NAME _____ SECTION NO. _____ MARKS _____

COLLEGE OF THE BAHAMAS

NATURAL SCIENCES DIVISION

MIDSEMESTER EXAMINATION – SEMESTER 942

CHEMISTRY 115 – INTRODUCTORY CHEMISTRY

TIME: 1½ HOURS

CODE R

SECTION A: MULTIPLE CHOICE QUESTIONS

INSTRUCTIONS: Answer **ALL** questions in this section. Select the single best alternative and mark it on the **ANSWER SHEET PROVIDED** with a **CROSS** in soft pencil. There is one mark for each of the questions in this section, making a total of 20 marks.

ORGANIC CHEMISTRY

1) In a homologous series of compounds all the members

A have the same chain length.

B contain only two elements.

C have identical physical properties.

D can be described by a general molecular formula.

E have identical chemical properties.

2) The general molecular formula for the alcohols is

A $C_nH_{2n}OH$

B $C_nH_{2n+2}OH$

C $C_nH_{2n+1}OH$

D $C_{n+2}H_{2n}OOH$

E $C_nH_{2n+1}O_{n-1}H$

3) The carbon-hydrogen bonds in methane are directed towards the corners of a

A tetrahedron

B cube

C triangle

D square

E pyramid

4) Compounds with the same ***molecular*** formula but with different ***structural*** formulae are called

A allotropes

B homologues

C isomers

D isotopes

E polymers

5) In the reaction between methane and chlorine

A light slows down the reaction.

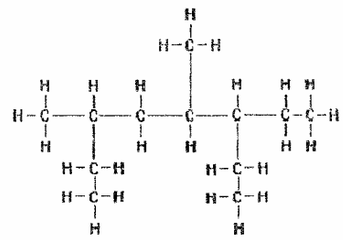
B manganese(IV) oxide is used as a catalyst.

C the final product is dichloromethane.

D the reaction is an addition reaction.

E hydrogen chloride is one of the products.

Questions 6 and 7 concern the following structure



6) The name of the compound represented by the above structural formula is

A 4-methyl-2,5-diethylheptane

B 3,5-dimethyl-6-ethyloctane

C 3-methyl-3,6-diethylheptane

D 2-(2-methylbutyl)-3-ethylpentane

E 3,6-diethyl-4-methylheptane

7) The compound represented by the above structure is

A an alkyne.

B an isomer of heptane.

C a straight-chain compound.

D a carbohydrate.

E chemically unreactive compared with most organic compounds.

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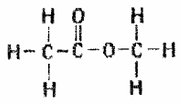
Questions 8 and 9 concern the following structures

A



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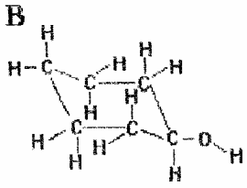

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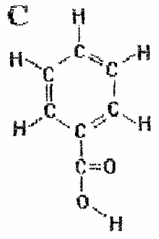

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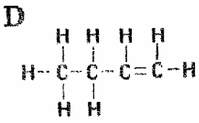
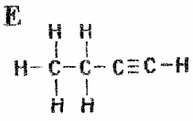


E



8) Which one of the above compounds is an alcohol?

9) Which one of the above compounds is an alkene?

10) Which one of the above compounds can be oxidized to a carboxylic acid?

11) Which one of the above molecules undergoes an addition reaction with two molecules of bromine?

12) A compound rapidly decolorises bromine water when shaken with it. What conclusion can be drawn?

A The compound is an alkene.

B The compound is unsaturated.

C The compound is an alcohol.

D The compound is an alkyne.

E The compound is not a carboxylic acid.

13) A compound reacts vigorously with sodium. A substance is formed which dissolves in water to give a solution which turns red litmus blue. The compound is

A an alkane

B an alkene

C a carboxylic acid

D an alcohol

E an ester

RATE OF REACTION

14) Which one of the following statements regarding the effect of light on chemical reactions is correct?

A All chemical reactions are speeded up by light.

B Most chemical reactions are speeded up by light.

C Some chemical reactions are speeded up by light.

D No chemical reactions are speeded up by light.

E Chemical reactions are usually slowed down by light.

15) The following results were obtained in an investigation of the effect of temperature on the rate of the reaction between sodium thiosulfate and hydrochloric acid in dilute solution.

TEMP./°C	TIME OF DISAPPEARANCE OF CROSS/s
26	400
35	200
44	100

The rate of this reaction is doubled by

A an increase in temperature of 9°C.

B an increase in temperature of 10°C.

C an increase in temperature of 18°C.

D a decrease in temperature of 9°C.

E a decrease in temperature of 18°C.

16) When mixed at a temperature of 1000°C, hydrogen and nitrogen react partially and quickly to form an equilibrium mixture according to the following equation

$$3H_2(g) + N_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H \text{ -ve}$$

Which one of the following factors, if changed, would **NOT** alter the equilibrium position?

