

# Dhaka Board-2017

Chemistry First Paper

Subject Code 

|   |   |   |
|---|---|---|
| 1 | 7 | 6 |
|---|---|---|

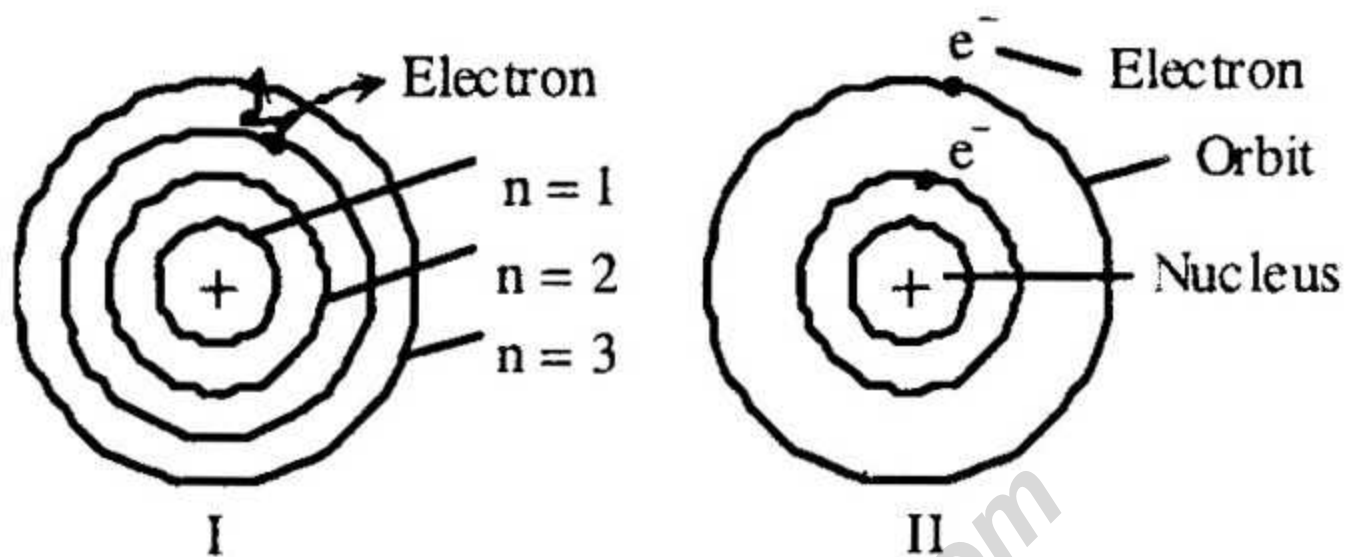
Time — 2 hours 35 minutes

Creative Essay Type

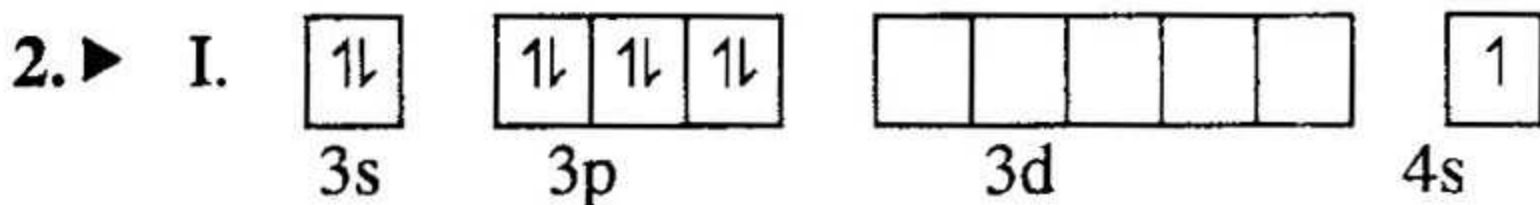
Full marks — 50

[N.B. -The figures in the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any five questions.]

1. ★



- a. What is orbital? 1
- b. What are the reasons for colloidal stabilisation? 2
- c. Calculate the values of  $b$  and  $m$  of the outermost shell of stem (fig I) and hence determine the number of orbitals. 3
- d. Compare the two models shown in I and II of the stem. 4



II. A(28)

- a. What is solubility? 1
- b. Between 'N' and 'O' which has smaller size? Explain. 2
- c. Why is 3d orbital vacant in I of stem? Explain. 3
- d. Does the element 'A' of II, show catalytic property? Analyse your answer. 4

3. ▶

|          |   |   |    |    |
|----------|---|---|----|----|
| Group →  | 1 | 2 | 14 | 17 |
| Period ↓ |   |   |    |    |
| 2        |   |   |    | X  |
| 3        | P | Q | R  | Y  |

- What is periodic property? 1
- Why is conc. HCl used in flame test? 2
- Between X and Y which element has higher element affinity? Explain. 3
- Analyse the nature of the compounds formed between Y and P, Q, R separately. 4

4. ★ Anik made a 100ml aqueous solution of 1.0589g in  $\text{Na}_2\text{CO}_3$  weighing the solute in 4-digit balance. Tuli used a 2-digit balance to weigh 1.62 g of  $\text{K}_2\text{Cr}_2\text{O}_7$  and made a 100 ml aqueous solution separately.

