SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

PHYSICS

MHT - CET - Physics

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

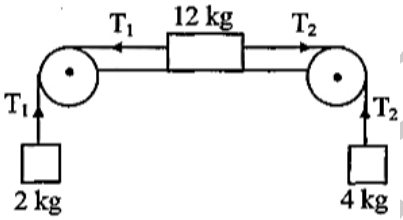
1. A particle first accelerates from rest and then retards to rest during the time interval of 8s. If the retardation is 3 times the acceleration, then the time for which it accelerated is **[1]**

   a) 4s
   b) 3s
   c) 2s
   d) 6s

2. A particle is fired from a point on the ground with speed u making an angle θ with the horizontal, then **[1]**

   a) the radius of curvature of the projectile at the highest point is $\frac{u^2 \cos^2 \theta}{g}$.
   b) the radius of curvature of the projectile at the highest point is $\frac{u^2 \sin^2 \theta}{g}$.
   c) At the point of projection, tangential acceleration is 2g sin θ.
   d) At the point of projection, tangential acceleration is g cos θ.

3. Three masses of 2 kg, 12 kg and 4 kg are connected to each other with threads and are placed on a table as shown in figure. **[1]**



   If g = 10 m s^{-2}, the acceleration with which the system is moving is

   a) 1.11 m/s^2
   b) 1.67 m/s^2
   c) 3.2 m/s^2
   d) 4 m/s^2

4. A body of mass (4m) is lying in x - y plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (v). The total kinetic energy generated due to explosion is **[1]**

   a) 2 mv^2
   b) $\frac{3}{2} mv^2$
   c) 4 mv^2
   d) mv^2

5. Magnitude of gravitational potential due to a point mass M at a distance r (>R) from the centre of earth is given by, **[1]**

   a) $V = \frac{G}{r}$
   b) $V = \frac{G}{r^3}$
   c) $V = \frac{GM}{r^2}$
   d) $V = \frac{GM}{r}$

6. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is not correct? **[1]**

a) Time period of a simple pendulum on the Earth would decrease.

b) Walking on the ground would become more difficult.

c) Raindrops will fall faster.

d) 'g' on the Earth will not change.

7. Temperature of the water at triple point is **[1]**

a) 373 K.

b) 273 K.

c) -273 K.

d) 0 K.

8. Calorimeter is used to determine _____ of a substance. **[1]**

a) quality

b) latent heat

c) specific heat

d) temperature

9. The radio station broadcasts is at wavelength of 200 m. The speed of the radio waves is 3×10^8 m/s. The frequency for tuning radio station is **[1]**

a) 1.5×10^8 Hz

b) 0.7×10^6 Hz

c) 6×10^6 Hz

d) 1.5×10^6 Hz

10. A man is watching two trains, one leaving and the other coming in with equal speeds of 4 m/s. If they sound their whistles, each of frequency 240 Hz, the number of beats heard by the man (velocity of sound in air = 320 m/s) will be equal to **[1]**

a) 12

b) 6

c) 0

d) 3

11. Light exhibits **[1]**

a) continuous nature.

b) wave nature.

c) dual nature.

d) particle nature.

12. To observe any rainbow the altitude of sun or the angle made by the sun with the horizontal should be _____. **[1]**

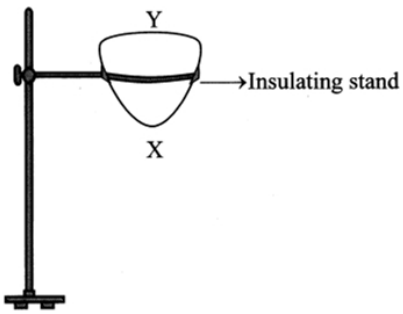
a) between 60° to 63°

b) greater than 42°

c) less than 42°

d) between 45° to 50°

13. Consider a charged conductor resting on an insulating stand as shown below. At point X, value of the charge density is σ, the potential is V and the field strength is E. What will be the values of same respectively at Y? **[1]**



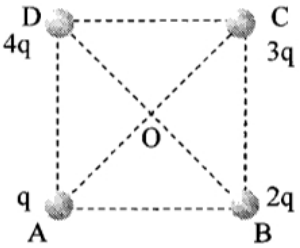
a) σ, > V, > E

b) < σ, < V, E

c) > σ, V, E

d) < σ, V, < E

14. Charges q, 2q, 3q and 4q are placed at the corners A, B, C and D of a square as shown in the following figure. The direction of electric field at the centre of the square is along **[1]**



a) BD

b) AB

c) AC

d) CB

15. At absolute zero temperature, a crystal of pure germanium **[1]**

a) behaves as a semiconductor.

b) behaves as perfect insulator.

c) behaves as perfect conductor.

d) contains no electron.

