1. Select the pair whose dimensions are same
(a) Pressure and stress
(b) Stress and strain
(c) Pressure and force
(d) Power and force

2. Dimensional formula $ML^{-1}T^{-2}$ does not represent the physical quantity
(a) Young's modulus of elasticity
(b) Stress
(c) Strain
(d) Pressure

3. Dimensional formula ML^2T^{-3} represents
(a) Force (b) Power
(c) Energy (d) Work

4. The dimensions of *calorie* are
(a) ML^2T^{-2} (b) MLT^{-2}
(c) ML^2T^{-1} (d) ML^2T^{-3}

5. Whose dimensions is ML^2T^{-1}
(a) Torque (b) Angular momentum
(c) Power (d) Work

6. Which pair has the same dimensions
(a) Work and power
(b) Density and relative density
(c) Momentum and impulse
(d) Stress and strain

7. Dimensions of one or more pairs are same. Identify the pairs
(a) Torque and work
(b) Angular momentum and work
(c) Energy and Young's modulus
(d) Light year and wavelength

8. Dimensional formula for volume elasticity is
(a) $M^1L^{-2}T^{-2}$ (b) $M^1L^{-3}T^{-2}$
(c) $M^1L^2T^{-2}$ (d) $M^1L^{-1}T^{-2}$

9. The dimensions of universal gravitational constant are
(a) $M^{-2}L^2T^{-2}$ (b) $M^{-1}L^3T^{-2}$
(c) $ML^{-1}T^{-2}$ (d) ML^2T^{-2}

10. The dimensional formula of angular velocity is
(a) $M^0L^0T^{-1}$ (b) MLT^{-1}
(c) $M^0L^0T^1$ (d) ML^0T^{-2}

11. The dimensions of power are
(a) $M^1L^2T^{-3}$ (b) $M^2L^1T^{-2}$
(c) $M^1L^2T^{-1}$ (d) $M^1L^1T^{-2}$

12. The dimensions of couple are
(a) ML^2T^{-2} (b) MLT^{-2}
(c) $ML^{-1}T^{-3}$ (d) $ML^{-2}T^{-2}$

13. The dimensional formula for impulse is
(a) MLT^{-2} (b) MLT^{-1}
(c) ML^2T^{-1} (d) M^2LT^{-1}

14. The dimensional formula for the modulus of rigidity is
(a) ML^2T^{-2} (b) $ML^{-1}T^{-3}$
(c) $ML^{-2}T^{-2}$ (d) $ML^{-1}T^{-2}$

15. The dimensional formula for *r.m.s.* (root mean square) velocity is
(a) M^0LT^{-1} (b) $M^0L^0T^{-2}$
(c) $M^0L^0T^{-1}$ (d) MLT^{-3}

16. The dimensional formula for Planck's constant (h) is
(a) $ML^{-2}T^{-3}$ (b) ML^2T^{-2}
(c) ML^2T^{-1} (d) $ML^{-2}T^{-2}$

17. Out of the following, the only pair that does not have identical dimensions is
(a) Angular momentum and Planck's constant
(b) Moment of inertia and moment of a force
(c) Work and torque
(d) Impulse and momentum

18. The dimensional formula for impulse is same as the dimensional formula for
(a) Momentum

(b) Force
(c) Rate of change of momentum
(d) Torque

19. Which of the following is dimensionally correct
(a) Pressure = Energy per unit area
(b) Pressure = Energy per unit volume
(c) Pressure = Force per unit volume
(d) Pressure = Momentum per unit volume per unit time

20. The equation of state of some gases can be expressed as $\left(P+\frac{a}{V^2}\right)(V-b)=RT$. Here P is the pressure, V is the volume, T is the absolute temperature and a, b, R are constants. The dimensions of 'a' are
(a) ML^5T^{-2} (b) $ML^{-1}T^{-2}$
(c) $M^0L^3T^0$ (d) $M^0L^6T^0$

21. Dimensional formula of stress is
(a) M^0LT^{-2} (b) $M^0L^{-1}T^{-2}$
(c) $ML^{-1}T^{-2}$ (d) ML^2T^{-2}

22. Dimensional formula of velocity of sound is
(a) M^0LT^{-2} (b) LT^0
(c) M^0LT^{-1} (d) $M^0L^{-1}T^{-1}$

23. MLT^{-1} represents the dimensional formula of
(a) Power (b) Momentum
(c) Force (d) Couple

24. Dimensional formula of heat energy is
(a) ML^2T^{-2} (b) MLT^{-1}
(c) $M^0L^0T^{-2}$ (d) None of these

25. Which of the following quantities has the same dimensions as that of energy
(a) Power (b) Force
(c) Momentum (d) Work

