PAST GCE QUESTIONS MEETLEARN.COM

2014 Past GCE Advanced Level Paper 2

JUNE 2014

SECTION I (One hour)
Answer all questions in this section

1. Figure 1 shows how capacitors are connected in a circuit.

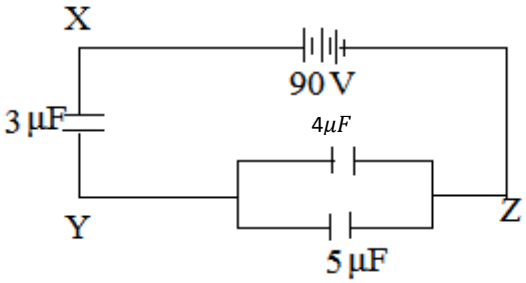

Figure 1

Calculate the

(i) Charge stored by the 4μF capacitor.
(ii) Potential difference across YZ.

2. (a) Explain why the specific latent heat of vaporization of a substance is always larger than the specific latent heat of fusion of the same substance.
(b) A mixture of 50g of ice and 210g of water at 0^0C are in a container. Steam at 100^0C is passed in until all the ice just melts. Calculate the mass of the water now in the container.

4. (a) Consider the acceleration of free fall on the moon's surface to be $1.6ms^{-2}$. Determine the length of a simple pendulum which will have a period of 1.0s on the moon's surface.
(b) A particle executing simple harmonic motion has 5 times the energy of another particle but their masses and frequencies are equal. Calculate the ratio of the amplitudes for the two motions.

5. (a) Explain how the internal energy of a system is modified when it undergoes an isothermal change. In one such change 200J of energy was added to a system. How much work was done on or by the system?
(b) Scientific analysis shows that light gases such as helium nuclei undergo fusion to release energy in the sun. Estimate the root-mean-square speed of helium atom of mass 6.6×10^{-27}kg near the surface of the sun where the temperature is about 6000k.

6. (i) Draw a diagram of a tuning circuit of a radio.
(ii) Distinguish between A.M and F.M radio transmission systems.

7. (a)Figure 2 shows how the force, F, between two molecules varies with the separation r.

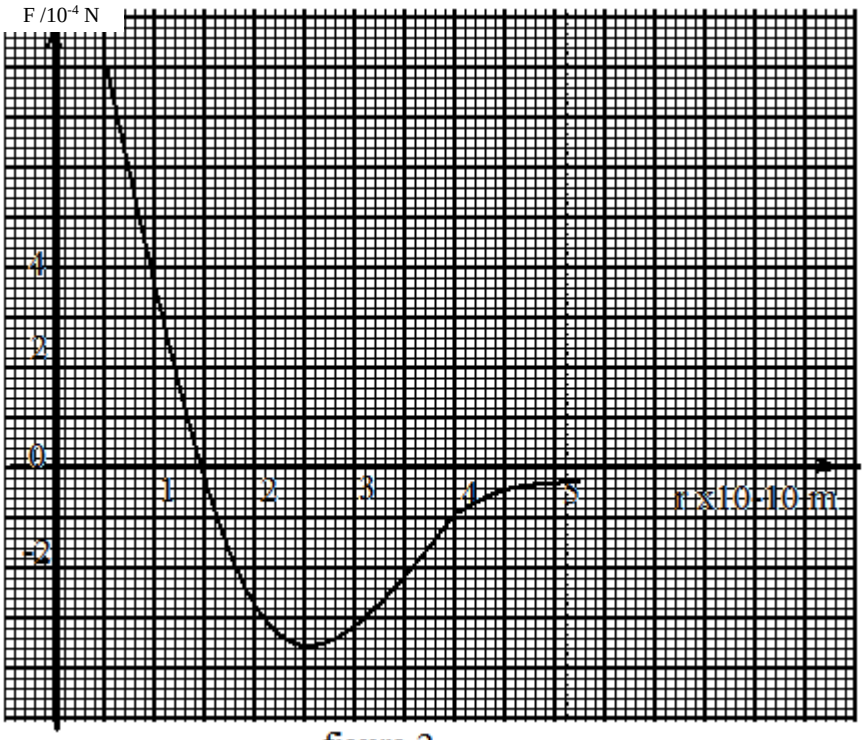

figure 2

Use the graph to calculate;
(i) The energy needed to completely separate the two molecules initially at their equilibrium separation.
(ii) Calculate the gradient of the graph around the linear region. What is the significance of the slop?