16. The angular velocity of a wheel is 70 rad/s. If the radius of the wheel is 0.5 m, then linear velocity of the wheel is **[1]**

a) 20 m/s

b) 10 m/s

c) 70 m/s

d) 35 m/s

17. A ballet dancer spins about vertical axis at 1.5 π rad/s with arms outstretched. With the arms folded, the moment on inertia about the same axis of rotation changes by 25%. The new frequency of rotation is **[1]**

a) 60 rpm

b) 100 rpm

c) 150 rpm

d) 120 rpm

18. Five particles of mass 2 kg each are attached to the rim of a circular disc of radius 0.1 m and negligible mass. Moment of inertia of the system about the axis passing through the centre of the disc and perpendicular to its plane is **[1]**

a) 2 kg-m^2

b) 0.2 kg-m^2

c) 1 kg-m^2

d) 0.1 kg-m^2

19. A flywheel at rest is reached to an angular velocity of 36 rad/s in 6 s with a constant angular acceleration. The total angle turned during this interval is **[1]**

a) 216 rad

b) 72 rad

c) 144 rad

d) 108 rad

20. The total energy of a particle executing simple harmonic motion is **[1]**

a) $\propto x^{\frac{1}{2}}$

b) $\propto$ x

c) independent of x

d) $\propto$ x^2

21. A block resting on the horizontal surface executes S.H.M. in horizontal plane with amplitude 'A'. The frequency of oscillation for which the block just starts to slip is (μ = coefficient of friction, g = gravitational acceleration) **[1]**

a) $4\pi\sqrt{\frac{A}{\mu g}}$

b) $\frac{1}{2\pi}\sqrt{\frac{\mu g}{A}}$

c) $\frac{1}{4\pi}\sqrt{\frac{\mu g}{A}}$

d) $2\pi\sqrt{\frac{A}{\mu g}}$

22. The total energy of a particle executing S.H.M. is proportional to **[1]**

a) frequency of oscillation.
b) square of amplitude of motion.
c) displacement from equilibrium position.
d) velocity in equilibrium position.

23. E.m.f. is given by, e = 200 sin 50t. The r.m.s. value of current in a circuit of resistance 50 Ω is **[1]**

a) 0.2828
b) 28.28
c) 2.828
d) 0.02828

24. The surface tension of a liquid is 5 Nm^{-1}. If a thin film is formed on a loop of area 0.02 m^2, then its surface energy will be **[1]**

a) 2.5×10^{-2} J
b) 3×10^{-1} J
c) 5×10^{-2} J
d) 2×10^{-1} J

25. The work done to increase unit area of the liquid surface is equivalent to **[1]**

a) surface tension.
b) power.
c) pressure.
d) viscosity.

26. $y = 6 \sin \frac{\pi x}{8} \cos 8\pi t$ represents a stationary 6 wave. The distance between two consecutive nodes is **[1]**

a) 3
b) 2
c) 6
d) 12

27. In a stationary wave, at the antinodes, there is a change in **[1]**

a) neither pressure nor density
b) both pressure and density
c) pressure
d) density

28. If the temperature of the Sun gets doubled, the rate of energy received on the Earth will increase by a factor of **[1]**

a) 2
b) 8
c) 16
d) 4

29. A vessel contains hydrogen gas which exerts a pressure of 4 atm. If gas is replaced by equal mass of oxygen, the pressure exerted on the walls will be **[1]**

a) 16 atm
b) 0.4 atm
c) 0.25 atm
d) 4 atm

30. The energy of a gas/litre is 300 joule; then its pressure will be **[1]**

a) 6×10^5 N/m^2
b) 3×10^5 N/m^2
c) 10^5 N/m^2
d) 2×10^5 N/m^2

31. A capacitor of capacitance 5 μF is being charged from a d.c. source of 20 V. The capacitance as a function of potential is given by (10V + 4) volt. The energy stored in the capacitor is **[1]**

a) 10000 J
b) 10040 J
c) 14000 J
d) 10400 J

32. When a dielectric is inserted in the space between parallel plates of a charged capacitor, then **[1]**

a) induced e.m.f. is generated between plates.
b) migration of electrons stop.

c) induced charges of same sign appear on each surface of dielectric.

d) induced charges of opposite signs appear on each surface of dielectric.

33. A capacitor of capacitance C is charged to potential difference V and then disconnected from the battery. The air dielectric of capacitor is replaced by another dielectric of dielectric constant k. The fractional decrease in energy of the capacitor is **[1]**

a) $\frac{1}{k^2}$

b) $\frac{1}{k}$

c) k

d) 1 - $\frac{1}{k}$

34. During the reflection of light from plane mirror, the incident ray, normal and reflected ray lie **[1]**

a) perpendicular to each other.

b) in same plane.

c) in different plane.

d) parallel to each other.

