# Advanced Level GCE Physics 2 June 2008 Corrections



## JUNE 2008

1.(i) Homogeneous means units or dimensions of all the terms in the equation are the same.

(ii) $\eta\pi av = \frac{4}{3}\pi a^3(\rho - \rho')g$

Units of LHS = units of( $\eta av) = kgm^{-1}s^{-1}.m.ms^{-1} = kgms^{-2}$

Units of RHS = units of $(a^3(\rho - \rho')g) = m^3kgm^{-3}ms^{-2} = kgms^{-2}$

Since the base units on both sides are the same, the equation is homogeneous.

2.$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \Rightarrow \frac{v}{f} = 1 + \frac{v}{u} \Rightarrow \frac{v}{f} = 1 + m \Rightarrow v = mf + f$. Slope of graph $= f \Rightarrow f = \frac{25.5-22.0}{1.50-1.20} = 11.67cm$

b) See June 2001 Q4

3.(i) When $Q = \frac{Q_0}{2}, t = T_{1/2} \Rightarrow \frac{Q_0}{2} = Q_0e^{-\frac{T_{1/2}}{RC}} \Rightarrow T_{1/2} = RCln2$

(ii) When $Q = \frac{Q_0}{2e}, t = \tau \Rightarrow \frac{Q_0}{e} = Q_0e^{-\frac{\tau}{RC}} \Rightarrow \tau = RC$

(iii) $T_{1/2} = \tau ln2$

4.Simple harmonic motion is the motion in which the acceleration is directly proportional to the displacement from a fixed point.

$y = r\sin\omega t$ Where

r is the amplitude (maximum displacement from equilibrium position)

$\omega$ is the pulsation (also called angular frequency)

$t$ is time interval during which the motion takes place.

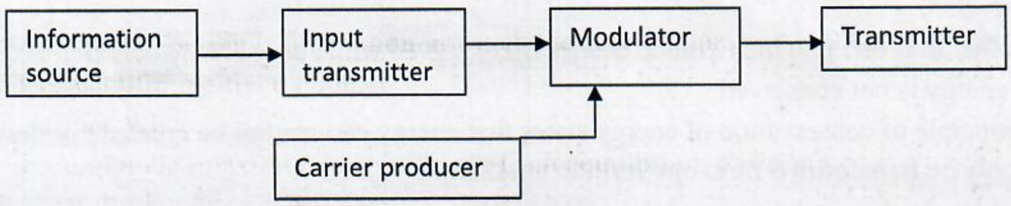
5.(a) $d\sin\theta = m\lambda \Rightarrow \frac{1}{N}\sin\theta = m\lambda \Rightarrow \lambda = \frac{\sin\theta}{mN} = \frac{\sin 36°}{2\times(5000\times10^2)} = 5.88\times10^{-7}m$

(b) For m = 3, $\sin\theta = 3\times5.88\times10^{-7}\times5000\times10^2 = 0.881 < 0$. Hence a order image is possible

(c) From$d\sin\theta = m\lambda \Rightarrow m = \frac{d\sin\theta}{\lambda} \Rightarrow m \propto \frac{1}{\lambda}$. Thus to increase the number of orders, the wavelength of the light should be reduced. The number of orders can also be increased by increasing the spacing of the grating.

6.See June 2001 Q5

7.(i)

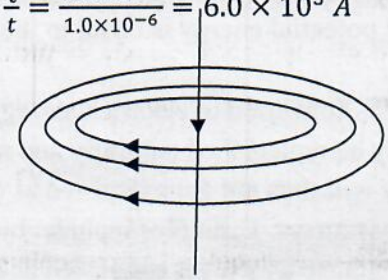



(ii) See June 2004 Q8

8.(a) See June 2001 Q8

(b) (i) $I = \frac{Q}{t} = \frac{600\times10^{-3}}{1.0\times10^{-6}} = 6.0\times10^{5}\ A$

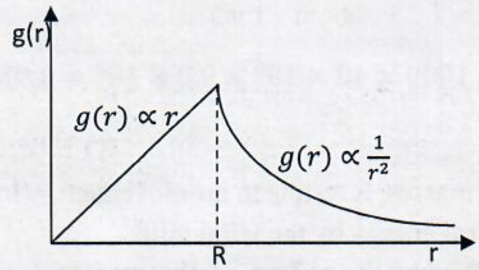
(ii)



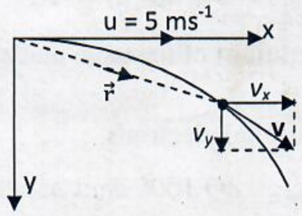
(iii) $B = \frac{\mu_0 I}{2\pi r} = \frac{2\pi\times10^{-7}\times6.0\times10^{5}}{2\pi\times0.1} = 0.6\ T$

(d) See June 2001 Q8

(f)




