

UNIVERSITY OF RUHUNA

BACHELOR OF SCIENCE IN MARINE AND FRESH WATER SCIENCES

BACHELOR OF SCIENCE IN FISHERIES AND MARINE SCIENCES

EXAMINATION JULY/AUGUST, 2017

LEVEL-I, SEMESTER-I

CHM 1111 – Principles in Chemistry: paper II

Time: one (1) hour

(85 marks)



Paper II

Index number:

Answer **all** the questions.

Write answers on this question paper

01. Answer **all** parts.

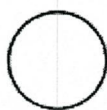
- (a) (i) Out of the following four sets of quantum numbers, select the incorrect ones and give reason(s) for your answer(s).

	n	ℓ	m_ℓ	m_s
(I)	3	2	-2	+1/2
(II)	9	5	6	+1/2
(III)	2	1	0	+1
(IV)	2	0	0	+1/2

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(15 marks)

- (ii) Out of the following figures which one represents an orbital with an azimuthal quantum number (ℓ) equals to 1?



(I)



(II)



(III)



(IV)

(05 marks)

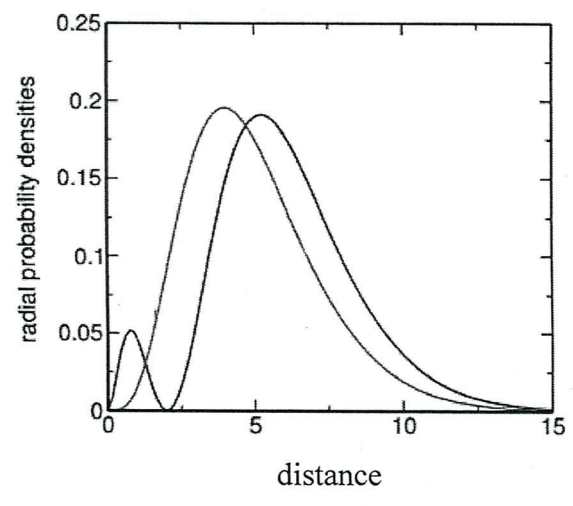
- (b) By using the quark model, show that the charge of a proton is +1 .

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(10 marks)

2. Answer **all** parts.

(a) Radial probability density function curves for the principal quantum number $n=2$ state are given in the following diagram.



Answer the following questions based on the above diagram.

- (i) Assign the relevant value(s) of azimuthal quantum number(s) ℓ , for each of the radial probability density function curves shown in the above diagram. (10 marks)
- (ii) Which orbital gives the greater probability for the electron to be found closer to the nucleus? (05 marks)

(b) (i) Atomic number of silicon is 14. Shielding constant for a 3p electron in silicon is 9.85. Calculate the effective nuclear charge for a 3p electron in silicon.

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(05 marks)

(ii) Dissolved oxygen content in water is important for fish. State the type(s) of intermolecular force(s) involved during dissolution of oxygen in water.

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(05 marks)

(iii) Solubility of $\text{LiCl}_{(s)}$ in water is higher than that of $\text{LiI}_{(s)}$.

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(05 marks)

(3) (a) Draw suitable diagrams to show the formation of σ and σ^* molecular orbitals by p- orbitals.

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(05 marks)

(b) (i) State the molecular orbital energy levels in the increasing order of energy for O_2^{2-} ion.

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(10 marks)

(ii) What is the bond order of O_2^{2-} ion?

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(05 marks)

(iii) Giving reasons indicate whether O_2^{2-} ion is diamagnetic or paramagnetic.

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(05 marks)

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