أجب عن الأسئلة الآتية:

[١] (١-أ) أكمل ما يأتي: (١٠درجات)

١- لأي متجهين A, B فإن المقدار $A \cdot (B \wedge A)$ يساوي ....

٢- إذا كان $A \perp B$ أو $A \parallel B$ فإن $(A \cdot B)(B \wedge A)$ يساوي ....

٣- إذا كان المتجهان $A = 2i$, $B = i + \lambda j$ متعامدان فإن الثابت λ يساوي ....

٤- لأي متجه A فإن الكمية الاتجاهية $i \wedge (A \wedge K)$ تساوي ....

٥- أقصى مدى لجسيم قذف في مستوى بسرعته $5\sqrt{g}$ m/sec يساوي ....

(ب) ضع علامة $(\sqrt{})$ أمام العبارة الصحيحة وعلامة $(\times)$ أمام العبارة الخطأ مع تصحيح الخطأ: (١٠درجات)

١- إذا تحرك جسيم حركة توافقية بسيطة فإن أكبر قوة مؤثرة عليه تحدث عند مركز الحركة ( )

٢- إذا كان تردد جسيم يساوي ٢٥red/sec فإن ربع الزمن الدوري له يساوي ١/١٠٠ . ( )

٣- إذا كانت مجموعة من القوى تكافئ عند نقطة ما قوة وازدواج متعامدين فإن هذه المجموعة عند يمكن أن تكافئ قوة وحيدة ( )

٤- مسقط المتجه $j + i$ على محور Z يساوي صفر ( )

٥- إذا قذف جسيم في مستوى بسرعته u فإن أقصى مدى له يبحث عندما تكون زاوية القذف ( )

(ب) حل المعادلة الاتجاهية $A \wedge X = A$

(١-١) إذا كان $A = i + j - k$، $B = i - 3j + k$ فأوجد:

(i) مسقط المتجه A على المتجه B

(ii) متجه يوازي المتجه $A + B$ وطوله يساوي ٦. $A \wedge X + X = A$. (١٤درجة)

(٢-١) إذا كان $\alpha = 30°$ أو $\alpha = 60°$ (١درجة)

[٢-١] محصلة من القوى تتكون من قوة $F_2 = i + j + k$ وقوة $F_1 = 2i - 3j$ وتمر بنقطة الأصل وقوة ثالثة F_3

بالنقطة $(1, 0, -1)$ ودور $(1, 0, -1)$ أوجد ما تكافئ هذه المجموعة عند نقطة الأصل. (١٠درجات)

(ب) أوجد المجموعة اللولبية المكافئة. $C_1 = 2i + j + k$ أوجد المجموعة اللولبية المكافئة. (١٠درجات)

[٤-١] من قمة برج ارتفاعه ٢٠٠ ft قذفت قنبلة بسرعة ٨٠ ft/sec فإنه يمكن إصابة شخص على بعد ٢٠٠ ft من قاعدة البرج بزاويتين مختلفتين وأوجد الزمن اللازم في كل حالة. (١٠درجات)

(ب) جسيم يتحرك حركة توافقية بسيطة شوهد عند لحظة معينة على مسافة $5\sqrt{3}cm$ من مركز الحركة وبعد ثانية أخرى مر بمركز الحركة. أوجد سعة الحركة وزمنها الدوري وكذلك موضع الجسيم بعد ثانية من مروره بالمركز. (١٠درجات)

(ب) جسم كتلته m شُد بأحد طرفي خيط خفيف مرن طوله الطبيعي L بينما ثبت الطرف الآخر للخيط في نقطة ثابتة O وعندما يكون الجسيم متزن (وضع الاتزان الاستاتيكي) فإن الخيط يستطيل بمقدار $\frac{L}{10}$ فإذا جذب الجسيم حتى أصبح أسفل O بمسافة 2L وترك ليتحرك من سكون. أوجد السرعة التي يصل بها إلى نقطة التعليق O. (١٠درجات)

