GGSIPU Physics 2012

1. A plane electromagnetic wave travels in vaccum along $\hat{k}$ direction, where $\hat{i}, \hat{j}$ and $\hat{k}$ are unit vectors along the x,y and z directions. The direction along which the electric and the magnetic field vectors point may be respectively

a $\hat{i}$ and $\hat{j}$ (b $\hat{i}$ and $-\hat{j}$

c $\hat{j}$ and $\hat{i}$ (d $\hat{k}$ and $\hat{i}$

2. In the order of increasing frequency, the electromagnetic spectrum may be arrabged as

a gamma rays, X -rays, visible light, radio waves

b X -rays , gamma rays,visible light,radfio waves

c radio waves,visible light,X -rays,gamma rays

d radio waves,visible light,gamma rays,X -rays

3. Two coherent monochromatic light beams of intensities I and 9I are super imposed. The maximum and the minimum intensities of the resultant beam are

a 10 I and zero

b 10 I and 8 I

c 10 I and 4 I

d 16 I and 4 I

4. In a single slit diffraction pattern, the distance between the first maximum on the left and the first maximum on the right is 5 mm. The screen on which the diffraction parttern is displaced is at a distance of 80 cm from the slit. The wavelength is 6000 $\AA$. The slit width in mm is about

a 0.576 b 0.348

c 0.192 d 0.096

5. When a ray is incident on a medium of refractive index n at Brewster's angle, it gets

a totally reflected

b totally absorbed

c circularly polarized

d plane polarized

6. An object is placed at a distance of 30 cm from a concave mirror and its real image is formed at a distance of 30 cm from the mirror. The focal length of the mirror is

a 60 cm b 45 cm

c 30 cm d 15 cm

7. A converging lens has a focal length of 50 cm. The power of the lens is

a + 5 D b + 2 D

c + 0.5 D d - 0.5 D

8. A converging lens of focal length f is used as simple microscope. If the least distance of distinct version of the observer is D and the lens is held close to the eye, the magnifying power of the lens is

a D□2f b f/D

c $\frac{D}{f}$ - 1 d D/f

9. A thin convex lens of refractive index 1.5 has 20 cm focal length in air. If the ,lens is completely immersed in a liquid refractive index 1.6, its focal length will be

a -160 cm b -100 cm

c + 10 cm d + 100 cm

10. In Thomson's experiment to measure e/m of electron, the electric and the magnetic fields are

a in the same direction

b in the opposite direction

c at an angle of 45 ^{0} with each other

d perpendicular to each other

11. The photo cut-off voltage in an experiment was found to be 1.5 V. The work function for the material used in the experiment was 4.2 2V. The maximum kinetic energy for the photoelectrons that was emitted was

a 1.5 eV b 2.7 eV

c 4.2 eV d 5.7 eV

12. A photo cell is a device which

a absorbs light and produces a stream of electrons

b absorb a stream of electron and produces light

c converts protons into photons

d coverts photons into protons

13. The ground state energy of hydrogen atom is -13.6 eV. The kinetic energy of the electron in this state is

a 27.2 eV b 13.6 eV

c 6.8 eV d 3.4 eV

14. When an atom undergoes β-decay, its atomic number

a does not change b increases by 1

c decreases by 1 d increases by 2

15. A nucleus X initially at rest, undergoes alpha decay according to the equation

$$92^{X^A} \rightarrow z^{Y^{228}} + \alpha$$

Then,the values of A and Z are

a 94,230 b 232,90

c 190,32 d 230,94

16. The energy gap between the velence band and the conduction band for the material is

a an insultor

b a metal

c an intrinsic semiconductor

d a superconductor

17. An AC signal of 50 Hz frequency is input of a full wave rectifier using two diodes. The output frequency after full wave rectification is

a 25 Hz b 50 Hz

c 100 Hz d 200 Hz

18. In a transistor biased in the common-emitter mode the emitter current is

a much smaller than base current

b much larger than base current

c nearly equal to the base current

d much smaller than the collector current

19. When the inputs of a two input logic gate are 0 and 0, the output is 1.When the inputs are 1 and 0 the output is o. The logic gate is of the type

a AND b NAND c NOR d OR

20. The sun revolves around galaxy with speed of 250 km/s around the centre of milky way and its radius is $3x10^4$ light year. The mass of milky way in kg is