SECTION II (ONE HOUR)
Answer all questions
Answer either 8 (a), (b) and (c) or 8 (d), (e) and (f).
Either 8 (a), (b) and (c)
8. (a) (i) Define the term resistivity.
(ii) Describe an experiment you can carry out to determine the electrical resistance of a space of copper wire.
(b) A student designs and electrical heating element using a wire 5.0m long of diameter 1.00mm so that it dissipates 2KW when connected to a 240Vmains. Calculate;
(i) The resistivity of the wire.
(ii) The cost of using the element for 30days if ENEO CAMEROON charges 60frs per kilowatt-hour and the coil is used for 6hrs each day.
(c) Sketch on the same axis, graphs to show the current across the following material vary with the potential difference across their ends.
(i) Copper wire
(ii) Silicon
(ii) Filament bulb.
OR 8(d), (e) and (f)
(d) (i) Defined temperature coefficient of resistance of a material.
(ii) Describe an experiment you can carry out to determine the coefficient of resistance of a metal wire.
(c) A surface of a metal is illuminated with light of wavelength 590nm. A p.d of 0.15V is applied between the metal surface and collecting electrodes in order to prevent the collection of electrons. Calculate;
(i) The work function of the metal.
(ii) The work done against the most energetic photoelectrons.
(iii) The speed of the most energetic electron.
(f) Light of varying frequencies is incident on the surface of three different metal, x, y, z. The work function (ω_0) are in the order $\omega_{0^z} < \omega_{0^y} < \omega_{0^x}$. Sketch on the same axis graphs to show how the maximum kinetic energies of photoelectrons vary with frequency.

Answer either 9 (a), (b) and (c)

Either 9 (a), (b) and (c)
9. (a) State Newton's laws of motion.
(b)

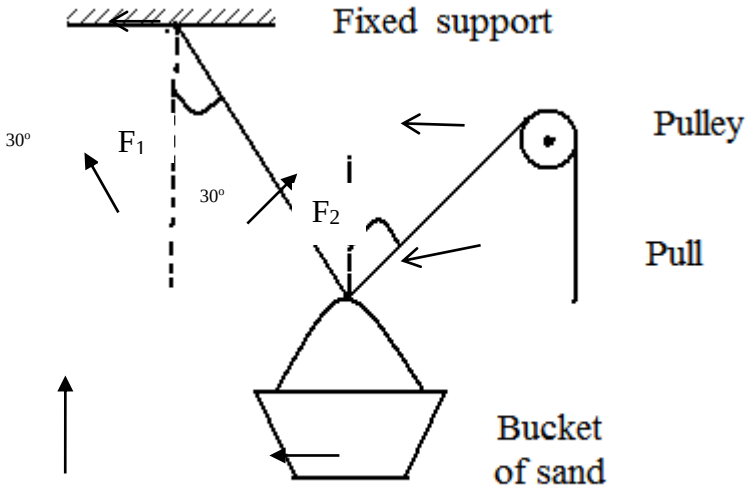

Figure 3

Figure 3 shows a bucket of sand which is pulled upward at a building site and at the instant shown, the forces F_1 and F_2 have equal magnitude of 600N and the bucket is moving with an acceleration of 2 ms^{-2}. Determine the mass of the bucket and its contents.
(c)

