

Name:

Uni. No.:



BUK

Bayero University, Kano

DEPARTMENT OF PHYSICS

FIRST SEMESTER EXAMINATION

COURSE: PHY1210: Mechanics

2020/2021 SESSION

TIME ALLOWED: 45 Min.

INSTRUCTION: Answer all questions by choosing the correct option as appropriate.

- All the following are sets of fundamental quantities EXCEPT? a. Mass, length and Temperature b. Time, Electric current and Mass c. Amount of substance, Length and Electric current d. Mass, frequency, and Potential difference
- One of the following options has wrong dimension. a. Velocity is LT^{-1} b. Force is MLT^{-2} c. Surface tension is MT^{-2} d. Work is ML^2T^{-1}

Use this information to answer questions 3 and 4: If a mathematical relation is given by $T = k m^x L^y g^z$.

- The respective values of x, y, and z are? a. 0, $\frac{1}{2}$, 1 b. 0, $-\frac{1}{2}$, $\frac{1}{2}$ c. $\frac{1}{2}$, $-\frac{1}{2}$, 0 d. 0, $\frac{1}{2}$, 0
- _____ is the mathematical expression of the relation. a. $T = kl\sqrt{g}$ b. $k\sqrt{\frac{l}{g}}$ c. $k\sqrt{\frac{g}{l}}$ d. $k\sqrt{\frac{m}{l}}$
- The equation for the density of earth (ρ_e) is given as? A. $\rho_e = \frac{3g}{4\pi r G}$ B. $\rho_e = \frac{3gr^2}{4\pi G}$ C. $\rho_e = \frac{GmM}{r^2}$ D. $\rho_e = \frac{\omega^2 r^3}{G}$
- Which of the following expression verify the variation of acceleration due to gravity? A. $g = \frac{3}{4}\pi G\rho(R - \frac{r}{2})$ B. $g = \frac{Gm}{2r\rho}$ C. $g = \sqrt{2vr}$ D. None of the above

Use this information to answer questions 7, 8, 9 and 10: If four (4) forces with their angles are defines as $F_1=19N$ & $\phi_1=90^\circ$, $F_2=15N$ & $\phi_2=60^\circ$, $F_3=16N$ & $\phi_3=45^\circ$, and $F_4=11N$ & $\phi_4=30^\circ$

- What is the resultant force along the x- axis? a. 55.93N b. 47.33N c. 5.7N d. 29.80N
- What is the resultant force along Y-axis? a. 55.93N b. 47.33N c. 5.7N d. 29.80N
- The equivalent resultant force along the x and y -axis. a. 55.93N b. 47.33N c. 5.7N d. 29.80N
- The direction of the force will be? a. 27° b. 32° c. 41° d. 53°
- A body moves with velocity $\vec{V} = 5\hat{i} + 2\hat{j} - 3\hat{k}$ under the influence of a constant force $\vec{F} = 4\hat{i} + 3\hat{j} - 2\hat{k}$. Determine the instantaneous power. (a) 67 W (b) 32 W (c) 100 W (d) 15 W
- Power is defined as: (a) $P = FV$ (b) $P = \vec{F} \times \vec{V}$ (c) $P = \vec{F} \cdot \vec{V}$ (d) $P = FS$
- Given the displacement vectors $A = 3\hat{i} - 4\hat{j} + 4\hat{k}$ m and $B = 2\hat{i} + 3\hat{j} - 4\hat{k}$ m, find the vector $D = 2A - B$. (a) $D = 8\hat{i} - 11\hat{j} + 4\hat{k}$ (b) $D = 8\hat{i} + 5\hat{j} + 4\hat{k}$ (c) $D = 4\hat{i} - 5\hat{j} + 4\hat{k}$ (d) $D = 4\hat{i} - 11\hat{j} + 12\hat{k}$
- Find the force of gravity between two lead balls of masses $m_1=20\text{kg}$ and $m_2=40\text{kg}$, if the distance between the centers is 10cm a) $5.34 \times 10^{-6}\text{N}$ b) $1.21 \times 10^{-6}\text{N}$ c) $3 \times 10^{-6}\text{N}$ d) $7.5 \times 10^{-6}\text{N}$

Use this information to answer question 15 and 16: A car moving at 30m/s slows uniformly to a speed of 10m/s in time of 5.0s.

