SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

PHYSICS

MHT - CET - Physics

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

1. In a projectile motion, the velocity vector of the projectile is **[1]**

   a) perpendicular to acceleration two times during its flight.

   b) never perpendicular to acceleration.

   c) perpendicular to acceleration only once during its flight.

   d) always perpendicular to the acceleration.

2. Neglecting the air resistance, the time of flight of a projectile is determined by **[1]**

   a) $u_{horizontal}$

   b) $u = u\left(u^2_{vertical} + u^2_{horizontal}\right)^{\frac{1}{2}}$

   c) $u_{vertical}$

   d) $u = u^2_{vertical} + u^2_{horizontal}$

3. Centre of mass of 3 particles 10 kg, 20 kg and 30 kg is at (0, 0, 0). Where should a particle of mass 40 kg be placed so that the combination centre of mass will be at (3, 3, 3) **[1]**

   a) (7.5, 7.5, 7.5)

   b) (1, 2, 3)

   c) (4, 4, 4)

   d) (0, 0, 0)

4. A particle of mass m moving in the x direction with speed 2v is hit by another particle of mass 2m moving in the y direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to **[1]**

   a) 62%

   b) 44%

   c) 56%

   d) 50%

5. Energy required to move a body of mass m from an orbit of radius 2R to 3R is **[1]**

   a) $\frac{GMm}{6R}$

   b) $\frac{GMm}{12R^2}$

   c) $\frac{GMm}{8R}$

   d) $\frac{GMm}{3R^2}$

6. Assume that the earth moves around the sun in a circular orbit of radius R and there exists a planet which also moves around the sun in circular orbit with an angular speed twice as large as that of the earth. The radius of the orbit of the planet is **[1]**

   a) $\frac{R}{\sqrt{2}}$

   b) $(2)^{\frac{-1}{3}}$ R

   c) $(2)^{\frac{-2}{3}}$ R

   d) $(2)^{\frac{2}{3}}$ R

7. The coefficient of cubical expansion of a solid is the increase in volume per unit original volume at 0 °C per **[1]**

   a) unit volume.

   b) square metre.

   c) degree rise in temperature.

   d) unit rise in temperature.

8. Large value of coefficient of thermal conductivity is due to **[1]**

a) small number of free electrons.
b) very few number of free electrons.
c) absence of free electrons.
d) large number of free electrons.

9. It is possible to distinguish between the transverse and longitudinal waves by studying the property of **[1]**

a) Polarisation
b) Diffraction
c) Interference
d) Reflection

10. Progressive waves in a vibrating medium have same _____. **[1]**

a) period
b) amplitude
c) distribution of particles
d) frequency

11. The angular dispersion produced by a prism of angle 5° is [n_V = 1.665, n_r = 1.645] **[1]**

a) 0.1°
b) 2°
c) 1°
d) 0.2°

12. The magnifying power of simple microscope is maximum when image is formed at _____. **[1]**

a) focus
b) twice the focus
c) infinity
d) D.D.V

13. A particle having a charge +e and mass 18×10^{-21} g enters midway between two parallel plates separated by 4 cm and having a potential difference of 400 V. Length of each plate is 10 cm and the initial velocity of the particle is parallel to the plates. The least initial velocity for which the particle will be able to come out of the plates is **[1]**

a) 4.7 km/s
b) 9.8 km/s
c) $5\sqrt{2}$ km/s
d) 13.3 km/s

14. The charges on two sphere are +7 μC and -5 μC respectively. They experience a force F. If each of them is given an additional charge of -2 μC, the new force of attraction will be **[1]**

a) $\frac{F}{2}$
b) F
c) $\frac{F}{\sqrt{3}}$
d) 2F

15. Carbon, silicon and germanium have four valence electrons each. The most appropriate statement for these elements (at room temperature) is **[1]**

a. Number of free electrons for conduction is significant in all three.
b. Number of free electrons for conduction is significant only in Si and Ge but small in C.
c. Number of free conduction electrons is significant in C but small in Si and Ge.
d. Number of free electrons is negligibly small in all three.

a) option (b)
b) option (a)
c) option (d)
d) option (c)

16. The angular velocity of a particle rotating in a circular orbit 100 times per minute is **[1]**

a) 60 deg/s
b) 10.47 deg/s
c) 10.47 rad/s
d) 1.66 rad/s

17. A uniform stick of length l and mass m lies on a smooth table. It rotates with angular velocity ω about an axis perpendicular to the table and through one end of the stick. The angular momentum of the stick about the end is **[1]**

a) $Ml^2\omega$ b) $\frac{Ml^2\omega}{3}$

c) $\frac{Ml^2\omega}{6}$ d) $\frac{Ml^2\omega}{12}$

18. The rail tracks are banked on the curves so that **[1]**

a. resultant force will be decreased.