a $6x10^{41}$ b $5x10^{41}$

c $4x10^{41}$ d $3x10^{41}$

21. The dimensions of the quantity hv/c, where h is planck's constant, v is the frequency and c is the velocity of light is

a $[ML^{-1}]$ b $[MLT^{-1}]$

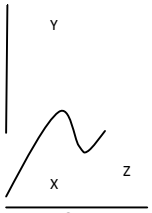
c $[MLT^{-2}]$ d $[ML^2T^2]$

22. The SI unit of the coefficient of viscosity is

a N $-m^2$ b N -s

c N $-s/m^2$ d N $-m^2/s$

23. A particle is constrained to move along a straight line. The graph in the adjoining figure shows the distance s moved by the particle in time t, measured from the starting time. The shape of the curve indicates that



a Acceleration of the particle is increasing at X

b The speed of the particle is maximum at the point Z

c The speed of the particle X is greater than that Z

d The particle is at rest at the point Y

24. A bomb is fixed from a canon with a velocity of 1000 m/s making an angle of 30^0 with the horizontal g=9.8 m/s^2. Time taken by bomb to reach the highest point is

a 40 s b 30 S c 51 s d 25 s

25. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle. The motion of the particle takes place in the plane.It follows that

a the speed of the particle is constant

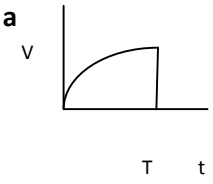
b the acceleration of the particle is constant

c the motion is that of a projectile

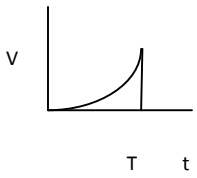
d the velocity of the particle is c onstant

26. A body is acted upon by a constant force from time t = 0 to a time t = T after which it does not experience any force. Which of the following graphs best represents the variation of the velocity of the body with time?

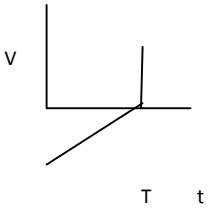
a



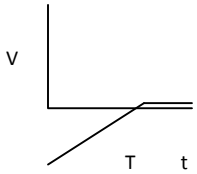
b



c



d



27. A satellite is in a circular orbit round the earth at an altitude R above the earth's surface, Where R is the redius of the earth. If g is the acceleration due to gravity of the earth the speed of the satellite is

a $\sqrt{2Rg}$ **b** $\sqrt{Rg}$

c $\sqrt{Rg/2}$ **d** $\sqrt{Rg/4}$

28. At the top of the trajectory of a projectile, thrown at an angle of projection $\theta < 90^0$, its

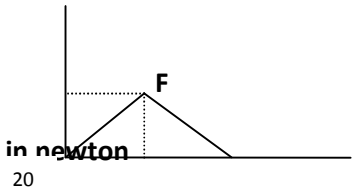
a velocity is z ero

b velocity is parallel to the direction of acceleration

c velocity is anti -parallel to the direction of acceleration

d velocity is perp endicular to the direction of acceleration

29. A body is initially at rest on a smooth surface.A force F, whose time variation is shown in the adjacent figure acts on it for a duration of 4 s. The momentum of the ball at the end of the 4 s is in N - s



a 10 b 20

c 30 d 40

30. Two satellites P and Q are in the same circular orbit round the earth. The mass of P is greater than that of Q. It follows that

a the second of P is equal to that of Q

b the speed of P is greater than that of Q

c the speed of P is less than that of Q

d the kinetic energy of P is equal to that of Q

31. A particle moving ,eastwards with a velocity of 5 m/s. In 10 s, its velocity changes to 5 m/s northwards. The average acceleration in this time is

a zero

b $\frac{1}{\sqrt{2}}$ m/s^2 towards north-west

c $\frac{1}{\sqrt{2}}$ m/s^2 towards north-east

d $\frac{1}{2}$ m/s^2 towards north-west

32. A particle moving in one dimension with a constant acceleration of 2 m/s^2 is observed to cover a distance of 5 m during a particular interval of 1 s. The distance covered by the particle in the next 1 s interval is in mettre

a 5 b 6

c 7 d 10

33. A body at rest is moved along a straight line by a machine which delivers constant power . The distance moved by the body in time t is proportional to

a $t^{1/2}$ b $t^{3/4}$

c t d $t^{3/2}$

34. Two bodies, A and B initially, at rest, move towards each other under mutual force of attraction. At the instant when the speed of A is ν and that of B is 2ν, the speed of the centre of mass of the bodies is

