PHYSICS I

2024

08:30AM-11:30AM

2nd TERM

REPUBLIC OF RWANDA

KAYONZA DISTRICT

SENIOR TWO PHYSICS MARKING GUIDE, 2023-2024

SUBJECT: PHYSICS I Class: SENIOR TWO

- ✓ **Section A:** all questions of Section A **(55mrks)**
- ✓ **Section B:** three questions for your choice (**45mrks)**

SECTIONA: Attempt ALL questions in this section(55mrks)

1. Measurement technique variation

Human error**/1pt** Instrument calibration**/1pt** Environmental factor**/1pt**
Inconsistent timing**/1pt**

2. Answer is **A** **/2pts** because,

Precision: Precision is determined by how closely your repeated measurements agree with each other. **/2pts**

Accuracy is correctness and how close the result is to the true value. **/2pts**

3.

a) **Acceleration: is the** rate at which velocity changes with time, in terms of both speed and direction. A point or an object moving in a straight line is accelerated if it speeds up. **/2pts**

- The **deceleration** to mean slowing down or negative acceleration. **/2pts**

b) v_0=20 m/s, a=2 m/s^2 and t=10 sec**/1pt**

i) v=at+v_o**/1pt** =(2x10)+20= 40m/s**/2pts**

ii)v^2-vo^2=2.a.d **/1pt** =40^2-20^2=2.x2d**/1pt**

=1600-400=4x **/1pt** finally x=300 m**/1pt**

4. a)a friction is the force between two sliding surfaces that opposes the motion. **/2pts**

b)

- In fixing a nail. **/1pt**
- In walking on the ground**/1pt**
- between cars tyre and road**/1pt**
- pushing a heavy load on horizontal surface. **/1pt**

c) any 4 points

- Friction can be reduced by Using lubricants like powders or Oils **/1pt**
- Friction can be reduced by Using rollers or wheels. **/1pt**
- Friction can be reduced by Using ball bearings. **/1pt**

- We sprinkle powder on a carrom board to reduce friction. **/1pt**
- Oil or grease is applied between moving parts of machines to reduce friction.
- Wheels are used in vehicles to reduce friction.
- Ball bearings are used in ceiling fans, bicycles and vehicles to reduce friction.

5. a) An **atmospheric pressure /1pt** is a pressure due to weight of air on surface area, **at sea /1pt** level atmospheric pressure is equal to $1.103x10^5$Pa. Atmospheric pressure decreases with **increasing /1pt** altitude.

b) P=F/A **/1pt** =150N/0.2m^2 **/1pt** P=7500Pa. **/1pt**

c) P=dgh **/1pt**

$\boldsymbol{h = \left(\frac{P}{dg}\right)}$ **/1pt** $\boldsymbol{h = \left(\frac{2.5x10^3}{1.0x10^3x10}\right)}$ **/1pt**

$\boldsymbol{h = 0.24m}$**/1pt**

6. Fuel gases are kept in hard metal cylinder: **/1pt**

- to prevent escaping of gas**/1pt**
- to prevent inflation of the container because of pressure of the gas inside the container**/1pt**

7. **The observation/applications**

- More you press on the plunger, the volume of the balloon inside the syringe decreases. **/1pt**
- When we place the bulb inside the syringe without squeezing the piston, the volume of the balloon remains unchanged as the air escapes from the front, keeping the atmospheric pressure the same. **/1pt**
- The moment we close the outlet of the syringe and squeeze the piston, the balloon becomes smaller under increased pressure.

8.

$\boldsymbol{V2 = \left(\frac{T1}{T2}xV1\right)}$ **/1pt**

Where $T_1=t_1+273=24+273=297K$ And $T_2=t_2+273=58+273=331K$**/1pt**

$\boldsymbol{V2 = \left(\frac{331K}{297K}x4L\right) = 4.45L}$ **/2pts**

9. $F2=mg=2000kgx10N/kg=20000N$, $A_2=0.5m2$ and $A_1=0.03m2$**/1pt**

$F1=(\frac{A1}{A2})$ F2 **/1pt** The minimum force that must be applied to lift the vehicle

$F1=(\frac{0.03m2}{0.5m2})x20000N=1200N$**/2pts**

SECTIONB: Attempt THREE questions in this section(45mrks)

