PHYSICS
024

14/03/2024 8:30 AM -11:30 AM

REPUBLIC OF RWANDA

KARONGI DISTRICT

KARONGI DISTRICT COMPREHENSIVE ASSESSMENT, 2023-2024

ORDINARY LEVEL 2nd TERM EXAMNATION,

SUBJECT: PHYICS

PAPER I: THEORY MARKING GUIDE

CLASS: S2

DURATION: 3 HOURS

INSTRUCTIONS:

This paper has **TWO** sections: **A** and **B**

SECTION A: Attempt **ALL** questions **(70 marks)**
SECTION B: Attempt **ONLY THREE** questions **(30marks)**

MARKING GUIDE OF PHYSICS THEORY S2

SECTION A: /70MARKS

1.a. (i) Yes
(1mark)

(ii) No **(1mark)**

(iii) Yes **(1mark)**

(iv) No **(1mark)**

(v) Yes **(1mark)**

b. 0.006cm, 17.04cm, 342.0 cm, 843cm **(2marks)**

2.a.

Numbers	Number of significant figures
5001.000	7 **(1mark)**
0.0050830	5 **(1mark)**
0.004004500	7 **(1mark)**

b.i. force **(1mark)** (ii) speed/velocity **(1mark)**

3.i.false (1mark) ii. false (1mark) iii.true (1mark) iv. false (1mark)

4.a. Friction force is a resistance against the movement of an object as aresult of its contact with another object (**2marks)**

b. Two ways of minimizing the friction are:

- Make the surfaces little more smooth **(1mark)**
- Lubrication is another way to make a surface smoother **(1mark)**
- Make the object more streamlined
- Reduce the Normal force acting between the surfaces in contact
- Reduce the contact between the surfaces, so that less number of bonds will be

5.This answer will be answered according to new ideas of a student **(5marks)**

6.a.i. Density of a substance is the mass per unit of volume **(1mark)**

ii. pressure is the force acting per unit area **(1mark)**

b. pressure in liquids depends on **density** and **depth** of the liquid **(1mark)**

c. pressure in solids depends on **force** and **area** **(1mark)**

7.a.i. As the density of strong salt solution is denser than that of fresh water, it exerts more upthrust on the egg that balances theweight of the egg hence the egg sinks in fresh water but floats on a strong salt solution. **(2mark)**

ii. The surface area of feet of camel is much more than that of man When a camel walks/ runs in a desert, the pressure due toits weight is much less. As a result, camel can run easily **(2mark)**

b. Pressure = ρ.g.h. **(1mark)**

=13600x9.8x10

=1332800 Pa **(1mark)**

8.a. i.an open system is a system which can exchange mass and energy with the surroundings. **(1mark)**

ii. a closed system exchanges only energy (not matter) with the surroundings **(1mark)**

iii. isolated system exchanges neither energy nor matter with the surrounding **(1mark)**

b. The law of conservation of mechanical energy in isolated system states that in an isolated system the total mechanical energy remains constant. **(2marks)**

Or Alternatively, the energy can neither be created nor destroyed but can only be converted from one form to another

9. i. Sphygmomanometer is used to measure blood pressure **(1mark)**

ii. An aneroid barometer is used to measure atmospheric pressure **(1mark)**

iii. Manometer to measure the pressure of fluids **(1mark)**

10.a. Hare's apparatus is used to measure relative density of two liquids **(2marks)**

b. P_1 is bigger than P_2,then ,

pressure difference = $P_1 - P_2$ **(1mark)**

=123.3kPa – 110.1kPa

=13.2kPa=13200Pa **(1mark)**

pressure difference = ρ.g.Δh. **(1mark)**

$\Delta h = \frac{P}{g.x\rho}$ **(1mark)**

$h = \frac{13200}{1080x9.81} = 1.25$ m **(1mark)**

11.a. Pascal's principle states that pressure applied to an enclosed fluid, is transmitted equally to every part of the fluid **(2marks)**

b. Applications of Pascal's principle are:

