GASABO DISTRICT

S2 PHYSICS MARKING GUIDE OF END 2nd TERM EXAMINATION

SECTION A (Attempt all questions 70marks)

1. a) Absolute errors: is defined as the difference between measure value and True value **(1mark)**

b) Random errors **(1mark)**
Systematic error **(1mark)**

2. a) False **(0.5marks)**
b) True **(0.5marks)**
c) False **(0.5marks)**
d) False **(0.5marks)**

3. L= 16cm -5cm = 9cm **(0.5marks)**
Number of sphere= 5

Diameter of each sphere $=\frac{Lenght\ of\ space\ occupied\ by\ spheres}{Number\ of\ spheres}$**/(0.5marks)**

D=$\frac{9cm}{5}$ =1.8 cm **(1mark)**

4. a) **The work-energy theorem states** that "the *work done on an object is equal to the change in its kinetic energy"*

$\Delta W = \Delta K.E = K.E_f - K.E_i$ **(1mark)**

b)

column A	**column B**
a) Energy	i) Energy that is stored in an object due to its position relative to some zero position. **(1mark)**
b) Power	ii) Capacity to do work **(1mark)**
c)Kinetic energy	iii) Rate at which work is done.**(1mark)**
d)Potential energy	iv) Energy which a body possesses by virtue of being in motion. **(1mark)**

A → ii
B → iii
C → iv
D → i

c.

m=1000kg

U=16.7m/s

V=0m/s (i.e it comes to stop after applies brake

F_r=8000N

d=? , by using work energy theorem

W=ΔKE (1mark)

Fd=$\frac{1}{2}m\Delta V^2$, Fa=-Fr so F=-8000N

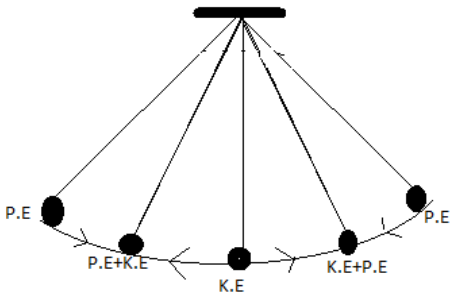
-8000d=$\frac{1}{2}$1000(0)^2 − $\frac{1}{2}$1000(16.7)^2 (1mark)

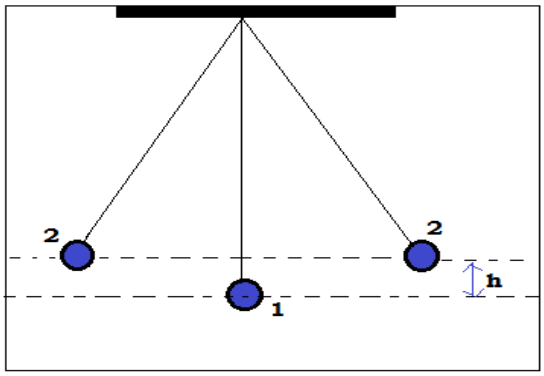
-8000d =-139445

d= $\frac{-139445}{-8000}$ = **17.4m (1mark)**

5. a) the law of conservation of mechanical energy state that" *the energy can neither be created nor destroyed but can only be converted from one form to another.* **(1mark)**

b) The diagram of a swinging pendulum





(1mark)

At **point1** KE is maximum, PE=0 (PE is converted into KE) **(0.5marks)**

At point 2 PE is Maximum while KE=0, minimum (KE is converted into PE) **(0.5marks)**

c) m=150g=0.150kg

h_1=1.8m, h_1=1.25m , g=10m/s^2

i) V=$\sqrt{2gh_1}$ = $\sqrt{2x10x1.8}$ = 6m/s **(1mark)**

ii) KE=$\frac{1}{2}mV^2$ = $\frac{1}{2}0.150x6^2 = 2.7\ J$ **(2 marks)**

iii) V=$\sqrt{2gh_2}$ = $\sqrt{2x10x1.25}$ = 5m/s **(1mark)**

iv) KE=$\frac{1}{2}mV^2$ = $\frac{1}{2}0.150x5^2 = 1.875\ J$ **(2 marks)**

6. a) Archimedes' principle "*Any object completely or partially submerged in a fluid, it experiences an upthrust force which is equal to the weight of the fluid displaced by the object.*" **(1mark)**

