Studentpad

MHT-CET-X1 PHYSICS(FULL PORTION) 2022-23

Time : 150 Min	Phy : Full Portion Paper	Marks : 50

01) Suppose the gravitational force varies inversely as the n^{th} power of distance. Then the time period of a planet in circular orbit of radius R around the sun will be proportional to

A) R^n

B) $R^{\left(\frac{n-2}{2}\right)}$

C) $R^{\left(\frac{n+1}{2}\right)}$

D) $R^{\left(\frac{n-1}{2}\right)}$

02) If a body gives out 10^9 electrons every second, then find out the time required to get a total charge of 1 C from it.

A) 98 years
B) 198 days
C) 400 years
D) 198 years

03) The ionosphere reflects the

A) sky waves.
B) space waves.
C) ground waves.
D) very high or ultra-high frequency waves.

04) Three identical bodies of mass M are located at the vertices of an equilateral triangle of side L. They revolve under the effect of mutual gravitational force in a circular orbit, circumscribing the triangle while preserving the equilateral triangle. What is their orbital velocity?

A) $\sqrt{\frac{3GM}{2L}}$

B) $\sqrt{\frac{GM}{L}}$

C) $\sqrt{\frac{3GM}{L}}$

D) $\sqrt{\frac{2GM}{3L}}$

05) A block of mass m placed on a rough inclined plane of inclination $\theta = 30^0$ can just be prevented from sliding down by applying a force F_1 up the plane and it can be just made to slide up the plane by applying a force F_2 up the plane. If the coefficient of friction between the block and the inclined plane is $\frac{1}{2\sqrt{3}}$, find the relation between F_1 and F_2.

A) $F_2 = F_1$

B) $F_2 = 2F_1$

C) $F_2 = 3F_1$

D) $F_2 = 4F_1$

06) Under normal conditions, the velocity of charge carries of about 1 A in a metallic conductor, is of the order of __

A) velocity of light
B) a fraction of mm/s
C) a few hundred m/s
D) several thousand m/s

07) Two identical rings P and Q of radius 0.1 m are mounted co-axially at a distance of 0.5 m apart. The charges on two rings are $2\,\mu C$ and $4\,\mu C$ respectively. How much work is done in transferring a charge of $5\,\mu C$ from the centre of P to that of Q?

A) 2 J
B) 0.72 J
C) 1.44 J
D) 1.28 J

08) A satellite revolves around the earth in an elliptical orbit. Its speed

A) is the same at all points in the orbit.
B) is greatest when it is farthest from the earth.
C) is greatest when it is closest to the earth.
D) goes on increasing or decreasing continuously depending upon the mass of the satellite.

09) About _____ is the minimum audible wavelength at room temperature.

A) $5\,\overset{0}{A}$

B) $0.2\,\overset{0}{A}$

C) 5 cm to 2 metre
D) 20 mm

10) Why there are three lenses in terrestrial telescope?

A) To get object more closer
B) To get final image erect
C) To get final image inverted
D) To get larger magnifying power

11) An infinite number of charges each equal to $4\,\mu C$ are placed along x-axis at x=1m, x=2m, x=4m and so on. What will be the total force on a charge of 1C placed at the origin?

A) Zero
B) 4.8×10^4N
C) 3N
D) 3.2×10^4N

12) What are the angle of dip at the poles and the equator?

A) $0^0, 90^0$

B) $45^0, 90^0$

C) $30^0, 60^0$

D) $90^0, 0^0$

13) What is the number of significant figures in 0.0006312?

A) 5
B) 3
C) 4
D) 2

14) Two identical thin bar magnets, each of length l and pole strength m, are placed at right angle to each other with north pole of one touching south pole of other. What will be the magnetic moment of system?

A) 1 ml
B) 0.5 ml
C) 2 ml
D) $\sqrt{2}$ ml

15) The volume of a gas at 20^0C is 100 cm^3 at normal pressure. If it is heated to 100^0C, its volume becomes 125 cm^3 at the same pressure. What will be the volume coefficient of expansion of the gas at normal pressure?

A) 0.0015^0C^{-1}
B) 0.0045^0C^{-1}
C) 0.0025^0C^{-1}
D) 0.0031^0C^{-1}

16) Two masses M and m are attached to a vertical axis by weightless threads of combined length l. They are set in rotational motion in a horizontal plane about this axis with constant angular velocity ω. If the tensions in the threads are the same during motion, the distance of M from the axis is

A) $\frac{Ml}{M-m}$

B) $\frac{ml}{M+m}$

C) $\frac{M-m}{M}l$

D) $\frac{M+m}{m}l$

17) If a magnet is suspended at an angle of 30^0 to the magnet meridian, the dip needle makes an angle of 45^0 with the horizontal . Find the real dip.

