UACE Physics paper 1 set2 guide

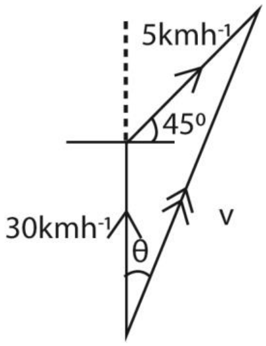
SECTION A

1. (a) What is meant by relative velocity? (01mark)

Relative velocity is the velocity of a body moves as observed from another body.

(b) A ship is heading due to north at a speed of $30ms^{-1}$. Water in the lake is moving in the north-east direction at an average speed of $5kmh^{-1}$. Calculate

(i) relative velocity of the ship (04 marks)



v_x = 5cons 45^0 = 3.536

v_y = 30 + 5sin 45^0 = 33.536

v = $\sqrt{v_x^2 + v_y^2} = \sqrt{3.536^2 + 33.536^2}$ =33.72ms-1

Direction of v; $\frac{5}{sin\theta} = \frac{33.72}{\sin 135}$

θ =6.0^0

(ii) distance off course the ship will be after 40 minutes. (02marks)

Distance, d = v_xt = 5sin45^0 x $\frac{40}{60}$ = 2.36km

(c) (i) Explain why a passenger in a car jerks forward when the brakes are suddenly applied. (03marks)

Before the brakes are applied, both the passenger and the car are moving with the same velocity. When brakes are applied, the force is exerted on the car and not the passenger. Because of inertia, the passenger tends to continue moving in a straight line.

(ii) Use Newton's second law to define the Newton. (04marks)

Consider a body of fixed mass, m acted on by constant force F and its velocity changes from u to v in time, t.

Change in momentum = $\frac{(mv - mu)}{t}$

From Newton's second law; $F \propto \frac{(mv - mu)}{t}$ or $F = km\frac{(mv - mu)}{t}$

But $\frac{(mv - mu)}{t} = a$

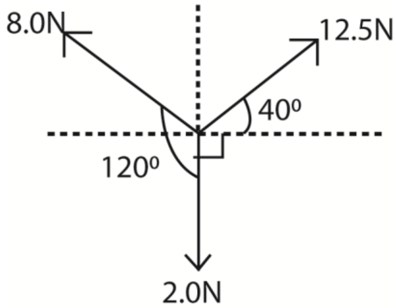
F = kma

For 1N, m = 1kg, a =$1ms^{-2}$ => k = 1

∴F =ma

The newton is a force which gives amass of kg an acceleration of $1ms^{-2}$.

(d) Three forces of 8.0N, 12.5N and 2.0Nact on a body of mass 0.7kg as shown below



Calculate the acceleration of the body

Fx = 12.5 cos40^0 – 8.0cos 30^0 + 0 = 2.65N

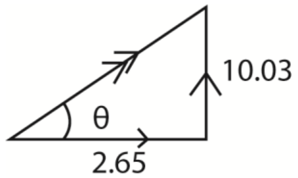
Fy = 12.5sin40^0 + 8.0sin 30^0 – 2 = 10.03N

Resultant force F = $\sqrt{2.65^2 + 10.03^2}$ = 10.37N

F = ma

Acceleration, a =$\frac{10.37}{0.7}$ = 14.82ms^{-2}

Direction



tan θ = $\frac{10.03}{2.65}$; θ = 75.2^0

2. (a) what is meant by the centre of the mass? (01mark)

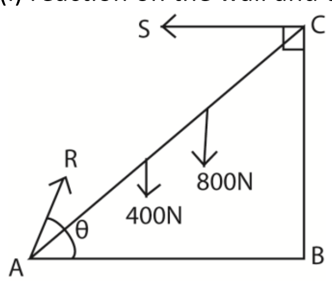
Centre of the mass is a point at which the whole mass of a body is considered to be concentrated.

(b) Explain why a long spanner is preferred to a short on n undoing a tight bolt. (03marks)

Undoing a tight nut is due to moment of a force. A long spanner provides a greater moment of force than a short one hence less force is applied.

(c) A uniform ladder of length 10m and weight 400N, leans against a smooth wall and its foot rests on rough ground. The ladder makes an angle of 60^0 with the horizontal. If the ladder just slips when a person of weight 800N climbs 6m up the ladder, calculate the

(i) reaction on the wall and the ground (05marks)



Rcosθ = S

Rsin θ = 1200

Taking moments about point A

400 x 5cos 60^0 + 800 x 6cos60^0 = s x 10sin60^0

S = 392.6N

Tanθ = $\frac{1200}{392.6}$ => θ = 71.9^0

R = $\frac{1200}{sin71.9}$ = 1262.6N

(ii) distance another person of weight 600N can climb up the ladder so that the same reaction are exerted as in (c)(i). (02marks)

400 x 5cos 60^0 + Lcos60^0 x 600 = 392.6 x 10sin 60^0

L= 0.8m

(d) (i) State the principle of conservation of energy. (01mark)

Energy can neither be created nor destroyed but can be changed from form to another.