b. weight of train may be reduced.

c. centrifugal force may be balanced by the horizontal component of the normal reaction of the rail.

d. frictional force may be produced between the wheels and tracks.

a) Option (c) b) Option (a)

c) Option (d) d) Option (b)

19. In uniform circular motion, **[1]**

a. both the angular velocity and the angular momentum vary.

b. the angular velocity varies but the angular momentum remains constant.

c. both the angular velocity and the angular momentum remains constant.

d. the angular momentum varies but the angular velocity remains constant.

a) Option (a) b) Option (d)

c) Option (c) d) Option (b)

20. The displacement of a particle moving in S.H.M. at any instant is given by $y = A\sin\omega t$. The acceleration after time $t = \frac{T}{4}$ is (where T is the time period) **[1]**

a) $A\omega$ b) $A\omega^2$

c) $-A\omega$ d) $-A\omega^2$

21. A particle in S.H.M. has velocity of 6.28 cm/s, two seconds after passing the equilibrium position. The period of motion is 12s and amplitude 24 cm. The epoch (initial phase) is **[1]**

a) $\frac{\pi}{12}$ b) $\frac{\pi}{4}$

c) 0 d) $\frac{\pi}{6}$

22. The velocity and acceleration of a particle performing S.H.M. have a steady phase relationship. The acceleration shows a phase lead of **[1]**

a) π b) $\frac{\pi}{4}$

c) $\frac{\pi}{2}$ d) 2π

23. A hot wire ammeter reads 10 A in A.C. circuit. The peak value of the current is **[1]**

a) $\frac{10}{\sqrt{2}}$ A b) $\frac{20}{\pi}$ A

c) 5π A d) $10\sqrt{2}$ A

24. The work done in breaking a big drop of radius R in n droplets of equal radii is (T = surface tension) **[1]**

a) $4\pi R^2T(n^{1/3} - 1)$ b) $4\pi R^2Tn^{2/3}$

c) $4\pi R^2T(n - n^{2/3})$ d) $4\pi R^2T(n^{2/3} - 1)$

25. A rectangular film of liquid is extended from (4 cm × 2 cm) to (5 cm × 4 cm). If the work done is 3×10^{-4} J, the value of the surface tension of the liquid is **[1]**

a) 0.2 Nm^{-1} b) 0.125 Nm^{-1}

c) 0.250 Nm^{-1} d) 8.0 Nm^{-1}

26. A pipe open at both ends has a fundamental frequency f in air. The pipe is dipped vertically in water so that half of it is in water. The fundamental frequency of the air column is now **[1]**

a) f b) $\frac{f}{2}$

c) 2f d) $\frac{3f}{4}$

27. A wave is expressed by the equation, y = 0.5 sin [π (0.01x - 3t)], where y and x are in metre and t is in second. The speed of propagation of the wave is **[1]**

a) 200 m/s b) 100 m/s

c) 300 m/s d) 150 m/s

28. The product of the pressure and volume of an ideal gas is **[1]**

a) directly proportional to its temperature. b) inversely proportional to its temperature.

c) approximately equal to the universal gas constant. d) a constant.

29. At constant volume, for different diatomic gases, the molar specific heat **[1]**

a) is same and its value is 4 cal/mol ^{o}C. b) is same and 3 cal/mol ^{o}C approximately.

c) are approximately equal and its value is 5 cal/mol ^{o}C. d) will be totally different.

30. Given that 'p' joule of heat is incident on a body and out of it 'q' joule is reflected and transmitted by it. The absorption coefficient of the body is **[1]**

a) $\frac{(q-p)}{p}$ b) $\frac{p}{q}$

c) $\frac{(p-q)}{p}$ d) $\frac{q}{p}$

31. The capacity of a parallel plate condenser is 15 μF when the distance between its plates is 6 cm. If the distance between the plates is reduced to 2 cm, then the capacity of this parallel plate condenser will be **[1]**

a) 15 μF b) 60 μF

c) 30 μF d) 45 μF

32. Dielectrics are **[1]**

a) preservative substances. b) non-conducting substances.

c) conducting substances. d) combustible substances.

33. A capacitance of 2 μF is required in an electrical circuit across a potential difference of 1.0 kV. A large number of 1 μF capacitors are available which can withstand a potential difference of not more than 300 V. **[1]**
The minimum number of capacitors required to achieve this is

a) 2 b) 32

c) 16 d) 24

34. When wavefront strikes a reflecting surface, **[1]**

a) the surface bends. b) it comes to rest.

c) the points on the surface become source of secondary wavelets. d) it penetrates the reflecting surface.

