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| **Entrance Examination****March 2022** |
| **CHEMISTRY**Time allowed: 1.5 hours (90 minutes)**Answer TWO questions**You may use a calculator and a periodic table |

1. This question is associated with alkenes and alkynes.
2. Describe and provide a diagram showing the different types of bonding present in 1,1,2,2-tetrachloroethene (PerkloneTM, a solvent used in dry cleaning). Give the shape and approximate bond angles for the carbon atoms.
3. Give the shape and approximate bond angles for the carbon atoms in trichloro­ethene (TrikloneTM, a solvent used in the chemical industry). How many isomers are possible?
4. How many isomers are possible for dichloroethene?
5. How many isomers are possible for chloroethene (vinyl chloride, the monomer for PVC)?
6. In 1971, a major chemical company found that the trichloroethene that it was using in a large-scale process was degrading to dichloroethyne, a highly unstable compound. Describe and provide a diagram showing the different types of bonding present in dichloroethyne. Give the shape and approximate bond angles for the carbon atoms.
7. You have a 21.90 cm3 (mL) of 0.00400 M solution of potassium permanganate (KMnO4). This was titrated with 20.0 cm3 of a solution of Fe (II) sulfate. The two half-reactions are:

MnO4- + 8 H+ + 5 e- → Mn2+ + 4 H2O

Fe2+ → Fe3+ + e-

1. Give the ionic redox equation for the reaction of the permanganate ion (MnO4-) and Fe2+.
2. Work out the concentration of the Fe2+ solution in molar (M) units.
3. The Fe2+ was present as Fe (II) sulfate (FeSO4). What mass of FeSO4 had been dissolved in the 20.0 cm3 of Fe (II) sulfate solution?
4. Define chirality and, with the use of diagrams and/or examples, explain its importance in chemistry and biochemistry.
5. Write an essay about the chemistry of water.

Period

1

2

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3

4

(1091-01A)

5

6

7

**THE PERIODIC TABLE**

**1 2 Group 3 4 5 6 7 0**

s Block

Key

relative atomic

4.00

He

Helium

2

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| 1.01HHydrogen1 |

p Block

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| *A*r |  |  |
| Symbol NameZ |  |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6.94LiLithium3 | 9.01BeBeryllium 4 | massatomic numberd Block  | 10.8BBoron5 | 12.0CCarbon6 | 14.0NNitrogen7 | 16.0OOxygen8 | 19.0FFluorine9 | 20.2NeNeon10 |
| 23.0NaSodium11 | 24.3MgMagnesium12 | 27.0AlAluminium13 | 28.1SiSilicon14 | 31.0PPhosphorus15 | 32.1SSulfur16 | 35.5ClChlorine17 | 40.0ArArgon18 |
| 39.1KPotassium19 | 40.1CaCalcium20 | 45.0ScScandium21 | 47.9TiTitanium22 | 50.9VVanadium23 | 52.0CrChromium24 | 54.9MnManganese25 | 55.8FeIron26 | 58.9CoCobalt27 | 58.7NiNickel28 | 63.5CuCopper29 | 65.4ZnZinc30 | 69.7GaGallium31 | 72.6GeGermanium32 | 74.9AsArsenic33 | 79.0SeSelenium34 | 79.9BrBromine35 | 83.8KrKrypton36 |
| 85.5RbRubidium37 | 87.6SrStrontium38 | 88.9YYttrium39 | 91.2ZrZirconium40 | 92.9NbNiobium41 | 95.9MoMolybdenum42 | 98.9TcTechnetium43 | 101RuRuthenium44 | 103RhRhodium45 | 106PdPalladium46 | 108AgSilver47 | 112CdCadmium48 | 115InIndium49 | 119SnTin50 | 122SbAntimony51 | 128TeTellurium52 | 127IIodine53 | 131XeXenon54 |
| 133CsCaesium55 | 137BaBarium56 | 139 ‣ LaLanthanum57 | 179HfHafnium72 | 181TaTantalum73 | 184WTungsten74 | 186ReRhenium75 | 190OsOsmium76 | 192IrIridium77 | 195PtPlatinum78 | 197AuGold79 | 201HgMercury80 | 204TlThallium81 | 207PbLead82 | 209BiBismuth83 | (210)PoPolonium84 | (210)AtAstatine85 | (222)RnRadon86 |
| (223)FrFrancium87 | (226)RaRadium88 | (227)Ac ‣‣Actinium89 | f Block |

* Lanthanoid elements

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| 140CeCerium 58 | 141PrPraseodymium59 | 144NdNeodymium60 | (147)PmPromethium61 | 150SmSamarium62 | (153)EuEuropium63 | 157GdGadolinium64 | 159TbTerbium 65 | 163DyDysprosium66 | 165HoHolmium 67 | 167ErErbium 68 | 169TmThulium 69 | 173YbYtterbium 70 | 175LuLutetium 71 |

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elements

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| 232ThThorium 90 | (231)PaProtactinium91 | 238UUranium 92 | (237)NpNeptunium93 | (242)PuPlutonium94 | (243)AmAmericium95 | (247)CmCurium 96 | (245)BkBerkelium 97 | (251)CfCalifornium98 | (254)EsEinsteinium99 | (253)FmFermium 100 | (256)MdMendelevium101 | (254)NoNobelium 102 | (257)LrLawrencium103 |

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