**PHYSICS 1 2011 - NECTA FORM FOUR**

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1.

| i | ii | iii | Iv | v | vi | vii | viii | ix | x |
|---|---|---|---|---|---|---|---|---|---|
| B | B | A | E | E | A | C | C | C | A |

2.

| i | ii | iii | Iv | v | vi | vii | viii | ix | x |
|---|---|---|---|---|---|---|---|---|---|
| B | P | J | M | T | O | S | K | Q | H |

3.

i. Periscope
ii. Choke
iii. Surface tension
iv. Weight of the fluid displaced
v. Relegation
vi. Multiplier
vii. Seismometer
viii. Star
ix. The greenhouse effects
x. Anomalous behavior.

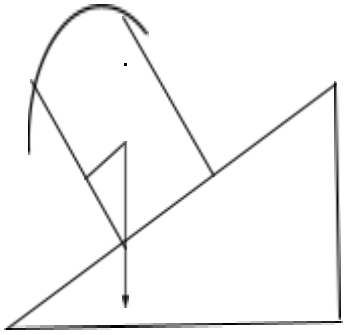
4. (a)(i) the amount of couple is the product of one of the forces and the distance between the forces.

(ii)Conditions for forces to form a couple

- They must be equal
- They must act in different directions on a rigid body
- They must be equidistance from the pivot

(b)(i) When its centre of gravity returns to its original position after the body is given a small displacement/push.

(ii)NOTE: For the cylinder to just remain on the inclined plane, its center of gravity must act through its lowest point.

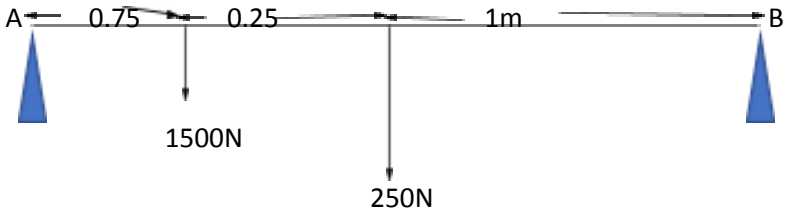


$$\tan\theta = \frac{\frac{\frac{d}{2}}{2}}{\frac{h}{2}} = \frac{d}{h} = \frac{0.2}{0.4} = \frac{1}{2}$$

angle is $26.56^0$

(c) (i)Principle of moments states that for a system to be in rotational equilibrium, the sum of clockwise moments must be equal to the sum of anticlockwise moments about any point in the system.

(ii)let moments be A and B




A + B = 250 + 1500

= 1750N.....(i)

Taking moments about A,

B x 2 = 250 x 1 + 1500 x 0.75

B = 687.5N

From (i)

A = 1062.5N

Thrust at A = 1062.5N

Thrust at B = 687.5N

-Assumptions made in above'

-the metal beam is rigid

-the supports are at end points of the beam.

Heat is the form of energy that transfers from one point to another due to temperature difference between the two points while Temperature is the measure of degree of hotness or coldness of the body.

-heat transfer leads to temperature difference.

-all relates to the energy of the body.

5. (a)The amount of heat energy in the body depends on the temperature of the body.

(b)(i) Fixed points of the thermometer are the highest and smallest temperatures that the thermometer is set to measure.

(ii)Range = 80 – 20 = 60

Temp. difference of range = 100 – 0 = $100^0$C

Temp. = thermometer reading /range x temp. difference

= $60^0$C = thermometer reading/60 x 100

Hence, thermometer reading = 36.

6. (a)(i) A sonometer is the hollow box with a peg at one end and a pulley at the other used to study the behavior of vibrating strings.

(ii)Resonance is said to occur whenever a body is set in vibration at its natural frequency as a result of disturbances from another system which is independent from it that is vibrating atbthat same frequency.

(b)First sound,

Distance travelled by sound = 200m

Time taken = 0.65

Speed of sound = 200/0.65

= 333.33 m/s

Second sound

Time taken = 0.65 + 0.255 = 0.855

Distance travelled = speed x time

= 333.33 x 0.855

= 283.3m

But, 283.3 = 2d

d = 141.67m.

(c)Amplitude = 0.2cm

Frequency = number of wave per second = 1/period

Note; - It takes 0.1 seconds for a complete wave to be formed.

This is called the period.

Hence frequency 1/0.1 = 10Hz

Wavelength = velocity/frequency = 2/10 = 0.2m

7. (a)(i) Sustainable sources of energy are the natural resources which are used in the production of electricity without adversely affecting the environment.

(ii)Water energy used in generating electricity has various advantages. Its importance to human life includes:

- The energy is the virtually available. Water flows freely from various sources e.g., mountains and rivers. Once the dam is built, the energy is free and relatively cheap since fuel costs are low or at times nil.

-it is environmentally friendly since no waste or pollution is produced. Water energy is a completely clean sources of energy because it creates no pollution or waste materials which are dangerous to the environment.