(ii) How does the principle in (d)(i) apply to a child sliding down an incline? (02marks)

Moving down an incline; potential energy is changed to kinetic energy to heat and sound

(e) A pump with power output of 147.1W can raise 2kg of water per second through a height of 5m and delver it into a tank. Calculate the speed with which the water is delivered into the tank. (03marks)

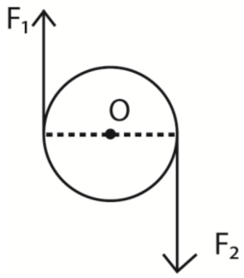
Power x time = kinetic energy of water + potential energy

= $\frac{1}{2}mv^2 + mgh$

147.1 = $\frac{1}{2}\ x\ 2\ x\ v^2 + 2\ x\ 5\ \ x9.81$

v = 7.0ms^{-2}

(f) Explain the effect of a **couple** on a rigid body. (03marks)



A **couple** consists of two parallel forces that are equal in magnitude, opposite in sense and do not share a line of action

3. (a) What is meant by a

(i) Brittle material (01mark)

A brittle material is a substance that breaks easily when a force is exerted on it e.g. glass

(ii) Ductile material (01marks)

A ductile material is one that can be hammered, rolled or moulded into different shapes.

(b) Give one example of each of the materials in (a) (01mark)

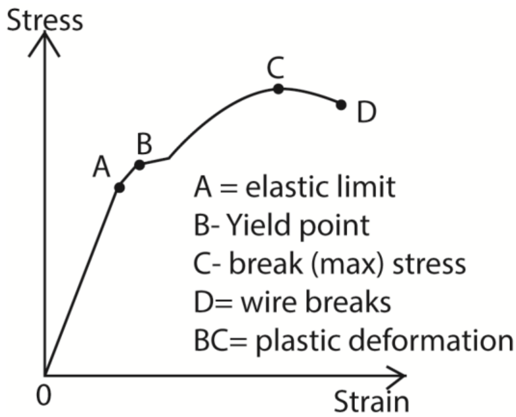
Brittle material: glass, clay, cast iron, stone

Ductile material: copper, aluminium

(c) Explain why bicycle frame are hollow (02mark)

Bicycle frame is hollow to reduce weight while maintain strength. A tube is significantly tougher to bend than a rod.

(d) (i) Sketch a labelled graph of stress against strain for a ductile material (02marks)



(ii) Explain the main features of the graph in (d)(i) (04marks)

- OA – stress is proportional to strain and the material regains its length
- AB - stress is not proportional to strain but the material regains its length
- Beyond B the material becomes permanently stretched
- CD the material undergoes plastic deformation
- Beyond D the material breaks

(e) Derive the expression for the energy stored per unit volume in a rod of length, L, Young's Modulus, Y, when stretched through distance, e. (04marks)

Energy stored in the rod = $\frac{1}{2}Fe$

∴ Energy stored per unit volume = $\frac{\frac{1}{2}Fe}{AL}$

But F = $\frac{YAe}{L}$

Energy store per unit volume = $\frac{1}{2}\ x\ \frac{YAe.e}{AL^2} = \frac{1}{2}Y\left(\frac{e}{L}\right)^2$

Or

For a small extension, dx

Work done, dw = Fdx

From Hooke's law, F = kx

$\therefore dw = kxdx$ => Total work done, w =$\int dw$

$w\ =\ \int_0^e kxdx$

Energy store =$\left|\frac{kx^2}{2}\right|_0^e$, but k = $\frac{YA}{L}$

=> Energy stored = $\frac{1}{2}\ x \frac{YAe^2}{L}$

Energy stored per unit volume = $\frac{1}{2}\ x\ \frac{YAe.e}{AL^2} = \frac{1}{2}Y\left(\frac{e}{L}\right)^2$

(f) A load of 5kg is placed on top of a vertical brass rod of radius 10mm and length 50cm. if

(i) decrease in length (03marks)

F = mg = 5 x 9.81

A = πr^2 = π(10 x 10^{-3})^2

e = $\frac{FL}{AY} = \frac{5\ x\ 9.81\ x\ 0.5}{\pi(10\ x\ 10^{-3})^2\ x\ 3.5\ x\ 10^{10}}$ = 2.23 x 10^{-6}m

(ii) energy stored in the rod. (02marks)