b) i) U=15N**(1mark)** ii) U= 32N **(1mark)** iii)U= 20N **(1mark)**

C) $\rho_b = 7800kg/m^3$

$W_{air} = 117N$, $W_{liquid} = 105N$

i) V=? , V_L=$\frac{W_{air}}{\rho_b g}$ **(1mark)** = $\frac{117}{7800x10} = 0.0015\text{m}^3$ **(1mark)**

ii) U= $W_{air} - W_{liquid}$, U=117N-105N=12N **(1mark)**

ρ_W = $\frac{U}{V_L g}$ = $\frac{12}{0.0015X10} = 800kg/m^3$ **(1mark)**

7. a)

Uniform linear motion	**Non-uniform linear motion**
This is the motion of body moving at constant velocity (V=constant) **(0.5marks)**	This the motion of body moving at varying velocity (V increasing or decreasing) **(0.5marks**
Acceleration is zero (a=0m/s^2) **(0.5marks**	Acceleration is positive or negative **(0.5marks**

b) i) **Point O to A:** body moving by increasing velocity uniformly at constant acceleration (**1mark)**

ii) a= $\frac{\Delta V}{\Delta t} = \frac{12-0}{4-0} = 3m/s^2$ (**1mark)**

iii) Distance = area of figure OAB8 which is trapezium

d=$\frac{(B+b)xh}{2}$ = $\frac{(8+4)x12}{2} = 72m$ (**2marks)**

8. a) Density: is defined as mass per unit volume of body **(1 marks)**

Or student can Write a formula of density and explain the quantities also is right he/she can get all total scores of question.

b) m=27g

V= 15cm^3 ρ=$\frac{m}{V} = \frac{27}{15} = 1.8\ g/cm^3$ **(1 marks)**

ρ=$\frac{m}{V} = \frac{0.027kg}{0.000015m^3} = 1800kg/m^3$ **(1 marks)**

c) m=190g-100g= 90g V= 30cm^3 ρ=$\frac{m}{V}$ = $\frac{90}{30}$ = 3g/cm^3 **(2marks)**

9. a) Friction force: Is defined as a force that opposes the motion of body

b) i) **Advantage**

- To walk **(1marks)**
- To write **(1marks)**
- To make fire
- In braking vehicles and machines
- To hold screws and nails in place
- To keep nuts on bolts. Etc

ii) Disadvantage

- Cause wear and tear of contact surfaces of the machines **(1marks)**
- Cause unnecessary heat and loss of energy **(1marks)**
- Cause unnecessary noise

c) i) Factors affecting friction force

- Adhesion **(1marks)**
- Smoothness **(1marks)**
- Area of the contact with the surfaces:

ii) Friction forces can be reduced by:

- Making surfaces as smooth as possible **(1mark)**
- Oiling or greasing **(1mark)**
- Use of ball or roller bearing
- Putting graphite between moving parts.etc

10. a) Pressure: is defined as force applied perpendicular per unit area **(1mark)**

S. I unit is Pascal(Pa) or N/m^2 **(1mark**)

b) F=45N, B=5m , h=3m

P=? P=$\frac{F}{A}$ Area of Triangle A=$\frac{BXh}{2} = \frac{5X3}{2} = 7.5m^2$ **(1mark)**

P=$\frac{45}{7.5} = 6Pa\ or\ N/m^2$ **(1mark)**

C) SHOE A is higher hill shoe so that is most damage than B because it has small area that can increase pressure to penetrate easily in the surface (note: teachers must analyze other opinion of learners refer to a pressure concept) **(2marks)**

11. $h_{oil} = 27.2cm$

$h_{water} = 27.2cm - 9.41cm = 17.79cm$

$\frac{\boldsymbol{\rho_{oil}}}{\boldsymbol{\rho_{watr}}} = \frac{h_{water}}{h_{oil}} = \frac{\boldsymbol{\rho_{oil}}}{\mathbf{1}} = \frac{17.79cm}{27.2cm}$ **(1mark)**