9.(a) (i) The path (trajectory) [illegible] parabola




(ii) Displacement

$x = ut = 5\times0.5 = 2.5\ m$

$y = \frac{1}{2}gt^2 = \frac{1}{2}\times9.8\times0.5^2 = 1.23m$

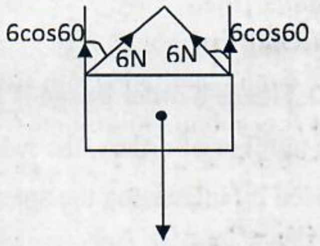
Thus displacement, $\vec{r} = (2.5\hat{i} + 1.23\hat{j})m$

$v_x = u = 5ms^{-1}$ and $v_y = gt = 9.8\times0.5 = 4.9ms^{-1}$

$\Rightarrow \vec{v} = (5\hat{i} + 4.9\hat{j})ms^{-1}$

(iii) Vertical component of acceleration is constant while horizontal component is zero. For the velocity, the vertical component increases with time while the horizontal component is constant

(b)




W = 6cos60 + 6cos60 = 12 N

(c) A collision is a situation in which bodies exert relatively strong forces on each other in a relatively short time interval.

An elastic collision is one in which kinetic energy is conserved while an inelastic collision is one in which kinetic energy is not conserved

(d) (i) The principle of conservation of energy states that energy can neither be created nor destroyed but can only be transformed from one form to another.

From the first law of thermodynamics, $\Delta Q = \Delta U + \Delta W$

Where, $\Delta Q$ is the energy supplied to the system

$\Delta U$ is the change in the internal energy of the system

$\Delta W$ is the work done on or by the system

(ii) A ball falling under gravity, the loss in gravitational potential energy is equal to the gain in kinetic energy.

In a battery, when connected to a load, chemical energy is converted to electrical energy.

(e) Renewable energy sources are sources be continually be replenished naturally and make use of processes that are part of our natural environment. They will thus not get exhausted as they are exploited for energy production. They are also called infinite energy sources. Examples include: biomass, sun, wind, flowing streams, etc. While non – renewable sources are those which get exhausted as they are being used. They are also called finite energy sources. Examples include: fossil fuels like coal, oil, natural gas etc.

(iia) mass of water, $m = \rho V = \rho A h$

$$G.P.e = mg\left(\frac{h}{2}\right) = \rho Ah\left(\frac{h}{2}\right) = \frac{1}{2}\rho Ah^2 = \frac{1}{2} \times 1000 \times 40 \times 10^6 \times 9.8 \times 10^2 = 1.95 \times 10^{13} J$$

(iib) $P = \frac{G.p.e}{t} = \frac{1.95\times10^{13}}{6\times60\times60} = 9.02 \times 10^8 W$

(f) When the heat from the sun heats up large air masses, it results to air movement (wind). The kinetic energy of the wind can then be converted to electrical energy by the wind mills.

(ii) Living organisms (plants) manufacture their food by the process of photosynthesis using sunlight. When they die and are buried, they decay to form fossil fuels after so many years e.g oil.

10. (a) Consult your textbooks

(b) (i) Radioactivity is the random and spontaneous decay (or disintegration) of unstable nuclei to form more stable ones by emitting nuclear radiations.

An alpha particle is an excited helium nucleus that has lost two of its orbital electrons

(ii) ${}^{238}_{92}U \longrightarrow {}^{234}_{90}Thn + {}^{4}_{2}\alpha + \text{energy}$

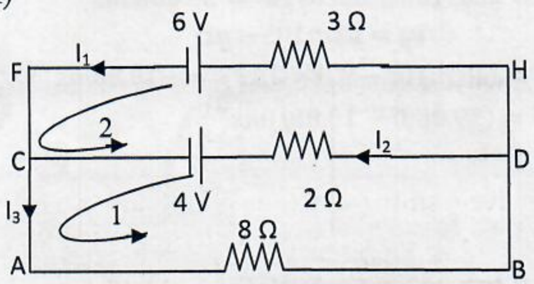
(c) (i) $\frac{dN}{dt} = N\lambda = \frac{N ln2}{T_{1/2}} = \frac{10^{10} ln2}{20\times24\times60\times60} = 4.0 \times 10^3\ Bq$

(ii) $N = N_0 e^{-\lambda t} \Rightarrow t = \frac{1}{\lambda} ln\left(\frac{N_0}{N}\right) = \frac{T_{1/2}}{ln2} ln\left(\frac{N_0}{N}\right) = \frac{20\ days}{ln2} ln\left(\frac{10^{10}}{10^4}\right) = 398.6\ days \approx 399\ days$

(d) (i) Temperature coefficient of resistance of a material is the fractional increase in the resistance of the material at zero degree per degree rise in temperature.

(ii) See June 2001 Q10

(f)




KCL: $I_3 = I_1 + I_2$ ............. .(1)

KVL in loop (2), $-3I_1 - 6 + 4 + 2I_2 = 0$

$\Rightarrow -3I_1 + 2I_2 = 2$ ..............(2)

KVL in loop (1); $-4 - 8I_3 - 2I_2 = 0$

$\Rightarrow I_2 + 4I_3 = -2$ ............. .(3)

Solving the above three equations,

$I_1 = -0.609\ A;\ I_2 = 0.087\ A, I_3 = -0.522\ A$