

SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

PHYSICS

NEET-UG - Physics

Maximum Marks: 180

Time Allowed: 1 hour General Instructions:

- For each correct response, the candidate will get 4 marks.
- For each incorrect response, one mark will be deducted from the total scores.

PHYSICS (Section-A)

- 1. The mass of a box measured by a grocer's balance is 2.4 kg. Two gold pieces of masses 20.16 g and 20.18 g are **[4]** added to the box. What is
 - i. the total mass of the box and
 - ii. the difference in the masses of the pieces to correct significant figures?
 - a) 2.4 kg, 0.02 g
 - c) 2.4 kg, 0 g
- 2. The potential energy of a particle varies with distance x as, $U = \frac{Ax^{1/2}}{x^2 + B}$, where A and B are constants. The [4] dimensional formula for A × B is

b) M¹L^{9/2}

d) $M^{1}L^{7/2}T^{-1}$

b) 2.44 kg, 0 g

d) 2.4 kg, 0.02 g

- a) $M^{1}L^{11/2}T^{-2}$
- c) $M^{1}L^{5/2}T^{-2}$
- 3. Choose the incorrect statement from the following for motion with uniform velocity.
 - a) Magnitude of displacement < distance b) The motion is always in the same direction. covered.
 - c) Average velocity is equal to thed) The motion is along a straight line path.instantaneous velocity.
- Two projectiles are fired from the same point with the same speed at angles of projection 60° and 30°
 respectively. Which one of the following is true?
 - a) Their velocity at the highest point will beb) Their range will be the same.
 - c) Their maximum height will be the same. d) Their time of flight will be the same.
- 5. A river is flowing from west to east with a speed 5 m/s. A swimmer can swim in still water at a speed of 10 m/s. [4]If he wants to start from point A on south bank and reach opposite point B on north bank, in what direction

[4]

should he swim?

- $B = 5 \text{ m s}^{-1}$
 - a) 30° east of north

b) 60° east of north

d) 60° west of north

- c) 30° west of north
- A roller is made by joining together two cones at their vertices O. It is kept on two rails AB and CD which are placed asymmetrically (see figure), with its axis perpendicular to CD and its center O at the center of line joining AB and CD (see figure). It is given a light push so that it starts rolling with its' center O moving parallel to CD in the direction shown. As it moves, the roller will tend to:

a) turn left and right alternately

- c) go straight
- 7. It is found that if a neutron suffers an elastic collinear collision with deuterium at rest, fractional loss of its energy is p_d ; while for its similar collision with carbon nucleus at rest, fractional loss of energy is P_c . The values of P_d and P_c are respectively:
 - a) (0, 0)

c) (·28, ·89)

b) (0, 1)d) (.89, .28)

b) turn left

d) turn right

8. Two inclined frictionless tracks, one gradual and the other steep, meet at A from where two stones are allowed to **[4]** slide own from rest, one on each track as shown in figure. Which of the following statements is correct?



- a) Both the stones reach the bottom with the same speed and stone I reaches the bottom earlier than stone II
- c) Both the stones reach the bottom with the same speed and stone II reaches the bottom earlier than stone I
- b) Both the stones reach the bottom at the same time and speed
- d) Both the stones, reach the bottom at the same time but not with the same speed
- 9. A particle of mass m = 5 units is moving with a uniform speed $v = 3\sqrt{2}m$ in the XOY plane along the line Y = **[4]** X + 4. The magnitude of the angular momentum of the particle about the origin is:
 - a) 60 unit b) zero
 - c) 7.5 unit d) $40\sqrt{2}unit$
- 10. A body of mass M while falling vertically downwards under gravity breaks into two parts, a body B of mass $\frac{1}{3M}$ [4] and body C of mass $\frac{2}{3M}$. The centre of mass of bodies B and C taken together shifts compared to that of body A towards:

	a) Body C	b) Body B	
	c) does not shift	d) depends on the height of the braking	
11.	Two point objects of masses 1.5 g and 2.5 g respective	ely are at a distance of 16 cm apart, the centre of gravity is	[4]
	at a distance x from the object of mass 1.5 g where x is:		
	a) 13 cm	b) 10 cm	
	c) 6 cm	d) 3 cm	
12.	The elastic limit of brass is 379 MPa. What should be 400 N load without exceeding its elastic limit?	the minimum diameter of a brass rod, if it is to support a	[4]
	a) 1.16 mm	b) 1.36 mm	
	c) 0.90 mm	d) 1.00 mm	
13.	If the temperature difference on the two sides of a wa	ll increases from 100°C to 200°C, its thermal conductivity:	[4]
	a) is halved	b) is doubled	
	c) remains unchanged	d) becomes four times	
14.	Water is enclosed in the glass tube ABCD and is warr	ned at A with a burner as shown in the figure. Which one	[4]
	of the following is correct? The water:		
	a) circulates in a clockwise direction.	b) circulates in both directions simultaneously.	
	c) does not circulate at all.	d) circulates in anticlockwise direction.	
15.	An electric heater supplies heat to a system at a rate or rate of increase in internal energy is:	f 120 W. If system performs work at a rate of 90 Js ⁻¹ , the	[4]
	a) _{60 Js} -1	b) _{30 Js} -1	
	c) 90 Js ⁻¹	d) ₂₁₀ Js ⁻¹	
16.	A 15 g mass of nitrogen gas is enclosed in a vessel at a temperature 27°C. Amount of heat transferred to the gas, so that rms velocity of molecules is doubled is about (Take, R = 8.3 J/K-mol)		[4]
	a) 6 kJ	b) 10 kJ	
	c) 0.9 kJ	d) 14 kJ	
17.	Two oscillations:		[4]
	$x_1 = A \sin \omega t$		
	and x_2 - A cos ωt .		
	Superimpose at right angles in x and y-axis respectively. What will be the resultant wave form?		
	a) Straight line	b) Sinusoidal	

c) Circle

d) Ellipse

- 18. The velocity of waves in a string fixed at both ends is 2 m/s. The string forms standing waves with nodes 5.0 cm [4] apart. The frequency of vibration of the string (in Hz) is:
 - a) 20 b) 10
 - c) 40 d) 30
- 19. Whenever stationary waves are set up, in any medium, then
 - a) No strain is experienced at the antinodes b) Condensations occur at nodes
 - c) Refractions occur at antinodes d) Maximum strain is experienced at the

antinodes

20. The electric field strength due to a ring of radius R at a distance x from its centre on the axis of the ring carrying [4] charge Q is given by:

$$\mathbf{E} = \frac{1}{4\pi\varepsilon_0} \frac{Qx}{\left(R^2 + x^2\right)^{3/2}}$$

At what distance from the centre, will the electric field be maximum?

- a) x = $\sqrt{2}R$
- c) x = $\frac{R}{2}$
- An electron microscope is used to probe the atomic arrangements to a resolution of 5Å. What should be the electric potential to which the electrons need to be accelerated?

d) x = R

b) 5 kV

d) 5.76 V

- a) 2.5 kV
- c) 2.5 V

22. The charge flowing through a resistance R varies with time according to $Q = at - bt^2$. Then the current: [4]

- a) reaches a maximum and then becomes zero b) changes at the rate $\frac{b}{a}$
 - d) decreases linearly with time
- 23. A Helmholtz coil has pair of loops, each with N turns and radius R. They are placed coaxially at distance R and [4] the same current I flows through the loops in the same direction. The magnitude of magnetic field at P, midway between the centres A and C, is given by (Refer to figure):



c) falls to zero after time $t = \frac{2b}{a}$

- b) $\frac{4N\mu_0 I}{5^{1/2}R}$ d) $\frac{8N\mu_0 I}{5^{3/2}R}$
- 24. The magnetic susceptibility is negative for:

a) paramagnetic and ferromagnetic materials	b) ferromagnetic material only
c) paramagnetic material only	d) diamagnetic material only

25. The ratio of voltage sensitivity (V_s) and current sensitivity (I_s) of a moving coil galvanometer is:

a)
$$\frac{1}{G}$$

b) G²

[4]

[4]