- Hydraulic press **(1mark)**
- Hydraulic jack **(1mark)**
- Hydraulic brake
- Hydraulic lift car
- Water tower

12. $\frac{Fa}{Aa} = \frac{Fb}{Ab}$ **(1mark)**

$$F_A = \frac{F_B \times A_A}{A_B} = \frac{3500\ N \times 60\ cm^2}{4200\ cm^2} = 50N$$

(2marks)

13.a. Archimedes' principle states that any object completely or partially submerged in a fluid, experiences an upthrust force which is equal to the weight of the fluid displaced by the object.

(3marks)

b. i.Upthrust is any force that causes an object to be pushed upwards in fluid **(1mark)**

ii. Apparent weight of an object is the weight of an object in a fluid **(1mark)**

14. a.work :is the product of force and the displacement moved in the direction of the force **(0.5mark)** and its SI unit is **Joule (0.5mark)**

b.energy: is the ability to do work **(0.5mark)** and its SI unit is **Joule (0.5mark)**

c.power: is the rate at which work is done **(0.5mark)** and its SI unit is **watt (0.5mark)**

15.a. Weight of the solid in air =117N

Volume of solid=mass/density=11.7/7800 = 0.0015 m^3 **(0.5mark)**

Weight of the solid in liquid = 105 N

Loss of weight in liquid = W_a-W_l = 117N – 105N = 12N

Upthrust= 12N **(0.5mark)**

Upthrust = ρ.g.v. ,then $\rho = \frac{(upthrust)}{vxg}$ **(0.5mark)**

$\rho = \frac{(12)}{0.0015x10}$ =800 kgm^{-3} **(0.5mark)**

b.$W_a = m_a.g = 0.45$ x10 = 4.5 N **(0.5mark)**

$W_f = m_f.g = 0.31$ x 10 = 3.1 N **(0.5mark)**

(i) The loss in weight of the body= W_a- W_f **(1mark)**

=4.5 N - 3.1 N= 1.4 N **(1mark)**

ii. the upthrust on the body = 1.4 N **(1mark)**

iii. $F_b = \rho.g.v.$

the volume of the body = F_b / $\rho.g$ **(1mark)**

=1.4/1000x10

= 0.000143m^3 **(1mark)**

c.This answer will be answered according to new ideas of a student **(5marks)**

SECTION B: /30MARKS

16.a.

1-c, **(1mark)**

2-a, **(1mark)**

3-d, **(1mark)**

4-e, **(1mark)**

5-b. **(1mark)**

b.i. 3km = 3000m **(0.5mark)**

potential energy ,P.E = m.g.h **(0.5mark)**

= 2x9.8x3000= 58800 J **(1mark)**

ii. F= weight of the load = m xg **(0.5mark)**

= 1850 x 10 =18500N **(0.5mark)**

P = FxV **(1mark)**

=18500x 3= 55500 W **(1mark)**

17.a. i. Dalton's law of partial pressure states that the total pressure exerted by the mixture of two or more non reacting gases in definite volume is equal to the sum of partial pressures of the constituent gases. **(2marks)**

ii. Avogadro's hypothesis states that equal volumes of all gases, at the same temperature and pressure, contain equal numbers of molecules **(1mark)**

b.Initial temperature,T_1 = 27^0c =(27+273)K= 300K **(0.5mark)**

Final temperature ,T_2 =54^0c = (54+273)K = 327K **(0.5mark)**

Initial volume ,v_1= 100 cm^3 ; final volume v_2 = ?

$\frac{V1}{T1} = \frac{V2}{T2}$; then $V_2 = V_1.T_2 / T_1$ **(1mark)**

V_2=100x327 / 300= 109 cm^3 **(1mark)**

c.i .It is called **the absolute zero** **(2marks)**

ii. **Absolute zero** is the temperature at which the pressure and volume of an ideal gas are zero.