= $27.2\boldsymbol{\rho_{oil}}$=17.79 , $\rho_{oil} = \frac{17.79}{27.2} = 0.654g/m^2$ **(2marks)**

12. a=4m/s^2

Initial position at t=0 X_0=5m

Initial velocity u=3m/s

i) Position at t=2s

Use equation of motion (X-X_0)=ut+$\frac{1}{2}at^2$ = (X-5=3x2+$\frac{1}{2}$4$x2^2$=19m **(3marks)**

Position is X= 19m

ii) position at velocity V=5m/s

use $V^2 = u^2 + 2a(X - X_0)$ = $5^2 = 3^2 + 2x4x(X - 5)$

25=9+8X-40 , 8X=25+31, 8X=56 so **X= 7m**

Position is X= 7m (3marks)

13. u=0m/s , V=0.620m/s , t=21.0ms= 0.021s , m=875g= 0.875kg

P=$\frac{work\ done}{time}$= $\frac{Fxd}{t} = FxV$ where V= $\frac{d}{t}$, so F=ma=0.875x($\frac{0.620-0}{0.021-0} = 25.8N$ **(2marks)**

Then P= FxV= 25.8x0.620= 16watts **(1marks)**

SECTION B (Choose 3 Questions 30marks)

14. ρ=860kg/m^3 , P_{atm}=101.2kPa=10200Pa, g=9.81m/s^2 h= 11.2cm=0.112m

(a) We use manometer to measure pressure in fluids and the relative density of fluids **(2 marks)**

(b) (i) $P_{atm} = 101.2 \times 10^3$ N/ m^2 or 101200Pa **(1 mark)**

(ii) The distance between two oil surface $h = 11.2 \times 10^{-2}\ m$ or h=0.112m **(1 mark)**

(c) (i) Non, the sealed container has less pressure than the atmospheric pressure **(2 marks)**

(ii) Pressure due to oil only $P_{oil} = \rho gh = 860 \times 9.81 \times 11.2 \times 10^{-2} = 944.9\ Pa$ **(1 mark)**

(iii) A learner A who propose this formula $P_{atm} - P_{air} = P_{oil}$ **(1 mark)**

(iv) The pressure of air in the sealed container $P_{air} = P_{atm} - P_{oil} = 101.2 \times 10^3 - 944.9 = 100.3$ kPa . **(2 marks)**

15. a) Pascal's principle: It states that a change in the pressure applied to a fluid is transmitted undiminished to every point of the fluid and to the walls of the container. (**1mark)**

Or Pascal's law states that if the effect of gravity can be neglected then the pressure in a fluid in equilibrium is the same everywhere.

b) application of Pascal's principle

- Hydraulic lift (**1mark)**
- Hydraulic Brakes (**1mark)**
- Hydraulic press

c) **piston A** m_B =8kg **piston A** m_A =?

A_B =16cm^2 =0.0016m^2 A_A =1600cm^2 =0.16m^2

g=10m/s^2

$F_B = mg = 80x10 = 80N$

i) $P_B = \frac{F_B}{A_B} = \frac{80N}{0.0016}$= 50000Pa (**2marks)**

ii) bridge is in equilibrium, $P_B = P_A = 50000Pa$ (**2marks)**

iii) $F_A = P_A A_A = 50000x0.16 = 8000Pa$ (**1mark)**

$W_A = \frac{F_A}{g} = \frac{F_B}{A_B} = \frac{8000}{10} = \mathbf{800Kg}$

The weight of vegetable is $\mathbf{800Kg}$ (**2marks)**

16.

i) Boyle's law:

Boyle's law states that, the volume of gas is inversely proportional to the absolute pressure applied to it when the temperature is kept constant.

That is $V \propto \frac{1}{P}$ Or PV =constant

Then $P_1V_1=P_2V_2$ (**2marks)**

ii) Charles' law

Charles gas law, states that, at constant pressure, the volume of a given amount of gas is directly proportional to the absolute temperature.