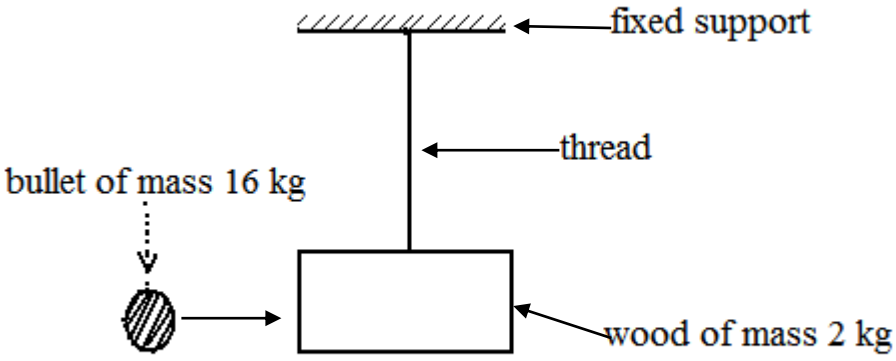

Figure 4

A bullet is fired horizontally as shown in figure 4, so that it strikes the wood with a velocity of 180ms^{-1}. It gets embedded in the block of wood suspended freely using as long thread. Calculates
(i) The magnitude of the momentum of the bullet just before it enters the block.
(ii)The magnitude of the initial velocity of the block and bullet immediately after the impact
(iii) The kinetic of the block and bullet immediately after impact and use it to say whether or not the collision is elastic.
(iv) The maximum height attained above the equilibrium position by the block and embedded bullet.
OR 9 (d) and (e)
9. (d) (i) State the following laws: Newton's law of universal gravitation, coulomb's force law and Faraday's of electromagnetic induction.
(ii)

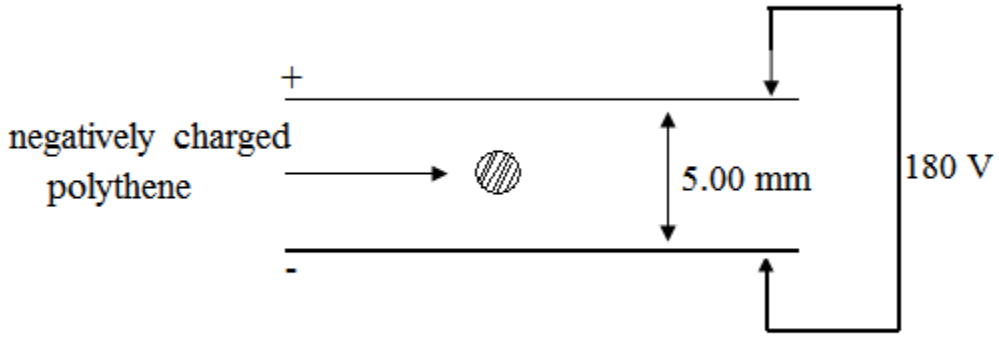

Figure 5

Figure 5 shows a negatively charged polythene sphere of mass 3.5×10^{-15}kg held stationary between two parallel plates. How manyexcesselectrons are on the sphere?

(e) A space ship of mass 6.0×10^{6}kg is launched into space so that it orbits the earth at a height, H, above the earth's surface. Where $H=R_E$. is the mean radius of the earth.

(i) Explain why an astronaut moving about in the spacecraft at this height feels weightless.

(ii)Determine the minimum energy required to take the spaceship to the desired height. Explain why more energy is needed in the practical situation than in the calculated value?

(iii) Calculate the period of the space ship in its orbit at this height and hence explain whether or not the space ship is in a geo-stationary orbit.

SECTION III (30 minutes)

10. A student used the electron diffraction experiment to investigate the variation of nuclear radius, R, and nucleon number, A for several nuclear species. The corresponding value of R and A are recorded in the table which follows:

$R/10^{-15}$m	A
4.4	25
4.7	50
5.0	75
5.3	100
5.7	125
6.0	150

6.2	175
6.5	200
6.8	225
7.0	250

R and A related by an expression of the form
$R=R_0A^n$ where, R_0 and n are constants

(a) (i) Plot a suitable graph to determine the values of R_0 and n.
(ii) Hence determine the value of R_0 and n

(b) (i) What is the physical significance of R_0?
(ii) State the relationship between R and A.