## JEE-MAIN EXAM APRIL, 2025

Date: - 03-04-2025 (SHIFT-1)

## PHYSICS

## **SECTION-A**

1. Two blocks of masses m and M, (M > m), are placed on a frictionless table as shown in figure. A massless spring with spring constant k is attached with the lower block. If the system is slightly displaced and released, then ( $\mu$  = coefficient of friction between the two blocks)



E. Maximum frictional force can be  $\mu(M+m)g$ .

Choose the correct answer from the options given below:

(1) B, C, D Only (2) A, B, D Only (3) C, D, E Only (4) A, B, C Only

- 2. During the melting of a slab of ice at 273 K at atmospheric pressure:
  - (1) Internal energy of ice-water system remains unchanged.
  - (2) Internal energy of the ice-water system decreases.
  - (3) Positive work is done by the ice-water system on the atmosphere.
  - (4) Positive work is done on the ice-water system by the atmosphere.
- 3. Choose the correct logic circuit for the given truth table having inputs  $\,A\,$  and  $\,B\,$  .

Inp	uts	Output					
A	В	Y					
0	0	0 0					
0	1						
1	0	1					
1	1	1					

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4. A parallel plate capacitor is filled equally(half) with two dielectrics of dielectric constants  $\varepsilon_1$  and  $\varepsilon_2$ , as shown in figures. The distance between the plates is d and area of each plate is A. If capacitance in first configuration and second configuration are  $C_1$  and  $C_2$  respectively, then  $\frac{C_1}{C}$  is



5. A piston of mass M is hung from a massless spring whose restoring force law goes as  $F = -kx^3$ , where k is the spring constant of appropriate dimension. The piston separates the vertical chamber into two parts, where the bottom part is filled with 'n' moles of an ideal gas. An external work is done on the gas isothermally (at a constant temperature T) with the help of a heating filament (with negligible volume) mounted in lower part of the chamber, so that the piston goes up from a height  $L_0$  to  $L_1$ , the total energy delivered by the filament is :(Assume spring to be in its natural length before heating)



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6.	Consider a completely full cylindrical water tank of height 1.6 m and of cross-sectional area $0.5m^2$ .									
	has a small hole in its side at a height 90 cm from the bottom. Assume, the cross-sectional area of									
	hole to be negligibly small as compared to that of the water tank. If a load 50 kg is applied at the									
	surface of the water in the tank then the velocity of the water coming out at the instant when the hole i									
	opened is: $(g = 10 \text{ m/s}^2)$									
	(1)	5m/s	(2) 3m/s		(3) 2m/s		) 4m/s			
7.	Aw	rire of length 25 m a	and cross-sectional	area	5 mm <sup>2</sup> having resistivity	y of	$2{ imes}10^{{ imes}6}\Omega m$ is b	ent into a		
	com	plete circle. The res	sistance between di	amet	rically opposite points wi	ll be				
	(1)	12.5Ω	(2) 50Ω		(3) 100Ω	(4)	25Ω			
8.	Mat	ch the LIST-I with L	IST-II							
ſ	List-I				-11		]			
-	A. ${}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{140}_{54}Xe + {}^{94}_{38}Sr + {}^{1}_{0}n$			I.	Chemical reaction	emical reaction				
	$\begin{array}{c c} B. & H_2 + O_2 \rightarrow 2H_2O \end{array}$		II.	Fusion with +ve Q valu						
-	C. ${}_{1}^{2}H_{2} + {}_{1}^{2}H \rightarrow {}_{2}^{3}He + {}_{0}^{1}n$				Fission					
-	D.	$^{1}_{1}\mathrm{H} +^{3}_{1}\mathrm{H} \rightarrow^{2}_{1}\mathrm{H} +^{2}_{1}$	Н	IV.	Fusion with -ve Q value	;	1			

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Choose the correct answer from the options given below:

PHYSICS

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

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

9. The angle of projection of a particle is measured from the vertical axis as  $\phi$  and the maximum height reached by the particle is  $\mathbf{h}_{\mathrm{m}}.$  Here  $\mathbf{h}_{\mathrm{m}}$  as function of  $\phi$  can be presented as