E = $\frac{1}{2}$Fe = $\frac{1}{2}\ x\ 5\ x\ 9.81\ x\ 2.23\ x\ 10^{-3}$ = 5.47 x 10^{-5}J

4. (a) Define the following:

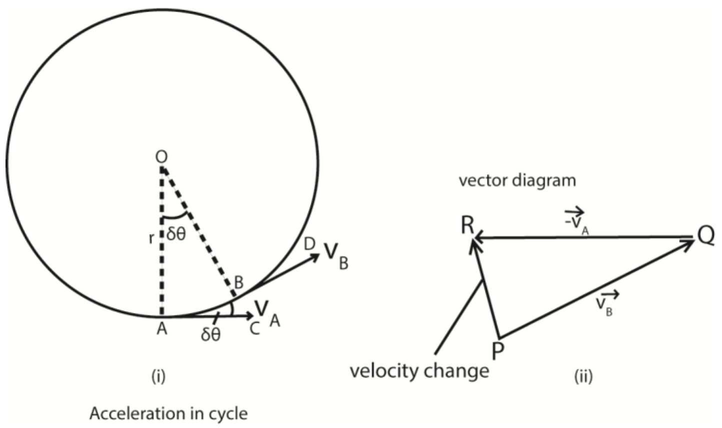
(i) Angular velocity

Angular velocity is the rate of change of angular displacement.

(ii) Period

Period is the time taken to make one complete oscillation

(b) An object moves in a circular path of radius, r, with a constant velocity, V. Derive an expression for its acceleration. (04marks)



The velocity change from A to B = $v_B - v_A$ or $v_B + (-v_A)$.

In figure 2(ii) above, PQ represents v_B in magnitude (v) and direction BD; QR represents $-v_A$ in magnitude (v) and direction (CA).

Velocity change = $v_B + (-v_A)$ = PR

When δt is small, the angle AOB or δθ is small;
Also angle PQR equal to δθ is small

PR or acceleration then points toward O, the centres of the circle.

a = $\frac{velocity\ change}{time} = \frac{PR}{\delta t} = \frac{v\delta\theta}{\delta t}$

but $\frac{\delta\theta}{\delta t}$ =ω and v = rω

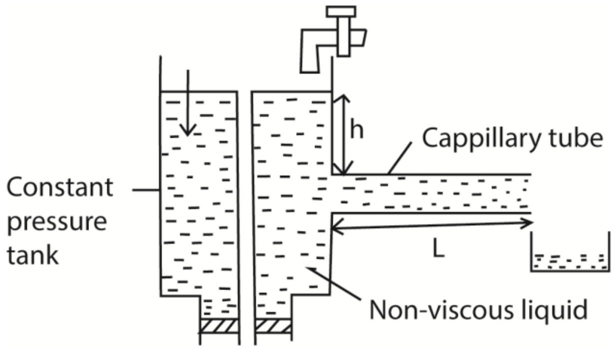
a = rω x ω = rω^2 but ω = $\frac{V}{r}$

- a = $\frac{v^2}{r}$

(c) (i) State two factors on which the rate of flow of a fluid through a tube depends. (02marks)

- viscosity of fluid
- diameter/radius or cross sectional area of the tube
- pressure difference between its end

(ii) Describe an experiment to measure the coefficient of viscosity of a liquid using Ponselle's formula



- the liquid of density, ρ, passes slowly from a constant head tank through a capillary tube of length, l and radius r.
- for a height, h, of the tube, the volume V is collect in time t.
- the flow rate R = $\frac{V}{t}$ is calculated
- the experiment is repeated for different value of V and h.
- a graph of R against h is plotted and slope S is obtained

For steady flow, $S = \frac{\pi r^4 P}{8\eta l}$

But P = hρg

$r = \frac{d}{2}$

$$S = \frac{\pi\left(\frac{d}{2}\right)^4 P}{8\eta l}$$

$$\eta = \frac{\pi\left(\frac{d}{2}\right)^4 h\rho g}{8Sl}$$

(d) Find the time take for an oil drop of diameter 6.0 x 10^{-3}mm to fall through a distance of 4.0 cm in air of coefficient of viscosity 1.8 x 10^{-5}Pa.

[The density of oil and air are 8.0 x 10^{3}kgm^{-3} and 1kgm^{-3} respectively]

v = $\frac{2r^2(P-\sigma)g}{9\eta} = \frac{2(3.0\ x\ 10^{-6})^2(800-1)x\ 9.81}{9\ x\ 1.8\ x\ 10^{-5}}$ = 8.7 x 10^{-4}ms^{-1}

time = $\frac{distance}{speed} = \frac{4\ x\ 10^{-2}}{8.7\ x\ 10^{-4}}$ = 45.98s

SECTION B

5. (a) Define the following quantities:

   (i) Thermometric property (01mark)

   Thermometric property is a physical measurable property that varies linearly and continuously with temperature and is constant at constant temperature.

