Faculty of Engineering at Helwan	HELWAN UNIVERSTY	1st	Semester Academic Year 2015/2016
Department: Physics & Eng. Maths			
Course Name: Mathematics 1(A)		Date of Exam: Jan. 2016	
		Time Allowed: 3 Hours	
Exam : Final Term		Maximum Mark: 100	

NOTES: For all questions: Idea (30)%, Steps (20)%, Calculations 40%, Final Result (10)% of the total mark.

Part one (Differentiation) **الجزء الأول (تفاضل) إجبارى لجميع الطلاب**

Answer the following two questions:

Question no.1 (25 marks):

a. Solve $|x-2|+|x-5|=9.$ **(3 *marks*)**

b. Solve $\log(x-9)+\log(100x)=3.$ **(3 *marks*)**

c. Given that $f(x)=x^2,\ g(x)=\sqrt{x+9},$ **and** $h(x)=\sqrt{4-x},$ **find:**

$f\circ g(x),\ g\circ f(x),$ **and** $h\circ h(x)$ **and their domains.** **(6 *marks*)**

d. Show that $\sinh^{-1}x=\ln\left(x+\sqrt{x^2+1}\right)$ **where** $x\in\mathbb{R}.$ **(6 *marks*)**

e. Study the continuity of $f(x)$ and determine the type of discontinuity if exist:

$$f(x)=\begin{cases} e^{-x}, & x<0 \\ 1, & 0<x<\dfrac{\pi}{2} \\ \cos x, & x\geq\dfrac{\pi}{2} \end{cases}$$ **(7 *marks*)**

Question no.2 (25 marks):

a. Evaluate $\lim\limits_{x\to 0}\dfrac{e^x+e^{-x}-2}{1-\cos 2x}.$ **(3 *marks*)**

b. Find $\dfrac{dy}{dx}$ **if** $x=t-\tanh^{-1}t$ **and** $y=\cosh t-t.$ **(3 *marks*)**

C. Find the equation of the tangent line to the graph of the curve

$$xy^2+x^2y=2$$

at the point $P(1,1).$ **(4 *marks*)**

d. Find $\dfrac{dy}{dx}$ **if** $y=\dfrac{(1-2x)^5\sqrt[3]{\tan 4x}}{\sqrt[3]{(\tan^{-1}4x)^5}}.$ **(6 *marks*)**

e. Given that $x=\tan\left(\dfrac{y}{x}\right)$ **prove that**

$(1+x^2)y^{(n+2)}+2(n+1)xy^{(n+1)}+(n+2)(n-1)y^{(n)}=0.$ **(9 *marks*)**

P.T.O.

Part two (Algebra)

الجزء الثاني (جبر) إجباري لجميع الطلاب ماعدا الطلبة الباقون للإعادة (وراسبون في التيرم الأول فقط وناجحون في التيرم الثاني)

Answer the following two questions:

Question no.3 (25 points):

a. **Use the synthetic division to find the quotient and the reminder of dividing** $x^5 - 4x^4 + 2x^3 + x - 5$ **by** $x^2 + x - 6$. **(5 marks)**

b. **Find the roots of the equation** $x^3 - 3x^2 - 16x + 48 = 0$ **if sum of two of its roots is zero.** **(5 marks)**

C. **Find the equation whose roots are decreased by 1 than the roots of** $x^4 - 3x^3 + 2x^2 - 5x - 6 = 0$. **(5 marks)**

d. **Use Caradan's method to find all solutions of the equation** $2x^3 + 6x^2 - 24x - 280 = 0$. **(10 marks)**

Question no.4 (25 points):

a. **Show that the matrix** $A = \begin{bmatrix} -3 & 1 & -1 \\ 1 & 0 & 1 \\ -2 & 2 & 2 \end{bmatrix}$ **has no inverse.** **(5 marks)**

b. **Find the inverse of the matrix** $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \\ 5 & 5 & 1 \end{bmatrix}$ **if exists.** **(5 marks)**

