

SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

PHYSICS

MHT - CET - Physics

Time Allowed: 1 hour **Maximum Marks: 50**

The diameter of a flywheel is 1.2 m and it makes 900 revolutions per minute. Calculate the acceleration at a 1. [1] point on its rim

a) $270 \pi^2 \text{ m/s}^2$

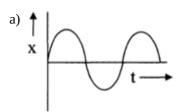
b) $360 \, \pi^2 \, \text{m/s}$

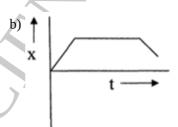
c) $540 \pi^2 \text{ m/s}^2$

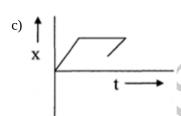
d) 540 m/s^2

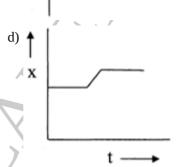
2. Which of the following position-time graph does NOT exist in nature?











A ball of mass 250 g moving with 20 m/s strikes a vertical wall and rebounds along the same line with a velocity [1] 3. of 15 m/s. If the time of contact is 0.1 s, the force exerted by the wall on the ball is

a) -87.5 N

b) -12.5 N

c) 87.5 N

d) 12.5 N

A man weighing 60 kg is in a lift moving down with an acceleration of 1.8 ms⁻². The force exerted by the floor 4. on him is

[1]

a) 480 N

b) Zero

c) 696 N

d) 588 N

5. If the density of the earth is tripled keeping its radius constant, then acceleration due to gravity will be (g = 9.8)[1] m/s^2)

a) 4.9 m/s^2

b) 2.45 m/s^2

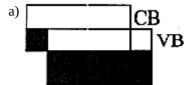
c) 9.8 m/s^2

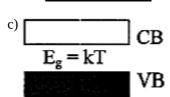
d) 29.4 m/s^2

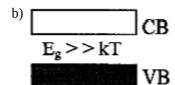
6. The value of gravitational acceleration at a height equal to radius of earth, is [1]

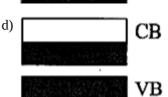
	a) 75% of value at earth's surface	b) 25% of value at earth's surface	
	c) 50% of value at earth's surface	d) same as value at earth's surface	
7.	Select the WRONG statement.		[1]
	i. Boyle's law states that at constant temperature, the volume of given mass of gas is inversely proportional to its pressure.		
	ii. Charles' law states that at constant pressure, volun absolute temperature.	ne of a given mass of gas is directly proportional to its	
	iii. The value of R is same for all gases.		
	iv. Boyle's law states that at constant temperature, the volume of a gas is directly proportional to its pressure.		
	a) Option (i)	b) Option (iv)	
	c) Option (iii)	d) Option (ii)	
8.	Expansion during heating	, ()	[1]
	a) decreases weight.	b) decreases density.	
	c) increases weight.	d) decreases density and weight.	
9.	Two aeroplanes A and B, each moving with a speed of	f 720 km/hour, are moving directly away from each other.	[1]
		he apparent frequency heard by a person in plane B will be	
	(velocity of sound in air = 340 m/s)		
	a) 300 Hz	b) 260 Hz	
	c) 200 Hz	d) 280 Hz	
10.	Which of the following is the example of transverse w	rave?	[1]
	a) Sound waves	b) Compressional waves in a spring	
	c) Vibration of string	d) Pulse wave	
11.	Light appears to travel in straight lines since	Y	[1]
	a) its velocity is very large.	b) its wavelength is very small.	
	c) it is not absorbed by the atmosphere.	d) it is reflected by the atmosphere.	
12.	If two plane mirrors are parallel to each other, the obje	ect lying between them will have (n) number of images	[1]
	given by		
	a) n = 1	b) $n = 0$	
	c) n = 3	d) $n = \infty$	
13.	Three point charges of $+2q$, $+2q$ and $-4q$ are placed at the comers A, B and C of an equilateral triangle ABC of side 'x'. The magnitude of the electric dipole moment of this system is		[1]
	a) $3\sqrt{2}$ qx	b) 2qx	
	c) $2\sqrt{3}$ qx	d) 3qx	
14.	Two positive point charges are 3 m apart and their cor. N, then the charges are	nbined charge is 20 μ C. If the force between them is 0.075	[1]
	a) 12 μ C, 8 μ C	b) 15 μ C, 5 μ C	