A) $\tan^{-1}\left(\sqrt{3}/2\right)$

B) $\tan^{-1}\left(\sqrt{3}/\sqrt{2}\right)$

C) $\tan^{-1}\left(2/\sqrt{3}\right)$

D) $\tan^{-1}\left(\sqrt{3}\right)$

18) A block of mass 2 kg rests on a horizontal surface. If a horizontal force of 5 N is applied on the block, what is the frictional force on it? $\left(\mu_k = 0.4, \mu_s = 0.5\right)$.

A) 5 N
B) 8 N
C) 10 N
D) zero

19) $\hat{i}\times\left(\hat{i}\times\hat{j}\right) =$

A) $-\hat{j}$

B) 0

C) $\hat{k}$

D) $\hat{j}$

20) A rain drops of radius 0.3 mm falls through air with a terminal velocity of $1 m s^{-1}$. The viscosity of air is 18×10^{-5} poise. What is the viscous force on the rain drop?

A) 1.018×10^{-2}dyne

B) 2.018×10^{-2}dyne

C) 3.081×10^{-2}dyne

D) 4.081×10^{-2}dyne

21) You are given 'mn' wires of equal resistance, if m wires are in series and n such combinations are in parallel then the resultant resistance is R_1. If n wires are in series and m such combinations are in parallel, then the resultant resistance is R_2. Then calculate the ratio of R_1/R_2.

A) m:n
B) $m^2:n^2$
C) 1:1
D) $n^2:m^2$

22) A uniform horizontal metre scale of mass m is suspended by two vertical strings attached to its two ends. A body of mass 2m is placed on the 75 cm mark. The tensions in the two strings are in which of the following ratio?

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

23) Zener breakdown occurs only if

A) the temperature is increased
B) it is lightly doped
C) it is forward biased
D) it is reverse biased

24) A rocket of mass M is launched vertically from the surface of the earth with an initial speed V. Assuming the radius of the earth to be R and negligible air resistance, the maximum height attained by the rocket above the surface of the

earth is

A) $R\left(\frac{2gR}{V^2}-1\right)$

B) $R/\left(\frac{2gR}{V^2}-1\right)$

C) $R\left(\frac{gR}{2V^2}-1\right)$

D) $R/\left(\frac{gR}{2V^2}-1\right)$

25) A wave of frequency 500 Hz has velocity 360 m/s. What is the distance between two nearest point 60^0 out of phase?
A) 0.6 cm
B) 12 cm
C) 120 cm
D) 60 cm

26) The angle of incidence, emergence and deviation in case of a prism are found to be 55°, 45° and 40° respectively. What will be the refracting angle of prism?
A) 45°
B) 50°
C) 40°
D) 60°

27) A circular road of radius 100 m has banking angle 45°. The maximum safe speed of a car having mass 2000 kg will be, if the coefficient of friction between tyre and road is 0.5
A) 8.6 m/s
B) 9.9 m/s
C) 12.4 m/s
D) 17.2 m/s

28) A metal rod 1.5 m length is clamped at the center. When it is set with longitudinal vibrations it emits a note of 1 KHz. If the density of the material is 8×10^3 then determine the Young's modulus.

A) $4.5\times10^{10}\,N/m^3$

B) $5.2\times10^{10}\,N/m^2$

C) $7.2\times10^{10}\,N/m^2$

D) $6.5\times10^{10}\,N/m^2$

29) A man of mass 60 kg is riding in a lift. What are the weights of the man, when the lift is accelerating upwards and downwards at $2\,m\,s^{-2}$? $\left(\text{Take } g=10\,m\,s^{-2}\right)$.
A) 600 N and 600 N
B) 480 N and 720 N
C) 720 N and 480 N
D) 600 N and 480 N

30) The given two vectors $\vec{A}=a\hat{i}+a\hat{j}+3\hat{k}$ and $\vec{B}=2\hat{i}-3\hat{j}+2\hat{k}$ are perpendicular to each other then what will be the value of 'a'?
A) 6
B) 2
C) 3
D) 5

31) An electron charge is revolving in a circular orbit of radius (r) around a nucleus with speed v the equivalent current will be__

A) $\frac{ev}{2\pi r}$

B) 0

C) $\frac{2e\pi r}{v}$

D) evr

32) A block is gently placed on a long conveyor belt moving with $11\,m\,s^{-1}$. If the coefficient of friction between block and belt is 0.4 , then the block will slide on the belt up to _____ distance.
A) 25.6 m
B) 20.3 m
C) 15.43 m
D) 10.21 m

33) The device used for addition of high frequency carrier wave and information signal is
A) rectifier.
B) amplifier.
C) modulator.
D) demodulator.