   (ii) Specific heat capacity (01mark)

   Specific heat capacity is the amount of heat requires to raise the temperature of 1kg mass of a substance by 1K or $1^{0}C$

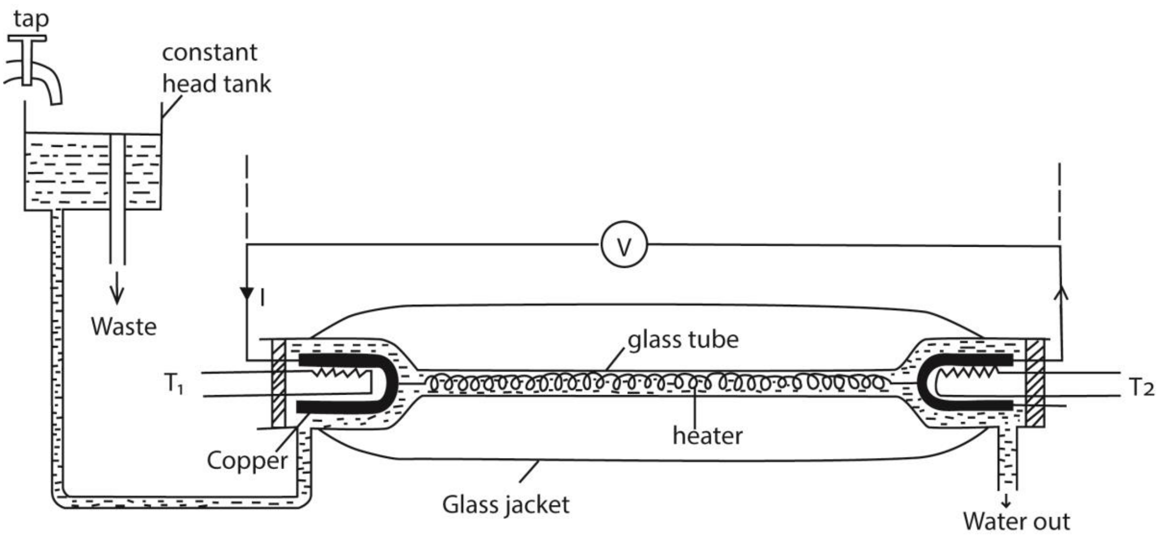
   (b) (i) state two examples of commonly used thermometric properties. (01mark)

   - Volume of constant mass of a gas at constant pressure
   - Pressure of a gas at constant volume
   - Electrical resistance of a platinum wire
   - e.m.f of a thermocouple

   (ii) Describe briefly how to determine the lower and upper fixed points for an uncalibrated liquid-in-glass thermometer (04marks)

   - the bulb of the thermometer is immersed in pure ice-water mixture; the level of liquid column falls to a constant length. The level of the liquid column is marked and is the lower fixed point.
   - the bulb of the thermometer is then immersed in steam from pure water; the level of liquid column rises to a constant length. The level of the liquid column is marked and is the upper fixed point.

   (c) (i) Describe with the aid of a diagram, an experiment to determine the specific heat capacity of a liquid using the continuous flow method. (07marks)



   - A liquid is allowed to flow at constant rate
   - Power is switched on and the liquid is heated until temperatures registered by T_1 and T_2 are steady and the values θ_1 and θ_2 respectively are recorded.
   - The p.d V and current I are recorded from the voltmeter and ammeter respectively

- The mass, m of a liquid collected in time t is recorded
- At steady state; $VIt = mc(\theta_2 - \theta_1) + h$ …………. (i)
  where h is heat lost to the surrounding
- The rate of flow is changed and the voltage and current are adjusted until the steady readings of T_1 and T_2 are θ_1 and θ_2 respectively
- If m_1, V_1 and I_1 are the values mass of liquid collected in time t, voltmeter and ammeter readings respectively, then
  $V_1I_1t = m_1c(\theta_2 - \theta_1) + h$ …………. (ii)
  Subtracting (ii) from (i)
  $c = \frac{(VI - V_1I_1)t}{(m - m_1)(\theta - \theta_1)}$

(ii) State two advantages of the continuous flow method over the method of mixtures. (01mark)

- No cooling correction is required
- Heat capacity of the apparatus is not requires
- Temperature measured at leisure when steady
- Resistance of the heater not required

(iii) State two disadvantages of the method in (c)(i) (01mark)
- larger volumes of liquid required
- not suitable for volatile liquids.