15. Which one of the energy band diagrams shown in the figure corresponds to that of semiconductor?









16. A particle with charge Q coulomb, tied at the end of an inextensible string of length R metre, revolves in a vertical plane. At the centre of the circular trajectory, there is a fixed charge of magnitude Q coulomb. The mass of the moving charge M is such that $Mg = \frac{Q^2}{4\pi\varepsilon_0 R^2}$. If at the highest position of the particle, the tension of the string just vanishes, the horizontal velocity at the lowest point has to be

a) $\sqrt{5gR}$

b) $2\sqrt{gR}$

c) 0

 $\sqrt{2gR}$

17. A wheel is 0.25 m in radius. When it makes 15 revolutions per minute, its linear speed at a point on circumference is

a) $\frac{\pi}{2}$ m/s

b) π m/s

c) $\frac{\pi}{8}$ m/s

d) $\frac{\pi}{4}$ m/s

18. Two solid cylinders P and Q of same mass and same radius start rolling down a fixed inclined plane from the same height at the same time. Cylinder P has most of the mass concentrated near its surface, while Q has most of its mass concentrated near the axis. Which statement (s) is/(are) correct?

- a. Both cylinders P and Q reach the ground at the same time.
- b. Cylinder P has larger linear acceleration than cylinder Q.
- c. Both cylinders P and Q reach the ground with same translational kinetic energy.
- d. Cylinder Q reaches the ground with larger angular speed.
 - a) Option (c)

b) Option (d)

c) Option (a)

d) Option (b)

19. The angle of banking of the road does not depend upon

[1]

[1]

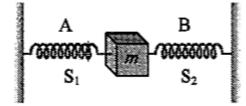
[1]

- a) radius of curvature of the road.
- b) speed of the vehicle.

c) mass of the vehicle.

d) acceleration due to gravity.

20. In the figure, S_1 and S_2 are identical springs. The oscillation frequency of the mass m is f. If one spring is removed, the frequency will become



	c) $\sqrt{2}$ f	d) $\frac{f}{\sqrt{2}}$	
21.	If a body of mass 0.98 kg is made to oscillate on a spr	ing of force constant 4.84 N/m, the angular frequency of	[1]
	the body is		
	a) 4.22 rad/s	b) 1.22 rad/s	
	c) 3.22 rad/s	d) 2.22 rad/s	
22.	A pendulum is hung from the roof of a sufficiently hig	gh building and is moving freely to and fro like a simple	[1]
	harmonic oscillator. The acceleration of the bob of the position. The time period of oscillation is	e pendulum is 20 m/s ² at a distance of 5 m from the mean	
	a) 2 s	b) π s	
	c) 2π s	d) 1 s	
23.	The r.m.s. current in an A.C. circuit is 2 A. If the watt	less current be $\sqrt{3}$ A, what is the power factor?	[1]
	a) $\frac{1}{2}$	b) $\frac{1}{\sqrt{2}}$	
	c) $\frac{1}{3}$	d) $\frac{1}{\sqrt{3}}$	
24.	In streamline flow velocity of liquid at the bottom lay	er is	[1]
	a) maximum	b) mean of velocities of all layers	
	c) zero	d) infinity	
25.	The device used to measure the rate of flow of incomp	pressible fluid in steady state is	[1]
	a) venturimeter	b) speedometer	
	c) calorimeter	d) thermometer	
26.	A uniform string of length 20 m is suspended from a n	rigid support. A short wave pulse is introduced at its lowest	[1]
	end. It starts moving up the string. The time taken to r	reach the support is (take $g = 10 \text{ ms}^{-2}$)	
	a) $2\sqrt{2}$ s	b) $\sqrt{2}$ s	
	a) $2\sqrt{2}$ s c) $2\pi\sqrt{2}$ s	d) 2 s	
27.	When a longitudinal wave is incident on a rigid wall,		[1]
	a. compression is reflected as rarefaction with phase	change of 0°.	
	b. compression is reflected as rarefaction with phase	<u> </u>	
	c. compression is reflected as compression with no pd. compression is reflected as compression with phase		
	a) Option (c)	b) Option (a)	
	c) Option (b)	d) Option (d)	
28.	The correct equation out of the following is	f blook body)	[1]
	(R = emissive power of body, R_B = emissive power of blackbody)		
	a) $\frac{\mathrm{R}}{\mathrm{R_b}}=\mathrm{a}$	b) $\frac{R_b}{R} = a$	
	c) R \times R _b = $\frac{1}{a}$	d) $R \times R_b = a$	