[4]

c)
$$\frac{1}{G^2}$$
 d) G

26. What is the charge induced in coil of 100 turns of resistance 100 Ω , if magnetic flux changes from 2 Tm² to - 2 [4] Tm²?

a) 0.4 C	b) 2 C
c) 2.8 C	d) 4 C

27. A 100 turns coil of area of cross-section 200 cm² having 2 Ω resistance is held perpendicular to a magnetic field [4] of 0.1 T. If it is removed from the magnetic field in one second, the induced charge produced in it is:

c) 0.2 C d) 0.1 C

28. An alternating voltage is given by:

 $e = e_1 \sin \omega t + e_2 \cos \omega t$ Then the root mean square value of voltage is given by:

a)
$$\frac{\sqrt{e_1^2 + e_2^2}}{2}$$

b) $\sqrt{e_1 e_2}$
c) $\sqrt{e_1^2 + e_2^2}$
d) $\sqrt{\frac{e_1 e_2}{2}}$

29. The sun delivers 10^4 W/m^2 of electromagnetic flux to the earth's surface. The total power that is incident on a **[4]** roof of dimensions (10×10) m² will be:

b) 10⁴ W

d) 10⁵ X

a) 10⁷ W

c) 10⁶ W

30. A diver in a swimming pool wants to signal his distress to a person lying on the edge of the pool by flashing his **[4]** waterproof flashlight:

- a) he must direct the beam vertically upwards
- c) he has to direct the beam at an angle to the vertical which is slightly more than the critical angle of incidence for total internal reflection

b) he has to direct the beam horizontally

d) he has to direct the beam at an angle to the vertical which is slightly less than the critical angle of incidence for total internal reflection

31. Four light sources produce the following four waves:

i.
$$y_1 = a \sin(\omega t + \phi_1)$$

ii. $y_2 = a \sin 2\omega t$
iii. $y_3 = a' \sin(\omega t + \phi_2)$

iv.
$$y_4 = a' \sin(3\omega t + \phi)$$

Superposition of which two waves give rise to interference?

- a) (i) and (ii)
 b) (iii) and (iv)

 c) (i) and (iii)
 d) (ii) and (iii)
- 32. A particle is moving 5 times as fast as an electron. The ratio of the de-Broglie wavelength of the particle to that [4] of the electron is 1.878×10^{-4} . The mass of the particle is close to:

a)
$$1.2 \times 10^{-28}$$
 kg b) 9.7×10^{-28} kg

[4]

[4]

	c) 9.1 \times 10 ⁻³¹ kg	d) 4.8×10^{-27} kg	
33.	The energy of a photon corresponding to the visible li	ght of maximum wavelength is approximately:	[4]
	a) 7 eV	b) 1 eV	
	c) 1.6 eV	d) 3.2 eV	
34.	A set of atoms in an excited state decay:		[4]
	a) to emit photons only when they collide	b) into a lower state only when excited by an external electric field	
	c) all together simultaneously into a lower state	d) in general, to any of the states with lower energy	
35.	The deuteron is bound by nuclear forces just as H-ato we consider the force between neutron and proton in a with an effective charge e', $F = \frac{1}{4\pi\varepsilon_0} \frac{e^2}{r}$. Estimate the is 2.2 MeV.	m is made up of p and e bound by electrostatic forces. If deuteron as given in the form of a Coulomb potential but e value of $\left(\frac{e'}{e}\right)$ given that the binding energy of a deuteron	[4]
	a) 3.64	b) 9.24	
	a) 7.62	d) 1.89	
	C) 7.02 PHYSIC	S (Section-B)	
	Attempt an	y 10 questions	
36.	A particle of mass m is moving in a horizontal circle	of K radius r under a centripetal force equal to $-\frac{K}{r^2}$, where	[4]
	K is a constant. The total energy of the particle is:		
	a) $-\frac{K}{r^2}$	b) $\frac{K}{2r}$	
	c) $-\frac{K}{2r}$	d) $-\frac{K}{2r^2}$	
37.	A particle is rotating along a circular path in the X-Y	plane. The angular momentum vector of the particle will	[4]
	be directed parallel to:	Y	
	a) x-axis	b) y-axis	
	c) z-axis	d) X and Y axis	
38.	The escape velocity from the Earth's surface is V. The	e escape velocity from the surface of another planet having	[4]
	a radius, four times that of Earth and same mass densiti	ity is:	
	a) 2 V	b) 4 V	
	c) V	d) 3 V	
39.	Pure substance would freeze or solidify at its:		[4]
	a) Freezing point	b) Sublimation point	
	c) Boiling point	d) Melting point	
40.	Which of the following properties of a wave does not	change with a change in the medium?	[4]
	a) Wavelength	b) Amplitude	
	c) Velocity	d) Frequency	
41.	When a tuning fork vibrates, the waves produced in the	ne fork are:	[4]

