RANKERS
JEE | NEET | FOUNDATION

RGP – RANKERS GENIUS PROGRAM

Set A

(Physics, Chemistry and Mathematics)

Time: 1 Hour | **Moving to Target (JEE)** | **Marks: 120**

1. General Instructions:

(Paper Code: 1301)

* *This test paper consists of 30 question in 3 section (A, B, C)*
  Marking Scheme:
  - ✓ *Full marks: + 4 if answered correctly.*
  - ✓ *Zero marks: 0 if not attempted or incorrect.*

2. RGP College Grant Criteria:

- ✓ Students must score a minimum of 70% positive marks in RGP.
- ✓ Student must get under AIR 5,000 in JEE/NEET Examination.

3. Cash Reward Criteria:

- ✓ Exciting Cash Rewards for RGP Toppers

SENIOR WING (Student's Moving to Class XIth, XIIth, Dropper JEE /NEET)		JUNIOR WING (Student's Moving to Class IXth & Xth)	
Overall 1st Topper	₹ 21,000/-	Overall 1st Topper	₹ 5,100/-
Overall 2nd Topper	₹ 11,000/-	Overall 2nd Topper	₹ 3,100/-
Overall 3rd Topper	₹ 5,100/-	Overall 3rd Topper	₹ 2,100/-
Overall 4th – 8th Topper	₹ 2,100/-	Overall 4th – 8th Topper	₹ 1,100/-
Overall 9th – 15th Topper	₹ 1,100/-	Overall 9th – 15th Topper	₹ 500/-

** Rankings from 1 to 20 are determined based on the specific criteria outlined in the FAQ section of our website, www.myrankers.com.

4. Scholarship Criteria in Rankers Offline Classroom Program:

- ✓ 100% Fee Waiver – Student Scoring 90% and Above
- ✓ 80% Fee Waiver – Student Scoring 85% to 89.999%
- ✓ 60% Fee Waiver – Student Scoring 75% to 84.999%
- ✓ 50% Fee Waiver – Student Scoring 70% to 74.999%
- ✓ 40% Fee Waiver – Student Scoring 60% to 69.999%
- ✓ 20% Fee Waiver – Student Scoring 40 % to 59.999%
- ✓ 10% Fee Waiver – Student Scoring 30% to 39.999%
- ✓ 5% Fee Waiver – All the Aspirants Appearing in RGP

RGP RESULT & REWARD CEREMONY

Result Date: 12th Feb 2025
Check Your Result at: www.myrankers.com
Reward Ceremony Date: 16th Feb 2025

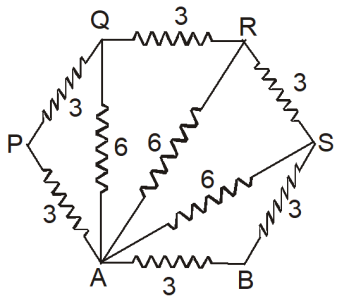
Student's Name: - .....

Physics (Section – A)

1. A block of mass 1kg connected with a spring of spring constant 4 N/m lies on a smooth horizontal surface. The block is compressed by 20 cm and then released. Find the minimum time after which the elongation in spring becomes 10 cm.

(A) π sec (B) $\frac{\pi}{2}$ sec (C) $\frac{\pi}{3}$ sec (D) $\frac{\pi}{4}$ sec

2. All resistance in diagram are in ohms.
Find the effective resistance between the points Q and S.



(A) 2 Ω

(B) 3 Ω

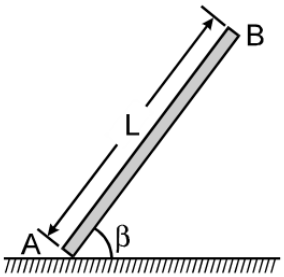
(C) 4 Ω

(D) 6 Ω

3. A charge +q is fixed at each of the points $x = x_0$, $x = 3x_0$, $x = 5x_0$, ... upto infinity on the x-axis and a charge -q is fixed at each of the points $x = 2x_0$, $x = 4x_0$, $x = 6x_0$, ... upto infinity. Here x_0 is a positive $\frac{Q}{4\pi\epsilon_0 r}$ constant. Take the electric potential at a point due to a charge Q at a distance r from it to be. Then the potential at the origin due to the above system of charges is:

(A) $\frac{q}{4\pi\epsilon_0 x_0 \ell n2}$ (B) $\frac{q}{8\pi\epsilon_0 x_0 \ell n2}$ (C) $\frac{q\,\ell n2}{8\pi\epsilon_0 x_0}$ (D) $\frac{q\,\ell n2}{4\pi\epsilon_0 x_0}$

4. The uniform rod AB of mass m is released from rest when $\beta = 60^\circ$. Assuming that the friction force between end A and the surface is large enough to prevent sliding.
What is the initial angular acceleration of the rod?