C. **Determine the type of the solution of the system (without solving it)**

$$\begin{bmatrix} 1 & 2 & -3 \\ 1 & 3 & 4 \\ 2 & 5 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$ **(5 marks)**

d. **Solve by Gauss elimination method**

$$\begin{aligned} 2x_1 - 3x_2 - 2x_3 &= 9 \\ 3x_1 + 2x_2 + x_3 &= 4 \\ x_1 - 4x_2 + 2x_3 &= 6 \end{aligned}$$ **(10 marks)**

Part three (Integration)

الجزء الثالث (تكامل) إجباري للطلبة الباقون للإعادة (وراسبون في التيرم الأول فقط وناجحون في التيرم الثاني) وهذا بدلاً من إجابتهم للجزء الثاني (جبر)

a. **Evaluate** $\int \sec x \, dx$ **(6 marks)**

b. **Evaluate** $\int \frac{1}{e^x + e^{-x}} dx$ **(6 marks)**

c. **Evaluate** $\int \sin^3 x \, dx$ **(6 marks)**

d. **Evaluate** $\int \sinh^2 x \, dx$ **(6 marks)**

e. **Evaluate** $\int \frac{x^2 + x - 16}{(x+1)(x-3)^2} dx$ **(6 marks)**

f. **Evaluate** $\int \ln(x^2 + 1) \, dx$ **(6 marks)**

g. **Evaluate** $\int \tan^3(2x) \sec^3(2x) \, dx$ **(6 marks)**

h. **Find the area between the curve** $y = 2 - x^2$ **and the line** $y = x$ **(8 marks)**

With our best wishes: Dr. Emad Alfraid *Dr. Khaled M. Abdelgaber* *Dr. Emad Abdallah*

Faculty of Science
Chemistry Department
Preparatory Engineering Students
Drs. Magdy, Mohammed and Ahmed

Final Exam: June 2016
Subject: General Chemistry
Time Allowed: 2 hours

PART ONE

1. Three isotopes of magnesium occur in nature. Their abundances and masses, determined by mass spectrometry, are listed in the following table. Use this information to calculate the atomic weight of magnesium **(4 Marks).**

Isotope	% Abundance	Mass (amu)
$^{24}_{12}Mg$	78.99	23.98504
$^{25}_{12}Mg$	10.00	24.98584
$^{26}_{12}Mg$	11.01	25.98259

2. Complete the four quantum numbers for the last electron in each of the following atoms or ions (6 Marks)

Element	n	ℓ	m_ℓ	m_s
$_{10}Ne$	2	.....	.....	-1/2
$_{24}Cr$	.....	2	.....	+1/2
$_{26}Fe^{2+}$	.....	2	-2	.....

3. Choose the correct answer (10 Marks)

1. Which of the following has 2 unpaired electrons?
a) $_{15}P$ b) $_{16}S^{-2}$ c) $_{32}Ge^{+2}$ d) $_{14}Si$

2. Which one of the following elements has the largest first ionization energy?
a) $_4Be$ b) $_9F$ c) $_5B$ d) $_8O$

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

4. _____corrosion occurs because of the potential difference that exists between two dissimilar metals.
a) Galvanic b) Pitting c) General d) Erosion

5. Which of the following is the electron configuration of $_8O^{2-}$?
a) $1s^2 1p^6 2s^2 2p^6$ b) $1s^2 2s^2 2p^6$
c) $1s^2 2s^2 2p^3 3s^2 3p^6$ d) $1s^2 2s^2 2p^1$

6. In drinking water treatment, empty aeration tanks are used to_____
a) remove bacteria b) remove salts
c) remove iron d) None

7. Which comparison of electronegativities is not correct?
a) $_3Li > _{11}Na$ b) $_8O > _7N$
c) $_9F > _{17}Cl$ d) $_5B > _6C$

8. The atomic number of an element gives the number of _____ and _____ in the atom while the mass number gives the total number of _____ and _____.
a) neutrons, electrons; protons, electrons
b) protons, electrons; neutrons, electrons
c) neutrons, electrons; neutrons, protons
d) protons, electrons; neutrons, protons

9. What value or values of *ml* are allowable for an orbital with $l = 2$?
a) 0 b) 2 c) -1 d) all of the above

10. Which of the following is NOT a property of a salt?
a) They have lattices structure. b) They conduct electricity when dissolved in water. c) They have a low melting point but a high boiling point. d) They are brittle.