أجب عن جزئين فقط من كل سؤال من الأسئلة الآتية فى ضوء ما درست (الجزء ١٠ درجات):-

السؤال الأول:- (٢٠ درجة)

أ- أثبت بإستخدام مبدأ الاستنتاج الرياضى أن لكل عدد طبيعى n

$$1^2 + 2^2 + 3^2 + \cdots \ldots \ldots \ldots \ldots \ldots + n^2 = \frac{n}{2}(n+1)(2n+1)$$

ب- ضع العدد $Z = \dfrac{1}{(2+i)^2} - \dfrac{1}{(2-i)^2}$ على الصورة المثلثية ثم أوجد $Z^{4/3}$.

ج- إذا كانت $f(x) = \dfrac{3x+5}{2x-3}$ أثبت أن $f(x)$ دالة أحادية ثم أوجد معكوسها.

السؤال الثانى:- (٢٠ درجة)

أ- باستخدام طريقة كرامر أوجد حل مجموعة المعادلات التالية:
$x + 3y - 2z = 0, \ 2x - y + 4z = 6, \ 2x + 2y + 3z = 5$.

ب- عرف علاقة التكافؤ على مجموعة A. وإذا كانت R علاقة معرفة على مجموعة الأعداد الصحيحة Z فى الصورة $R = \{(x,y): x,y \in Z, x + y = $ زوجى عدد $\}$ ، فأثبت أن R علاقة تكافؤ ثم أوجد فصول التكافؤ.

ج- حلل الكسر $\dfrac{2x+1}{(x-2)^2(x^2+1)}$ إلى كسوره الجزئية.

السؤال الثالث:- (٢٠ درجة)

أ- عين احداثيات المركز والبؤرتين والاختلاف المركزى وطول الوتر البؤرى العمودى وطولى المحورين ومعادلات المحورين والدليلين والخطين التقاربين للقطع
$16x^2 - 9y^2 + 64x + 18y = 89$ ثم ارسمه.

ب- ارسم القطع الذى تمثله المعادلة $y^2 + 8x - 6y + 17 = 0$ مع ذكر البيانات الخاصة به.

ج- أوجد معادلة الخط المستقيم المار بنقطة تقاطع المستقيمين
$2x - y - 1 = 0, 3x + 2y - 12 = 0$ والعمودى على الخط المستقيم $3x + 3y - 8 = 0$.

السؤال الرابع:- (٢٠ درجة)

أ- أوجد المعادلة الجديدة للمنحنى $x^2 + y^2 - 6x - 10y - 2 = 0$ بعد نقل المحاور موازية لنفسها إلى النقطة $O'(3,5)$.

ب- أوجد معادلة القطع المكافئ الذى بؤرته هى $(0,6)$ ودليله هو الخط المستقيم $y = -3$ وأوجد معادلة المحور وطول الوتر البؤرى العمودى ثم ارسم القطع.

ج- ارسم القطع $9x^2 + 25y^2 - 18x + 100y = 116$ مع ذكر البيانات الخاصة به.

Mansoura University
Faculty of Science
Chemistry Department
Course: Chem. (121)

First Level
Date: **20/1/2015**
Time Allowed: **2 hours**
Full Mark: **60** Marks

**** *Answer Only four of the following questions* ****

[Q1] Complete the following *statements (10 Only)*: *(15 marks)*

1. Heisenberg Uncertainty Principle states that ……………..
2. The four quantum numbers of the last electron in $4d^6$ are ……..
3. The electronic configuration of an element with (Z = 31) is …….., it is roomed in ……group and ……period.
4. The maximum number of electrons in the n shell is ……..
5. The atomic size of F is …… than that of O and the atomic size of Na is …... than that of Li.
6. The elements in the same period have the same …… shell while that of the same group have the same …….
7. ……….. results from attraction between ions of different charges.
8. ……….. results from sharing of electrons.
9. Down the group, the first ionization energy ……….. and the electron affinity………..
10. In Lyman series of H spectrum, the third line represents the movement of electron from the ……...energy level to the …..........
11. s-s overlap produce …….and …… molecular orbitals.
12. 80% of known elements on the earth are ………..
13. The number of periods in the periodic table are …….. and the elements are arranged in the order of increasing ………..
14. The % yield of chemical reaction equal ………
15. The electron configuration of iron atom (Z = 26) is …………… and there are …….. unpaired electrons.