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	a) longitudinal	b) stationary	
	c) transverse	d) progressive	
42.	An electron accelerated by a potential difference V, or it experiences a magnetic force F. If the accelerating	enters a region of the uniform transverse magnetic field and potential is tripled, the force will be:	[4]
	a) $\sqrt{3}$ F	b) $\frac{F}{3}$	
	c) 3F	d) F	
43.	Relative permeability of iron is 5500, then its magnetic susceptibility will be:		[4]
	a) 5501	b) 5500×10^7	
	c) 5499	d) 5500×10^{-7}	
44.	A rectangular, a square, a circular and an elliptical lo magnetic field with a constant velocity, $\vec{V} = v\hat{i}$. Th direction. The induced emf, during the passage of th for:	pop, all in the X and Y-plane, are moving out of a uniform e magnetic field is directed along the negative z-axis ese loops, out of the field region, will not remain constant	[4]
	a) the rectangular, circular and elliptical loops	b) only the elliptical loop	
	c) any of the four loops	d) the circular and the elliptical loops	
45.	The instantaneous current in a circuit is, $I=\sqrt{2}\sin^2 t$	$\ln(\omega t + \phi)$ ampere. The rms value of current (in ampere) is:	[4]
	a) $\frac{1}{\sqrt{2}}$	b) 2	
	c) 1	d) $\sqrt{2}$	
46.	To increase the angular magnification of a simple m	icroscope, one should increase:	[4]
	a) the object size	b) the focal length of the lens	
	c) the power of the lens	d) the aperture of the lens	
47.	If the tube length of astronomical telescope is 105 cr the focal length of the objective:	m and magnifying power is 20 for normal setting, calculate	[4]
	a) 25 cm	b) 100 cm	
	c) 10 cm	d) 20 cm	
48.	A photon of wavelength 6630 A is incident on a tota photon is equal to:	lly reflecting surface. The momentum delivered by the	[4]
	a) 10 ⁻²² kg-m/s	b) 6.63×10^{-27} kg-m/s	
	c) 10 ⁻²⁷ kg-m/s	d) $_{2 \times 10^{-27}}$ kg-m/s	
49.	An electron in an atom jumping from 3 rd orbit to 2 nd	1 orbit emits radiation of wavelength λ_{1}) and when it jumps	[4]
	a media at a		

from 2^{nd} orbit to 1^{st} orbit emits radiation of wavelength λ_2 . The wavelength of radiation emitted when it jumps from 3^{rd} orbit to 1^{st} orbit is:

a)
$$\frac{\lambda_1 + \lambda_2}{2}$$

b) $\frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$
c) $\lambda_1 + \lambda_2$
d) $\sqrt{\lambda_1 \lambda_2}$

50. The phenomenon of nuclear fission can be carried out both in a controlled and in an uncontrolled way. Out of the **[4]**

following, the incorrect statement is:

- i. The energy released per fission as well as the energy released per unit mass of the fuel in nuclear fission, both greater than the corresponding quantities for nuclear fusion.
- ii. The control rods in a nuclear reactor must be made of a material that absorbs neutrons effectively.
- iii. It is the surface to volume ratio of the sample of nuclear field used which determines whether or not the reaction would sustain itself as a chain reaction.
- iv. The fission energy released per reaction is much more than conventional nuclear reaction and one of the products of the reaction is the very particle that initiates the reaction.
 - a) Option (iii)

c) Option (iv)

b) Option (i)

d) Option (ii)