35. In Young's double slit experiment the source is white light. One slit is covered with red filter and the other with blue filter. There shall be **[1]**

a) No interference

b) Alternate dark and pink fringes

c) Alternate red and blue fringes

d) Alternate dark and yellow fringes

36. λ_a and λ_m are the wavelengths of a beam of light in air and medium respectively. If i_p is the polarising angle, the correct relation between λ_a, λ_m and i_p is **[1]**

a) $\lambda_a = \lambda_m \tan^2 i_p$

b) $\lambda_m = \lambda_a \tan^2 i_p$

c) $\lambda_m = \lambda_a \tan i_p$

d) $\lambda_a = \lambda_m \tan i_p$

37. An ammeter is obtained by shunting a 30 Ω galvanometer with 30 Ω resistance. What additional shunt be connected across it to double its range? **[1]**

a) 50 Ω

b) 30 Ω

c) 15 Ω

d) 10 Ω

38. The resistance per unit length of a wire is 1 Ω/m. A Leclanche cell of e.m.f. 1.45 V is balanced against 2.9 m length of potentiometer wire. The current through the wire is **[1]**

a) 1 A

b) 0.5 A

c) 0.1 A

d) 2 A

39. Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that O is the common point for the two. The wires carry I_1 and I_2 currents, respectively. Point P is lying at distance d from O along a direction perpendicular to the plane containing the wires. The magnetic field at the point P will be **[1]**

a) $\frac{\mu_0}{2\pi d}\left(I_1^2 - I_2^2\right)$

b) $\frac{\mu_0}{2\pi d}\left(\frac{I_1}{I_2}\right)$

c) $\frac{\mu_0}{2\pi d}\left(I_1 + I_2\right)$

d) $\frac{\mu_0}{2\pi d}\left(I_1^2 + I_2^2\right)^{\frac{1}{2}}$

40. A current carrying loop is placed in a uniform magnetic field. The torque acting on it does not depend upon the **[1]**

a) shape of loop.

b) number of turns

c) angle between normal of coil and magnetic field.

d) area of loop.

41. Two concentric coils, of 10 turns each are placed in the same plane. Their radii are 20 cm and 40 cm and carry 0.2 ampere and 0.3 ampere current respectively in opposite directions. The magnetic induction (in Tesla) at their centre is **[1]**

a) $\frac{3}{4}\mu_0$ b) $\frac{5}{4}\mu_0$

c) $\frac{7}{4}\mu_0$ d) $\frac{9}{4}\mu_0$

42. A susceptibility of a certain magnetic material is 400. What is the class of the magnetic material? **[1]**

a) Ferroelectric b) Paramagnetic

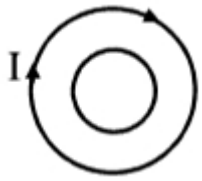
c) Ferromagnetic d) Diamagnetic

43. In an A.C. generator, when the plane of the amature is perpendicular to the magnetic field **[1]**

a) both magnetic flux and e.m.f. are zero b) magnetic flux is maximum and e.m.f. is zero

c) both magnetic flux and e.m.f. are half of their respective maximum values d) both magnetic flux and e.m.f. are maximum

44. Two different wire loops are concentric and lie in the same plane. The current in the outer loop (I) is clockwise and increases with time. The induced current in the inner loop. **[1]**



a) has a direction that depends on the ratio of the loop radii. b) is zero.

c) is clockwise. d) is counter clockwise.

45. The study of photoelectric effect is useful in understanding **[1]**

a) quantisation of energy. b) quantisation of charge.

c) conservation of kinetic energy. d) conservation of charge.

46. During mean life of a radioactive element, the fraction that disintegrates is **[1]**

a) $\frac{e-1}{e}$ b) e

c) $\frac{1}{e}$ d) $\frac{e}{e-1}$

47. According to Bohr's atomic model, the electrons revolve round the nucleus in **[1]**

a) stationary circular orbits b) stationary elliptic orbits

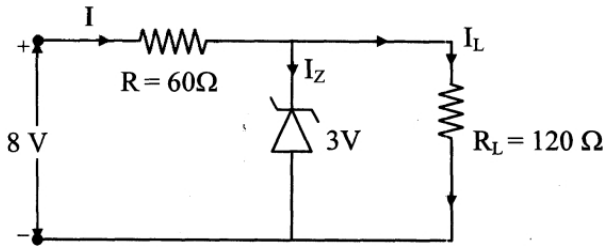
c) radiating circular orbits d) arbitrary circular orbits

48. In tritium nucleus, there are **[1]**

a) one proton + 2 neutrons b) 1 proton + 4 neutrons

c) 1 proton + 3 neutrons d) one proton + 1 neutron

49. In the circuit shown below, current passing through R_L and zener diode is, **[1]**



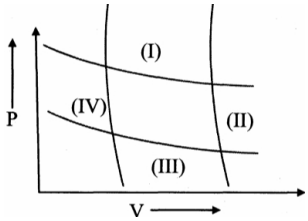
a) $\frac{1}{40}A, \frac{1}{120}A$

b) $\frac{1}{12}A, \frac{3}{40}A$

c) $\frac{1}{30}A, \frac{7}{30}A$

d) $\frac{1}{40}A, \frac{7}{120}A$

50. Which of the following is INCORRECT for the graph shown below? **[1]**



a. The graph shows the working of heat engine.

b. Curve (I) and (III) represent work done by the gas and on the gas respectively.

c. Curve (II) and (IV) represent heat rejected and absorbed by the gas respectively.

d. Curve (I) and (III) represent heat rejected and work done by the gas respectively.

a) Option (c)

b) Option (b)

c) Option (d)

d) Option (a)