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PHYSI	CS					03-04-2025 (MORNING SESSION)				
10.	Со	nsider following sta	tements for refraction	n of li	ght through prism, v	when angle of deviation is minimum.				
	A. <sup>-</sup>	A. The refracted ray inside prism becomes parallel to the base.								
	B. I	B. Larger angle prisms provide smaller angle of minimum deviation.								
	<ul><li>C. Angle of incidence and angle of emergence becomes equal.</li><li>D. There are always two sets of angle of incidence for which deviation will be same except at mir</li></ul>									
	deviation setting.									
	E. Angle of refraction becomes double of prism angle.									
	Choose the correct answer from the options given below:									
	(1)	B, D and E Only	(2) B, C and D On	ly	(3) A, C and D On	ly (4) A, B and E Only				
11.	Αp	erson measures n	nass of 3 different p	articl	es as 435.42g, 226	6.3 g and 0.125 g. According to the				
	rule	es for arithmetic op	erations with significa	ant fig	gures, the addition o	f the masses of 3 particles will be.				
	(1)	661.8 g	(2) 661.84 g		(3) 661.845 g	(4) 662 g				
12.	Ар	article is released f	from height S above	the s	urface of the earth.	At certain height its kinetic energy is				
	thre	e times its potentia	al energy. The height	t from	the surface of the	earth and the speed of the particle at				
	tha	t instant are respec	tively.							
		S 30S	$S_{3\sigma}S$		S 30S	S 30S				
	(1)	$\frac{3}{4}, \sqrt{\frac{323}{2}}$	(2) $\frac{3}{2}, \frac{353}{2}$		(3) $\frac{3}{2}, \sqrt{\frac{323}{2}}$	(4) $\frac{3}{4}, \frac{323}{2}$				
13	The	radiation pressure	e exerted by a 450 V	V liah	at source on a perfe	ctly reflecting surface placed at 2 m				
	awa	av from it is		v ngi						
	(1)	$3\times10^{-8}$ Decede	(2) $1.5 \times 10^{-8}$ Dec		(2) 0	(4) $6 \times 10^{-8}$ Passels				
	(I) Th		(2) 1.3×10 Pas	cais	(3) 0	(4) 0×10 Pascals				
14.	Ine		for a thin convex ler	is are	e TU cm and T5 cm	respectively. The local length of the				
		s is 12 cm. The reli		ens m						
45	(1) Th	1.8	(2) 1.4		(3) 1.5					
15.	I Ne	e work function of a	a metal is 3 ev. The	COIO	of the visible light i	that is required to cause emission of				
	pnc		(0) )/- !!		(2) Оте ст					
40	(1) Ma				(3) Green	(4) Blue				
16.	Ma		LIST-II			1				
	LIS	t-I	<u> </u>							
	Α.	Gravitational constant			$\lfloor LT^{-2} \rfloor$					
	В.	Gravitational pote	ential energy	$\begin{bmatrix} \mathbf{I} & \mathbf{I} \\ \mathbf{I} & \mathbf{I} \end{bmatrix}$						
	C.	Gravitational pote	ential	III.	$\left[ ML^{2}T^{-2} \right]$					
		Acceleration due	to gravity	11/						
	0.		lo gravity	1.	$\left\lfloor M^{-1}L^{3}T^{-2}\right\rfloor$					
	L			1		l				

Choose the correct answer from the options given below:

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

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

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



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## **SECTION-B**

- 21. Three identical spheres of mass m, are placed at the vertices of an equilateral triangle of length a. When released, they interact only through gravitational force and collide after a time T = 4 seconds. If the sides of the triangle are increased to length 2a and also the masses of the spheres are made 2 m, then they will collide after \_\_\_\_\_ seconds.
- 22. In the figure shown below, a resistance of  $150.4\Omega$  is connected in series to an ammeter A of resistance  $240\Omega$ . A shunt resistance of  $10\Omega$  is connected in parallel with the ammeter. The reading of the ammeter is \_\_\_\_\_ mA.



**23.** A loop ABCDA, carrying current I = 12A, is placed in a plane, consists of two semi-circular segments of radius  $R_1 = 6\pi$  m and  $R_2 = 4\pi$  m. The magnitude of the resultant magnetic field at center O is  $h_1 = 10^{-7}$  T. The value of king  $r_1 = 6\pi$  m and  $R_2 = 4\pi$  m.

 $m k imes 10^{-7} \, T$  . The value of k is \_\_\_\_\_ (Given  $\mu_0 = 4\pi imes 10^{-7} \, Tm A^{-1}$  )



- **24.** A 4.0 cm long straight wire carrying a current of 8 A is placed perpendicular to a uniform magnetic field of strength 0.15 T . The magnetic force on the wire is \_\_\_\_\_ mN .
- 25. Two coherent monochromatic light beams of intensities 4 I and 9 I are superimposed. The difference between the maximum and minimum intensities in the resulting interference pattern is xI. The value of x is \_\_\_\_\_.

NTA ANSWERS													
1.	(2)	2.	(4)	3.	(2)	4.	(3)	5.	(1)	6.	(4)	7.	*(4)
8.	(3)	9.	(2)	10.	(3)	11.	(1)	12.	(1)	13.	(4)	14.	(3)
15.	(4)	16.	(4)	17.	(3)	18.	(4)	19.	(1)	20.	(1)	21.	(8)
22.	(125)	23.	(1)	24.	(48)	25.	(24)						

\*Qs. 7 Provisional Answer-(4), Final answer by NTA Bonus