(d) The brake lining of the wheel of a car of mass 800kg have total mass of 4.8kg and are made of a material of specific heat capacity 1200$Jkg^{-1}K^{-1}$. If the car is at 15ms^{-1} and is brought to rest by applying the brakes, calculate the maximum possible temperature rise of the brake lining. (04marks)

Mechanical energy = heat absorbed by the lining

$\frac{1}{2}mv^2 = mc\theta$ where θ is temperature change

$\frac{1}{2}\ x\ 800\ x\ 15^2 = 4.81\ x\ 1200\ x\ \theta$

$\theta = 15.6\ ^0C$

6. (a) (i) What is meant by conduction of heat? (01mark)
Conduction of heat is a process of heat transfer by which heat floe from a hotter region of a substance to the cold regions without the bulk movement of a substance as a whole.
(ii) Explain why mercury conducts heat better than water. (03marks)

Mercury has free electrons capable of transferring energy without any part of mercury moving. Mercury atoms are closer allowing conduction of atomic vibrations while in water there is no free electrons and atoms are farther apart.

(iii) Explain the occurrence of land and sea breezes. (06marks)

During day, the land is heated to a high temperature than the sea. Hot air expands and rises from land. A stream of cool air from the sea blows towards the land to replace the uprising air, hence sea breeze occurs.
At night the land cools faster because it is no longer heated by the sun. The sea retains the warmth because it is heated deeply. Warm less dense air rises from the sea surface and air from land blows to replace it leading to land breeze.

(b) A copper sphere of radius 7cm and density 900kgm^{-3}, is heated to a temperature of 127^{0}C and then transferred to an evacuated enclosure whose walls are at a temperature of 27^{0}C. Calculate

(i) net rate of loss of heat by the copper sphere

P= A$\sigma(T_1^2 - T_0^2) = 4\pi R^2\sigma(T_1^2 - T_0^2)$ = 4π(0.07)^2 x 5.67 x 10^{-8} (400^4 – 300^4) = 61.122Js^{-1}

(ii) temperature of copper sphere after 5minutes

Average rate of heat loss = $\frac{61.122+0}{2}$ = 30.6Js^{-1}

P = mc$\frac{d\theta}{dt} = \frac{4}{3}\pi r^3\rho c\frac{d\theta}{dt}$

30.6 = $\frac{4}{3}\pi(0.007)^3 x\ 900\ x\ 400\ x\ \frac{d\theta}{dt}$

$\frac{d\theta}{dt} = 0.059Ks^{-1}$

(c) Explain why heating system based on the circulation of steam are more efficient than those based on circulation of boiling water. (02marks)

A given mass of steam gives out more energy that an equal amount of water because of the specific latent heat.

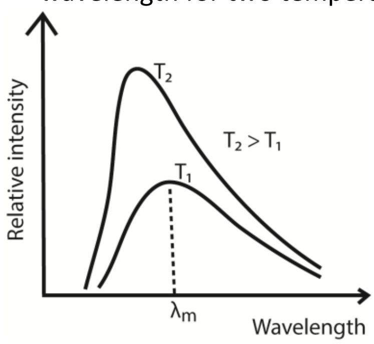
7. (a) (i) what is meant by a black body? (02marks)

A black body is a body that absorbs all radiations incident on it and transmits and reflects none

(ii) Give two examples of a black body. (01mark)

- The sun
- Star
- Black hole (remnants of a star after it has used up all its energy]
- An almost enclosed blackened surface with hole/furnace with small hole

(b) With aid of graphs describe how radiation emitted by a black body varies with wavelength for two temperatures.

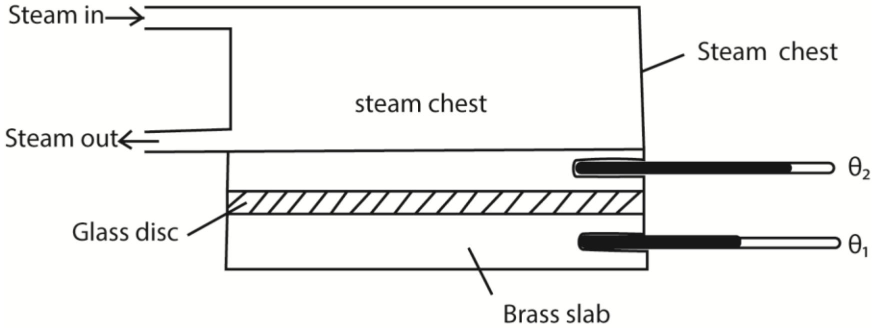


- For every wave length, relative intensity increases as temperature is increased.
- The wavelength at which maximum intensity occur shifts to the shorter wavelength as temperature is increased.
- λ_{max} is the wavelength of radiation emitted at maximum intensity/emission of a black body at a particular temperature.

(c) (i) Define thermal conductivity. (01mark)

Thermal conductivity is the rate of heat transfer per unit cross section area per unit temperature gradient.