[Q2] Put the Mark (√) for the right sentence and (X) for the wrong with writing its correction *(10 Only)*:

1. The maximum number of electrons in each of s, p, d and *f*-subshell is $(4\ell +1)$.   *(15 marks)*
2. BF_3 is a liner molecule whereas $BeCl_2$ is an angular planar. ($_5B$, $_4Be$, $_{17}Cl$)
3. In the periodic table, the F element is the highest electronegative and Cs is the least. ($_6C$, $_7N$, $_8O$, $_9F$)
4. The size of Na is smaller than Na^+ (Atomic no. of Na = 11).
5. The polarity of the covalent bond increases as follow: **C-O > C-N > C-F**   ($_6C$, $_7N$, $_8O$, $_9F$)
6. The first ionization energy of **P atom** is less than that of **S atom**. ($_{15}P$, $_{16}S$)
7. No two electrons in one atom have different set of quantum numbers.
8. The maximum number of electrons in *f* subshell is 10.
9. The atoms combined together to form moles.
10. The resonance structures should all have similar energies.
11. Bonding M.O. possess higher energy than of atomic orbitals.
12. The isoelectronic species have the same number of protons.
13. The % of elements in a compound depends on the amount of compound.
14. The Cl-P-Cl bond angles in PCl_5 are 90° and 120°. ($_{15}P$, $_{17}Cl$)
15. The hybridization of N in NH_3 is sp^2.

[Q3] Choose the correct answer for *(10 Only)* of the following questions: *(15 marks)*

1. Which sketch represents an orbital with the quantum numbers n = 3, ℓ = 0, m_ℓ = 0?
   a)   b)   c)   d)
2. What is the maximum number of *d orbitals* that are possible for a given value of *n* (≥ 4)?
   a) **1**   b) **7**   c) **5**   d) **3**

Which of the following is most likely to be an ionic compound?
   a) **NF_3**   b) **N_2**   c) **CO_2**   d) **Na_2O**

3. Which of the following has the largest radius?

   a) **F**   b) **Cl**   c) **Br**   d) **I**

4. What is the electron configuration for magnesium ion, $_{12}Mg^{2+}$?

   a) $1s^2 2s^2 2p^6$ b) $1s^2 2s^2 2p^6 3s^1$ c) $1s^2 2s^2 2p^6 3s^2 3p^2$ d) $1s^2 2s^2 2p^6 3s^2$

2. Which of the following is most likely to be an ionic compound?

   a) NF_3 b) N_2 c) CO_2 d) Na_2O

6. Which one of the following is a nonmetal?

   a) $_{13}Al$ b) $_{17}Cl$ c) $_{20}Ca$ d) $_{19}K$

7. The electron configuration of copper atom ($_{29}Cu$) is given by:

   a) $[Kr] 4s^1 3d^{10}$ b) $[Kr] 4s^2 3d^9$ c) $[Kr] 4s^1 3d^9 4p^1$ d) $[Kr] 4s^2 3d^{10} 4p^1$

8. Which one of the following is the correct orbital diagram for ground state nitrogen ($_7N$)?

9. Which of the following elements has the largest atomic radius?

   a) $_7N$ b) $_8O$ c) $_5B$ d) $_6C$

10. Which of the following elements has the most negative electron affinity?

   a) $_{10}Ne$ b) $_9F$ c) $_8O$ d) $_6C$

11. In which orbital below would an electron be closest to the nucleus?

   a) **4s**   b) **5d**   c) **2p**   d) **2s**

12. Which of the following Lewis N_2O structures is false?

   a) $: N \equiv N - \ddot{O} :$ b) $\ddot{N} = N = \ddot{O}$ c) $: \ddot{N} - N \equiv O :$

13. How many equivalent resonance forms can be drawn for NO_2^-?

   a) **1**   b) **2**   c) **3**   d) There are no resonance structures for this ion.