26. Which one of the following does not have the same dimensions
(a) Work and energy
(b) Angle and strain
(c) Relative density and refractive index
(d) Planck constant and energy

27. Dimensions of frequency are
(a) $M^0L^{-1}T^0$ (b) $M^0L^0T^{-1}$
(c) M^0L^0T (d) MT^{-2}

28. Which one has the dimensions different from the remaining three
(a) Power (b) Work
(c) Torque (d) Energy

29. The expression $[ML^2T^{-2}]$ represents
(a) Pressure (b) Kinetic energy
(c) Momentum (d) Power

30. The dimensional formula of wave number is
(a) $M^0L^0T^{-1}$ (b) $M^0L^{-1}T^0$
(c) $M^{-1}L^{-1}T^0$ (d) $M^0L^0T^0$

1. (a) Pressure $= \frac{\text{Force}}{\text{Area}} = ML^{-1}T^{-2}$

Stress $= \frac{\text{Restoring force}}{\text{Area}} = ML^{-1}T^{-2}$

2. (c) Strain $= \frac{\Delta L}{L} \Rightarrow$ dimensionless quantity

3. (b) Power $= \frac{\text{Work}}{\text{Time}} = \frac{ML^2T^{-2}}{T} = ML^2T^{-3}$

4. (a) *Calorie* is the unit of heat *i.e.*, energy.

So dimensions of energy $= ML^2T^{-2}$

5. (b) Angular momentum = $mvr = MLT^{-1} \times L = ML^2T^{-1}$

6. (c) Impulse = change in momentum so dimensions of both quantities will be same and equal to MLT^{-1}

7. (a,d) [Torque] = [work] = $[ML^2T^{-2}]$

[Light year] = [Wavelength] = $[L]$

8. (d) Volume elasticity = $\frac{\text{Force/Area}}{\text{Volume strain}}$

Strain is dimensionless, so

$= \frac{\text{Force}}{\text{Area}} = \frac{MLT^{-2}}{L^2} = [ML^{-1}T^{-2}]$

9. (b) $F = \frac{Gm_1m_2}{d^2} \Rightarrow G = \frac{Fd^2}{m_1m_2}$

$\therefore [G] = \frac{[MLT^{-2}][L^2]}{[M^2]} = [M^{-1}L^3T^{-2}]$

10. (a) Angular velocity = $\frac{\theta}{t}$, $[\omega] = \frac{[M^0L^0T^0]}{[T]} = [T^{-1}]$

11. (a) Power = $\frac{\text{Work done}}{\text{Time}} = \left[\frac{ML^2T^{-2}}{T}\right] = [ML^2T^{-3}]$

12. (a) Couple = Force $\times$ Arm length $= [MLT^{-2}][L] = [ML^2T^{-2}]$

13. (b) Impulse = Force $\times$ Time $= [MLT^{-2}][T] = [MLT^{-1}]$

14. (d) Modulus of rigidity = $\frac{\text{Shear stress}}{\text{Shear strain}} = [ML^{-1}T^{-2}]$

15. (a)

16. (c) $E = h\upsilon \Rightarrow [ML^2T^{-2}] = [h][T^{-1}] \Rightarrow [h] = [ML^2T^{-1}]$

17. (b) Moment of inertia $= mr^2 = [M][L^2]$

Moment of Force = Force $\times$ Perpendicular distance

$= [MLT^{-2}][L] = [ML^2T^{-2}]$

18. (a) Momentum = $mv = [MLT^{-1}]$

Impulse = Force $\times$ Time = $[MLT^{-2}] \times [T] = [MLT^{-1}]$

19. (b) Pressure = $\frac{\text{Force}}{\text{Area}} = \frac{\text{Energy}}{\text{Volume}} = ML^{-1}T^{-2}$

20. (a) By principle of dimensional homogenity $\left[\frac{a}{V^2}\right] = [P]$

$\therefore [a] = [P][V^2] = [ML^{-1}T^{-2}] \times [L^6] = [ML^5T^{-2}]$

21. (c) Stress = $\frac{\text{Force}}{\text{Area}} = \frac{[MLT^{-2}]}{[L^2]} = [ML^{-1}T^{-2}]$

22. (c)

23. (b) Momentum = $mv = [MLT^{-1}]$

24. (a) $Q = [ML^2T^{-2}]$ (All energies have same dimension)

25. (d) Energy = Work done [Dimensionally]

26. (d) [Planck constant] = $[ML^2T^{-1}]$ and

[Energy] = $[ML^2T^{-2}]$

27. (b) Frequency $= \frac{1}{T} = [M^0L^0T^{-1}]$

28. (a) Power = $\frac{\text{Energy}}{\text{Time}}$

29. (b)

30. (b) Wave number = $\frac{1}{\lambda}$ $\therefore$ dimension is $[M^0L^{-1}T^0]$