PART TWO

Atomic weights, (H=1, He=4, C=12, N=14, O=16), gas constant R=0.082 L. atm. mol^{-1} k^{-1} :

I. Discuss with figures the internal combustion operation of four-stroke engine which depends on gas compressibility.

II. Discuss X-ray diffraction technique and Bragg equation for calculating the wavelength of X-rays.

III. Graphite is used as lubricant in motor oil. Give Reason.

IV. Steam engine and dynamite depend on the enormous change in gases volume to do work. Explain.

V. Bucky ball C60 is a third stable crystalline form of carbon. It collects between the properties of diamond and graphite. Explain, then discuss its conductivity to electricity.

VI. Choose the correct answer

1. What volume will 12.40 grams of CO_2 (small) occupy at STP, if it behaves ideally?
a. 6.31 L b. 8.46 L c. 4.42 L d. 11.7 L e. 9.68 L

2. Which liquid would have the highest viscosity at room temp?
a. $C_8H_{17}NH_2$ b. C_7H_{14} c. C_9H_{18} d. C_5H_{12} e. CH_3NH_2

3. As we increase the temperature of a liquid, its properties change. Which of the following would not be an expected change in the properties of a typical liquid as we increase its temperature?
a. decrease in viscosity b. decrease in density
c. increase in surface tension d. increase in vapor pressure
e. increase in tendency to evaporate

4. A real gas would act ideal at
a. 1 atm and 273 K b. 10 atm and 547 K
c. 10 atm and 273 K d. 0.5 atm and 546 K
e. 0.5 atm and 273 K

5. Which of the following is NOT a characteristic of pure water?
a. Water has a high specific heat capacity
b. Water is a polar molecule c. Water forms H-bonds.
d. Water conducts electricity. e. Water has density = 1

6. Metals are good conductors of electricity because
a. Their atoms are held together weakly b. All their electrons are held tightly by the nucleus
c. Their atoms give up outer electrons easily
d. They have a luster e. None of the above

7. Which of the following in the solid state would be an example of a covalent crystal
a. Water b. Barium fluoride c. Diamond
d. Carbone dioxide e. None of the above

8. Which of the following gases would be expected to have a rate of effusion that is one-third as large as that of H_2?
a. O_2 b. N_2 c. He d. H_2O e. CO_2

9. In general, which kind of crystalline solid is easiest to melt?
a. Ionic b. Covalent c. Amorphous d. Metallic
e. Molecular

Turn over →

← إقلب الورقة

10. Why does it take longer to hard-boil an egg in boiling water at high altitude than at or below sea level?

a. The ambient temperature is lower at higher altitude
b. The boiling point increases
c. There is an increase in atmospheric pressure
d. The boiling point goes down **e.** It does not take longer

PART THREE

1. What are the economic advantages of cracking?
- **a.** There is more tax to pay for products that are cracked.
- **b.** There is less tax to pay for products that are cracked.
- **c.** There is more demand for the shorter chain products.
- **d.** There is more demand for longer chain products.

2. The net heat of combustion of the hydrocarbon fuels is
- **a.** Equal to the gross heat of combustion of the hydrocarbon fuels
- **b.** Greater than the gross heat of combustion of the hydrocarbon fuels
- **c.** Equal to the gross heat of combustion minus the latent heat of condensation of the water formed during the combustion reaction
- **d.** Equal to the latent heat of condensation of the water formed during the combustion reaction.

