JEE-MAIN EXAM APRIL, 2024

Date: - 06-04-2024 (SHIFT-1)

PHYSICS

SECTION-A

1. To find the spring constant (k) of a spring experimentally, a student commits 2% positive error in the measurement of time and 1% negative error in measurement of mass. The percentage error in determining value of k is :

(1) 3%   (2) 1%   (3) 4%   (4) 5%

2. A bullet of mass 50 g is fired with a speed 100 m/s on a plywood and emerges with 40 m/s. The percentage loss of kinetic energy is :

(1) 32%   (2) 44%   (3) 16%   (4) 84%

3. The ratio of the shortest wavelength of Balmer series to the shortest wavelength of Lyman series for hydrogen atom is :

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

4. To project a body of mass m from earth's surface to infinity, the required kinetic energy is (assume, the radius of earth is R_E, g = acceleration due to gravity on the surface of earth) :

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

5. Electromagnetic waves travel in a medium with speed of 1.5×10^8 ms^{-1}. The relative permeability of the medium is 2.0. The relative permittivity will be :

(1) 5   (2) 1   (3) 4   (4) 2

6. Which of the following phenomena does not explain by wave nature of light.

(A) reflection   (B) diffraction

(C) photoelectric effect   (D) interference

(E) polarization

Choose the most appropriate answer from the options given below :

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

7. While measuring diameter of wire using screw gauge the following readings were noted. Main scale reading is 1 mm and circular scale reading is equal to 42 divisions. Pitch of screw gauge is 1 mm and it has 100 divisions on circular scale. The diameter of the wire is $\frac{x}{50}$ mm. The value of x is :

(1) 142   (2) 71   (3) 42   (4) 21

---

8. σ is the uniform surface charge density of a thin spherical shell of radius R. The electric field at any point on the surface of the spherical shell is :

    (1) $\sigma/\epsilon_0 R$ (2) $\sigma/2\epsilon_0$ (3) σ/ϵ_0 (4) $\sigma/4\epsilon_0$

9. The value of unknown resistance (x) for which the potential difference between B and D will be zero in the arrangement shown, is :

    (1) 3Ω   (2) 9Ω   (3) 6Ω   (4) 42Ω
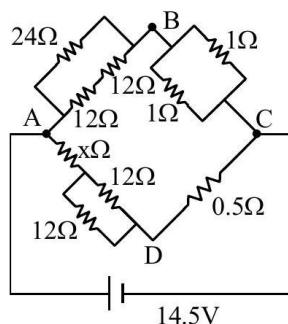
10. The specific heat at constant pressure of a real gas obeying $PV^2 = RT$ equation is :

    (1) $C_V + R$ (2) $\dfrac{R}{3} + C_V$ (3) R (4) $C_V + \dfrac{R}{2V}$

11. Match List I with List II

	LIST I		LIST II
A.	Torque	I.	$[M^1L^1T^{-2}A^{-2}]$
B.	Magnetic field	II.	$[L^2A^1]$
C.	Magnetic moment	III.	$[M^1T^{-2}A^{-1}]$
D.	Permeability of free space	IV.	$[M^1L^2T^{-2}]$

    Choose the correct answer from the options given below :

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

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

12. Given below are two statements :

    Statement I : In an LCR series circuit, current is maximum at resonance.

    Statement II : Current in a purely resistive circuit can never be less than that in a series LCR circuit when connected to same voltage source.

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

    (1) Statement I is true but Statement II is false

    (2) Statement I is false but Statement II is true

    (3) Both Statement I and Statement II are true

    (4) Both Statement I and Statement II are false

13. The correct truth table for the following logic circuit is :
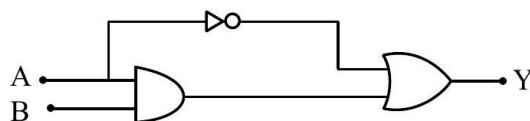
Options :

(1)

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1

(2)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	1

(3)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

14. A sample contains mixture of helium and oxygen gas. The ratio of root mean square speed of helium and oxygen in the sample, is :

(1) $\dfrac{1}{32}$
(2) $\dfrac{2\sqrt{2}}{1}$
(3) $\dfrac{1}{4}$
(4) $\dfrac{1}{2\sqrt{2}}$

15. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (where $m_2 > m_1$). If the acceleration of the system is $\dfrac{g}{\sqrt{2}}$, then the ratio of the masses $\dfrac{m_1}{m_2}$ is :

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

16. Four particles A, B, C, D of mass $\dfrac{m}{2}$, m, 2m, 4m, have same momentum, respectively. The particle with maximum kinetic energy is :

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

17. A train starting from rest first accelerates uniformly up to a speed of 80 km/h for time t, then it moves with a constant speed for time 3t. The average speed of the train for this duration of journey will be (in km/h) :