- What is a standard solution? 1
- Explain the importance of optimum use of chemicals in the laboratory. 2
- Calculate the pH of solution prepared by Anik. 3
- Which of the two solutions is more acceptable as a standard solution? Justify your answer. 4

5. ▶ Given below is the industrial production of  $\text{NH}_3$ :



- Define pH. 1
- 'All transition elements are d-block elements, but all d-block elements are not transition metals — why? 2
- Determine the  $K_p$  of the reaction given in the stem. 3
- Analyse the optimum conditions required for obtaining the highest yield in the reaction given in the stem. 4

|      |   |                             |                  |
|------|---|-----------------------------|------------------|
| 6. ▶ | 0.1M 50 mL $\text{DH}_4\text{OH}$<br>$K_b = 1.8 \times 10^{-5}$ | 0.001M 15 mL<br>HA solution | Mixture of K + L |
|      | Container-K   | Container-L                 | Container-M      |

(The atomic numbers of A and D are 17 and 7 respectively.)

- Write down Hess's law. 1
- Why is the neutralisation enthalpy of a strong acid and a strong base is a constant value? 2
- Describe with equations the identification of the cation of the container K. 3
- Does the addition of a small amount of strong acid or base change the pH of the solution of container-M? 4

7. ★

| Reagent                | Product   |
|------------------------|-----------|
| Caustic soda           | Cleaner A |
| $\text{NH}_3$ solution | Cleaner B |

- What is a suspension? 1
- Explain the role of chemistry in food security. 2
- Explain the cleaning mechanism of cleaner 'A'. 3
- Can the cleaner 'B' be used as a toilet cleaner? Analyse with justification. 4

8. ▶ The atomic numbers of elements Q, R and T are 6, 7 and 15 respectively.

- What is a sigma bond? 1
- $\text{H}_2\text{O}$  is a liquid but  $\text{H}_2\text{S}$  is gas — explain. 2
- 'Q and R show similar hybridisation – but the shapes of their hydrides are different' — explain. 3
- R forms only one compound with chlorine, but 'T' forms two compounds. Analyse. 4

[N.B. Choose the best answer among the options. Fill the circle in the answer sheet with ball point pen. Each question has value 1.]

1. The solubility product of  $\text{Mg}(\text{OH})_2$  at  $25^\circ\text{C}$  is  $4 \times 10^{-3}$ . What is the concentration of  $\text{OH}^-$  ion in  $\text{mol.L}^{-1}$ ?

- (a)  $10^{-1}$       (b)  $10^{-2}$   
(c)  $10^{-3}$       (d)  $10^{-4}$

\* N.B. Correct answer:  $2 \times 10^{-1}$

2. What is difference in mL between two consecutive lines in a burette?

- (a) 1.0      (b) 0.1  
(c) 0.01      (d) 0.001

3. **★** What is the value of ionic product of water at  $25^\circ\text{C}$ ?

- (a)  $1 \times 10^{-7}$       (b)  $1 \times 10^7$   
(c)  $1 \times 10^{-14}$       (d)  $1 \times 10^{14}$

4. Catalyst induces change in a chemical reaction —

- (a) activation energy  
(b) potential energy of product  
(c) potential energy of reactant  
(d) heat of reaction

5. Which set of quantum numbers belongs to the two outermost electrons of calcium?

- (a)  $n = 4, l = 0, m = 0, s = +\frac{1}{2}, -\frac{1}{2}$   
(b)  $n = 3, l = 1, m = 0, s = +\frac{1}{2}, -\frac{1}{2}$   
(c)  $n = 4, l = 1, m = 0, s = -\frac{1}{2}, -\frac{1}{2}$   
(d)  $n = 4, l = 2, m = 1, s = +\frac{1}{2}, -\frac{1}{2}$

6. Which is used to detect fake passport?

- (a)  $\gamma$ -ray      (b) X-ray  
(c) IR-radiation      (d) UV-radiation

7. Which orbital is possible?

- (a) 3f      (b) 3d  
(c) 2d      (d) 1p

8. **★** What is the pH of a 0.005 M  $\text{H}_2\text{SO}_4$  solution?

- (a) 2.3      (b) 2.0  
(c) 1.3      (d) 1.0

9. What are the number of d-block elements in the periodic table?

- (a) 28      (b) 36  
(c) 41      (d) 44

10. Which one is vinegar?

- (a) 6-10%  $\text{HCOOH}$   
(b) 6-10%  $\text{CH}_3\text{COOH}$   
(c) 6-10%  $\text{C}_2\text{H}_5\text{COOH}$   
(d) 6-10%  $\text{C}_6\text{H}_5\text{COOH}$

Observe the stem and answer question no. 11 and 12:

At  $25^\circ\text{C}$  temperature and 1.5 atm pressure, 15.6% of  $\text{PCl}_5$  is dissociated at equilibrium. The partial pressure of  $\text{PCl}_5$  and  $\text{Cl}_2$  gas are 1.095 and 0.202 atm respectively.