(2marks)

18. a. i. elastic potential energy is the energy due to the stretched or compressed object **(1mark)**

ii. gravitational potential energy is the energy a body has due its position **(1mark)**

b.

- At positin,12m, E_p=mgh=10x10x12= 1200J **(0.5mark)**

  E_k= 0 **(0.5mark)**

  $E_t = E_p + E_k$= 1200J +0 =1200J **(0.5mark)**

- At positin, 6m, E_p=mgh=10x10x6= 600J **(0.5mark)**

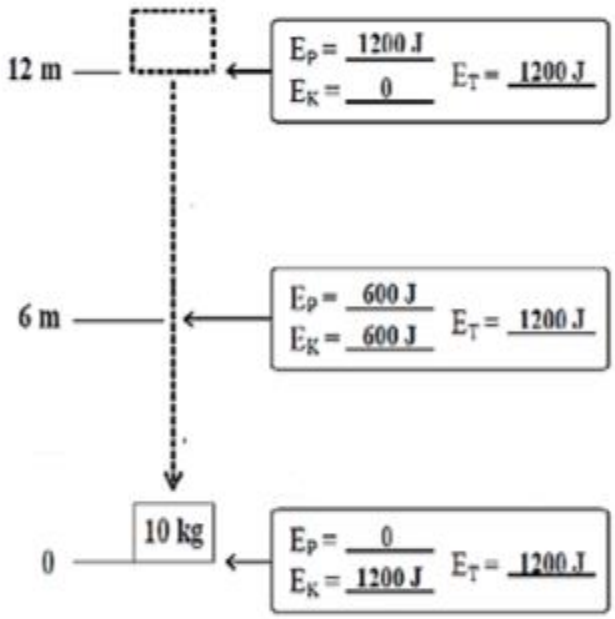
  $E_k = E_t - E_p$ =1200J -600J= 600J **(0.5mark)**

  $E_t = E_p + E_k$= 600J + 600J =1200J **(0.5mark)**

- At positin ,0m, E_p=mgh=10x10x0= 0 **(0.5mark)**

  $E_k = E_t - E_p$ =1200J – 0 = 1200J **(0.5mark)**

  $E_t = E_p + E_k$= 1200J **(0.5mark)**



c. 'Energy can be transformed from one form of energy to another form of energy

For example,

1. When a fruit falls down from a tree, the gravitational potential energy is converted into kinetic energy just before hitting the ground. On hitting the ground, the kinetic energy of the fruit is converted into sound and heat energy. The same is the case of waterfalls.

2. When a ball is thrown vertically upwards, the kinetic energy at the bottom is converted into the gravitational potential energy at the top most position.

A device which converts one form of energy to another is called a transducer.

Examples of transducers

Transducer	**Transformation of energy**
Microphone	Sound to electrical
Loudspeaker	Electrical to sound
Battery	Chemical to electrical
Light bulb	Electrical to light

/3.5marks

19.a. i.Acceleration is the rate of change of velocity **(1mark)**

ii. Displacement is an arrow that points from the starting position to the final position . **(1mark)**

b. i.in region AB **(1mark)**

ii. a = v/t **(1mark)**

a =30/4 = 7.5 ms^{-2} **(1mark)**

iii.Retardation = $\frac{(Vf-Vi)}{t}$ **(1mark)**

t=10s – 8s = 2s

Retardation = $\frac{(0-30)}{2}$ = -15ms^{-2} **(1mark)**

iv. The motorcyclist was stationary in region DE **(1mark)** during 2s **(1mark)**

(i.e 12s – 10s = 2s)

20.a. i.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 **(2marks)**

ii. Charles gas law, states that, at constant pressure, the volume of a given amount of gas is directly proportional to the absolute temperature **(2marks)**

b. i.**isochoric process:** The process, in which the volume occupied by a gas is constant **(2marks)**

ii. **isobaric process** : The process that occurs when the pressure of a gas is constant **(2marks)**

iii. **isothermal process** : The process in which, the volume occupied by a gas and the pressure, at constant temperature . **(2marks)**