(1) 80
(2) 70
(3) 30
(4) 40

18. An element $\Delta l = \Delta x i$ is placed at the origin and carries a large current I = 10 A. The magnetic field on the y-axis at a distance of 0.5 m from the elements Δx of 1 cm length is :
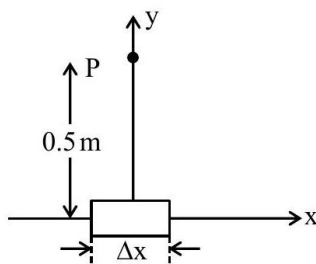

(1) $4\times10^{-8}T$
(2) $8\times10^{-8}T$
(3) $12\times10^{-8}T$
(4) $10\times10^{-8}T$

19. A small ball of mass m and density ρ is dropped in a viscous liquid of density ρ_0. After sometime, the ball falls with constant velocity. The viscous force on the ball is :

(1) $mg\left(\dfrac{\rho_0}{\rho}-1\right)$ 　　(2) $mg\left(1+\dfrac{\rho}{\rho_0}\right)$ 　　(3) $mg\left(1-\rho\rho_0\right)$ 　　(4) $mg\left(1-\dfrac{\rho_0}{\rho}\right)$

20. In photoelectric experiment energy of 2.48 eV irradiates a photo sensitive material. The stopping potential was measured to be 0.5 V. Work function of the photo sensitive material is :

(1) 0.5 eV 　　(2) 1.68eV 　　(3) 2.48 eV 　　(4) 1.98 eV

SECTION-B

21. If the radius of earth is reduced to three-fourth of its present value without change in its mass then value of duration of the day of earth will be hours 30 minutes.

22. Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is $\dfrac{X\sigma}{\epsilon_0}$. The value of x is (all quantities are measured in SI units).
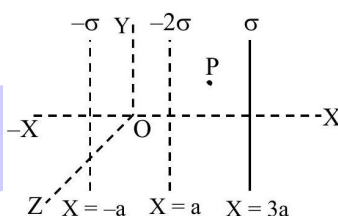
23. A big drop is formed by coalescing 1000 small droplets of water. The ratio of surface energy of 1000 droplets to that of energy of big drop is $\dfrac{10}{x}$. The value of x is

24. When a dc voltage of 100 V is applied to an inductor, a dc current of 5A flows through it. When an ac voltage of 200 V peak value is connected to inductor, its inductive reactance is found to be $20\sqrt{3}\,\Omega$. The power dissipated in the circuit is W.

25. The refractive index of prism is $\mu=\sqrt{3}$ and the ratio of the angle of minimum deviation to the angle of prism is one. The value of angle of prism is

26. A wire of resistance R and radius r is stretched till its radius became r/2. If new resistance of the stretched wire is x, then value of x is

27. Radius of a certain orbit of hydrogen atom is 8.48Å. If energy of electron in this orbit is E/x, then x = (Given a_0 = 0.529Å, E = energy of electron in ground state)

28. A circular coil having 200 turns, 2.5×10^{-4} m^2 area and carrying 100 μA current is placed in a uniform magnetic field of 1T. Initially the magnetic dipole moment $(\vec{M})$ was directed along $\vec{B}$. Amount of work, required to rotate the coil through 90º from its initial orientation such that $\vec{M}$ becomes perpendicular to $\vec{B}$, is μJ.

29. A particle is doing simple harmonic motion of amplitude 0.06 m and time period 3.14 s. The maximum velocity of the particle is cm/s.

30. For three vectors $\vec{A}=(-x\hat{i}-6\hat{j}-2\hat{k}), \vec{B}=(-\hat{i}+4\hat{j}+3\hat{k})$ and $\vec{c}=(-8\hat{i}-\hat{j}+3\hat{k})$. if $\vec{A}\cdot(\vec{B}\times\vec{C})=0$, them value of x is.

OFFICE ADDRESS : Plot number 35, Gopalpura Bypass Rd, near Riddhi Siddhi Circle, 10 B Scheme, Triveni Nagar, Gopal Pura Mode, Jaipur, Rajasthan 302020
www.competishun.com
Mob. 8888-0000-21, 7410900901
-4

NTA ANSWERS

1.	(4)	**2.**	(4)	**3.**	(1)	**4.**	(2)	**5.**	(4)	**6.**	(2)	**7.**	(2)
8.	(3)	**9.**	(3)	**10.**	(4)	**11.**	(2)	**12.**	(3)	**13.**	(2)	**14.**	(2)
15.	(1)	**16.**	(3)	**17.**	(2)	**18.**	(1)	**19.**	(4)	**20.**	(4)	**21.**	(13)
22.	(2)	**23.**	(1)	**24.**	(250)	**25.**	(60)	**26.**	(16)	**27.**	(16)	**28.**	(5)
29.	(12)	**30.**	(4)										