PHYS 105 · Chapter 1: Measurement

Past-Exam Review — questions from PSU past midterm (Major 1) and final exams

Constant: g = 9.81 m/s^2 · The source of each question is shown in [brackets].

Part 1: Multiple-Choice Questions (27)

Indicate the answer choice that best completes the statement or answers the question.

1.1 Physical Quantities: Fundamental, Derived, Scalar and Vector

Q1. *Which of the following is NOT a fundamental quantity?* **[Midterm 233]**

A *Time*
B *Weight*
C *Length*
D *None of the above*

Q2. *The physical quantities that do not depend on any other physical quantities for their measurement are known as:* **[Final 231]**

A *Derived quantities*
B *Fundamental quantities*
C *Both of the above*
D *None of the above*

Q3. *Which of the following is a scalar quantity?* **[Midterm 252]**

A *Speed*
B *Velocity*
C *Displacement*
D *Acceleration*

Q4. *Which of the following is NOT a vector quantity?* **[Final 241]**

A *Weight*
B *Velocity*
C *Acceleration*
D *Speed*

Q5. *Temperature is considered as a:* **[Final 232]**

A *Vector quantity*
B *Scalar quantity*
C *Both of the above*
D *None of the above*

Q6. *The mass of an object:* **[Final 221]**

A *is fixed*
B *varies from location to location*
C *has the unit newton*
D *is a vector quantity*

Q7. *Which of the following pairs are both vector quantities?* **[Final 222]**

A *Momentum and energy*
B *Momentum and impulse*
C *Momentum and velocity*
D *Both (b) and (c)*

1.2 Units and Changing Units

Q8. *Density is defined as $\rho = m/V$, where m is the mass and V is the volume. What is the SI unit of density?* **[Midterm 243]**

A N/m^3
B kg/cm^3
C kg/m^3
D g/m^3

Q9. *The SI unit of force is the newton (N). Using Newton's second law $\Sigma F = ma$, the newton is equivalent to:* **[Midterm 201]**

A kgm/s
B kgm/s^2
C ms^2/kg
D kgm^2/s

Q10. *Convert a speed of 30 mi/h to m/s. (1 mile = 1609 m)* **[Midterm 241]**

A 16.7 m/s
B 13.4 m/s
C 33.3 m/s
D 67.1 m/s

Q11. *The speed limit on a street is 75 mi/h. What is this speed in SI units? (1 mi = 1609 m)* **[Midterm 201]**

A 33.5 m/s
B 167.8 m/s
C 120.7 m/s
D 45.3 m/s

Q12. *A car moves with a speed of 65 mi/h. What is its speed in m/s? (1 mile = 1.61 km)* **[Final 182]**

A 145.3 m/s
B 29.1 m/s
C 376.7 m/s
D 11.2 m/s

Q13. *A speed of 40 mi/h is equal to: (1 mile = 1.61 km)* **[Midterm 233]**

A 17.9 m/s
B 89.4 m/s
C 6.9 m/s
D 11.1 m/s

Q14. *A cheetah can reach a speed of 30.0 m/s in short bursts. Convert 30.0 m/s to miles per hour. (1 mile = 1609 m)* **[Midterm 242]**

A 53.6 mi/h
B 67.1 mi/h
C 398 mi/h
D 13.4 mi/h

Q15. *A car moves at 110 km/h. What is its speed in feet per second? (1 km = 3281 ft)* **[Midterm 243]**

A 75 ft/s
B 100 ft/s
C 125 ft/s
D 150 ft/s

Q16. *Garden snails have top speeds of 0.0090 km/h. Which of the following correctly converts this speed into another unit?* **[Final 242]**

A *2.5 mm/s*
B *9.0 m/s*
C *250 cm/s*
D 2.5×10^{-9} *m/s*

Q17. *Given that 1 gallon = 3.785 liters, how many gallons are there in 80 liters?* **[Final 211]**

A *80 gallons*
B *21.14 gallons*
C *37.85 gallons*
D *302.8 gallons*

Q18. *The selling price of a cable is 5 dollar/meter. What is its price in Saudi riyal/inch? (1 dollar = 3.78 riyal, 1 meter = 39.37 inch)* **[Midterm 211]**

A *0.48*
B *52.1*
C *744.1*
D *0.033*

1.3 Dimensional Analysis

Q19. *Which of the following quantities has the dimensions of distance?* **[Midterm 241]**

A $\frac{1}{2}a^2t$
B v/t
C at^2
D $2vt^2$

Q20. *Which of the following has dimensions of distance?* **[Final 182]**

A $2at$
B v^2/a
C a/t^2
D $\sqrt{2av}$

Q21. *Which of the following quantities has the dimensions of acceleration? (v is velocity, x is distance and t is time)* **[Midterm 242]**

A $\frac{x^2}{vt}$
B $\frac{2vx}{t}$
C $\frac{5v^2}{x}$
D $\sqrt{\frac{2v^2}{xt}}$

Q22. *Which of the following equations is dimensionally consistent?* **[Final 221]**

A $x = vt$
B $x = \frac{1}{2}at$
C $x = \left(\frac{2x}{a}\right)^{1/2}$
D *None of these*

Q23. *Which of the following equations is dimensionally consistent? (x is position, v is velocity, a is acceleration and t is time)* **[Final 241]**

A $v = at^2$
B $x = at$
C $v = at$
D $x = a/t$

Q24. *The orbital speed v of a satellite depends only on the orbital radius r and the orbital period T. Which expression for v could be dimensionally correct?* **[Midterm 251]**

A $v = 2\pi \frac{r^2}{T^2}$
B $v = 2\pi \frac{r}{T}$
C $v = 2\pi \frac{T}{r}$
D $v = 2\pi rT$

Q25. *The acceleration of an object is given by $a = v_0/t + At^2$, where v_0 is the initial velocity and t is time. What are the dimensions of A?* **[Midterm 233]**

A L/T^2
B L^2T^2
C L/T^4
D LT^4

Q26. *The acceleration of a particle moving with constant speed v in a circle of radius r is $a = r^n v^2$. Using dimensional analysis, what is the value of n?* **[Midterm 201]**

A *2*
B *1*
C *−2*
D *−1*

Q27. *The speed v (in m/s) of an object is given by $v = A(a/t) + Bxt^2$, where t is in seconds, x in meters and a in m/s^2. What are the units of A and B?* **[Midterm 211]**

A s^2, s^3
B $ms^2, m/s^3$
C $1/s^2, ms^3$
D $s^2, 1/s^3$

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