(ii) Describe an experiment to determine thermal conductivity of glass. (07marks)



- Glass s cut in form of a thin disc of cross section area, A and thickness, x.
- The disc is sandwiched between a steam chest and brass slab of mass, m and specific heat capacity, c.
- Steam is passed through the chest until the thermometers register steady temperatures, θ_1 and θ_2.
- Then, $\frac{\theta}{t} = kA\left(\frac{\theta_2 - \theta_1}{x}\right)$
- The glass disc is removed and brass slab is heated directly by steam chest, until its temperature is about 10^0C above θ_1.
- Steam chest is removes and the top of the glass slab is covered by the glass disc.
- The temperature of the slab is recorded at suitable time interval until its temperature is about 10^0C below θ_1.
- A graph of temperature against time is plotted and its slope s determined at θ_1

$$\frac{\theta}{t} = mcs$$

$$\therefore\ kA\left(\frac{\theta_2 - \theta_1}{x}\right) = mcs$$

$$k = \frac{mcsx}{A(\theta_2 - \theta_1)} \text{ but } A = \frac{\pi D^2}{4}$$

$$\therefore k = \frac{4mcsx}{\pi D^2(\theta_2 - \theta_1)}$$

(d) Radiation from the sun falls normally on a blackened roof measuring 20m x 50m. If half of the solar energy is lost in passing through the earth's atmosphere, calculate the energy incident on the roof per minute. [Temperature of the sun's surface = 6000K; radius of the sun = 7.5 x 10^8m, distance of the sun from the earth = 1.5 x 10^{11}m]

Power radiated by the sun, P = $A\sigma T^4 = 4\pi r^2\sigma T^4$

Power incident on sphere, $P_i = \frac{P}{2} = 2\pi r^2\sigma T^4$

Power received by roof, $P_r = \frac{A_1}{A}\ x\ P_i$

$= \frac{L\ x\ w}{4\pi R^2} x\ 2\pi r^2\sigma T^4$

$= \frac{20\ x\ 50\ x\ 2\pi\ x\ (7.5\ x\ 10^8)^2\ x\ 5.7\ x\ 10^{-8} x\ 6000^4}{4\pi\ x\ (1.5\ x\ 10^{11})^2}$

= 923, 400W

Energy incident on roof per minute

P_i =Pr x 60 (1minute)

= 923, 400 x 60

= 5.54 x 10^7J

SECTION C

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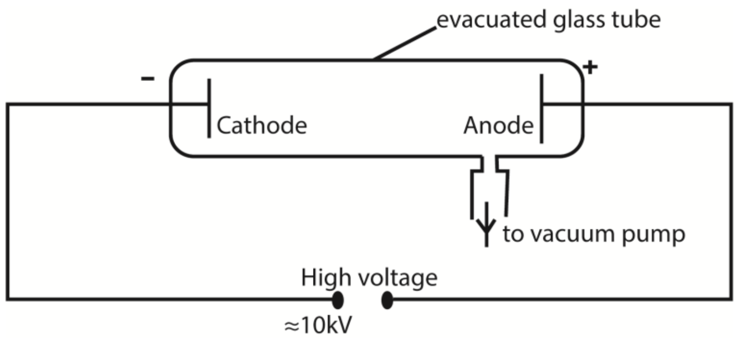
8. (a) Define the following
   (i) Binding energy (01marks)
   Binding energy is the energy required to split the nucleus into protons and neutrons.
   (ii) Unified Atomic Energy (01marks)
   Unified atomic mass unit is a twelfth of the mass of one atom of carbon-12 isotope.

(b) Explain how energy is released in a nuclear fusion process. (03marks)

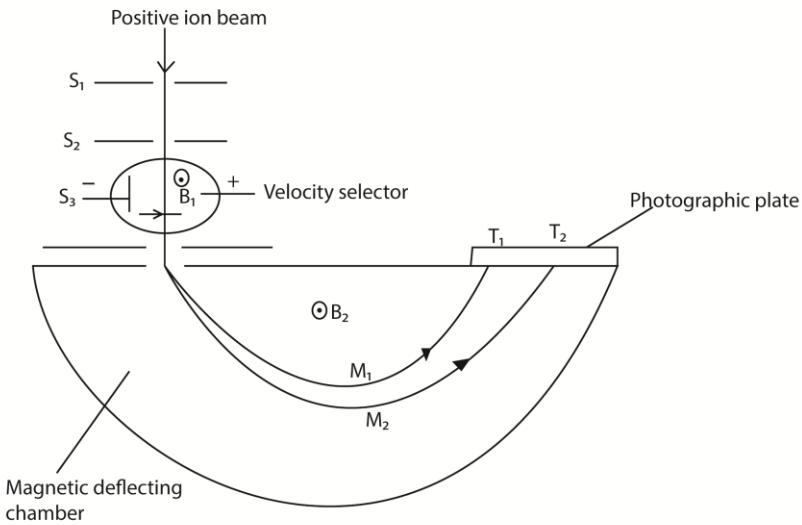
When two small nuclei combine, the total mass of the two nuclei is greater than the mass of the resulting heavy nucleus. The difference in the mass accounts for the energy released.