-Water energy is more reliable than other sources like wind, solar and wave power.

- water energy increases power very quickly.

(b)(i) Geothermal energy is the energy generated by water which has been heated by rocks beneath the earth's crust.

(ii)Harnessing geothermal energy involves the drilling vents through rocks in the ground and laying down pipes that directs water into the hot rocks and draws it in the form of steam which is then directed to turbines which rotate to generate electricity.

(c)(i) A windmill is a tall tower with blades, connected to rotors that are used to convert the energy of moving air to mechanical motion and then electric energy.

(ii)Disadvantages of wind energy,

- It is variable
- Not reliable
- Wind turbines makes noise, hence disturbance.

(iii)YES, wind has energy since it is an air in motion. Thus, has kinetic energy.

8. (a)(i) In series, they will produce total emf of 4.5V and internal resistance equals to the sum of to their internal resistances.

(ii)In parallel, they will deliver an emf of 1.5v and internal resistance given by the formula $\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$

(b)(i) Current through $A_2$ is the sum of current through $A_1$ and through switch Thus current through $A_2$ will be greater than that at $A_1$ when switch is closed

(ii)When switch is open, total resistance of the circuit rises from R to 8Ω

$\frac{1}{R} = \frac{1}{4} + \frac{1}{8}$

R = 2.67Ω

Hence current will fall from v/2.67 to v/8

(iii)When switch is open, $A_1$ and $A_2$ are in series, thus the current through each one is the same.

9. (a)An earthquake is a suddenly vibration of the earth crust caused by rapid movement of the earth's rocky outer layer.

(b)(i) Hypocenter is a point with the earth where an earthquake originates.

(ii)Epicenter is a point on the ground immediately above the focus of the earthquake.

(c)(i) Global warming is the increase in surface temperature of the earth due to increase in amount of greenhouse gases in the atmosphere such as carbon dioxide.

(ii)Gases contributing to global warming.

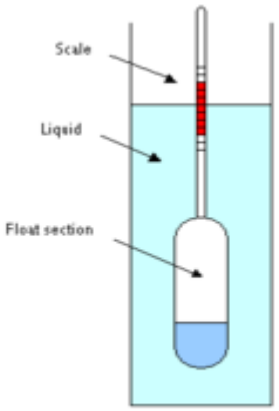
| GAS | SOURCE |
|---|---|
| Carbon dioxide | -burning of fossil fuels and wood |
| Methane | -natural gas |
| Ozone | Ozone layer of the atmosphere |

10. (a)(i) Law of flotation states that "A floating body displaces its own weight of the fluid in which it floats"

(ii)conditions for the body to float;

-its density must be smaller than that of fluid in which it floats.

(b)Hydrometer diagram.

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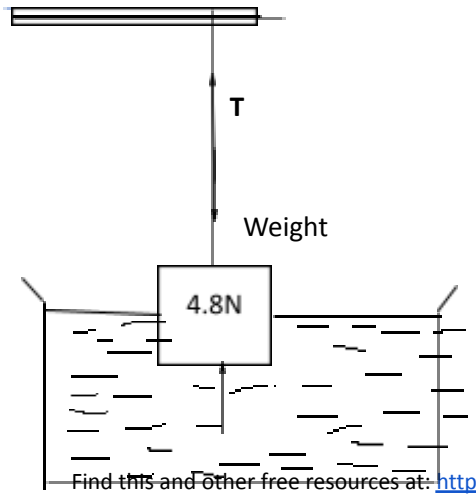
-The hydrometer (or lactometer) is based on **Archimedes' principle**, which states that a solid suspended in a fluid is buoyed by a force equal to the weight of the fluid displaced by the submerged part of the suspended solid. Hence, the lower the density of the substance, the farther the hydrometer sinks

(c)



**Upthrust**

**Upthrust on iron cube =** weight of fluid displaced

= volume of cube immersed x density of oil x g

Total volume = 480/8 = 60 $cm^3$

Immersed volume = ½ x 60 = 30 $cm^3$

Upthrust on cube = (30 x 0.9 x 9.8)/1000

= 0.27 N

Tension on string = weight – upthrust

= 4.53N

11. (a)(i) A fuse is a thin piece of wire that melts and breaks when the current exceeds its limit in order to protect other electrical components.

(ii)Fuses are made of very thin wires so that they can easily and timely melt down and break a circuit in an event of an increase in current.

Electrical heaters are made of thick wires so that they do not melt as convert electric energy to heat energy.

(b)(i) Short circuits occur when a live wire meets a neutral wire without an appliance in the circuit This can happen when naked wires touch each other.

(ii)causes of electrical short circuits;

-poorly insulated wires

-worn out appliances

-incorrect wiring

(c)(i)2.856kW = 2586J/s

From power = IV

2856 = I x 240

I = 12 A fuse.

(ii)Determining the resistance of the conductor.

Resistance, R = $\frac{voltmeter\ reading}{ammeter\ reading}$