35. In a medium, different colours of light travel with **[1]**

a) same speeds. b) different speeds.

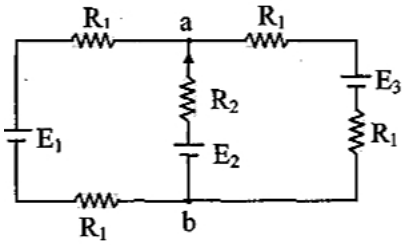
c) continuously increasing speeds. d) continuously decreasing speeds.

36. When a plane wavefront is incident on a double convex lens, the refracted wavefront is **[1]**

a) a plane wavefront. b) a spherical wavefront which is diverging.

c) a spherical wavefront which is converging. d) a cylindrical wavefront.

37. For the circuit shown, with $R_1 = 1.0\ \Omega$, $R_2 = 2.0\ \Omega$, $E_1 = 2$ V and $E_2 = E_3 = 4$ V, the potential difference between the points 'a' and 'b' is approximately (in V): **[1]**



a) 2.7 b) 2.3

c) 3.7 d) 3.3

38. What determines the conventional direction of the product of current and resistance while applying the Kirchhoff's law? **[1]**

a) Terminals of cell. b) Value of resistance.

c) Direction of electrons. d) Direction of current.

39. A wire of length L carrying a current I is bent into a circle. The magnitude of the magnetic field at the centre of the circle is **[1]**

a) $\frac{\mu_0 I}{2\pi \mathrm{L}}$ b) $\frac{\mu_0 \mathrm{I}}{2\mathrm{L}}$

c) $\frac{\pi\mu_0 I}{\mathrm{L}}$ d) $\frac{2\pi\mu_0 I}{L}$

40. The force acting on a particle of charge q moving in a uniform magnetic field with velocity 'v' is **[1]**

a) perpendicular to $\vec{v}$ and parallel to $\vec{B}$. b) parallel to $\vec{v}$ and perpendicular to $\vec{B}$.

c) parallel to both $\vec{v}$ and $\vec{B}$. d) perpendicular to both $\vec{v}$ and $\vec{B}$.

41. Two long straight conductors of length 1 m each separated by a distance of half metre and carrying currents of 200 A and 50 A respectively in opposite directions. Then the force of attraction is **[1]**

a) 4×10^{-4} N b) 2×10^{-3} N

c) 4×10^{-3} N d) zero

42. If a paramagnetic substance is placed in a non-uniform magnetic field, then it will move from **[1]**

a) stronger to weaker field

b) perpendicular to field

c) remains stable

d) weaker to stronger part

43. A transformer having efficiency of 90% is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6 A, the voltage across the secondary coil and the current in the primary coil respectively are **[1]**

a) 450 V, 15 A

b) 600 V, 15 A

c) 450 V, 13.5 A

d) 300 V, 15 A

44. Whenever current in a coil is changed, an e.m.f is induced in the same coil. This property of coil is due to _____. **[1]**

a) hysteresis

b) mutual induction

c) eddy currents

d) self induction

45. What amount of energy should be added to an electron to reduce its de-Brogile wavelength from 200 pm to 100 pm? **[1]**

a) three-times the initial energy

b) equal to the initial energy

c) four-times the initial energy

d) two-times the initial energy

46. In the Bohr's hydrogen atom model, the radius of the stationary orbit varies with principle quantum number as **[1]**

a) $r \propto n^2$

b) $r \propto n^{-2}$

c) $r \propto n$

d) $r \propto n^{-1}$

47. In Bohr's model of hydrogen atom, the period of revolution of the electron in any orbit is proportional to **[1]**

a) square of the quantum number

b) the quantum number

c) square root of the quantum number

d) cube of the quantum number

48. Number of spectral line in hydrogen atom is **[1]**

a) ∞

b) 8

c) 6

d) 15

49. Constant DC voltage is required from a variable AC voltage. Which of the following is correct order of operation? **[1]**

a) Filter, regulator, rectifier

b) Rectifier, regulator, filter

c) Regulator, filter, rectifier

d) Rectifier, filter, regulator

50. One mole of an ideal gas at temperature T is cooled isochorically till the gas pressure drops P from P to $\frac{p}{n}$. Then, the gas was restored to the n initial temperature isobarically. The net amount of heat absorbed by the gas in the process is **[1]**

a) RT(n - 1)

b) $RT(1 - n^{-1})$

c) nRT

d) $\frac{RT}{n}$