1) ⓒ 1, 1, -1, $-1/2$

maximum ℓ is $n-1$

so for $n=1$, $\ell=0$

2) ⓑ Cr: [Ar] $4s^2$ $3d^4$

$n=4$ $\ell=0$ $\quad$ $n=3$ $\ell=2$

a) 3, 2, -2, $+1/2$ $\quad$ 3d electron → Cr has

b) 4, 1, 0, $+1/2$ $\quad$ 4p electron → Cr doesn't have

c) 4, 0, 0, $-1/2$ $\quad$ 4s electron → Cr has

d) 3, 2, -1, $+1/2$ $\quad$ 3d electron → Cr has

3) Cu: [Ar] $4s^1$ $3d^{10}$

Cu^+: [Ar] $3d^{10}$

Cu^{2+}: [Ar] $3d^9$

First: 4s e^- → $n=4$, $\ell=0$

Second: 3d e^- → $n=3$, $\ell=2$

4) ⓒ $n=3$ → $\ell=0$, $\ell=1$, $\ell=2$

$2e^- + 6e^- + 10e^- = 18e^-$

5) (d) I) Cs^+: 54 e^- I^-: 54 e^- isoelectronic

II) Al^{3+}: 10 e^- Ne: 10 e^- isoelectronic

III) Cl^-: 18 e^- K: 19 e^- not isoelectronic

IV) Zn^+: 29 e^- Cu: 29 e^- isoelectronic

6) Pt^{4+}: $[Xe]4f^{14}5d^6$

7) (a) I correction: $Ca^{2+} < Ca^+ < Ca$

II correction: $Ar < Cl < S < Ca < K$

III is correct as is

8) (c) $Cs < Li < Co < Sb < N$

Smallest largest

1st I.E. increases up and to the right on the periodic table

9) (b)

a) true, because they have more e^- with the same number of protons

b) false, because they may have different numbers of protons

c) true, larger n means larger orbitals, which means larger radius

d) true (explanation in answer)

10) (b)

$$1.37\ L\ H_2O \cdot \frac{1000\ mL}{1\ L} \cdot \frac{1\ g\ H_2O}{1\ mL\ H_2O} = 1370\ g\ H_2O$$

$$\frac{1028\ g\ Pb(NO_3)_2}{1370\ g\ H_2O} = \frac{x}{100\ g\ H_2O}$$

$$x = 75.03\ g\ Pb(NO_3)_2$$

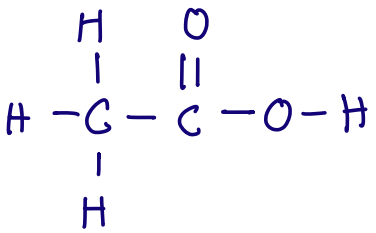
Look on graph (yellow curve) to see at what temperature solubility $\approx 75\ g\ Pb(NO_3)_2 / 100\ g\ H_2O$

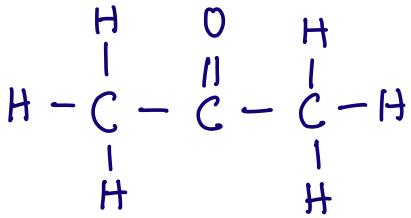
$T = 40^\circ C$

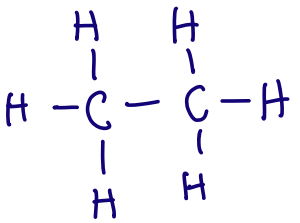
11) (a) where purple curve is above light blue and dark blue curves

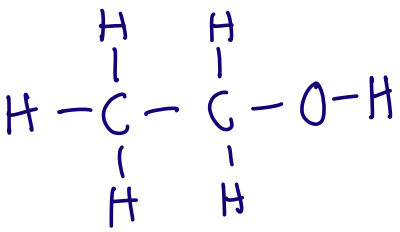
12) (c) ★ like dissolves like ★

benzene is a hydrocarbon → will dissolve other hydrocarbons

a)  has H-bonding / dipole-dipole

b)  has H-bonding / dipole-dipole interactions

c)  Hydrocarbon!

d)  has H-bonding / dipole-dipole

13) **5.27g**

$$2\,AgNO_{3(aq)} + CaCl_{2(aq)} \longrightarrow 2\,AgCl_{(s)} + Ca(NO_3)_{2(aq)}$$

$$47\,mL \cdot \frac{0.783\,mol\,AgNO_3}{1000\,mL} \cdot \frac{2\,mol\,AgCl}{2\,mol\,AgNO_3} \cdot \frac{143.32\,g}{1\,mol\,AgCl} = 5.27\,g\,AgCl$$

$$92\,mL \cdot \frac{0.592\,mol\,CaCl_2}{1000\,mL} \cdot \frac{2\,mol\,AgCl}{1\,mol\,CaCl_2} \cdot \frac{143.32\,g}{1\,mol\,AgCl} = 15.6\,g\,AgCl$$