14. The number of unpaired electrons in $_{27}Co$ is

   a) **3**   b) **4**   c) **4**   d) **6**

15. Which one of the following molecular formulas is an empirical formula?

   a) $C_6H_6O_2$ b) H_2O_2 c) C_2H_6SO d) $H_2P_4O_6$ e) **None of the above**.

16. The limiting reagent in a chemical reaction is one that:

   a) has the largest molar mass (formula weight).   b) has the smallest molar mass (formula weight).

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17. The % yield of chemical reaction equal

   a) Theoretical yield/ Actual yield   b) Theoretical yield + Actual yield   c) Actual yield/ Theoretical yield

---

[Q4] a) If 16 grams of O_2 react with excess C_2H_6, **how many grams of CO_2** will be formed? The formula mass of $O_2 = 32$ amu and the formula mass of $CO_2 = 44$ amu. Balance the equation:

$$C_2H_6 \text{ (g)} + O_2 \text{ (g)} \rightarrow CO_2 \text{ (g)} + H_2O \text{ (g)}$$

(5 marks)

  b) How much water must be added to 25.0 cm^3 of 0.5 M KOH solution to produce a solution whose concentration is 0.350 M? *(5 marks)*

  c) Draw Born-Haber cycle of NaCl? *(5 marks)*

[Q5] A. Complete the following: *(3 marks)*

  i. The Pauli Exclusion Principle states that ……………………

 ii. Hund's rule states that ……………………

B. Draw Lewis structure of two only and calculate the formal charge of the following molecules: *(6 Marks)*

      i) HNO_3 ii) SO_2 iii) $POCl_3$ ($_1H, _7N, _8O, _{15}P, _{16}S, _{17}Cl$)

C. Write the electronic configuration and deduce the 4 Q. No. of the last electron in the following: *(3 Marks)*

      i) **Na**   ii) **Fe^{3+}**   ($_{11}Na, _{26}Fe$)

D. Calculate the wavelength of the radiation that has energy of 3.6×10^{-17} joules. *(3 marks)*

    ($C = 3 \times 10^8$ m/s. Planl's constant (h) $= 6.6 \times 10^{-34}$ J.s)

***** Best Wishes *****

Mansoura University
Faculty of Science
Chemistry Department
Course: Chem. (121)

First Level
Date: 20/1/2015
Time Allowed: 2 hours
Full Mark: 60 Marks

**** *Answer __Only four__ of the following questions* ****

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    a) Theoretical yield/ Actual yield   b) Theoretical yield + Actual yield   c) Actual yield/ Theoretical yield

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[Q4] a) If 16 grams of O_2 react with excess C_2H_6, how many grams of CO_2 will be formed? The formula mass of $O_2 = 32$ amu and the formula mass of $CO_2 = 44$ amu. Balance the equation:

$$C_2H_6 \text{ (g)} + O_2 \text{ (g)} \rightarrow CO_2 \text{ (g)} + H_2O \text{ (g)}$$ *(5 marks)*

b) **How much water must be added** to 25.0 cm^3 of 0.5 M KOH solution to produce a solution whose concentration is 0.350 M?   *(5 marks)*

c) **Draw Born-Haber cycle of NaCl?**   *(5 marks)*

[Q5] A. Complete the following: *(3 marks)*

i. The Pauli Exclusion Principle states that ....

ii. Hund's rule states that ....

