KARONGI DISTRICT

SUBJECT: PHYSICS THEORY

PROPOOSED MARKING GUIDE OF PHYSICS(THEORY) SECOND TERM 2023-2024

1. A) thermodynamics**(0.5)**, mechanics**(0.5)**, electronics, electromagnetism, optics, acoustics,

b) Engineering, **(0.5)** technology**(0.5)**, laboratory technology, mapping and surveying, civil engineering, electrical engineering. Etc.

c)

- Read labels carefully. **(0.5)**
- Clean up your work area before leaving. **(0.5)**
- Use the appropriate equipment for the appropriate purpose of laboratory activity

(any other correct answer should be considered)

2. A) Friction force**(0.5)**, tension force**(0.5)**, air resistance force**(0.5)**, action and reaction force.

b) Force can change the state of motion of a body. **(0.5)**
Force can distort or change the shape of an object. **(0.5)**
Force can cause turn about a point or rotation. **(0.5)**
Force can cause heating effect**(0.5)**
Frictional force causes noise when rough surfaces are rubbed together.

3. A) iv. The force between two bodies varies with the distance between them. **(1)**
B. ii) Mass **(1)**
C)) iii) 12.5N **(1)**
D) True **(1)**

4. a) Velocity is also defined *as the displacement covered per unit time* or *the rate of change of displacement.* **(1)**

Velocity = displacement /time taken
The SI unit of velocity is metres per second (m/s) **(1)**
b) Acceleration due to gravity (g) Is the acceleration due to the pull of the earth on the objects. **(1)** Experiments have shown that g is approximately 9.8 m/s^2.

5. i)efficiency**(1)**, ii) compound machine **(1)** iii) effort**(1)** iv) simple machine**(1)**

6. a) Kinetic theory of matter states that matter is made up of tiny discrete individual particles that are continuously in random motion. **(2)**
b) Malleability**(0.5)**, Tensile strength**(0.5)**:, Conductivity**(0.5)**, Elasticity**(0.5)**, Hardness
(any other correct answer should be considered)

7. a) solar energy**(0.5)**, chemical energy**(0.5)**, heat energy**(0.5)**, electrical energy**(0.5)**, ….
b) water**(1)**, sun**(1)**, geothermal, biomass.

8. a) The law of conservation of energy states that energy cannot be created or destroyed but is simply converted from one form into another. **(1)**
b) Air and water pollution**(0.5)**, deforestation**(0.5)**, climate change and global warming. Land degradation

c)

Device	Form A	Form B
Loudspeaker	***electrical*(0.5)**	sound
***Battery/Dry cells*(0.5)**	Chemical	electrical
Microphone	***Sound*(0.5)**	electrical
Bulb	electrical	***Light*(0.5)**

9. a)

Fundamental quantities	**Derived quantities**
Fundamental quantities are those quantities that are not defined in terms of other quantities. **(1)** OR Examples: length, mass, time, …	Derived quantities are quantities which are defined in terms of the fundamental quantities. **(1)** OR Examples: velocity, volume, density, **…**

b) i) beam balance **(1)** ii) measuring cylinder, burette**(1)**

10. a) The centre of gravity of a body is the point from which the whole weight of the body appears to act. **(1)**

b) 1=C**0.5)** **2=A(0.5)** **3=B(0.5)**

c) i)= stable equilibrium **(1)** ii) =Neutral equilibrium**(1)**

iii) unstable equilibrium**(1)**

11. a) both solids and liquids have definite size(volume).

b)

- Ductile materials like copper can be drawn out into wires which are used in transmitting electricity. **(1)**
- Aluminum is a highly malleable metal thus it is used to make aluminium foil and cans .
- To separate and collect a liquid from a solution, the solution is heated in a flask until it boils. **(1)**
- Solubility of liquids help to separate a liquid from an insoluble solids.

c) the density of gas molecules is less than that of liquid and gas because the distance between the molecules**(1)** in gas is very large compared to that between particles in liquid and solids. Thus the mass of a gas per unit volume is small due to large intermolecular space between molecules. **(1)**

12. a)Distance is the total length of the path followed by an object, regardless of the direction of motion. It is a scalar quantity. **(1)**