That is $V \propto T$ Or $\frac{V}{T}$ = constant, Then the equation takes the form $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ (**2marks)**

iii) Gay Lussac 's law (pressure law)

The law states that at constant volume, the absolute pressure of a gas is directly proportional to the absolute temperature.

That is $P \propto T$ $\frac{V}{T} =$ constant Then Then the equation takes the form $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ (**2marks)**

b) r=18.0cm=0.18m

P=1.05atm= 1.05x1.013x10^5 =

$V = \frac{4}{3}\pi r^3$, $V = \frac{4}{3}\pi(0.180m)^3 = 0.0244m^3$ **(1mark)**

$P = 1.05atm = 1.064\times10^5 N/m^2$. **(0.5marks)**

$T = (20+273) = 293K$. **(0.5marks)**

$R = 8.314J/mol.K$, therefore

$n = \frac{PV}{RT} = \frac{(1.064\times10^5 N/m^2)\times(0.0244m^3)}{8.314J/mol.K(293K)} = 1.066mol$ **(1mark)**

The mass of helium with molar mas $M = 4.00g/mol$

is $m = n\times M = (1.66)(4) = 4.263g$ **(1mark)**

17. a) Types of friction

- **Static friction force**

It is the force that arises between two objects in contact at rest.
It is an equilibrium force.
The magnitude of this force is given by $F_s = \mu_s mg$
F_s=Static friction force, **m**= mass of an object, μ_s = coefficient of static friction
g= acceleration due to gravity **(1mark)**

- **Kinetic friction force**

It is the force that arises between two objects in contact when one is sliding relative to another.
It is an opposing force.
The magnitude of this force is given by $F_k = \mu_k mg$ **(1mark)**

b) $F_{app} = 4.5N$, m=0.5kg, μ=0.410, g= 10 m/s^2

a=? a=$\frac{F_{net}}{m}$, $F_f = \mu_s mg$= 0.410x0.5x10=2.05N **(1mark)**

$F_{net} = F_{app} - F_f$= 4.5N-2.05= 2.45N **(1mark)**

Therefore a=$\frac{2.45}{0.5}$=**4.9m/s^2** **(1mark)**

C) m=5kg , a=2m/s^2 $\mu = 0.1$,

F_G= ? $F_{Normal} = ?$ $F_{app} = ?$ $F_f = ?$ $F_{net} = ?$

1. F_G=mg=5x10=50N **(1mark)**

2. $F_{Normal} = F_G = 50N$ **(1mark)**

3. $F_{app} = ma = 5x2 = 10N$ **(1mark)**

4. $F_f = \mu F_{Normal} = 0.1x50 = 5N$ **(1mark)**

5. $F_{net} = F_{app} - F_f$=10N-5N=5N **(1mark)**

18. a) $\boldsymbol{W_1} = 600g$, $\boldsymbol{W_2} = 450g$. $\boldsymbol{W_3} = 480g$

i) Weight of water displaced = 600 - 450 = 150 g.
Density of water = 1 g/cm^3
Density = $\frac{mass}{Volume}$
So **volume of solid** = $\frac{mass}{Density} = \frac{150}{1}$ = **150 cm^3** **(2marks)**

ii) RD of the solid = $\frac{\text{Weight in air}}{\text{Weight in air} - \text{Weight in water}} = \frac{600}{600-450} = \mathbf{4}$ **(2marks)**

iii) RD of the liquid = $\frac{\text{Loss of weight of solid in liquid}}{\text{Loss of weight of solid in water}} = \frac{600-480}{600-450} = \mathbf{0.8}$ **(2marks)**

b) i) The relative density of the body= $\frac{Weight\ of\ solid\ in\ air}{Loss\ of\ weight\ of\ solid\ in\ water} = \frac{20}{20-18} = 10$ **(2marks)**

ii) RD of the liquid= $\frac{loss\ of\ weight\ of\ solid\ in\ liquid}{Loss\ of\ weight\ of\ solid\ in\ water} = \frac{20-18.2}{20-18} = 0.9$ **(2marks)**

End!