UNITS & DIMENSION BOOKLET (SOLUTION)

1. **(D)**
Theoretical

2. **(B)**
Impulse $= \Delta p$

4. $F = 6\pi\eta r\ V$

5. $T = \dfrac{F}{L}$

6. $F = \dfrac{GM_1M_2}{r^2}$

7. $\dfrac{d\theta}{dt} = \dfrac{KA(\Delta T)}{L}$ thermal conductivity

8. $P = e\sigma AT^4$

9. Theoretical

10. Theoretical

11. Theoretical

12. Theoretical

13. Theoretical

14. Theoretical

15. Theoretical

16. $\left(P + \dfrac{a}{v^2}\right)(v - b) = C\ T$

$\dfrac{a}{v^2}$ must have dimension of pressure

$M^1L^{-1}T^{-2} = \dfrac{[a]}{\left[L^3\right]^2}$

$[a] = M^1L^5T^{-2}$

17. $PV = nRT$

$[R] = \left[\dfrac{PV}{nT}\right]$

18. Theoretical

19. $E = hv$

$n = \frac{e}{v}$

$M^1L^2T^{-1}$

20. $h = \frac{E}{v}$

Joule second

21. Theoretical

22. $M^oL^oT^1 \propto M^aL^b\left[L^1T^{-2}\right]^c$

$a = 0$

$b + c = 0$

$1 = -2c$

$c = \frac{-1}{2}$

$b = \frac{1}{2}$

23. **(B)**

$L^3\alpha\left(L^2\right)^\alpha\left(L^1T^{-1}\right)^\beta t^r$

$2\alpha + \beta = 3$

$-\beta + r = 0$

$\beta = r$

24. $h = \frac{2T\cos\alpha}{rsg}$

25. **(D)**

M = mass/length

$ML^{-1}T^o$

26. **(D)**

bt dimentionless

27. wave velocity

28. $(P) = \left[\frac{a}{v^2}\right]$

$[a] = [pv^2]$

29. $[v] = [b]$

30. nRT = pv

Energy

31. $ab = [pv^2][v]$

$\left[M^1L^{-1}T^{-2}\right]\left[L^6\right]\left[L^3\right]$

$= M^1L^8T^{-2}$

32. $y = \dfrac{F'L}{A\,\Delta L}$

$[y] = \left[FA^2V^{-1}\right]$

33. $F = \dfrac{q^1q^2}{4\lambda\varepsilon_0 r^2}$

$[\varepsilon_0] = \dfrac{[F]\left[R^2\right]}{\left[q^2\right]}$

35. $\dfrac{1}{\sqrt{\mu_0\varepsilon_0}} = v$

36. $Q = ms\,\Delta T$

$S = \dfrac{[Q]}{[m][\Delta T]}$

$= \dfrac{M^1L^2T^{-2}}{M\ K}$

$M^0L^2T^{-2}K^{-1}$

37. $Q = ML$

$L = \dfrac{Q}{M}$

$[L] = \left[M^oL^2T^2\right]$

38. Theoretical

39. Theoretical

40. Theoretical

41. $E = \dfrac{kq}{r^2}$

42. Theoretical

43. Theoretical

44. Theoretical

45. Theoretical

46. $M \propto V^a\,F^b\,E^c$

$\left[M^1\right] = \left[L^1T^{-1}\right]^a\left[M^1L^1T^{-2}\right]^b\left[M^1L^2T^{-2}\right]^c$

$a + b + 2c = 0$

$-a - 2b - 2c = 0$

$b + c = 1$

$2b + 2c = 2$

$-a-2=0$

$-2+b+2(1-b)=0$

$-2+b+2-2b=0$

$b=0$

$c=1$

$[M]=V^{-2}F^{0}E^{1}$

47. $F \propto \sqrt{T}$

$Y \propto T$

48. Theoretical

49. Theoretical

50. $[t]=[d]^{1}[R]^{b}[S]^{1}$

$T=\left[M^{1}L^{3}\ L^{b}\ M^{1}L^{1}T^{-2}L^{-1}\right]^{1/2}$

$L\dfrac{3+b}{2}=L^{o}$

$\dfrac{3+b}{2}=0$

$b=-3$

51. Theoretical

54. $\left[\dfrac{dp}{dx}\right]=M^{1}L^{-2}T^{-2}$

55. Theoretical

56. Theoretical

57. Theoretical

58. Theoretical

59. $M^{1}L^{2}T^{-2}$

$\left[cv^{2}\right]=[E]$

60. Theoretical

61. $[S]=[E]^{a}\ [V]^{b}\ [T]^{c}$

$M^{1}T^{-2}=\left[M^{1}L^{2}T^{-2}\right]^{a}\ \left[L^{1}T^{-1}\right]^{b}\ [T]^{c}$

$1=a$

$0=2a+b$

$0=2$

$-2=-2a-b+c$

$-2=-2+2+c$

$c=-2$

62. Theoretical

63. Theoretical

65. $\frac{\Delta v}{v} = \frac{3\Delta r}{r}$
$= 3\ \%$

66. $\frac{\Delta v}{v} = \frac{3\Delta r}{r}$
$\frac{6}{3} = \frac{\Delta r}{r}$
$\frac{\Delta r}{r} = 2\%$
$\frac{\Delta A}{A} = \frac{2\Delta r}{r} = 4\%$

67. $\frac{dx}{x} = X\frac{\Delta M}{M} + Y\frac{\Delta L}{L} + Z\frac{\Delta T}{T}$
$= ax + by + cz$

68. $T = 2z\sqrt{\frac{\ell}{g}}$
$T^2 = 4z^2\frac{\ell}{g}$
$g = 4z^2\frac{\ell}{T^2}$
$\frac{\Delta g}{g} = \frac{\Delta \ell}{\ell} + \frac{2\Delta T}{T}$
$= 2 + 2\times 3$
$= 8\ \%$

WINDOW TO JEE MAIN

1. Jorque work
Work = F. S
Jorque $r \times F$

2. same as 1

3. $v = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$
$v^2 = \frac{1}{\mu_0\varepsilon_0}$
$\left[\frac{1}{\mu_0\varepsilon_0}\right] = \left[L^2T^{-2}\right]$

4. $F = 6\ z\eta rv$

$$[\eta] = \frac{[F]}{[r][v]}$$

$$= \frac{M^1 L^1 T^{-2}}{L^1 L^1 T^{-1}} = M^1 L^{-1} T^{-1}$$

5. Theoretical

6. Theoretical

8. $p = mv$

$$p = 3.513 \times 5.00$$

$$= 17.565$$

$$= 17.6 \text{ kg ms}^{-1}$$

9. Theoretical

10. $$LC = \frac{1}{30} \times \left(0.5^{o}\right) = \frac{1}{60} = 1\text{min}$$

11. 5, 1, 2

12. Theoretical

13.

14.

15. Theoretical

16. $$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$$g = \frac{4\lambda^2 \ell}{T^2}$$

$$\frac{\Delta g}{g} = \frac{\Delta \ell}{\ell} + 2\frac{\Delta T}{T}$$

$$= \frac{1}{200} + 2 \times \frac{1}{90}$$

17.

18.