- Determine the acceleration of the car? a. -2.5m/s^2 b. -4.0m/s^2 c. 6.5m/s^2 d. -8.0m/s^2
- The distance it move in the third second a. 2.0m b. 3.7 m c. 6.5m d. 5.3m

Use this information to answer question 17, and 18: An object starts from rest with a constant acceleration of 8.0m/s^2 along a straight line.

- Find the speed at the end of 5.00s? a. 20m/s b. 30m/s c. 40m/s d. 50m/s
- The distance travel in the 5.0s? a. 75m b. 130m c. 100m d. 50m.

Use this information to answer questions 19, 20, 21 and 22: A ball is lifted with an initial velocity of 20m/s at an angle of 40° .

- The positions (S_x and S_y) at 2 seconds will be? a. 18.5m and 32.1m b. 7.8m and 16.1m c. 30.64m and 5.71m d. 19.8m and 9.8m
- The time taken to reach the maximum height and total time of flight will be? a. 2.57 and 1.29 b. 1.34 and 8.23 c. 5.6m and 12.3m d. 11.31 and 7.89m
- _____ and _____ will be the respective values of Range and Height. a. 18.5m and 32.1m b. 39.4m and 8.26mm c. 30.64m and 5.71m d. 19.8m and 9.8m
- The magnitude and direction of its velocity will be? a. 17m/s and 15° b. 20m/s and 40° c. 1.7m/s and 18° d. 27m/s and 25°

23. A particle undergoes the following consecutive displacements: 3.50 m south, 8.20 m northeast, and 15.0 m west. What is the resultant displacement? (a) $R = 4.5, \theta = -14^\circ$ (b) $R = 9.5, \theta = -14^\circ$ (c) $R = 9.5, \theta = 330^\circ$ (d) $R = 4.5, \theta = 330^\circ$

The distance x in meters (m) covered by a car at any time t in seconds (s) is given by $x = 1 + 3t - 2t^2$. Use this information to answer 24 & 25.

24. What is the displacement of the dog from $t_1 = 2s$ to $t_2 = 5s$? (a) -25m (b) 8m (c) 85m (d) -33m (e) 25m
 25. The velocity of the body at $t = 0$ will be? (a) 3m/s (b) 4m/s (c) -4m/s (d) 18/s (e) 7m/s
 Use this information to answer question 26 and 27. The Velocity (v) of a car at any time t is given by $v = t^2 - 9t$. v is in meter (m/s) and t is in seconds (s).
 26. How far can the car move after 1 minute? a) 5.3km b) 558km c) 342.8km d) 160m e) 10m
 27. With what acceleration would the car move after 20s? a) 31m/s² b) 51m/s² c) 0.54m/s² d) 3m/s² e) 9.8m/s²
 28. Work-energy theorem states that: (a) The change in energy of a body is equal to the work done by the body. (b) The change in energy of a body is equal to the work done on the body. (c) The change in velocity of a body is equal to the work done by the body. (d) The change in energy of a body is equal to the velocity of the body
 29. A car with mass of 1400 Kg has a net forward force of 4500 N applied to it. The car starts from rest and travels down a horizontal highway. What is its kinetic energy after it has traveled 100 m. ?
 (a) $4.8 \times 10^{-5} J$ (b) $5.7 \times 10^5 J$ (c) $4.5 \times 10^5 J$ (d) $4.5 \times 10^{-5} J$

30. The escape velocity v of a lighter molecules in the earth atmosphere is a) $\frac{2GM_e}{r_e}$ b) $\left(\frac{2GM_e}{r_e}\right)^{\frac{1}{2}}$ c) $\left(\frac{2GM_e}{r_e}\right)^2$ d)

$$\left(\frac{2GmM_e}{r_e}\right)^{\frac{1}{2}}$$

ANSWER SHEET

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