Displacement is the object's overall change in position from the starting to the end point. It is the shortest distance along a straight line between two points in the direction of motion. It is a vector quantity. **(1)**

b) distance = 18m + 6m = 24m **(1)**

displacement = $\sqrt{AB^2 + BC^2}$ = $\sqrt{18^2 + 6^2}$ = 18.9m**(1)**

c) given : u=om/s, V=20m/s, t=4s

acceleration = $\frac{change\ of\ velocity}{time}$ **(0.5)**= $\frac{(20-0)m/s}{4s}$ **(0.5)**= 5m/s^2**(1)**

13. a) Heat is a form of energy which passes from a body at high temperature to a body at low temperature. The SI unit of heat is the joule (J). Measured experimentally by a calorimeter. **(1)**

Temperature is the degree of hotness or coldness of a body or a place. The S.I unit is Kelvin. Measured by a thermometer . **(1)**

b) i) 299^o C = 299 + 273 = 572K**(1)**

II) 343 K = 343-273 = 70 ^{o}C**(1)**

iii) 98^o F = (98-32)x$\frac{5}{9}$ = 36.6^o C**(1)**

14. a) **Relationship**

weight = mass x acceleration due to gravity.

Or Mass = $\frac{weught}{mass}$ (1)

Difference

Mass	**Weight**
Quantity of matter in a body (0.5) Unit : kg	Pull of gravity on a body (0.5) Unit N

b) mass on earth m_e = 200kg acceleration of gravity on earth g_e =9.81m/s^2

i) weight on earth = m x g_e (0.5)

W_E= 200kg x 9.81N/kg (0.5)= 1962N(1)

ii) weight on Mars =38% of that on earth (0.5)

$=\frac{38}{100}\ x\ 1962N$ (0.5)= 588.6 N(1)

15. a) power is the rate of doing work(0.5). The S.I Unit of power is Watt(W) (0.5)

b) work = 30 J time = 6 sec

Power = work/time (0.5)

Power = 30J/6sec (0.5)= 5 W (1)

c) mass of box = 400kg distance/height = 2.3m velocity = 3m/s g= 10N/Kg

i) maximum upward force = weight of the box

= mass x acceleration of gravity(0.5)

= 400kg x 10N/kg = 4000 N(0.5)

II) Potential energy gained by the box = m x g x h (0.5)

P.E = 400kg x 10N/kg x 2.3m(0.5) = 9200 J (1)

iii) kinetic energy K. E = 1/2 $m\ x\ V^2$ (0.5)

K.E = $\frac{400kg\ x\frac{3m}{s}x\ 3m/s}{2}$ (0.5)= 1800 J (1)

iv) when the box stop, the K.E is Zero**(1)** Because there is no motion V= 0 m/s (1)

SECTION B: ATTEMPT ONLY THREE QUESTION (30Marks)

16. a) i) S.I Unit of length is metre (m) (1)

ii) **Name**: micrometre screw gauge (1)

use: It is used for measuring very short length such as the diameters of wires, thin rods, thickness of a paper etc. (1)

iii) reading = (6.5(0.5) + $\frac{13}{100}$ (0.5))mm= (6.5 + 0.13)mm = 6.63mm(1)

b) Mass = 50g= 0.05kg(0.5) Volume = 25 dm^3 = 0.025m^3(0.5)

i)Density = $\frac{mass}{volume}$ (0.5) = $\frac{0.05kg}{0.025m^3}$ (0.5) = 2 kg/m^3(1)

ii) the box will floats on surface of water because its density is less than that of water. (1)

17. a) initial velocity u= 5m/s (1) final velocity V= 10m/s(1)

b) in the first 10 seconds the was moving with uniformly accelerated motion. (1)

c) The deceleration is in the last 10 seconds.

