF between the point of suspension and point of oscillation is ________ mV. (Take g = 10 m/s²)

Ans. **(100)**

Sol. $\varepsilon_{max} = \dfrac{B\omega_{max}\ell^2}{2}$ ...(1)

Using energy conservation,

$$mg\ell(1-\cos 60°) = \frac{1}{2}(m\ell^2)\omega_m^2$$

$$\omega_m = \sqrt{\frac{g}{\ell}} = 10 \text{ rad/s}$$

From eq.(1),

$$\varepsilon_{max} = \frac{2\times 10\times 0.01}{2} = 0.1 \text{ V}$$

= 100 mV

47. The equation of the electric field of an electromagnetic wave propagating through free space is given by :

$$E = \sqrt{377}\ \sin(6.27\times 10^3 t - 2.09\times 10^{-5} x) \text{ N/C}$$

he average power of the electromagnetic wave is $\left(\dfrac{1}{\alpha}\right)$ W/m^2. The value of α is ________

$\left(\text{Take } \sqrt{\dfrac{\mu_0}{\varepsilon_0}} = 377 \text{ in SI units}\right)$

Ans. **(2)**

Sol. Here, $v = \dfrac{\omega}{K} = \dfrac{6.27\times 10^3}{2.09\times 10^{-5}}$

$= 3\times 10^8$

So, wave moving in vacuum

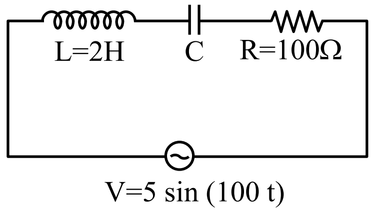
$$\text{Now, } I = \left(\frac{1}{2}\varepsilon_0 E_0^2\right)c = \frac{1}{2}\varepsilon_0 E_0^2 \frac{1}{\sqrt{\mu_0\varepsilon_0}}$$

$$= \frac{1}{2}\sqrt{\frac{\varepsilon_0}{\mu_0}}E_0^2 = \frac{1}{2}\frac{1}{377}\times 377$$

$$\frac{1}{d} = \frac{1}{2}$$

$d = 2$

48. Using a variable-frequency a.c. voltage source, the maximum current measured in the given LCR circuit is 50 mA for V=5sin(100t). The values of L and R are shown in the figure. The capacitance of the capacitor (C) used is ________ μF.



Ans. **(50)**

Sol. Current is maximum, so resonance

and $\omega = \frac{1}{\sqrt{LC}}$

$$C = \frac{1}{\omega^2 L} = \frac{1}{2 \times 10^4}$$

$= 50 \times 10^{-6} = 50\ \mu F$

49. In two separate Young's double-slit experimental set-ups, two monochromatic light sources of different wavelengths are used to get fringes of equal width. The ratios of the slit separations and that of the wavelengths of light used are 2 : 1 and 1 : 2 respectively. The corresponding ratio of the distances between the slits and the respective screens (D_1 / D_2) is ________.

Ans. **(4)**

Sol. $\beta_1 = \beta_2$

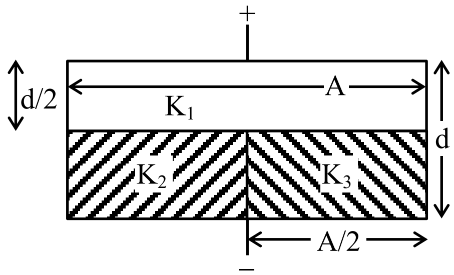
$$\frac{D_1\lambda_1}{d_1} = \frac{D_2\lambda_2}{d_2}$$

$$\frac{D_1}{D_2} = \frac{\lambda_2}{\lambda_1}\left(\frac{d_1}{d_2}\right)$$

$= 2 \times 2$

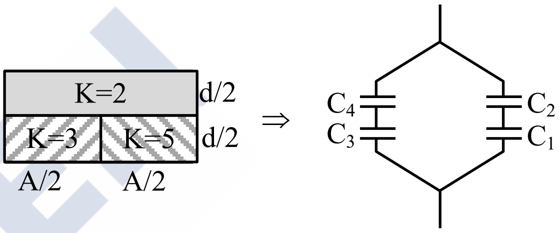
$$\frac{D_1}{D_2} = 4$$

50. The space between the plates of a parallel-plate capacitor of capacitance C (without any dielectric) is now filled with three dielectric slabs of dielectric constants $K_1 = 2$, $K_2 = 3$, and $K_3 = 5$ (as shown in the figure). If new capacitance is $\frac{n}{3}C$ then the value of n is _______.



Ans. **(8)**

Sol.



$$C_1 = \frac{5 \in_0 A/2}{d/2} = \frac{5 \in_0 A}{d} = 5C$$

$$C_2 = \frac{2 \in_0 A/2}{d/2} = \frac{2 \in_0 A}{d} = 2C$$

C_1 & C_2 in series.

$$C' = \frac{C_1C_2}{C_1 + C_2} = \frac{(5C)(2C)}{7C} = \frac{10}{7}C$$

$$C_3 = \frac{3 \in_0 A/2}{d/2} = 3C$$

$$C_4 = \frac{2 \in_0 A/2}{d/2} = 2C$$

C_4 & C_3 in series; $C'' = \frac{(2C)(3C)}{5C} = \frac{6}{5}C$

C' & C" in parallel;

So, $C_{eq} = C\left(\frac{6}{5} + \frac{10}{7}\right) = C\left(\frac{42+50}{35}\right) = \left(\frac{92}{35}\right)C$

$$\frac{92}{35}C = \frac{nC}{3}$$

$$n = \frac{92 \times 3}{35} = 7.9 \Rightarrow n \simeq 8$$