b) 2f

a) f

29.			[1]
	hydrogen and oxygen molecules is		
	a) 1:4	b) 1:1	
	c) 1:16	d) 1:5	
30.	Two thermometers A and B are exposed in sunlight.	The valve of A is painted black but B is not painted. The	[1]
	correct statement regarding this case is		
	A. Temperature of A will rise faster than B but the	final temperature will be the same in both.	
	B. Both A and B show equal rise in beginning.		
	C. Temperature of A will remain more than B.		
	D. Temperature of B will rise faster.		
	a) Option (D)	b) Option (C)	
	c) Option (B)	d) Option (A)	
31.	An electric dipole has the magnitude of charge q and	d dipole moment p. It is placed in a uniform electric field. If	[1]
	its dipole moment is along the direction of the field	then the force on it and its potential energy are respectively	
	a) qE and maximum.	b) zero and minimum.	
	c) qE and minimum.	d) 2 qE and minimum.	
32.		R and 2R carry charges Q and 2Q respectively. When both	[1]
	the shells are connected by a conducting wire, the cl	nange in potentials on the outer shell is $\left(\mathrm{k}=rac{1}{4\piarepsilon_0} ight)$	
	a) zero	b) $\frac{2kQ}{R}$	
	c) $\frac{3kQ}{R}$	d) $\frac{kQ}{R}$	
33.	Small drops of the same size are charged to V volt e	ach. If n drops coalesce to form a single large drop, its	[1]
	potential will be		
	a) $\frac{V}{n}$	b) Vn	
	c) $Vn^{\frac{2}{3}}$	d) $Vn^{\frac{1}{3}}$	
34.	Two identical light sources s ₁ and s ₂ emit light of sa	ame wavelength $\lambda.$ These light rays will exhibit interference	[1]
	if their		
	a) phase differences remain constant.	b) light intensities change randomly.	
	c) phases are distributed randomly.	d) light intensities remain constant.	
35.	A ray of light strikes a glass slab of thickness t. It en	nerges on the opposite face, parallel to the incident ray but	[1]
	laterally displaced. The lateral displacement, $\Delta\boldsymbol{x}$ is		
	a) $\Delta x = \frac{t \sin i}{\cos r}$	b) $\Delta_{\rm X} = \frac{{ m t sin(i-r)}}{{ m cos r}}$	
	c) $\Delta x = 0$	d) $\Delta x = t \sin(i - r) \cos r$	
36.	Unpolarised light consists of electric field vectors in	·	[1]
	a) perpendicular to plane of paper	b) plane of paper	
	c) all possible planes	d) any one plane	
37.	A uniform wire of 16 Ω is made into the form of a s	quare. Two opposite corners of the square are connected by	[1]

a wire of resistance 16 Ω . The effective resistance between the other two opposite corners is

a) 32 Ω

b) 4 Ω

c) 20Ω

 Ω 8 (b

38. A galvanometer coil has a resistance of 50 Ω and the meter shows full scale deflection for a current of 5 mA. [1] This galvanometer is converted into voltmeter of range 0-20 V by connecting

- a) 3950 Ω in series with galvanometer.
- b) 4050 Ω in series with galvanometer.
- c) 3950 Ω in parallel with galvanometer.
- d) 4050 Ω in parallel with galvanometer.