A The concentration of nitrogen.

B The concentration of hydrogen.

C The temperature.

D The pressure.

E The length of time the substances were given to react.

17) At a temperature of 30°C the product of a reversible chemical reaction is found to be present at a concentration of 90% when equilibrium is established. At a temperature of 40°C the equilibrium concentration of the same product is only 80%. From this information is possible to deduce that

A The forward reaction is endothermic.

B The forward reaction is exothermic.

C The forward reaction is always slower than the back reaction.

D The back reaction is always slower than the forward reaction.

E The back reaction is exothermic.

18) In solution hydrogen peroxide decomposes rapidly when solid manganese dioxide catalyst is added. The rate at which the hydrogen peroxide decomposes would be **LEAST** affected by

A grinding the manganese dioxide more finely.

B heating the solution.

C adding more hydrogen peroxide.

D using more concentrated hydrogen peroxide.

E adding more of the hydrogen peroxide solution.

19) A catalyst speeds up a reaction by

A Increasing the velocity of the reactant molecules.

B Reducing the activation energy for the reaction.

C Preventing product molecules from colliding with one another.

D Allowing reactant molecules to collide with each other more frequently.

E Decreasing the ΔH value for the reaction.

20) When a system is at chemical equilibrium:

A The forward and reverse reactions are proceeding at equal rates.

B The forward and reverse reactions have stopped completely.

C Reactant molecules are no longer colliding with one another.

D Product molecules are no longer colliding with one another.

E Reactants and products are indistinguishable.

SECTION II: Short answer questions
Answer each of the following questions in the space provided on your question paper. There is a total of 25 marks for this section

1) a) Briefly explain the collision theory of chemical reactions, referring to and explaining the concept of activation energy. (3)

b) By referring to the collision theory explain how each of the following factors affects the rate of a chemical reaction. (3)

i) Temperature

ii) Pressure of reactants. (4)

2) Write down the structural formula of each of the following compounds. (7)

i) propane ii) 2-butanol

iii) 2,2-dimethylpropanoic acid

v) ethyl ethanoate

iv) ethyne

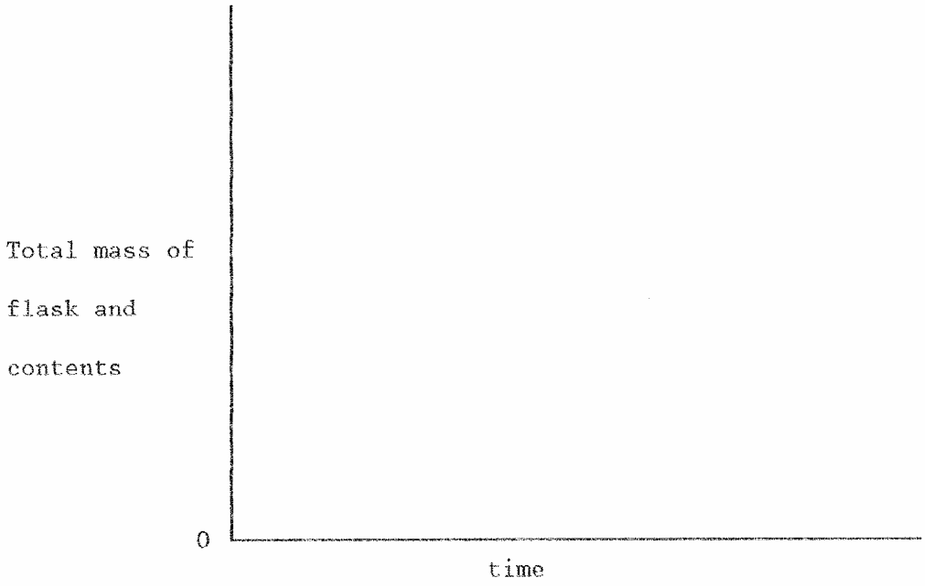
vi) 2-butene

vii) 1-propanol

3) The following question concerns the reaction of marble chips (a naturally occurring form of calcium carbonate, $CaCO_3$, and dilute hydrochloric acid, HCl(aq). The equation for the reaction is:

$$CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

a) Marble chips were added to dilute hydrochloric acid in a flask which was then weighed immediately and at regular intervals afterwards. Sketch a graph of the total mass of the flask and contents against time using the axes below. Label the line "a". (2)



b) On the axes above sketch a second line (use a dotted line this time) to show the graph which would be obtained if the marble chips were replaced with **THE SAME AMOUNT** of finely ground marble. Label this line "b". (2)

c) On the axes above sketch a third line (use a different style or colour) to show the graph which would be obtained if the reaction were carried out with the same amount of finely ground marble as in (b), but at a higher temperature. Label this line "c". (2)

d) On your graph mark (i) the initial mass of flask plus contents and (ii) the final mass of flask + contents. (2)