**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2017/2018**

**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**

**SCH 2100: ATOMIC STRUCTURE**

**DATE: JANUARY 2018 TIME: 2 HOURS**

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

**QUESTION ONE**

**Physical constant**

Plank’s constant h=6.023×10-34JS

Mass of an electron m= 9.1× 10-31kg

Charge of an electron e=1.6× 10-19C

Permittivity of a vacuum $\in $o=8.85× 10-12kg-1m-3A2

Velocity of light in vacuum C=3.0× 108ms-1

Avogdro’s constant No. = 6.23× 1023mol-1

Rydberg constant RH= 1.097×107M-1

Atomic mass of manganese =55.0

Atomic mass of iron =55.9

Atomic mass of oxygen = 16.0

Atomic mass K= 39

1. Briefly discuss the four modes of radioactive decay. [12 marks]
2. Write electronic configurations of the elements with atomic numbers. 15, 19, 46, 64 and 78
3. Indicate the groups and the periods to which the elements above belong to in the periodic table. [10 marks]
4. Draw a sketch diagram showing the various parts of the electromagnetic radiation spectrum. [8marks]

**QUESTION TWO**

1. Briefly, discuss the various assumptions of the Bohr Theory. [8 marks]

The energy of the electron in the hydrogen is given by the equation: En=$\frac{-me^{4}}{8ϵ^{2}˯oh^{2 }n\^2}$ derive the equation to show that $\frac{l}{λ}$=R$\left[\frac{l}{n^{2}}-\frac{l}{ni^{2}}\right]$ where R is the Rydberg constant.

1. Calculate the longest wavelength in the Balmer series of the hydrogen spectrum. The value of Rydberg constant is :- R= 1.097× 107M-1 [12 marks]

**QUESTION THREE**

1. Briefly discuss the significance of the wave function ψ
2. Briefly discuss the various boundary conditions necessary for solutions to the Schrodinger’s equation. [10 marks]
3. Using the relevant equation, briefly discuss Heisenberg uncertainty principle. [5 marks]
4. Draw the shapes of orbital’s 2s, 3P, and 3d. [5 marks]

**QUESTION FOUR**

1. 8.425g of sodium carbonate dissolved in enough distilled water to make 250ml of solution. Calculate the molarity of solution.
2. Calculate the mass of potassium permanganate (KMn04) required to make500ml of 0.02 M standard solution.
3. Write a balanced partial ionic equations for the reaction between acidified permanganate solution and iron(II) solution.(8 marks)
4. A salt of Fe(II) was dissolved in 1.0 litre of distilled water. 40ml of the standard solution required 41.0m of the Fe(II) solution for complete reaction.
5. Calculate the concentration of Fe2+ solution in moles per litre.
6. Calculate the concentration of Fe2+ ion in grams per litre.