विद्या सर्वार्थि साधिका

ANANDALAYA

PERIODIC TEST -1

Class: XI

Subject: Chemistry (043) MM : 40

Date : 18-07-2025 Time: 1 Hr. 30 min.

General Instructions:

1. There are 20 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
3. Section A consists of twelve MCQs of 1 mark each, Section B consists of two questions of 2 marks each, Section C consists of two questions of 3 marks each, Section D consists of two long questions of 5 marks each and Section E consists two case study-based questions of 4 marks each.
4. There is no overall choice. However, an internal choice has been provided in section D and E. You have to attempt only one of the choices in such questions.

SECTION A

1. Convert 1,285 cm^2 to m^2. (1)
   (A) 1.285 x 10^7 m^2 (B) 12.85 m^2 (C) 0.1285 m^2 (D) 1.285 x 10^5 m^2

2. Given that at. mass of Cu = 63.6 and S = 32, calculate the percentage of H_2O in $CuSO_4 \cdot 5H_2O$. (1)
   (A) 50 % (B) 29.8 % (C) 40 % (D) 36.14 %

3. Determine the number of atoms in 1.85 mL of mercury. The density of mercury is 13.5 g/mL. (1)
   (A) 3.02 x 10^{27} atoms (B) 4.11 x 10^{20} atoms
   (C) 7.50 x 10^{22} atoms (D) 1.50 x 10^{25} atoms

4. Calculate the number of moles of oxygen in one litre of air containing 21% oxygen by volume, under standard conditions. (1)
   (A) 2.10 mol (B) 0.0093 mol (C) 0.21 mol (D) 0.186 mol

5. Find the density (in g/mL) of a 3.60 M H_2SO_4 solution having 29% by mass of H_2SO_4 (molar mass 98). (1)
   (A) 1.88 (B) 1.22 (C) 1.64 (D) 1.45

6. Which of the following is responsible to rule out the existence of definite paths or trajectories of electrons? (1)
   (A) Pauli's exclusion principle. (B) Heisenberg's uncertainty principle.
   (C) Hund's rule of maximum multiplicity. (D) Aufbau principal

7. Which wavelength of light has highest frequency? (1)
   (A) 10 nm (B) 10 mm (C) 1 nm (D) 1mm

8. The quantum number m of a free gaseous atom is associated with _____. (1)
   (A) the effective volume of the orbital
   (B) the shape of the orbital
   (C) the spatial orientation of the orbital
   (D) the energy of the orbital in the absence of the magnetic field.

9. The correct order of the increasing energy of the orbitals is _____. (1)
   (A) 5p < 4f < 6s < 7s (B) 4f < 6s < 5p < 7s
   (C) 5p < 6s < 4f < 7s (D) 4f < 5p < 6s < 7s

10. Which of the following sets of quantum numbers is correct for an electron in a 4f orbital? (1)
(A) n=4, l=3, ml= +4, m_s= +½ (B) n=4, l=2, ml= +2, m_s = -½
(C) n=4, l=3, ml= +1, m_s= -½ (D) n=4, l=4, ml= -2, m_s= +½

For question numbers 11 and 12, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is NOT the correct explanation of A.
(C) A is true but R is false
(D) A is false and R is true.

11. A: Law of conservation of mass hold good for nuclear reaction. (1)
R: Law states that mass can be neither created nor destroyed in a chemical reaction.

12. A: Both position and momentum of an electron cannot be determined simultaneously with maximum accuracy. (1)
R: The path of an electron in an atom is clearly defined.

SECTION B

13. Sodium oxide reacts with water to produce sodium hydroxide. 20.0 g of sodium oxide is dissolved in 500 mL of water. Neglecting the change in volume what will be the concentration of the resulting NaOH solution? (Atomic mass of Na=23, O=16, H=1) (2)

14. Nitrogen laser produces a radiation at a wavelength of 337.1 nm. If the number of photons emitted is 5.6×10^{24}, calculate the power of this laser. (2)

SECTION C

15. If 10^{21} molecules are removed from 400 mg of CO_2, what is the number of moles of CO_2 left? (3)

16. Neon gas is generally used in the sign boards. If it emits strongly at 616 nm, calculate: (3)
(i) the frequency of emission.
(ii) distance travelled by this radiation in 30 s.
(iii) energy of quantum.
(iv) number of quanta present if it produces 2 J of energy.