(A) $\frac{3g}{L}$

(B) $\frac{3g}{2L}$

(C) $\frac{3g}{4L}$

(D) $\frac{6g}{L}$

---------- *Rough Work* ----------

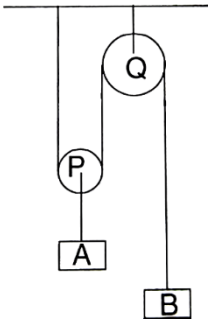
5. In figure the mass of body A is four times as great as that of body B.
The system is released from rest find acceleration of block B. (g = 10 m/s^2)

(A) 2.5 m/s^2

(B) 3.75 m/s^2

(C) 5 m/s^2

(D) 7.5 m/s^2



6. The magnetic field at the origin due to a current element $i\,\overrightarrow{d\ell}$ placed at a position $\vec{r}$ is

(A) $\frac{\mu_0 i}{4\pi}\frac{\overrightarrow{d\ell}\times\vec{r}}{r^3}$ (B) $-\frac{\mu_0 i}{4\pi}\frac{\vec{r}\times\overrightarrow{d\ell}}{r^3}$ (C) $\frac{\mu_0 i}{4\pi}\frac{\vec{r}.\overrightarrow{d\ell}}{r^3}$ (D) $-\frac{\mu_0 i}{4\pi}\frac{\overrightarrow{d\ell}\times\vec{r}}{r^3}$

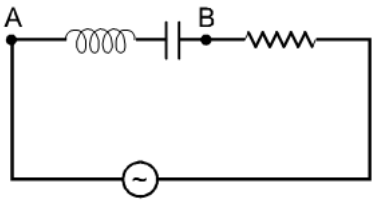
7. An inductor $\left(L=\frac{1}{100\pi}H\right)$, a capacitor $\left(C=\frac{1}{500\pi}F\right)$ and a resistance (3Ω) is connected in series with an AC voltage source as shown in the figure. The voltage of the AC source is given as V = 10 cos(100 πt) volt. What will be the potential difference between A and B?

(A) 8 cos(100 πt – 127º) volt

(B) 8 cos(100 πt – 53º) volt

(C) 8 cos(100 πt – 37º) volt

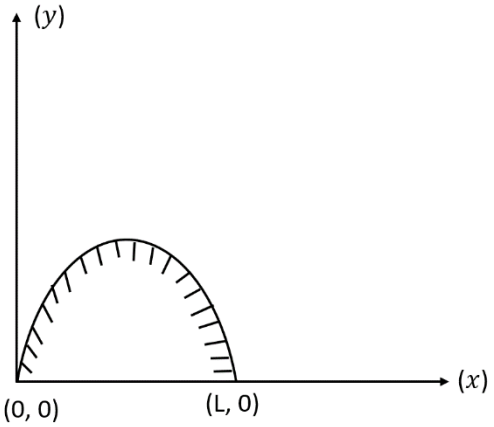
(D) 8 cos(100 πt + 37º) volt



---------- *Rough Work* ----------

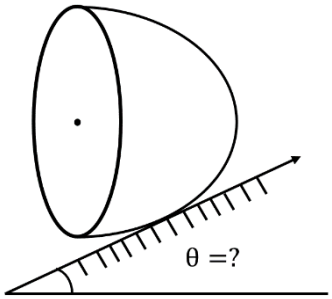
8. Two blocks of mass 2kg and 3kg are connected to a spring of force constant 120 N/m. If both the blocks are given a velocity 1.0 m/s each directed away from each other then find the maximum elongation in spring.
(A) 20cm (B) 10cm (C) 5cm (D) 15cm

9. A curved mirror is kept such that it's cross section lies in $x-y$ plane whose equation is given as $y=\frac{2L}{\pi}\sin\left(\frac{\pi x}{L}\right)$. Find the point at which a light ray travelling parallel to x-axis must incident in order to get reflected parallel to y-axis.



(A) $\left(\frac{L}{4},\frac{\sqrt{2}L}{\pi}\right)$
(B) $\left(\frac{L}{3},\frac{\sqrt{3}L}{\pi}\right)$
(C) $\left(\frac{L}{6},\frac{L}{\pi}\right)$
(D) $\left(\frac{L}{2},\frac{2L}{\pi}\right)$

10. A hollow hemisphere rests on a sufficiently rough surface inclined at an angle θ with horizontal, with it's base being vertical. For what value of θ the sphere will remain in equilibrium.
(A) 15°
(B) 30°
(C) 45°
(D) 60°



---------- *Rough Work* ----------

Chemistry (Section – B)

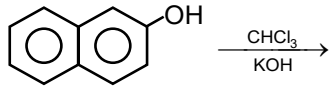
11. Which of the following imparts green colour to the burner flame?
(A) $B(OMe)_3$ (B) Na(OMe)
(C) $Al(OPr)_3$ (D) $Sn(OH)_2$

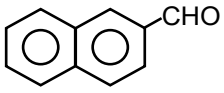
12. 100g of an ideal gas is kept in a cylinder of 416 L volume at 27° C under 1.5 bar pressure. The molar mass of the gas is g mol^{-1}. (Given: R = 0.083 L bar K^{-1} mol^{-1})
(A) 6 (B) 4 (C) 5 (D) 7

