1. Ans. D.

Let the radius of the circular path be 'r' then, $a_c = \frac{v^2}{r}$ (equation 1), centrifugal force.

When velocity is doubled then, $a_c^1 = \frac{(2v)^2}{r}$

$$a_c^1 = \frac{4v^2}{r}$$

$a_c^1 = 4a_c$ (from equation1)

The ratio of acceleration after and before the change of velocity,

$$\frac{a_c^1}{a_c} = \frac{4}{1}$$

2. Ans. D.

The sensation of weightless of an astronaut moving in a satellite is a situation of freefall.

• It is felt because there is no gravitational force.

• The effect of gravity is cancelled by inertial force.

• Zero difference between the acceleration of the spacecraft and the acceleration of the astronaut.

3. Ans. C.

Germanium is a semiconductor therefore; resistance of it keeps decreasing by increasing the temperature because semiconductors conduct at high temperature.

Copper, aluminium and tungsten are metals, therefore; resistance will increase with increasing temperature.

4. Ans. C.

The range of dip is from +90 degree to -90 degree. It is +90 degree at north magnetic pole and -90 degree at south magnetic pole.

Therefore, magnitude of angle of dip will be 90 degree.

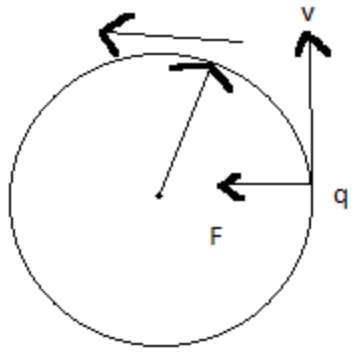
5. Ans. D.

Let a force F=qvB acts on a particle perpendicular to both $\vec{v}$ and $\vec{B}$. This force continuously deflects the particle sideways without changing speed of the particle will move along with circle perpendicular to the field. Thus, magnetic force provides centripetal force.

Let 'r' be the radius of circular path

Centripetal force=magnetic force

$\frac{mv^2}{r}$ =qvB



r=$\frac{mv}{qB}$

period of revolution= $\frac{circumference}{speed}$

or T= $\frac{2\pi r}{v}$ = $\frac{2\pi}{v} \times \frac{mv}{qB}$= $\frac{2\pi m}{qB}$

it is clear that T does not depend on velocity of particle but depends upon magnitude field B, charge q and mass of particle m.

6. Ans. A.

The composition of nuclear is-

M=Z+N

Where,

M=mass number or atomic mass

Z=atomic number or number of protons

N=number of neutrons

Therefore, N=M-Z

7. Ans. B.

The filter is a device that allows passing the dc component of the load and blocks the ac component of the rectifier output. Therefore in a rectifier circuit will give you a steady dc output.

8. Ans. D.

As the net external force on the system in particular direction is zero with centre of mass at rest then the centre of mass will not move along that particular direction even though some particular may move along that direction.

As above question $\overrightarrow{F1}=\overrightarrow{F2}$

Therefore, velocity of centre of mass=0

9. Ans. C.

The radius of gyration of solid sphere about its diametrical axis is

$K=\sqrt{\frac{2}{5}}r$ as $I=\frac{2}{5}MR^2$

Distance of the axis from centre of sphere

$K=\sqrt{\frac{2}{5}}r=\sqrt{0.4}r$

10. Ans. B.

According to first law of thermodynamics,

rQ=rU+rW

As for adiabatic process, rQ=0

Therefore, rU=-rW

rU is negative.

11. Ans. A.

As in SHM, velocity,

$V=W\sqrt{A^2-x^2}$

In mean position x=0

Therefore, v=WA, which is maximum velocity.

12. Ans. A.

From Faraday's law,

$E=\frac{\emptyset}{t}$

As $\emptyset=\vec{B}.\vec{A}=4\times2=8$

Then $E=\frac{8}{2}=4V$

13. Ans. C.

Rectification is the process of converting alternating current into direct current. This is done by using a device that allows only one way current like diode.