3. Natural rubber is basically a polymer of
a. Propylene **b.**Ethylene **c.** Isoprene **d.** Chloroprene

4. The following is the monomer of Teflon
a. $CF_2=CF_2$ **b.** $CH_2=CF_2$ **c.** $CH_2=CHCl$ **d.** $CF_2=CHF$

5. The polymer produced from the polymerization of $HOOC(C_6H_4)COOH$ and $HOCH_2CH_2OH$ is
- **a.** $(-OOC(C_6H_4)COCH_2CH_2O-)_n$
- **b.** $(-OCH_2CH_2OOC(C_6H_4CO-)_n$
- **c.** $(-OOCOOCH_2CH_2(C_6H_4)O-)_n$
- **d.** $(-OCCH_2OOC(C_6H_4)CH_2O-)_n$

6. Fuels produce energy because
- **a.** Their oxidation reactions are endothermic
- **b.** They produce large volumes of gases
- **c.** Their oxidation processes are exothermic
- **d.** None of the above

7. Crude oil is _____
- **a.** Composed of just a few types of hydrocarbon molecules
- **b.** Usable in its raw form.
- **c.** Formed less than 100 yards below the surface; in deeper places with more pressure, coal is formed
- **d.** Formed in a wide range of temperature and pressure circumstances.
- **e.** Fractionated to obtain the chemicals used for gasoline, lubricants, plastics and other products

8. You must not wear synthetic fibres while working with fire because
- **a.** They make you feel cold and so you may get a frost-bite
- **b.** They are lustrous and so they shine under the flame
- **c.** They melt on heating and stick to your body when they catch fire **d.** None of the above

9. The most commonly used reagent for vulcanization of natural rubber is
a. Graphite **b.** Sulphur **c.** Carbon black **d.** Dry ice

10. The proper arrangement of the petroleum fractions in order of their boiling points is
- **a.** Lubricating oil > diesel > petrol > LPG
- **b.** Lubricating oil > petrol > diesel > LPG
- **c.** Petrol > lubricating oil > diesel > LPG
- **d.** Petrol > diesel > LPG > lubricating oil

11. Safety glass is
a. An amorphous polymer. **b.** A natural polymeric fibre.
c. Polyacrylonitrile. **d.** Polymethylmethacrylate (PMMA).

12. The complete and perfect combustion of a hydrocarbon fuel yields
a. Carbon monoside gas and water vapour
b. Carbon dioxide gas only **c.** Water vapour only
d. Both carbon dioxide gas and water vapour

13. Orlan fibre which is used as a wool substitute is
a. An amorphous polymer. **b.** A natural polymeric fibre.
c. Polyacrylonitrile.
d. Polymethylmethacrylate(PMMA).

14. Which one among the following is a thermosetting plastic
a. Bakelite (phenol-formaldehyde resin)
b. PVC (polyvinyl chloride)
c. PVA (polyvinyl alcohol)
d. PE (polyethylene)

15. What happens when crude oil is fractional distilled?
a. Different fractions are mixed together to form oil.
b. Sulfur is removed from the crude oil.
c. The oil is separated into fractions of different boiling ranges by heating.
d. Longer chain fractions are broken down into shorter chain fractions.

16. The polymerization in which two or more chemically different monomers take part is called
a. Co-polymerization **b.** Chain polymerization
c. Addition polymerization **d.** Homo polymerization

17. Select the correct statement
a. Gaseous fuels are ideal from the standpoint of complete combustion
b. Liquid fuels are ideal from the standpoint of complete combustion
c. Solid fuels are ideal from the standpoint of complete combustion
d. Liquid as well as solid fuels are ideal from the standpoint of complete combustion

18. The fibre obtained by the step polymerization of hexamethylene diamine & adipic acid
a. Decarbon **b.** Nylon
c. Rayon **d.**Terylene

19. The general formula : XCH=CHY, represents unsaturated monomers, when X= H and Y= CN, the common name of this monomer is:
a. Acrylonitrile **b.** Acrylamide
c. Ethyl cyanide **d.** Cyanoethyl