B. **Draw Lewis structure of two only and calculate the formal charge of the following molecules:**   *(6 Marks)*
    i) HNO_3 ii) SO_2 iii) $POCl_3$ ($_1H$, $_7N$, $_8O$, $_{15}P$, $_{16}S$, $_{17}Cl$)

C. Write the electronic configuration and deduce the 4 Q. No. of the last electron in the following: *(3 Marks)*
    i) Na   ii) Fe^{3+} ($_{11}Na$, $_{26}Fe$)

D. Calculate the wavelength of the radiation that has energy of 3.6×10^{-17} joules.   *(3 marks)*
    ($C = 3 \times 10^8$ m/s. Planl's constant (h) = 6.6×10^{-34} J.s)

***** **Best Wishes** *****

Answer the following Questions:

Q.1) Choose and write the correct answers: (10 Marks)

1- A and B are two wires. The radius of A is twice that of B. They are stretched by the some load. Then the stress on B is.

Equal to that on A - Two times that on A - Four times that on A - Half that on A

2- The amount of radiation emitted by a perfectly black body is proportional to.

Temperature on ideal gas scale - Fourth power of temperature on ideal gas scale
Source of temperature on ideal gas scale - Fourth root of temperature on ideal gas scale

3- If the temperature increases, the modulus of elasticity

Increases - Decreases - Remains constant - Becomes zero

4- Construction of submarines is based on.

Archimedes' principle - Pascal's law - Newton's laws - Bernoulli's theorem

5- If the force F equal $F = 2\pi r L v \eta / R$ where r is radius L is length, v is speed and R is distance, What are the dimensions of η (viscosity)?

$M L^{-2} T^{-1}$ - $M L^{-1} T^{-2}$ - $M^{-1} L^{-1} T^{-1}$ - $M L^{-1} T^{-1}$

6- A body executes simple harmonic motion. The potential energy (P.E.), the kinetic energy (K.E.) and total energy (T.E.) are measured as a function of displacement x. Which of the following statements is true .

P.E. is maximum when x = 0 - T.E. is zero when x = 0
K.E. is maximum when x = 0 - K.E. is maximum when x is maximum

7- Water flows through a pipe, the diameter of the pipe at point B is larger than at point A. Then the speed of the water greater at.

Point A - cannot be determined - Point B - Same at both a and B

8- Shear modulus is given by

$S = (F/V)/(\cos \theta)$ - $S = (F/A)/(\Delta V/V)$ - $S = (F/A) / \theta)$ - $S = (A/F)/\tan\theta$

9- In simple harmonic motion the acceleration of the oscillating particle is given by

$a = -\omega^2 A \sin(\omega t + \delta)$ - $a = A \cos(\omega t + \delta)$ - $a = -\omega A \sin(\omega t + \delta)$ - $a = -\omega^2 A^2 \sin(\omega t + \delta)$

10- The latent heat of vaporization of a substance is always .

Greater than its latent heat of fusion - Equal to its latent heat of condensation
Greater than its latent heat of condensation - Less than its latent heat of fusion

Q 2- What is the meaning of each expression: (20 Marks)

1) If the material restore to its original shape and size after removing the load from it, it's said to be
....

2) If the material does not return to its original dimensions after removing the applied stress, it's said to be ....

3) If a body is totally or partially immersed in a fluid, the buoyant force will equal to the weight of displaced fluid ....

4) Is the constant of each matter and equal ratio between stress and strain. ....

5) It is the motion of a fluid in which every particle in the fluid follows the same path as the previous particle. ....

6) The rate of heat flow per unit area per unit temperature gradient when the heat flow is at right angle to the faces of a thin parallel material under steady state condition ....

7) Suppose a rod of material has a length L_0 at some initial temperature T_0 when the temperature changes by ΔT, the length changes by ΔL. ....

8) the quantity of heat required to raise the temperature of a unit mass of the material one degree ....

9) Law states that, an external pressure applied to an enclosed fluid is transmitted uniformly throughout the volume of the liquid. ....

10) The amount of heat per unit mass required to change the phase ....