SECTION D

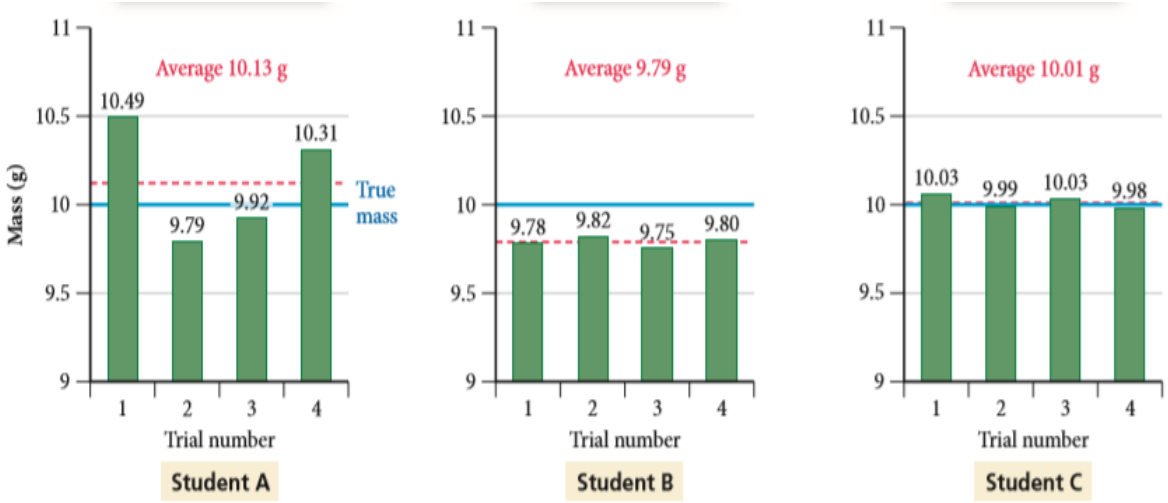
17. The complete combustion of 0.492 g of an organic compound containing ‘C’, 'H’ and ‘O’ gives 0.793g of CO_2 and 0.442 g of H_2O. Calculate the percentage of oxygen composition in the organic compound. (Atomic mass of C=12, O=16, H=1) (5)

18. (a) How did the photoelectric effect lead Einstein to propose that light is quantized? (5)
(b) What is a probability distribution map?
(c) Why does the uncertainty principle make it impossible to predict a trajectory for the electron?

SECTION E

Questions 19 and 20 are Case Study based questions and are compulsory. Each question carries 4 marks.

19. Scientists often repeat measurements several times to increase their confidence in the result. We can distinguish between two different kinds of certainty—called accuracy and precision—associated with such measurements. Accuracy refers to how close the measured value is to the actual value. Precision refers to how close a series of measurements are to one another or how reproducible they are. A series of measurements can be precise (close to one another in value and reproducible) but not accurate (not close to the true value). Consider the results of three students who repeatedly weighed a lead block known to have a true mass of 10.00 g tabulated below and displayed in figure.



(i) Comment on the results of student A. (1)
(ii) Comment on the results of student B. (1)
(iii) Comment on the results of student C and explain. (2)

OR

(iii) The result of a titration is 11.4, 11.5, and 11.7 mL. Write the values which are precise but not accurate if true value is 11.9 mL

20. The modern quantum mechanical model of the atom describes electrons not as particles orbiting in fixed paths, but as existing in regions of space called orbitals. Orbitals are defined by probability, meaning there is a certain probability of finding an electron in a particular region around the nucleus. These orbitals have different shapes and energies, described by quantum numbers. The principal quantum number (n) describes the energy level, the azimuthal quantum number (l) describes the shape, and the magnetic quantum number (ml) describes the spatial orientation.

(i) How does the quantum mechanical model differ from Bohr's model? (1)
(ii) How many orbitals are associated with n = 3? (1)
(iii) How many electrons are possible in an orbital? Why? (2)

OR

(iii) Sketch the general shapes of the s, p, and d orbitals.