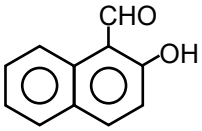
13. Which of the following statements is not correct?
(A) Silicon is extensively used as a semiconductor
(B) Carborundum is SiC
(C) Silicon occurs in free state in nature
(D) Mica contains the element silicon

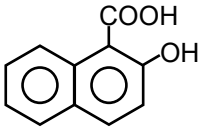
14. In the mixture of (Na_2CO_3 + $NaHCO_3$) volume of HCl required is x mL with phenolphthalein indicator and y mL with methyl orange indicator in the same titration. Hence volume of HCl for complete reaction of $NaHCO_3$ is:
(A) 2x (B) y (C) $\frac{x}{2}$ (D) (y – x)

15. Give product for following reaction.



(A) 

(B) 

(C) 

(D) None of these

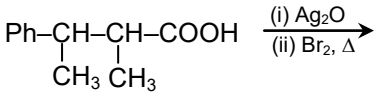
---------- *Rough Work* ----------

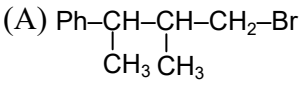
16. 4.5 moles each of hydrogen and iodine is heated in a sealed ten litre vessel. At equilibrium, 3 moles of HI were found. The equilibrium constant for
$H_2(g) + I_2(g) \rightleftharpoons 2HI_{(g)}$ is
(A) 4 (B) 3 (C) 2 (D) 1

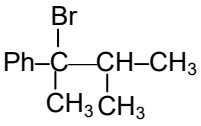
17. Which of the following is a non-reducing sugar?
(A) Lactose (B) Fructose (C) Sucrose (D) Maltose

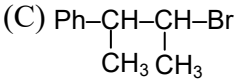
18. The most basic compound among the following is
(A) Acetanilide (B) Benzylamine (C) p-Nitro aniline (D) Aniline

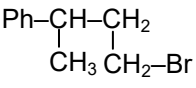
19. Calculate the volume of water (in mL) required to dissolve 0.1 g lead (II) chloride to get a saturated solution (K_{sp} of $PbCl_2 = 3.21 \times 10^{-8}$, atomic mass of Pb = 207 u). Report your answer by rounding it up to nearest whole number.
(A) 160 (B) 170 (C) 190 (D) 180

20.  Product is-

(A) 

(B) 

(C) 

(D) 

---------- *Rough Work* ----------

Math (Section – C)

21. $\lim_{x\to 0} \frac{x\tan 2x - 2x\tan x}{(1-\cos 2x)^2}$ equals

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

22. A bag contains 4 red and 6 black balls. A ball is drawn at random from the bag, its colour is observed and this ball along with two additional balls of the same colour are returned to the bag. If now a ball is drawn at random from the bag, then the probability that this drawn ball is red, is

(A) $\frac{3}{4}$ (B) $\frac{3}{10}$ (C) $\frac{2}{5}$ (D) $\frac{1}{5}$

23. If $f(x) = \frac{(\tan 1°)x + \log_e(123)}{x\log_e(1234) - (\tan 1°)}, x > 0$, then the least value of $f(f(x)) + f\left(f\left(\frac{4}{x}\right)\right)$ is

(A) 4 (B) 2 (C) 0 (D) 8

24. Suppose A is any 3 × 3 non-singular matrix and $(A - 3I)(A - 5I) = O$, where $I = I_3$ and $O = O_3$. If $\alpha A + \beta A^{-1} = 4I$, then $\alpha + \beta$ is equal to

(A) 13 (B) 7 (C) 12 (D) 8

25. The value of $\int_{1/e}^{\tan x} \frac{tdt}{1+t^2} + \int_{1/e}^{\cot x} \frac{dt}{t(1+t^2)}$ is equal to

(A) –1 (B) 1 (C) 0 (D) e

---------- *Rough Work* ----------

26. The value of cosec 20° tan 60° – sec 20° is
(A) 0 (B) 1 (C) 2 (D) 4

27. The sum of all the solutions of the equation $(8)^{2x} - 16 \cdot (8)^{x} + 48 = 0$ is:
(A) $1 + \log_6(8)$ (B) $\log_8(6)$ (C) $1 + \log_8(6)$ (D) $\log_8(4)$

28. If x satisfies the inequality $\log_{25} x^2 + (\log_5 x)^2 < 2$, then x belongs to
(A) $\left(\frac{1}{5}, 5\right)$ (B) $\left(\frac{1}{25}, 5\right)$ (C) $\left(\frac{1}{5}, 25\right)$ (D) $\left(\frac{1}{25}, 25\right)$

29. Let $a_1, a_2, a_3, \ldots, a_n, \ldots$ be in A.P. If $a_3 + a_7 + a_{11} + a_{15} = 72$, then the sum of its first 17 terms is equal to
(A) 306 (B) 204 (C) 153 (D) 612

30. Number of common tangents of $y = x^2$ and $y = -x^2 + 4x - 4$ is
(A) 1 (B) 2 (C) 3 (D) 4

---------- *Rough Work* ----------