$5.27\,g < 15.6\,g$, so $AgNO_3$ is the limiting reactant and 5.27g is the maximum mass of AgCl that can be formed

14) $0.171 = \frac{m_{MgBr_2}}{m_{total}}$, $m_{total} = 200\,g$

$m_{MgBr_2} = (0.171)(200\,g)$

$m_{MgBr_2} = 34.2\,g$

$n_{MgBr_2} = \frac{34.2\,g}{184.11\,g/mol}$

$n_{MgBr_2} = 0.186\,mol$

15) $m_{total} = m_{MgBr_2} + m_{H_2O}$

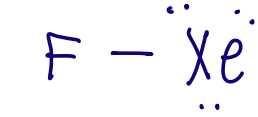
$m_{H_2O} = 200\,g - 34.2\,g = 165.8\,g$

$\frac{165.8\,g}{1\,g/mL} = 165.8\,mL$

$n_{MgBr_2} = 0.186\,mol$

$$M = \frac{0.186\ mol}{165.8\ mL} = \boxed{1.12 \times 10^{-3}\ M}$$

16) (d) XeF_2

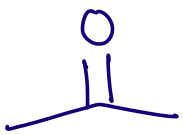


AX_2E_3

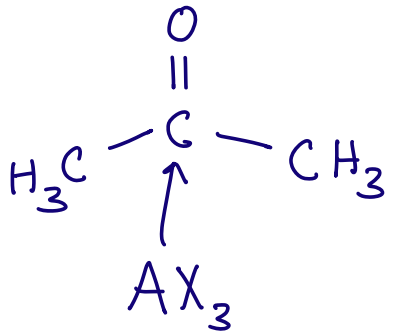
electronic geometry: trigonal bipyramidal

molecular geometry: linear

17)



=

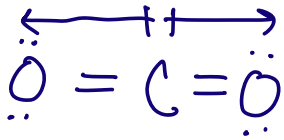


trigonal planar electronic geometry

→ bond angles = 120°

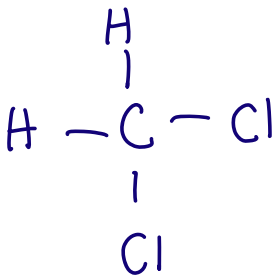
18) (d) H & F have the largest electronegativity difference

19) ©



each bond is equally polar and pointing in opposite directions so they cancel each other out

a)



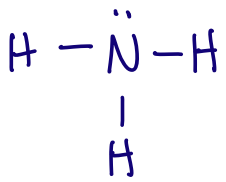
C–Cl: polar

C–H: nonpolar

↓

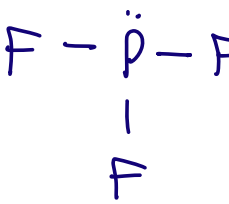
molecule is polar

b)



bonds are polar but do not cancel out due to molecular geometry (trigonal pyramidal)

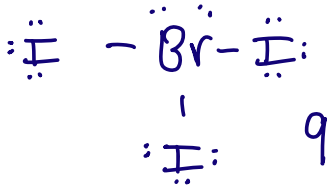
d)



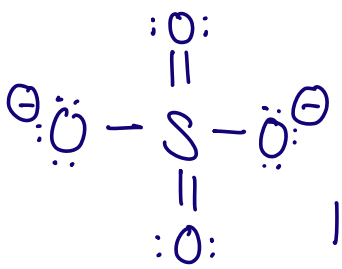
bonds are polar but do not cancel out due to molecular geometry (trigonal pyramidal)

20) ⓓ

I (correct)

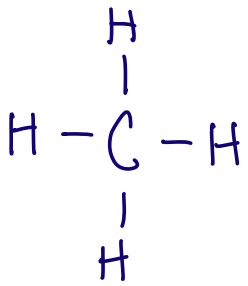


90°



109.5°

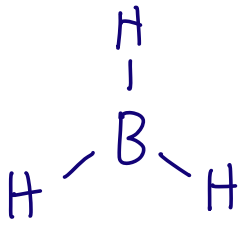
II



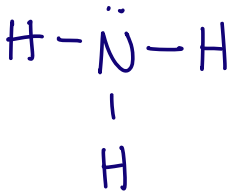
109.5°

< 109.5°

III

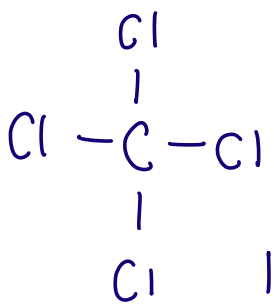


120°

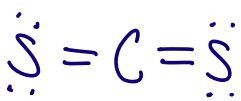


< 109.5°

IV (correct)



109.5°



180°