1. Find the force of mass 500 gm if velocity of given mass is related as given
\[ v = 10 \sqrt{t} \]
\[
(1) \frac{3}{2} \text{ N} \\
(2) \frac{2}{3} \text{ N} \\
(3) \frac{3}{2} \text{ N} \\
(4) \frac{2}{3} \text{ N}
\]
Ans. (3)
Sol.
\[
\frac{dv}{dt} = 10 \sqrt{t} \\
\frac{a}{v} = \frac{10}{2 \sqrt{t}} = \frac{5}{\sqrt{t}}
\]
\[
\therefore \ F = ma = \frac{5}{\sqrt{t}} \times 0.5 = \frac{5}{2} \text{ Newton}
\]

2. A stone is projected with projection speed 40 m/s and projection angle 30° on horizontal surface. Find the velocity of stone after time \( t = 2 \) sec of projection.
\[
(1) [40 \sqrt{5} - 10] \text{ m/s} \\
(2) [20 \sqrt{5} - 10] \text{ m/s} \\
(3) [20 \sqrt{7} - 10] \text{ m/s} \\
(4) 20 \sqrt{3} \text{ m/s}
\]
Ans. (4)
Sol.
\[
\frac{dy}{dt} = 40 \cos 30° = 20 \sqrt{3} \text{ m/s}
\]
After time \( t = 2 \) sec
\[
v_x = u_x = 20 \sqrt{3} \text{ m/s}
\]
\[
v_y = u_y + gt = 20 + (-10) \times 2 = 0
\]
\[
v = v_x + v_y = 20 \sqrt{3} \text{ m/s}
\]

3. Electric potential on conducting spherical shell's surface is 'V'. What is the value of electric potential at the centre of this spherical shell?
\[
(1) \frac{3}{2} V \\
(2) V \\
(3) \frac{V}{2} \\
(4) 2V
\]
Ans. (2)
Sol. Potential inside uniform charge shell is constant because there is no electric field inside the shell.
4. Two cars A and B are running on the same road and in same direction. Car A is blowing here with frequency $f_a = 500$ Hz. Find the frequency experienced by the driver of car B (approximately). (Consider the speed of sound in air = 320 m/s).

```
\[
\begin{align*}
(1) & \quad 260 \text{ Hz} \\
(2) & \quad 200 \text{ Hz} \\
(3) & \quad 270 \text{ Hz} \\
(4) & \quad 300 \text{ Hz}
\end{align*}
\]
```

Ans. (2)

Sol. 
\[
\begin{align*}
\frac{f_b}{f_a} &= \frac{V - V_o}{V}\\
&= \frac{300 - 320}{300}\\
&= 0.333
\end{align*}
\]

\[= \frac{200}{320} = 0.625 \text{ Hz.}
\]

5. \[\text{Physics question}
\]

Find power of lens $F$ at time $t = 10$ s. Initial velocity of the ball is zero.

```
\[
\begin{align*}
(1) & \quad 50 \text{ W} \\
(2) & \quad 45 \text{ W} \\
(3) & \quad 100 \text{ W} \\
(4) & \quad 50\sqrt{3} \text{ W}
\end{align*}
\]
```

Ans. (1)

Sol. 
\[
F = \frac{m}{V^2} = \frac{5}{100} = 0.05 \text{ N}
\]

\[
V = a + at = 0 + 1 \times 10 = 10 \text{ m/s}
\]

\[
\text{5e power} P = F \times V = 10 \times 10 = 50 \text{ W}
\]

6. Find ratio of Ct’s Bragg’s wavelength of photon & electron kinetic energy of both the particles is same.

```
\[
\begin{align*}
(1) & \quad 1:43 \\
(2) & \quad 1:1 \\
(3) & \quad 2:45 \\
(4) & \quad 1:20
\end{align*}
\]
```

Ans. (1)

Sol. 
\[
\frac{h}{\nu} = \frac{h}{\nu} = \frac{\lambda}{\lambda}
\]

\[
\Rightarrow \frac{\lambda}{\lambda} = \frac{1}{43}
\]

---

7. A capacitor is charged to voltage $V$. Its positive plate is enclosed by a closed surface. Find flux passing through the closed surface capacitance of the capacitor is $C$.

```
\[
\begin{align*}
(1) & \quad CV \\
(2) & \quad CV \\
(3) & \quad RV/C \\
(4) & \quad CV
\end{align*}
\]
```

Ans. (1)

Sol. Change on capacitor $\phi = CV$

charge on positive plate will be $\phi = -CV$

so flux passing through the closed surface is $\phi = \frac{CV}{\epsilon_0}$

8. Find energy for He$^{++}$ in first excited state.

```
\[
\begin{align*}
(1) & \quad 13.6 \text{ eV} \\
(2) & \quad 27.2 \text{ eV} \\
(3) & \quad 3.4 \text{ eV} \\
(4) & \quad 1.51 \text{ eV}
\end{align*}
\]
```

Ans. (1)

Sol. 
$E = \frac{Z^2}{r^2} \text{eV} = \frac{5^2}{2^2} \times 13.6 \text{ eV} = 13.6 \text{ eV}$

9. A wave is propagating in stretched string. Find the frequency of this propagating wave if density of string material = $\rho$. Young’s modulus = E. Extension in string = $L$. Natural length of string = $L$. Wavelength of wave $= \lambda$.

```
\[
\begin{align*}
(1) & \quad \frac{\sqrt{\omega L}}{\sqrt{\rho}} \\
(2) & \quad \frac{\sqrt{E L}}{\sqrt{\rho}} \\
(3) & \quad \frac{\sqrt{E L}}{\sqrt{\rho}} \\
(4) & \quad \frac{\sqrt{E L}}{\sqrt{\rho}}
\end{align*}
\]
```

Ans. (4)

Sol. 
$F = \frac{\sqrt{E L}}{\sqrt{\rho}}$
10. If \( A = 2 \hat{j} + 2 \hat{k} \) and \( B = 3 \hat{i} - \hat{j} + 2 \hat{k} \), find magnitude of \( B \).

\[ |B| = \sqrt{2^2 + (-1)^2 + 2^2} = \sqrt{4 + 1 + 4} = \sqrt{9} = 3 \]

Ans. (2)

11. A body rotating with kinetic energy \( E \). If angular velocity of body is increased by three times of initial angular velocity, then kinetic energy becomes \( 9E \). Find the value of \( \omega \).

\[ E = \frac{1}{2} I \omega^2 \]

\[ 9E = \frac{1}{2} I (3\omega)^2 \]

\[ 9 = 9 \]

Ans. (2)

12. If force \( F \), velocity \( V \) and time \( T \) are taken as fundamental quantities then find dimensions of density.

\[ [V/F/T^2] = [F/T^2] = [V/T^2] = [F/V/T] \]

Ans. (4)

13. Eight identical drops each has velocity 6 m/s in same direction combine to form a bigger drop find velocity of the bigger drop.

(1) 15 m/s
(2) 20 m/s
(3) 5 m/s
(4) 4 m/s

Ans. (3)

14. An electromagnetic wave is propagating along positive x-axis. Amplitude of electric field is 6 \( \times 10^{-3} \) V/m. Find amplitude of magnetic field.

\[ \text{Ans. (2)} \]

\[ B = \frac{E}{c} \]

\[ B = \frac{6 \times 10^{-3}}{3 \times 10^8} = 2.2 \times 10^{-11} T \]