Q.3a) Bernoulli's Equation Studies the relation between P, ρ, υ and h (height) and their ability to describe fluids in motion. Discuss this equation in When i- the liquid at rest, ii- if the height is constant. - iii- When there is no change in pressure (6 Marks)

Q.3b) Draw the stress- strain curve defining all the main points and parts of the curve. (5 Marks)

Q.3c) The bar shown has a square cross section for which the length is 40 mm. If an axial force of 800 N is applied along the centroidal axis of the bar's cross sectional area, determine the average normal stress acting on the bar ? 800 N (5 Marks)

Q.4a) The position, x, of an object is given by the equation $x = A + Bt + Ct^2$, where t refers to time. What are the dimensions of A, B, and C using the dimension analysis, (5 Marks)

Q.4b) Fill the space in the table (4 Marks)

$T\,^0{}_C$	$T\,^0{}_F$	$T\,^0{}_K$
....	....	273
....	68	....

Q.4c) A handful of copper shot is heated to $90^{\circ}C$ and then dropped into 80g of water at $10^{\circ}C$. The final temperature of the mixture is $18^{\circ}C$. What was the mass of the shot?
(Specific Heat of water = 1 cal/g°C, Specific heat of copper = 0.093 cal/g°C) (5 Marks)

Good luck
Examiners

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أجب عن جزئين فقط من كل سؤال من الأسئلة الآتية فى ضوء ما درست (الجزء ١٠ درجات):-

السؤال الأول:- (٢٠ درجة)

أ- أثبت بإستخدام مبدأ الاستنتاج الرياضى أن لكل عدد طبيعى n

$$1^2 + 2^2 + 3^2 + \cdots \ldots \ldots \ldots \ldots \ldots + n^2 = \frac{n}{6}(n+1)(2n+1)$$

ب- ضع العدد $Z = \dfrac{1}{(2+i)^2} - \dfrac{1}{(2-i)^2}$ على الصورة المثلثية ثم أوجد $Z^{4/3}$.

ج- إذا كانت $f(x) = \dfrac{3x+5}{2x-3}$ أثبت أن $f(x)$ دالة أحادية ثم أوجد معكوسها.

السؤال الثانى:- (٢٠ درجة)

أ- باستخدام طريقة كرامر أوجد حل مجموعة المعادلات التالية:

$x + 3y - 2z = 0, \ 2x - y + 4z = 6, \ 2x + 2y + 3z = 5$.

ب- عرف علاقة التكافؤ على مجموعة A. وإذا كانت R علاقة معرفة على مجموعة الأعداد الصحيحة Z فى الصورة $R = \{(x,y): x,y \in Z, x + y = \text{عدد زوجى}\}$ ، فأثبت أن R علاقة تكافؤ ثم أوجد فصول التكافؤ.

ج- حلل الكسر $\dfrac{2x+1}{(x-2)^2(x^2+1)}$ إلى كسوره الجزئية.

السؤال الثالث:- (٢٠ درجة)

أ- عين احداثيات المركز والبؤرتين والاختلاف المركزى وطول الوتر البؤرى العمودى وطولى المحورين ومعادلات المحورين والدليلين والخطين التقاربين للقطع

$16x^2 - 9y^2 + 64x + 18y = 89$ ثم ارسمه.

ب- ارسم القطع الذى تمثله المعادلة $y^2 + 8x - 6y + 17 = 0$ مع ذكر البيانات الخاصة به.

ج- أوجد معادلة الخط المستقيم المار بنقطة تقاطع المستقيمين $2x - y - 1 = 0, 3x + 2y - 12 = 0$ والعمودى على الخط المستقيم $3x + 3y - 8 = 0$.
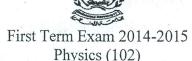
السؤال الرابع:- (٢٠ درجة)

أ- أوجد المعادلة الجديدة للمنحنى $x^2 + y^2 - 6x - 10y - 2 = 0$ بعد نقل المحاور موازية لنفسها إلى النقطة $O'(3,5)$.

ب- أوجد معادلة القطع المكافئ الذى بؤرته هى $(0,6)$ ودليله هو الخط المستقيم $y = -3$ وأوجد معادلة المحور وطول الوتر البؤرى العمودى ثم ارسم القطع.

ج- ارسم القطع $9x^2 + 25y^2 - 18x + 100y = 116$ مع ذكر البيانات الخاصة به.

