

20 questions – 30 minutes. You will need a Periodic Table.

All questions can be done without a calculator.

1. Consider the process: $I_2(g) \rightarrow I_2(s)$
The name of this process is
- A. condensation
B. sublimation
C. deposition
D. vaporization
2. Which of the following contains an element, a compound and a mixture?
- A. $H_2O(l)$, $H_2(g)$, $FeS(s)$
B. $Cl_2(aq)$, $Br_2(g)$, $NaBr(l)$
C. $CH_4(g)$, $I_2(l)$, $CO_2(l)$
D. $NaCl(aq)$, $CO(g)$, $H_2S(g)$
3. A room contained 40.0 m^3 of air. The concentration of $H_2S(g)$ in the room is 0.500 ppm . The volume of H_2S in the room is
- A. 20.0 cm^3
B. $2.00 \times 10^{-5} \text{ cm}^3$
C. 2.00 cm^3
D. 8.00 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
B. low temperature and high pressure
C. high temperature and low 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 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 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 kJ mol^{-1}

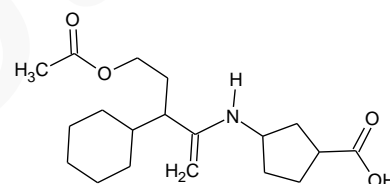
- A. -670 kJ mol^{-1} B. $-1985 \text{ kJ mol}^{-1}$
 C. -255 kJ mol^{-1} D. -335 kJ mol^{-1}

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 ^1H 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. 4-methylbut-1-yne
 C. 1,2-dimethylpropyne D. 2-methylbut-3-yne