11. What is the value of  $K_p$ ?

- (a)  $2.74 \times 10^{-2}$  atm  
(b)  $2.84 \times 10^{-2}$  atm  
(c)  $3.74 \times 10^{-2}$  atm  
(d)  $5.74 \times 10^{-2}$  atm

12. If  $\text{PCl}_5$  is added to the reaction given in the stem —

- i. the reaction proceeds towards forward  
ii. the reaction proceeds towards backward  
iii. there will be change in equilibrium

Which one is correct?

- (a) i      (b) i & iii  
(c) iii      (d) i, ii & iii

13. "S" is the solubility of  $\text{Al}_2(\text{SO}_4)_3$ . The value of ionic product of  $\text{Al}_2(\text{SO}_4)_3$  will be —

- (a)  $S^5$       (b)  $6S^5$   
(c)  $27S^5$       (d)  $108S^5$

14. **★** What type of hybridisation occurs at the central atom of  $[\text{Fe}(\text{CN})_6]^{2-}$ ?

- (a)  $sp^3d^2$   
 (b)  $sp^3d$   
 (c)  $sp^3d^3$   
 (d)  $d^3sp^3$

15. Which one is the natural food preservative?

- (a) formalin  
 (b) sulfur dioxide  
 (c) sodium nitrate  
 (d) sodium chloride

16. In semi micro analytical method  $\text{H}_2\text{S}$  is replaced by —

- (a)  $\text{CH}_3\text{CSNH}_2$  (b)  $\text{CS}(\text{NH}_2)_2$   
 (c)  $\text{CH}_3\text{CNS}$  (d)  $\text{CH}_3 - \text{S} - \text{CH}_3$

17. Which one is the main component of glass cleaner?

- (a) vinegar  
 (b) aqueous ammonia  
 (c)  $\text{NaOH}$   
 (d) Na-lauryl sulfate

18. Which is the main component of talcum powder?

- (a)  $3\text{MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$   
 (b)  $\text{CaCO}_3 \cdot 2\text{MgCO}_3$   
 (c)  $\text{C}_4\text{H}_{10}\text{O}_4$   
 (d)  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

Observe the stem and answer question nos. 19 and 20:

|                    |   |    |
|--------------------|---|----|
| Group → / Period ↓ | 2 | 13 |
| 3                  | X | Z  |
| 4                  | A | Y  |

19. What is the value of magnetic quantum number of the outermost electron of element A?

- (a) +1 (b) -1  
 (c) 0 (d) +2

20. Among the elements of the stem —

- i. X has higher ionisation energy than A  
 ii. the aqueous solution of chloride of Z is acidic  
 iii. the polarisation power of  $\text{Z}^{3+}$  is higher than that of  $\text{X}^{2+}$

Which one is correct?

- (a) i & ii (b) ii & iii  
 (c) i & iii (d) i, ii & iii

21. Which one is the secondary standard?

- (a)  $\text{Na}_2\text{CO}_3$   
 (b)  $\text{K}_2\text{Cr}_2\text{O}_7$   
 (c)  $\text{H}_2\text{C}_2\text{O}_4$   
 (d)  $\text{KMnO}_4$

22. **★** Octet-completed compound is —

- i.  $\text{H}_2\text{O}$  ii.  $\text{BCl}_3$  iii.  $\text{NCl}_3$

Which one is correct?

- (a) i & ii  
 (b) ii & iii  
 (c) i & iii  
 (d) i, ii & iii

23. Due to which orbital's overlapping,  $\pi$  bond is formed in  $\text{C}_2\text{H}_4$ ?

- (a)  $sp^2-sp^2$   
 (b)  $sp^2-s$   
 (c)  $2p_x-2p_z$   
 (d)  $2p_y-2p_y$

24. Which is the conjugate base of  $\text{HCO}_3^-$ ?

- (a)  $\text{H}_2\text{CO}_3$  (b)  $\text{CO}_3^{2-}$   
 (c)  $\text{CO}_2^{2-}$  (d)  $\text{H}^+$

25. **★** In which orbital, the 19<sup>th</sup> electron of copper enters?

- (a) 3s (b) 4s  
 (c) 3d (d) 4p

|      |    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |    |     |
|------|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|----|-----|
| Ans. | 1  | *   | 2  | (b) | 3  | (c) | 4  | (a) | 5  | (a) | 6  | (d) | 7  | (b) | 8  | (b) | 9  | (c) | 10 | (b) | 11 | (c) | 12 | (b) | 13 | (d) |
|      | 14 | (d) | 15 | (d) | 16 | (a) | 17 | (b) | 18 | (a) | 19 | (c) | 20 | (d) | 21 | (d) | 22 | (c) | 23 | (c) | 24 | (b) | 25 | (b) |    |     |

1. N.B. : The Correct answer is  $2 \times 10^{-1}$