20. Vinyl flooring is done using _____ sheets.
a. Polypropylene **b.** Polythene
c. PVC **d.** Polyvinyl acetate

Best wishes

حاسب امدادى ١٢/١/٢٠١٦

كلية الهندسة بحلوان	**Dept/Division : Communication & Information Eng.** **Academic level:** preparatory **Semester:** First 2015/16 **Course code & title:** : Introduction to Computers **Instructor:** Dr/ Hesham Mohamed keshk Dr/ Hossam Eldeen Ibrahim Ali **Total mark:** 60 marks **Time allowed:** 3 hrs	جامعة حلوان

Instructions:
Answer the following 6 questions

اجب عن هذا الجزء فى النصف الأول من ورقة الإجابة من جهة الاسم

Part1

Question 1 (10 marks)

a) Differentiate between different types of ROM's.
b) Draw a diagram illustrating the construction of control unit. Describe the function of each part.
c) Draw a diagram representing the construction a typical magnetic disk.
d) Draw a diagram representing the theory of operation of a typical optical disk.

Question 2 (10 marks)

a) Convert the following into decimal: $(45.71)_8$, $(13.24)_5$,$(7A.4C)_{14}$
b) Convert the following into base 2, 5 and 16 numbers: $(359.89)_{10}$
c) Convert the following into 8 bits 2's complement equivalent: $(97)_{10}$, $(-54)_{10}$
d) Using the results in (c) perform (97-54) using 2's complement.

Question 3 (10 marks)

Consider a combinational logic circuit with four inputs x_0, x_1, x_2, and x_3 and three outputs y_0, y_1, and y_2. The output is the total number of ones in the four inputs. Hint: If [x_3, x_2, x_1, x_0 = *0,1,0,1] then total number of ones will be 2 and the output will be [y_2, y_1, y_0 = 0,1,0])* Create **a truth table** for the three outputs. Write the **logic expression** for y_0, y_1 **only**. Draw the **logic diagrams** for y_0 and y_1.

"من فضلك اقلب الصفحة"

اجب عن هذا الجزء فى النصف الثانى من ورقة الإجابة من جهة الرسم البيانى

Part2

Question 4 (10 marks)

a. Show the output of running this program:

```
int main(void) {
  int a = b = c = d = e = f = h = k = 10;
  int    y , z ;
  a++;          cout << "a = " << a << endl;
  ++b;          cout << "b = " << b << endl;
  cout << "c = " << c++ << endl;
  cout << "d = " << ++d << endl;
  y = e++;      cout << "e = " << e << " \t y = " << y << endl;
  z = ++f;      cout << "f = " << f << " \t z = " << z << endl;
  h += 5;       k *= 5 ;      cout << "h = " << h << " \t k= " << k << endl;
  }
```

b. Draw a flowchart and write a program to make a simple calculator. The program will ask the user to enter 2 double numbers and the operation symbol (+, -, *, or /). Then, the program will perform the required operation on the two numbers and print the result.

Question 5 (10 marks)

a. Write a program to print all prime numbers between 100 and 200.