a 3 ν b 2 ν

c 1.5 ν d zero

35. A mass 3m, initially at rest at the origin, explodes into three fragments of equal mass. Two of the fragments have a speed ν each and move perpendicular to teach other.bThe third fragment will move with a speed

a $\nu/\sqrt{2}$ b $\nu/2$

b ν d $\sqrt{2\nu}$

36. A constant force F is pushing a 5 kg mass on a horizontal surface at a constant velocity of 2 m/s. The coefficient of friction between the surface and the mass is 0.3Take g = 10 m/s^2. If F acts along the direction of motion, the rate at which F is doing work in watt

a 3 b 6 c 10 d 30

37. The moment of inertia of a of a ring about of one its diameter is I. What will be its moment of inertia about a tangent parallel to the diameter is I. What will be its moment of inertia about a tangent parallel to the diameter?

a 44 b 2 I

c $\frac{3}{2}$I d 3 I

38. A massless spring of natural length of 0.5 m and spring constant 50 N/m has one end fixed and the other end attached to a mass of 250 g. The spring mass system is on a smooth floor. The mass is

pulled until the length of the spring is 0.6 and then released from rest. The kinetic energy of the mass when the length of trhe spring is o.5 m is

a 0.25 J b 2.25 J

c 6.25 J d 9 J

40. A thin disc is rotating with a constant angular velocity about its own axis. A is a point on the rim of the disc and B is a point half-way between the rim and the centre. The ratio of the velocity at A to that at B is

a 1:4 b 1:2

c 1:1 d 2:1

41. A simpler pendulum has a time period of 1 s. in order to increase the time period to 2 s

a the mass of the bob should be doubled

b the length of the pendulum should be doubled

c the length of the pendulum should be increased by a factor of 4

d the length of the pendulum should be decreased by a factor of 4

42. The amplitude of a particle executing simple harmonic motion with a frequency of 60 Hz is 0.01 m. The maximum value of acceleration of the particle is

a 144 π^2 m/s^2 b 12 m/s ^{2}

c 11 m/s ^{2} d 169 m/s ^{2}

43. Standing waves are formed on a string when interference occurs between two waves having

a the same amplitu de travelling in the same direction with no phase difference between them

b the same amplitude, travelling in the opposite direction with no phase difference between them

c diff erent amplitudes travelling in the same direction

d different amplitudes travelling in the opposite direction

44. A 4 m long copper wire of cross-sectional area 1.2 cm^2 is stretched by a force of 4.8x10^3 N. Young's modules for copper Y = 1.2x10 ^{11} N/m^2 the increase in length of wire is

a 1.32 mm b 0.8 mm

c 0.48 mm d 5.36 mm

45. A stationary police car sounds a siren with a frequency of 990 Hz. If the speed of sound is 330 m/s,will hear a frequency of

a 891 Hz b 900 Hz

c 1089 Hz d 1100 Hz

46. The pressure required to stop the increase in volume of a copper block when it is heated from 50^0 C to 70^0 C. Coefficient of linear expansion of copper is $8x10^{-6}$ /^{0}C and bulk modules of eaasticity = $3.6x10^{11}$ N/m^2, is

a $2.8x10^5$ N/m^2

b $1.72x10^{8}$ N/m^2

c $6.3x10^{3}$ N/m^2

d $8x10^{-6}$ N/m^2

47. Given that the surface tension of water is 75 dyne/cm, its density 1 g/cc and angle of contact zero, the height to which water rises in a capillary tube of 1 mm diameter is take g = 10 m/s ^{2}

a 9.0 cm b 7.5 cm

c 6.0 cm d 3.0 cm

48. An open tank filled with water density ρ has a narrow hole at a depth of h below the water flowing out is

a $h h\rho g$ b 2 gh

c $\sqrt{2gh}$ d gh

49. A heat engine undergoes a process in which its internal energy decrease by 400 J and it gives out 150 J of heat. During the process

a it does 250 J of work and its temperature rises

b it does 250 J of work and its temperature falls

c it does 550 J of work and its temperature rises

d it does 550 J of work and its temper ature falls

50. An ideal gas heat engine operates in carnot cycle between 227^0 C and 127^0C. It absorbs $6x10^4$ cal of heat at higher temperature.Amount of heat converted into work,is

a 1.2×10^{4} **cal**

b 2.4×10^{4} **cal**

c 6.0×10^{4} **cal**

d 4.8×10^{4} **cal**