(c) Explain what is observed in a discharge tube when the pressure is gradually reduced to low values? (05marks)



- At 100mmHg, thin streamer of luminous gas appear between the electrodes.
- Between 10mHgand 0.1mmHg, the discharge becomes a steady glow spreading throughout the tube. Four regions appear

(d) With the aid of a diagram, describe the operation of Bainbridge mass spectrometer in the determination of charge to mass ratio. (07marks)



T_1 and T_2 are tracers on photographic plate, S_1, S_2 and S_3 are slits

Mode of action

- Positive ions are produced in a discharge tube and admitted as a beam through slits S_1 and S_2.
- The beam then passes between insulated plates P, Q, connected to a battery, which create an electric field of intensity E.
- A uniform magnetic field B_1, perpendicular to E is applied over the region of the plates and all ions, charge e with the same velocity, v given by $B_1ev = Ee$ will then pass undeflected through the plates and through a slit S_3.
- The selected ions are deflected in a circular path of radius r by a uniform perpendicular magnetic field B_2 and an image is produced on a photographic plate as shown.
  In this case
  $\frac{mv^2}{r} = B_2ev$
  $\therefore \frac{m}{e} = \frac{rB_2}{v}$
  But for the ions selected v = $\frac{E}{B_1}$ from above
  $\therefore \frac{m}{e} = \frac{rB_2B_1}{E}$

(e) An ion of mass 2.6 x 10^{-26} kg moving at a speed of 4 x 10^4ms^{-1} enter a region of uniform magnetic field of flux density 0.05T. Calculate the radius of the circle described by the ion.

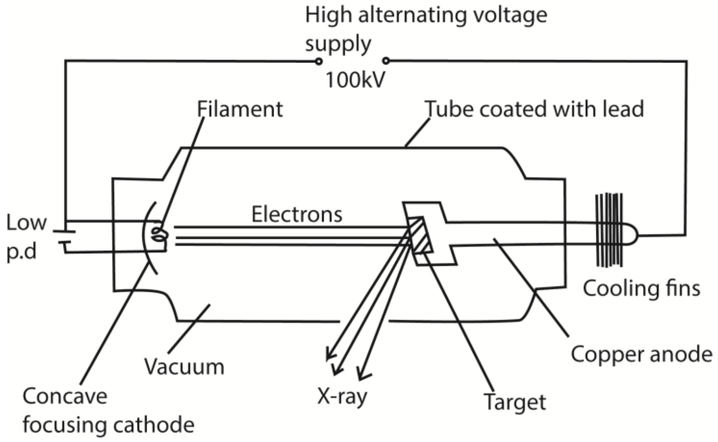
$\frac{mv^2}{r} = Bev$

$r = \frac{mv}{Be} = \frac{2.6 \times 10^{-26} \times 4 \times 10^4}{0.05 \times 1.6 \times 10^{-19}} = 0.13m$

9. (a)(i) State three differences between X-rays and cathode rays. (03marks)

X-rays	Cathode rays
Electrical magnetic wave of very short wavelength	Streams of fast moving electrons
Have no charge	Are negatively charged
Are not deflected by electric and magnetic field	Are deflected by both magnetic and electric field
Move with high speed	Move with low speed
Affect photographic plates	Have no effect on photographic plates

(ii)Describe using a labelled diagram, the mode of operation of an X-ray tube (06marks)



Mode of operation

- The filament is heated by a low voltage supply and the electrons are emitted by thermionic emission.
- The concave focusing cathode focuses the electrons from the filament onto the target.
- These electrons are accelerated towards the anode by the high voltage between the filament and the Anode.
- When the electrons (cathode rays) strike the metal target, about only 1% their kinetic energy is converted to X-rays and the 99% of their kinetic energy is converted to heat, which is conducted away by the cooling fins.

(iii) What is the difference between soft and hard X-rays (01mark)

- Hard X-rays have higher penetrating power than soft X-rays
- Hard X-rays have shorter wavelength than soft X-ray.

(b) (i) What is the main distinction between work function and ionization energy? (02marks)

Ionization energy is the minimum energy required to remove its most loosely bound electron from the atom while work function is the minimum energy required to liberate an electron from a metal surface.

