

Exam Date & Time: 08-Jul-2024 (02:00 PM - 05:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER BSc. HEALTH SCIENCES DEGREE EXAMINATION - JULY 2024

SUBJECT: BHS-103 - CHEMISTRY I

(RETAKE - OLD SCHEME)

CHEMISTRY I [BHS-103]

Marks: 75

Duration: 180 mins.

### B

Answer all the questions.

Answer the following in TWO or THREE sentences.

- 1A) Find the de Broglie wavelength of an electron with a speed of  $1.00 \times 10^6$  m/s (electron mass =  $9.11 \times 10^{-31}$  kg,  $h = 6.626 \times 10^{-34}$  kg.m<sup>2</sup>/s). (2)
- 1B) Round off each number to the indicated number of significant figures.  
(i) 0.0003554 (to 2 sf); (ii) 35.8348 (to 4 sf); (iii) 22.4555 (to 3 sf); (iv) 231.554 (to 4 sf). (2)
- 1C) A dental hygienist uses X-rays of wavelength  $1.00 \text{ \AA}$  to take a series of dental radiographs while the patient listens to a radio station. The wavelength of the radio signals is 325 cm. What is the frequency (in s<sup>-1</sup>) of the electromagnetic radiation from each source? Assume that the radiation travels at the speed of light,  $3.00 \times 10^8$  m/s. (2)
- 1D) Indicate the bond polarity in each of the following molecules by using polar arrow:  
(i) BF<sub>3</sub> (ii) CO<sub>2</sub> (2)
- 1E) Describe the experiment carried out to determine the properties of cathode rays. (2)
- 1F) Distinguish (i) Principal quantum number from angular momentum quantum number (ii) Molarity from molality. (2)
- 1G) How does the lattice energy of an ionic compound depend on the charges and sizes of the ions? (2)
- 1H) Describe the photoelectric effect. Why does it not exhibit a time lag? (2)

- 1I) Arrange the following elements in the increasing order of their ionization energies.  
(i) Kr, He, Ar (ii) Sb, Te, Tn (iii) K, Ca, Rb (iv) I, Xe, Cs (2)
- 1J) Successive ionization energy for Sodium increases. Give reason. (2)
- 1K) Write condensed electron configurations and write reactions showing the formation of the common ions for the following elements: (i) Te(Z=52) (ii) In(Z=49) (2)
- 1L) How many liters of 2.5 M sucrose contain 90 g of solute? (2)
- 1M) Give reason: Ionic compounds conduct electricity in the molten or aqueous state but covalent compounds are non-conductors. (2)
- 1N) Give reason: Paramagnetic properties of the  $\text{Fe}^{+3}$  compounds are higher than that of Fe compounds. (2)

### C

**Answer all the questions.**

**Write a short note on the following questions.**

- 2A) Define (i) Definite composition (ii) Empirical formula (iii) Electronegativity. (3)
- 2B) A chemical engineer places a mixture of noble gases consisting of 5.50 g of He, 15.0 g of Ne, and 35.0 g of Kr in a piston-cylinder assembly at STP. Calculate the partial pressure of each gas. (3)
- 2C) Explain with an example, the effect of ionic size along the period and down the group in a periodic table. (3)
- 2D) Explain the energy and shape of  $\text{H}_2$  molecular orbitals with the help of MOT theory. (3)

### D

**Answer all the questions.**

**Answer the following questions:**

- 3A) (i) Tetraphosphorus decaoxide reacts with water to form phosphoric acid. (a) What is the mass (in g) of  $4.65 \times 10^{22}$  molecules of tetraphosphorus decaoxide? (b) How many P atoms are present in this sample? (5)  
(ii) The compound  $\text{Mg}_3\text{O}_2$  does not exist. Give reason.
- 3B) i) Give two differences between ionic and covalent bonding.  
ii) Describe the calculation of lattice energy for the formation of LiF by following Born Haber Cycle. (5)

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