39. A long straight wire carrying current 16 A is bent at 90° such that half of the wire lies along the positive x-axis and other half lies along the positive y-axis. What is the magnitude of magnetic field at the point $\vec{r} = (-2\hat{i} + 0\hat{j})$ mm? (Assume $\frac{\mu_0}{4\pi} = 10^{-7}$ Hm⁻¹)

a) 1.6 mT

b) 0.8 mT

c) 1.2 mT

d) 3.2 mT

40. The value of magnetic induction will be minimum at a point due to a small current carrying conductor when angle between element and line joining point and centre of element is

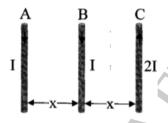
a) 0°

b) 180°

c) both 180° and 0°

d) 90°

41. A, B and C are parallel conductors of equal length carrying currents I, I and 2I respectively. Distance between A and B is x. Distance between B and C is also x. F₁ is the force exerted by B on A and F₂ is the force exerted by C on A. Choose the correct answer.



a) $F_1 = -F_2$

b) $F_1 = 2F_2$

c) $F_2 = 2F_1$

d) $F_1 = F_2$

42. A permanent magnet can be made from which one of the following substances?

[1]

[1]

a) Paramagnetic

b) Soft iron

c) Ferromagnetic

d) Diamagnetic

43. A long solenoid of radius R carries a time (t) - dependent current $I(t) = I_0 t (1 - t)$. A ring of radius 2R is placed coaxially near its middle. During the time interval $0 \le t \le 1$, the induced current (I_R) and the induced EMF (V_R) in the ring change as:

- a) Direction of I_R remains unchanged and V_R is zero at $t=0.25\,$
- b) At t = 0.5 direction of I_R reverses and V_R is zero
- c) Direction of I_R remains unchanged and V_R is maximum at t=0.5
- d) At t = 0.25 direction of I_R reverses and V_R is maximum.

44. The basic requirement for the operation of a transformer is that its input voltage must be

	a) amplified	b) alternating	
	c) rectified	d) pulsating D.C. voltage	
45.	Photons are not deflected in electric and magnetic fiel	d as they are	[1]
	a) electrically neutral	b) negatively charged	
	c) positively charged	d) affected by gravitational field	
46.	If by successive disintegration of $92U^{238}$, the final pro	oduct obtained is $_{82}\mathrm{Pb}^{206}$, then how many number of α and	[1]
	eta particles are emitted?		
	a) 12 and 6	b) 6 and 8	
	c) 8 and 12	d) 8 and 6	
47.	Which pair is isotonic?		[1]
	a) ${}_{6}\mathrm{C}^{14},{}_{7}\mathrm{N}^{14}$	b) ₇ N ¹³ , ₆ C ¹²	
	c) ₆ C ¹⁴ , ₆ C ¹²	d) $_{7}$ N 13 , $_{7}$ N 14	
48.	The radius of hydrogen atom, in its ground state, is of	the order of	[1]
	a) 10 ⁻⁸ cm	b) 10 ⁻⁵ cm	
	c) ₁₀ -4 cm	d) ₁₀ -6 cm	
49.	The current gain of a transistor in common-emitter co	nfiguration is 80. If the emitter current be 8.1 mA, then	[1]
	what is the collector current?		
	a) 8.1 mA	b) 1.0 mA	
	c) 8.0 mA	d) 0.1 mA	
50.	A reversible engine absorbs 746 J heat energy from so		[1]
	difference between source and sink is 100 K, then the	efficiency of engine will be approximately	
	a) 40%	b) 36%	
	V '		