34) Mark the correct statement about the value of the zener current.
A) It is always in the a microampere range
B) It is determined by the zener voltage
C) It does not depends upon the temperature
D) It is limited by the external circuit resistance

35) A motor cycle starts from rest and acceleration along a straight path at $2m/s^2$. At the starting point of the motor cycle there is a stationery electric siren. How far has the motor cycle gone when the driver hears the frequency of the siren at 94% of its value when the motor cycle was at rest? (Speed of sound $= 330\ ms^{-1}$)
A) 49 m
B) 98 m
C) 147 m
D) 196 m

36) A ray of light travels from an optically denser medium to a rarer medium. What is the maximum possible deviation of the ray if C is the critical angle?
A) 90^0-C
B) 90^0-2C
C) 90^0
D) $\sqrt{90°+C}$

37) Increase in length of rod on heating does not depends on its ___

A) material
B) initial length
C) mass
D) rise in temperature

38) In a certain place, the vertical component of earth's magnetic field is 0.5 oersted and zip angle is 60^0. What is the earth's magnetic field at that place?
A) $\frac{\sqrt{3}}{2}$ oersted
B) 2 oersted
C) 1 oersted
D) $\frac{1}{\sqrt{3}}$ oersted

39) ____ is not transported by the electromagnetic waves.
A) Charge
B) Energy
C) Momentum
D) Information

40) Two vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes. If magnitude of $\vec{A}+\vec{B}$ is equal to n times the magnitude of $\vec{A}-\vec{B}$, then find the angle between $\vec{A}$ and $\vec{B}$.
A) $\sin^{-1}\left(\frac{n^2-1}{n^2+1}\right)$
B) $\cos^{-1}\left(\frac{n^2-1}{n^2+1}\right)$
C) $\sin^{-1}\left(\frac{n-1}{n+1}\right)$
D) $\cos^{-1}\left(\frac{n-1}{n+1}\right)$

41) Height of Ionosphere is up to ___ Km from ground surface.
A) 80 km
B) 12 km
C) 50 km
D) 400 km

42) Two copper wires have the same length but their cross sections are in the ratio of 3:1 .They are joined in series. The resistance of the thick wire is $10\,\Omega$. What will be the total resistance of the combination?
A) $20\,\Omega$
B) $40\,\Omega$
C) $30\,\Omega$
D) $40/3\,\Omega$

43) Certain neutron stars are believed to be rotating at about 1 rev/s. If such a star has a radius of 20 km, the acceleration of an object on the equator of the star will be
A) $4\times10^8\ m/s^2$
B) $8\times10^5\ m/s^2$
C) $20\times10^8\ m/s^2$
D) $120\times10^5\ m/s^2$

44) 1 light year = _____ kilometers.
A) 11×10^{10}
B) 9.45×10^{15}
C) 3×10^8
D) 9.45×10^{12}

45) The phenomenon in which heat is transferred from one place to another by molecular collisions without their actual migration is called as:
A) Condensation
B) Radiation
C) Convection
D) Conduction

46) The law of conservation of charge is followed in ___.
A) nuclear reactions
B) electrification by Induction
C) electrification by friction
D) all of these

47) When _____, avalanche breakdown in a semiconducting diode occurs.
A) the forward current exceeds a certain value
B) the depletion region is reduced to zero
C) reverse bias exceeds a certain value
D) forward bias exceeds a certain value

48) A body of mass m moves with speed v collides with wall and recoils with same speed, then due to collision change in its momentum will be ___.
A) 0
B) 2 mv
C) mv
D) -2 mv

49) What will be the length of an aluminium rod is 100 cm at 20°C then its length at 80°C, if coefficient of linear expansion of aluminium is 2.5×10^{-5} per°C?
A) 100 cm
B) 100.15 cm
C) 99.85 cm
D) 100.30 cm

50) The sun looks reddish at the time of sunrise or sunset because:
A) Of the scattering of light
B) The sun is hottest at these times
C) The sun is coldest at these times
D) Of the effects of reflection and refraction