مع أطيب التمنيات بالتوفيق
أسرة قسم الرياضيات

Mansoura University Faculty of Science Departmentof Physics	First Term Exam 2014-2015 Physics (102)	Time Allowed: 2 h Date: 10 / 1 / 2014 All Programs

Answer the following Questions (60 Marks):   الأسئلة على وجهى الورقة

Q.1 a) Choose the correct answer:

1- The unit of resistivity is

a- $\Omega.m$ b- C.m   c- N.m

2- Two Capacitors $C_1= 4$ µf and $C_2= 6$ µf connect in parallel. $C_{eq.}$ is equal

a- 2.2 µf   b- 2.4 µf   c- 2.6 µf

3- If we have a potential difference of 110 (V) connected with a wire of 10 (Ω) and the current (I) carried by the wire is 11 Amp. The power rating is:

a- 1.11 KW   b- 1.21 KW   c- 1.31 KW

4- The force effect on charge (q) moving in magnetic field (B) with velocity (v) is given maximum value if

a- $\theta= 0°$ or $180°$ b- $\theta= 90°$ c- $\theta= 360°$

5- The electric force acting on a positive test charge defined by:

a- electric field   b- electric flux   c- electric potential

6- The unit of electric field is:

a- N/C   b- C/N   c- C.N

7- The electric field of a dipole is:

a- $2qa/(y^2+a^2)^{3/2}$ b- $2kqa/(y^2+a^2)^{3/2}$ c- $2kq/(y^2+a^2)^{3/2}$

8-If a charge Q is uniformly distributed throughout a volume V, the charge per unit volume, ρ, is defined by:

a- Q/V   b- V/Q   c- QV

9- The product of the electric field E and surface area A is called

a- electric potential   b- electric current   c- electric flux

10- Phase difference is defined by:

a- (path difference) π/λ b- (path difference)$2\pi/\lambda$ c- (path difference)$\pi/2\lambda$

Q.1b) State wither these statements are true or false

1- No two electric field lines can cross.   (   )

2- The net flux theough any closed surface is given by q_{in}/ε_0.   (   )

3- Superconductors is a class metals and compounds whose resistance goes virtually to zero below a certain temperature, T_c.   (   )

4- For most metal , resistivity increases with decreasing with temperature.   (   )

5- The inverse of the conductivity of a material is called the permittivity.   (   )

Q-2a) a charge $q_1 = 9$ µf is located at the origin and $q_2 = -7$ µf is located on the x axis 0.3 m from the origin (Fig. 1).
Find the electric field at the point p with coordinates (0, 0.4)

Q.2b) Find the electric field (E) of a uniform ring of charge.

Q.2c) Consider that a symmetric sphere of radius (a), has uniform charge density ρ, and total positive charge Q, using Gauss's law:
  (a) Calculate the electric field intensity at a point outside the sphere, that is for $r > a$.
  (b) Find the electric field intensity at a point inside the sphere, that is for $r < a$.

Q.3a) Define: 1- Lorentz force law   2- Magnetic field

Q.3b) Use the Biot–Savart law to find magnetic field (B) due to a current (I) in a long straight of length (L) at point (P).

Q.3c) A uniform magnetic field (B) points horizontally from south to north its magnitude is 1.5 T. If a 5 Mev proton moves vertically downward through this field, what force will act on it? (Proton charge = 1.6×10^{-19} J/eV)

Q.4a) Define: 1- Huygens's Principle   2- Snell's law of refraction

Q.4b) A particle executing simple harmonic motion given by $y = 4 \sin (2\pi t/4 + \alpha)$ is displaced +1 unit when t = 0.
Find: (a) The phase angle when t = 0.
  (b) The difference in phase between any two positions of the particle 2 seconds apart.
  (c) The phase angle corresponding to a displacement of +4.
  (d) The time necessary to reach a displacement of +4 from the initial position.

Q.4c) Prove that the index of refraction for a prism material is $n = \sin (\delta_m + A)/\sin (A/2)$.

Good luck
Examiners