10. a) Pascal's principle states that: "*pressure applied to an enclosed fluid, is transmitted equally to every part of the fluid."* /**2pts**

Real life applications (any three points)

- working principle of hand sanitizer
- heart pushing blood into circulation in living animals
- pushing out tooth paste
- pumping a bicycle wheel
- in hydraulic lift/**1pt**
- in hydraulic brake/**1pt**
- in hydraulic press/**1pt**

b) (i) $P_A = \frac{F_A}{A_A} = \frac{m \times g}{A_A} = \frac{8 \times 10\ N}{16 \times 10^{-4}\ m^2} = 5 \times 10^4 Pa = 50 \times KPa$ /**4pts**

(ii) Pressure at A= pressure at B, i.e, $P_A = P_B$=50KPa (according to Pascal's law)/**2pts** (iii) $\frac{x}{1600} = \frac{8}{16} \Rightarrow x = \frac{8kg \times 1600\ cm^2}{16\ cm^2} = 800kg$/**2pts**

The weight of the vegetables on the large piston A=800 X 10 = 8000N/**2pts**

11.a) **Archimedes' principle states**:

"when an object is partially or completely immersed in a fluid,it is acted on by an upward buoyant force which is equal to the weight of the displaced fluid." /**2pts**

Applications in: submarine, Ships and Boats, Densimeter, Lactometer, Airships and hot air balloons/**3pts**

b) A big part of ships is a hollow which is occupied by air. This air make the average density of the ship to be less than the density of the water and this makes the ship to float over water. /**2pts**

A nail made of iron sinks in water because it is a compact object; it occupies a small volume over the water, so its density is higher than the density of the water. /**2pts**

c) Materials : Eureka can ,stone ,water, weighing scale, weighed beaker /1pt

STEPS or PROCEDURES

- Take a container filled with water to the brim. /**1pt**
- Now take any solid object you like and measure its weight using a spring balance.Note this down. /**1pt**
- Keep the object attached to the spring balance and submerge it in the water. Just make sure the spring balance is not submerged. /**1pt**
- Now, note down the weight shown by the spring balance. You will notice that it is less. Some water will be displaced into the bowl. /**1pt**
- Collect this water and weigh it. You will find that the weight of the water will be exactly equal to the loss of weight of the object! /**1pt**

12.(a) The principle of the conservation of mechanical energy states that the total mechanical energy in a system (i.e. the sum of the potential plus kinetic energies) remains constant/**2Mrks**

Aplications: Almost all power plants make use of the law of conservation of energy to produce electrical energy. For instance, hydropower plants convert the potential energy

of water into electrical energy. Similarly, nuclear power plants convert chemical energy into electrical energy, and so on. Rollercoaster moving, water falls, fruit falling from tree/**2Mrks**

(i)Mechanical energyof rollercoaster=KE+PE/3Mrks**(To be calculated)**

(ii)kinetic energy of rollercoaster at 6m high/4Mrks **(To be calculated)**

(iii)height at which rollercoaster reached, if it has a speed of 10m/s/**4Mrks(To be calculated)**

13. **(a) Portion A: A**ccelerated motion. /**1pt**

Portion B: Uniform motion. /**1pt**

Portion C: Accelerated motion/**1pt**

Portion D: Decelerated motion. /**1pt**

(b) Speed of moving car at 40s is **5m/s**

(c)

A=(1/2)x 10 x 15=75m B =10 x15 =150 m C=(1/2)(15 + 25) x 10 =200m

D=(1/2)x 20 x 25 =250m

Total distance=75m +150m + 200m+ 250m=675m/**2pts**

Total time =50s

Average speed=$\frac{\text{total distance}}{\text{total time}} = \frac{675\text{m}}{50\text{s}} = 13.5\text{m/s}$/**2pts**

(d)**Section A**: Acceleration between 0s and 11s gradient =$\frac{15-0}{10-0} = \frac{\frac{1.5\text{m}}{s^2}}{\mathbf{2}}$/**2. 5pts**

Section D: Deceleration between 30s and 50s gradient $= \frac{0-25}{50-30} = -\frac{\frac{1.25\text{m}}{s^2}}{\mathbf{2}}$/**2. 5pts**