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**University Examinations 2015/2016**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL ENGINEERING

**SPH 2150: BASIC PHYSICS**

**DATE: AUGUST, 2016 TIME:1 ½ HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *Compulsory**and any other* ***two*** *questions*

*CONSTANTS:*

*R:Universal gas constant (8.314J/mol/K)*

**QUESTION ONE - (30 MARKS)**

1. Differentiate between the following terms:
2. Distance and displacement (2 Marks)
3. Speed and velocity (2 Marks)
4. Given that $\vec{A}$ = (2.0$\hat{i}+2.0\hat{j}$) m and $\vec{B}$ = (2.0$\hat{i}-4.0\hat{j}$) Find;
5. $\vec{R}= \vec{A}+\vec{B}$ (3 Marks)
6. The magnitude of vector $\vec{R}$ ;$\left|R\right|$. (2 Marks)
7. The direction of $\vec{R}$ (2 Marks)
8. With reference to an ideal gas, explain the following processes;
9. Isothermic process (2 Marks)
10. Adiabatic process (2 Marks)
11. Isobaric process (2 Marks)
12. The cartesian coordinates of a point in the XY plane are (-2,3). Find the polar coordinates of this point. (3 Marks)
13. State the following laws; (3 Marks)
14. Charle’s law
15. Boyle’s law
16. 1st law of thermodynamics
17. Differentiate between strain and stress. (2 Marks)
18. (i) Define molar specific heats Cp and Cv of an ideal gas. (2 Marks)

(ii) Explain why Cp > Cv for any amount of ideal gas. (1 Mark)

1. Show that the following equations are dimensionally correct. (2 Marks)
2. V= at: V is the velocity, a is the acceleration and t is the time
3. S = ½ a$t^{2}$:S is the displacement

**QUESTION TWO ( 15 MARKS)**

1. (i) State Newton’s second law of motion. (2 Marks)

(ii) A body of mass , m = 4kg was acted upon by a force 40N as shown in figure (i) below;

 

If the coefficient of friction between the block and the surface was $μ=0.15$, calculate the acceleration of the block. (4 Marks)

1. Two blocks of masses M1 and M2 were connected by a light inextensible string over a frictionless pulley as shown below [ $θ=30^{0}$]
2. Show that Angle $∠ θ^{0}=Angle ∠ x^{0}$ (3 Marks)
3. Given that M1 = 2kg and $M\_{2}=4kg$. Calculate the acceleration of the system.[The direction of motion of the system is as shown in the diagram above] (3 Marks)
4. Calculate the magnitude of the tension in the string. (3 Marks)

**QUESTION THREE (15 MARKS)**

1. Define the following terms;
2. Impulse (2 Marks)
3. Momentum (2 Marks)
4. A body of mass 6kg was travelling at 400cm/s. Calculate its momentum (3 Marks)
5. Differentiate between elastic and inelastic collisions. (4 Marks)
6. A body of mass 4kg travelling at 6m/s collided head-on with another body of mass 5kg travelling at 2m/s. If the collision is perfectly inelastic, calculate their common velocity.

(4 Marks)

**QUESTION FOUR (15 MARKS)**

1. Show that for an isothermal expansion of an ideal gas, the work done on the gas is given by; (4 Marks)

 W = nRT/n $\left(\frac{V\_{i}}{V\_{t}}\right)$

 where R – Universal gas constant

 n – Moles

 $V\_{i(f)}$ – initial / final volume of the gas

1. A 1.0 mol sample of an ideal gas is kept at 0.00C during an expansion from 3.0L to 10.0L
2. How much work is done on the gas during the expansion. (4 Marks)
3. How much energy transfer by heat occurs between the gas and its surrounding in the process. (3 Marks)
4. If the gas is returned to the original volume by means of an isobaric process, how much work is done on the gas. (4 Marks)