b. Write a program to print this figure using nested loop

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
6 6 6 6 6 6
7 7 7 7 7 7 7
```

Question 6 (10 marks)

a. Write a program to read 10 float numbers, calculate the average, then print the numbers which are greater the average. Print also how many of these numbers are greater than the average

b. Write 2 programs (one using array and the other without using array) to read a date: year, month, and day. Then calculate and print how many days passed from the beginning of this year to the specified date.

Best Wishes

Course: Physics A
Final exam 1st semester – 2015-2016.

Helwan University
Time: 1.5 hour.

Assistant Prof. Dr. Reda El-Agmy

(Total Marks: 45)

Heat

أختار إجابة واحد صحيحة، اختيار أكثر من إجابة سوف تخسر الطالب درجة السؤال

السؤال الأول

1) If the temperature changes by 15°C, then what is the change in temperature in Fahrenheit?
   A. 27°F B. 30°F C. 32°F D. 40°F

2) Which type of heat transfer is used in most automobile engines to carry excess heat away from the hot engine?
   A. natural convection of air falling over the cooling land
   B. forced convection air or force convection of water
   C. forced convection of water
   D. natural convection of air rising over the warming land

3) If an object feels cold to the touch, the only statement that you can make that must be correct is that:
   A. the object has a smaller coefficient of thermal conductivity than your hand.
   B. the volume of the object will increase while it is in contact with your hand.
   C. the object contains less thermal energy than your hand.
   D. the object is at a lower temperature than your hand.

4) A cylinder of 70 cm in diameter and 2 cm in length, its temperature is 100°C. The energy radiated each second is: (e= 0.8, $\sigma = 5.6696 \times 10^{-8}$ W/m$^2\cdot$K^4).
   A. 223 W B.511 W C. 611 W D. 711 W

5) A temperature inside a house is at 20°C and outside is 0°C. The surface area of the house is 200 m^2, and the emissivity is ~1. How much energy is radiated (in W) per second. ($\sigma = 5.6696 \times 10^{-8}$ W/m$^2\cdot$K^4).
   A. 20 000 B. 2000 C. 200 D. 20

6) A double glassier widow 6.00 m^2 area and 4.00 mm thick each are separated by an air space of 5.00 mm. If the inside surface is at 20.0°C and the outside is at –30.0°C, the rate of energy transfer by conduction is: (K_{glass}=0.8 W/m°C, K_{air}=0.0234 W/m°C)
   A. 134 W B. 134 KW C. 67 W D. 67 KW

7) A 30-m long steel beam is rigidly clamped at 0°C to prevent expansion. The beam has a cross-sectional area of 30 cm^2. What force against the clamps does the beam exert when it is heated to 40°C? [$\alpha_{Steel} = 1.1\times10^{-5}/°C$, $Y_{Steel} = 20\times10^{10}$ N/m^2].
   A. 2.6× 10^5 N B. 26 × 10^5 N C.2.6 GN D. 10 ^{5}N

8) An airplane of length 35.0 m and an inner radius of 2.50 m. Is isolated with a material of 6.00 cm in thickness (K= 4.00 × 10^{-5} cal/s·cm·°C). The inner and outer temperatures are 25.0 & -35°C. What power must be supplied to the heater to keep 25°C inside:
   A. 93.2 KW B. 932 W C. 9.32 KW D. 932 KW

أنظر خلفة

9) The specific heat of steam is 2020 J/kg K in the mks system of units. What is the value of the specific heat of steam in cal/gm °C?

A. 1.000 B. 0.8765 C. 0.6812 D. 0.4826

10) A box with a total surface area of 1.20 m^2 and a wall thickness of 4.00 cm is made of an insulating material. A 10.0-W electric heater inside the box maintains the inside temperature at 15.0°C above the outside temperature. Find the thermal conductivity *k* of the insulating material.

A. 2.22×10^{-2} W/m. °C B. 1.11×10^{-2} W/m. °C C. 33.3×10^{-2} W/m.°C D. 111×10^{-2}W/m/°C

على الطلاب نقل هذا الجدول مع الأختيارات فى ورقة الأجابة.

Answers	1	2	3	4	5	6	7	8	9	10

السؤال الثانى

Answer with (√) or (X)

1- Emissivity of a black body is greater than its absorptivity.
2- Do the Kelvin and Fahrenheit temperature scales ever read the same?
3- Metal lids on glass jars can often be loosened by running hot water over them. How is this possible?
4- Hot bodies radiate electromagnetic waves directly proportional to temperature.
5- Tensile thermal stress depends on coefficient of linear expansion.
6- Latent heat of vaporization of water is smaller than of fusion.
7- If two bodies are in thermal equilibrium with a third body, they are not necessarily in thermal equilibrium with each other.
8- Some materials have a negative average coefficient of linear expansion.
9- Is it possible to convert internal energy to mechanical energy?
10- When a sealed Thermos bottle full of hot coffee is shaken, is there any change in the temperature of the coffee and the internal energy?

على الطلاب نقل هذا الجدول مع الإجابات بعلامة (√) أو (X) فى ورقة الأجابة

Answers	1	2	3	4	5	6	7	8	9	10

السؤال الثالث

Derive mathematically the cylindrical heat flow.

Good luck