(ii) An electron of charge, e, enters at right angles into a uniform magnetic field of flux density B and rotates at frequency, f, n a circle of radius, r.

Show that the frequency, f, is given by; f = $\frac{Be}{2\pi m}$. (03marks)

$$Bev = \frac{mv^2}{r}$$

$$Be = \frac{mv}{r} = \frac{m}{r}(2\pi fr) \text{ since } v = 2\pi fr$$

$$f = \frac{Be}{2\pi m}$$

(c) An X-ray beam is produced when electrons are accelerated through 50kV are stopped by the target of an X-ray tube. When the beam falls on a set of parallel atomic plates of a certain metal at glancing angle of 16^0, a first order diffraction maximum occurs. Calculate the atomic spacing of the planes. (05marks)

From $\frac{hc}{\lambda} = eV$

$$\lambda = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{1.6 \times 10^{-19} \times 50000} = 2.48 \times 10^{-11} \text{m}$$

$$2d\sin\theta = n\lambda$$

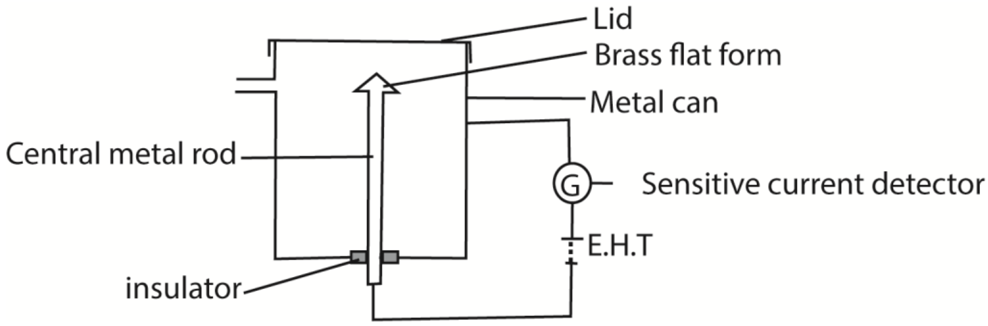
$$d = \frac{1 \times 2.48 \times 10^{-11}}{2 \sin 16^0} = 4.5 \times 10^{-11} \text{m}$$

10. (a) State two differences between alpha and beta particles

Alpha particle	Beta particles
Positively charged	Negatively charged
Low penetrating power	High penetrating power
High ionizing power	Low ionizing power

Helium nucleus	An electron

(b) Describe with the aid of a diagram, the structure and mode of operation of an ionization chamber. (06marks)



- A radiation source on the brass flat form causes ionization of air in the chamber producing electrons and positive ions.
- The electrons move to the metal can and positive ions drift to the central metal rod.
- Movement of the ions to the electrodes causes discharge and current pulse flows in external circuit.
- The current sensitive detector detects current.
- The magnitude of current detected shows the extent to which ionization takes place.

(c)(i) Explain the application of carbon-14 in carbon dating. (03marks)

- Carbon-14 isotope is radioactive with half-life $t_{½}$ = 5600years
- It is absorbed and maintained at constant concentration by plants during photosynthesis.
- When plants die carbon- 14 decays and its concentration falls due to lack of renewal by photosynthesis.
- If N_0 is the activity of fresh plant and N is the activity of dead plant after time t, the age of the dead plant t is deduced from $N = N_0 e^{\frac{0.693}{5600}t}$

(ii) A sample of dad wood was found to have activity of 20units due to carbon-14 isotope whose half-life is 5600 years. If activity of wood just cut is 47.8 units, estimate the age of the sample. (03marks)

From $N = N_0 e^{\frac{0.693}{5600}t}$

47.8 = 20$e^{\frac{0.693}{5600}t}$

In$\frac{47.8}{20} = \frac{0.693}{5600}t$

t = 7040.8years

(d) The photoelectric work function of potassium is 2.25eV. Light having a wavelength of 360mm falls on a potassium metal.

(i) Calculate the stopping potential (04marks)

$hf = w_0 + \frac{1}{2}mv^2$

$but\ \frac{1}{2}m{v_{max}}^2 = eV_s$

- $\frac{hc}{\lambda e} = w_0 + V_s$

$\frac{6.6 \ x \ 10^{-34} \ x \ 3 \ x \ 10^{8}}{360 \ x \ 10^{-3}}$ = 2.25 x 10^{-19} + eVs

$V_s = -2.25V$

(ii) Calculate the speed of the most energetic electron emitted by the metal (02marks)

$\frac{1}{2}mv_{max}{}^{2} = eV_s$

$v_{max} = \sqrt{\frac{2 \ x \ 2.25 \ x \ 10^{-19}}{9.11 \ x \ 10^{-31}}}$ = 8.89 x 10^{5}ms^{-1}