

1. Consider the process:  $I_2(g) \rightarrow I_2(s)$   
The name of this process is
- A. condensation  
C. deposition
- B. sublimation  
D. vaporization
2. Which of the following contains an element, a compound and a mixture?
- A.  $H_2O(l)$ ,  $H_2(g)$ ,  $FeS(s)$   
C.  $CH_4(g)$ ,  $I_2(l)$ ,  $CO_2(l)$
- B.  $Cl_2(aq)$ ,  $Br_2(g)$ ,  $NaBr(l)$   
D.  $NaCl(aq)$ ,  $CO(g)$ ,  $H_2S(g)$
3. A room contained  $40.0 \text{ m}^3$  of air. The concentration of  $H_2S(g)$  in the room is  $0.500 \text{ ppm}$ . The volume of  $H_2S$  in the room is
- A.  $20.0 \text{ cm}^3$   
C.  $2.00 \text{ cm}^3$
- B.  $2.00 \times 10^{-5} \text{ cm}^3$   
D.  $8.00 \text{ cm}^3$
4. The behaviour and properties of a real gas differs most from those of an ideal gas at
- A. low temperature and low pressure  
C. high temperature and low pressure
- B. low temperature and high pressure  
D. high temperature and high pressure
5. A student carried out an experiment to determine the value of  $x$  in the formula  $MgSO_4 \cdot xH_2O$ . They weighed a sample of  $MgSO_4 \cdot xH_2O$ , heated it to drive off the water and then weighed it again. The experimental data is shown in the table:
- |                                    |      |
|------------------------------------|------|
| Mass of $MgSO_4 \cdot xH_2O$ / g   | 2.46 |
| Mass of $MgSO_4$ after heating / g | 1.20 |
- The value of  $x$  is
- A. 2  
B. 4  
C. 5  
D. 7
6. Which of the following is the symbol of an actinoid?
- A. Cd  
B. Co  
C. Cf  
D. Ce
7. Which of the following compounds is paramagnetic?
- A. NaCl  
B.  $ScCl_3$   
C.  $CoCl_2$   
D. CuCl
8. Cobalt(III) forms a complex ion,  $[Co(H_2O)_4(CN)_2]$ . The charge on this complex ion is
- A.  $3+$   
B.  $2+$   
C.  $1+$   
D.  $1-$
9. Which of the following has the most exothermic value of electron affinity?
- A. F  
B. Cl  
C. Br  
D. I
10. In which of the following does the central atom have an expanded octet?
- A.  $Cl_2O$   
B.  $H_2S$   
C.  $NO_2^+$   
D.  $SF_6$
11. In the Lewis structure of  $C_6H_5NO_2$  the formal charge on the nitrogen atom is
- A. 0  
B.  $1-$   
C.  $1+$   
D.  $2+$

12. What is the shape and electron domain geometry of  $\text{SF}_4^{2-}$ ?

|    | shape         | electron domain geometry |
|----|---------------|--------------------------|
| A. | octahedral    | octahedral               |
| B. | square planar | octahedral               |
| C. | see-saw       | octahedral               |
| D. | see-saw       | trigonal bipyramidal     |

13. Some enthalpy changes are given in the table. The enthalpy change of hydration of the chloride ion is

|  |                             |
|--|-----------------------------|
| Enthalpy change of solution of $\text{CaCl}_2(\text{s})$   | $-80 \text{ kJ mol}^{-1}$   |
| Enthalpy change of hydration of $\text{Ca}^{2+}(\text{g})$ | $-1650 \text{ kJ mol}^{-1}$ |
| Lattice enthalpy of $\text{CaCl}_2(\text{s})$              | $2240 \text{ kJ mol}^{-1}$  |

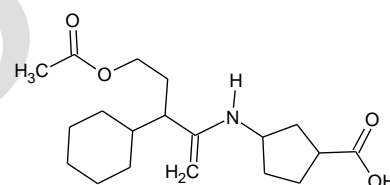
- A.  $-670 \text{ kJ mol}^{-1}$       B.  $-1985 \text{ kJ mol}^{-1}$   
 C.  $-255 \text{ kJ mol}^{-1}$       D.  $-335 \text{ kJ mol}^{-1}$

14. Which of the following could exist as a pair of diastereomers?

- A.  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$       B.  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CHBrCH}_3$   
 C.  $\text{CH}_3\text{CH}(\text{OH})\text{CHCH}_2$       D.  $\text{CH}_3\text{COOCH}_2\text{CH}_3$

15. Which functional group is not present in the molecule shown?

- A. phenyl      B. secondary amine  
 C. carboxyl      D. ester



16. Which of the molecules shown could be described as (an) (*E*)-isomer(s)?

|   |    |     |
|---|----|-----|
|   |    |     |
| I | II | III |

- A. I only      B. I and II only  
 C. II and III only      D. III only

17. In the reaction between HCl and propene

- A. HCl acts as a nucleophile      B. the major product is 1-chloropropane  
 C. the intermediate is a tertiary carbocation      D. the mechanism is electrophilic addition

18. The  $^1\text{H}$  NMR spectrum of propanoic acid will consist of

- A. a triplet, a doublet and a singlet      B. a quartet, a triplet and a singlet  
 C. three singlets      D. a quartet, and two triplets

19. Which of the following does not have an IHD of 1?

- A. ethyl ethanoate      B. but-2-ene  
 C. cyclopropane      D. 2-methoxypropane

20. The IUPAC name of  $\text{HCCCH}(\text{CH}_3)_2$  is

- A. 2-methylbutane      B. 3-methylbut-1-yne  
 C. 1,2-dimethylpropyne      D. 2-methylbut-3-yne