Final velocity V=0m/s initially the body moves at u= 10m/s

Time = 30s-20s = 10 s

Deceleration = $\frac{final\ velocity\ V - initial\ velocity\ u}{time}$ (0.5) = $\frac{\frac{(0-10)m}{s}}{10s}$ (0.5) = $\left(-\frac{10}{10}\right) m/s^2$ = -1m/s^2(1)

d) displacement in first 10sec. S1 = $(\frac{v+u}{2})$x t_1 = $(\frac{5+10}{2})$x10m = 75m (1)

displacement from 10th second to the 20th second S2= V x t_2 = 10m/s x 10s = 100m (1)

displacement in the last 10 sec S3= = $(\frac{v+u}{2})$x t_3 = $(\frac{0+10}{2})$ x 10 m = 50m(1)

Total displacement S = S1 + S2 + S3 = 75m + 100m + 50m = 225m (1)

(any other correct method that lead to answer should be considered)

18. a) The Newton's universal law of gravitation states that any two bodies in the universe attract each other(1) with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. (1)

OR

F = $\frac{Gm1m2}{r^2}$ (1)where G=universal gravitational constant

m = mass of bodies

r = distance of separation

F = gravitational force of attraction (1)

b)

- This law helps in predicting the tides which were due to the gravitational pull of the moon on earth. (1)
- All planets in the solar system are revolving around the sun due to this force.
- It allow satellites to turn around the earth. etc(1)

c) m1= 1.6 × 10^{2}kg m2= 2.3 × 10^{2}kg F= 3.4 x 10^{-6} N

G=6.67x10^{-11} Nm^2/kg^2

r = $\sqrt{\frac{Gm_1m_2}{F}}$ (1) $r = \sqrt{\frac{\frac{6.67x10^{-11}Nm^2}{kg^2} \text{x } 1.6 \times 10^2 kg \text{ x} 2.3 \text{ x } 10^2 kg}{3.4\ x\ 10^{-6} N}}$ (1)= 0.84m(1)

d) According to the Newton's universal law of gravitation, when the gravitational force between earth and the moon decrease to a half, the gravitational force between them would be *four times greater*. (2)

F = $\frac{Gm1m2}{(\frac{r}{2})(\frac{r}{2})} = \frac{Gm1m2}{\frac{r^2}{4}} = 4\frac{Gm1m2}{r^2}$ (1)

19. a) a body is more stable if:

- The centre of gravity is as low as possible. (1)
- The area of the base is as large as possible, and (1)
- The vertical line drawn from the centre of gravity falls within its base.

b) The passenger of a double-decker bus are not allowed to stand on the upper deck because standing raise the centre of gravity (1)of the car and lower its stability(1) (make it unstable) it may lead to accident.

c) the centre of gravity of regular lamina is located it their geometrical center. (1)

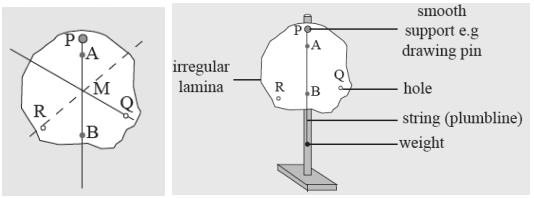
d) **Steps**

1. Make three holes P, Q and R on an irregularly shaped lamina as close as possible to the edges and far away from each other. (1)

2. Suspend the lamina on the clamp using the drawing pin through each hole at a time. (1)

3. Suspend a plumbline (a thin thread with a small weight at one end) from the point of support, P), and draw the line of the plumbline on the lamina by marking two points A and B far apart and joining them. (1)

4. Repeat the steps with the support Q and mark the point M where the two lines intersect. (1)



The point M is the centre of gravity of the irregular lamina (1)

(*consider and review any drawing or other explanations given*)

20. a) lever, (1) pulley(1), inclined plane, wedge, wheel and axle, etc

b) load = 900 N, effort= 250N, distance of the load = 5m distance of the effort = 25m

i) work done by the load = load x load distance(0.5) = 900N X 5m(0.5) = 4500J(Nm) (1)

ii) work done by the effort =Effort x effort distance (0.5) 250N X 25m(0.5) = 6250J (Nm) (1)

iii) efficiency of the machine = $\frac{work\ output}{work\ input} X100 = \frac{work\ done\ by\ the\ load}{work\ done\ by\ the\ effort} X\ 100$(0.5)

$EFFICIENCY = \frac{4500J}{6250J}$ X 100(0.5)= 72%(1)

c) i) velocity ratio = 2(1) (for one single pulley)

ii) mechanical advantage M.A $= \frac{load}{effort}$(0.5) $= \frac{15000N}{20000N} = 0.75$ (0.5)

efficiency = $\frac{M.A}{V.R} X\ 100$(0.5)= $\frac{0.75}{2} X\ 100$ = 37.5 %(0.5)

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