14. Ans. B.

$W_0=hV_0$

As $V_0=\frac{c}{\gamma_0}$

Therefore, $W_0=h\frac{c}{\gamma_0}$

Putting the value we get,

$W_0 = \frac{6.63\times10^{-34}\times3\times10^{8}}{5000\times10^{-10}} = \frac{6.63\times3}{5}\times10^{-19} = 3.978\times10^{-19}$

$W_0 \approx 4\times10^{-19}$

15. Ans. D.

Radio-waves are the type of electromagnetic radiation which can be propagated through ground wave, sky-wave and space wave propagation.

16. Ans. A.

Visible light wavelength (400-800nm) that means 4×10^{-7} to 8×10^{-7} m.

It is between infrared and ultraviolet.

17. Ans. A.

Dimensional formula of G, universal gravitational constant

$F = G\frac{m_1 m_2}{r^2}$

$G = \frac{Fr^2}{m_1 m_2} = \frac{MLT^{-2}L^2}{M^2} = M^{-1}L^3T^{-2}$

18. Ans. B.

For two balls, $t = \sqrt{\frac{2h}{g}}$

When h=h then $t_1 = \sqrt{\frac{2h}{g}}$

When h=2h then $t_2 = \sqrt{\frac{4h}{g}}$

Ratio of time taken by balls,

$\frac{t_1}{t_2} = \frac{\sqrt{\frac{2h}{g}}}{\sqrt{\frac{4h}{g}}} = \frac{1}{\sqrt{2}}$

$t_1 : t_2 = 1 : \sqrt{2}$

19. Ans. A.

Energy stored by spring $= \frac{1}{2}mx^2$

When x=2cm then $E_1 = 100J$

Therefore, $100 = \frac{1}{2}m(2)^2$

$m = \frac{100}{2} = 50$

when x=4cm then

$E = \frac{1}{2}mx^2 = \frac{1}{2}50(4)^2 = 400J$

Decrease in energy $E_2 - E_1 = 300J$

20. Ans. D.

The surface tension of water decreases with increase in temperature.

Order of surface tension,

0 degree>25 degree> 60 degree> 75 degree

21. Ans. C.

For water drops, excess pressure, $P = \frac{2T}{R}$

For 2 cm, $P_1 = \frac{2T}{\frac{1}{2}}$

For 1.5 cm $P_2 = \frac{2T}{\frac{1.5}{2}}$

Ratio of them, $\frac{P_1}{P_2} = \frac{15}{10}$

$P_1 : P_2 = 3 : 2$

22. Ans. B.

$n=\frac{d}{\gamma}$

where n= number of fringes

d= width of fringe

γ=wavelength of light

for $\gamma=5898\dot{A}$ and n=92

d= $\gamma n=92\times5898=542616$

for $\gamma=5461\dot{A}$, $n=\frac{d}{\gamma}=\frac{542616}{5461}=98.44\approx99$

23. Ans. A.

$\Delta V=\int E.dr=E.r$

$V_B-V_A=E\times2\times10^{-2}$

$30-(-10)=E\times2\times10^{-2}$

$E=20\times10^{2}=2000\ V/m$

24. Ans. B.

The resolution power of light microscope is proportional to the wavelength of light

Since blue light has shorter wavelength than red light, then in theory the resolving power of the microscope should be slightly increase.

25. Ans. C.

As $\gamma=\frac{C_p}{C_v}=\frac{E_v+R}{C_v}=1+\frac{R}{C_v}$

$C_v = f.\frac{R}{2}$ so, $\gamma = 1 + \frac{2}{5}$

As, for f (degree of freedom) of diatomic molecule

F=5 (3 translational and 2 rotational)

$\gamma = 1 + \frac{2}{5} = 1.4$

$C_p : C_v = 1.4$