CHEM1901/1903 Example Multiple Choice Questions

The following multiple choice questions are provided to *illustrate* the type of questions used in this section of the paper and to provide you with extra practice.

It is *not* a sample quiz. The questions in the paper will be in the style of these questions but may well cover different topics.

In the exam, the answer should be indicated by clearly circling the letter next to the choice you make **and** by filling in the corresponding box on the computer-marked sheet provided. The marks for each correct answer are given beside each question.

<u>Instructions for use of the computer sheet</u>. Draw a **thick** line through the **centre** and crossing both edges of each box selected, as in this example.



Use a **dark** lead pencil so that you can use an eraser if you make an error. Errors made in ink cannot be corrected – you will need to ask the examination supervisor for another sheet. Boxes with faint or incomplete lines or not completed in the prescribed manner may not be read. Be sure to complete the SID and name sections of the sheet.

Your answer as recorded on the sheet will be used in the event of any ambiguity.

There is only one correct choice for each question.

Negative marks will not be awarded for any question.

1.	Which one of the following sets of quantum numbers is valid?							
		n	l	m_l	m_s			
	A	4	3	4	_1/2			
	B	3	1	0	+1/2			
	С	1 .	-1	1	+1/2			
	D	2	1	2	_l⁄2			
	Ε	2	3	-3	+1/2			
2.	How barit	v many j um isoto	proto	ons (p) ²³ Ba 2	, neutrons (n) and electrons (e) are present in the	1		
	A	56 p	67	7 n	56 e			
	B	56 p	12	23 n	67 e			
	С	123 p	56	5 n	56 e			
	D	67 p	56	5 n	67 e			
	Ε	67 p	12	23 n	56 e			
3.	Wha	at is the	grou	nd sta	te electronic configuration of the bromine atom?	1		
	A	$1s^2 2s^2$	$2^{2} 2p^{6}$	$3s^2 3$	$p^{6} 4s^{2} 4d^{15}$			
	B	$1s^2 2s^2$	$22p^{6}$	$3s^2 3$	$p^6 4s^2 3d^{10} 4p^5$			
	С	$1s^2 2s^2$	$^{2}2p^{6}$	$3s^2 3$	$p^6 4s^2 4d^{10} 4p^6$			
	D	$1s^2 2s^2$	$^{2}2p^{6}$	$3s^2 3$	$p^6 4s^2 3d^9 4p^6$			
	Ε	$1s^2 2s^2$	$^{2}2p^{6}$	$3s^2 3$	$p^6 4s^2 4d^{10} 4p^5$			
4.	²²² R final	n is uns l decay j	table prodi	and duct?	lecays by emits two alpha and two beta particles. What is the	1		
	A	²¹⁸ Bi						
	В	²¹⁶ Bi						
	С	²¹⁶ Pb						
	D	²¹⁴ Po						
	Ε	212 Tl						

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5.	For anal	which one of th ytically and obt	e following species is it poss ain an equation for its electro	ible to solve the wave equation onic energy levels?	Marks 1	
	A	He				
	B	Li ²⁺				
	С	H_2				
	D	H^{-}				
	Ε	He				
6.	Whi	ch of the follow	ving atoms has the highest fin	rst ionisation energy?	1	
	Α	Rb				
	B	Na				
	С	Κ				
	D	Cs				
	E	Si			-	
7.	Whi	ch of the follow	ing quantities is proportiona	l to the electron density at a point?	1	
	Α	the wavefunct	ion			
	B	the square of	the wave function			
	С	the de Broglie	wavelength			
	D	the reciprocal	of the de Broglie wavelengt	h		
	Ε	the Rydberg c	onstant		-	
8.	How	w many valence	electrons are there in the P^{3-}	ion?	1	
	Α	3				
	B	5				
	С	8				
	D	15				
	Ε	18			-	
9.	The radi	¹⁴ C activity of a ocarbon age of	a sample of wood is 0.250 of the sample (to 3 significant f	a modern standard. What is the igures)?	1	
	A	2780 years				
	B	5570 years				
	С	11,100 years				
	D	16,100 years				
	Ε	22,300 years				



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14.	LiF of L the f	and NaBr are ionic salts that both form a simple cubic lattice. The ionic radii i^+ , F^- , Na^+ and Br^- are 0.76, 1.33, 1.02 and 1.96 Å respectively. Which one of following statements is <i>true</i> ?	Marks 1							
	A The atomic radius of Na is smaller than 1.0 Å.									
	B The atomic radius of F is larger than 1.4 Å.									
	C Each Li^+ ion in LiF has 8 F ⁻ ions as nearest neighbours.									
	D	The lattice energy of LiF is greater in magnitude than the lattice energy of NaBr.								
	Ε	The boiling point of NaBr is higher than the boiling point of LiF.								
15.	How would the concentration of $Pb^{2+}(aq)$ ions in equilibrium with $PbI_2(s)$ be affected if the concentration of $\Gamma(aq)$ ions were doubled?									
	A	no change								
	B	increased by a factor of 2								
	C decreased by a factor of 2									
	D	decreased by a factor of 4								
	Ε	decreased by a factor of 16								
16.	List	the following "ideal" gases in order of increasing density at 25 °C and 1 atm.	1							
		Cl_2 H_2 N_2 NO_2 O_2								
	$\mathbf{A} \mathbf{H}_2 < \mathbf{N}_2 < \mathbf{O}_2 < \mathbf{N}\mathbf{O}_2 < \mathbf{C}\mathbf{l}_2$									
	B	$Cl_2 < NO_2 < O_2 < N_2 < H_2$								
	С	$H_2 < N_2 < O_2 < Cl_2 < NO_2$								
	D	$NO_2 < Cl_2 < O_2 < N_2 < H_2$								
	Е	All ideal gases have the same density								
17.	Wha	1								
	A	- 3								
	B	$-\frac{1}{3}$								
	С	0								
	D	$+ \frac{1}{3}$								
	Ε	+3								

CHE	EM19	U1/1903 June 2008 Example Multiple Choice	Questions		
18.	Whi and	ich type of rocket fuel is chosen for a space engine that needs to be turned on off frequently?	Marks 1		
	A	solid fuel			
	B	hypergolic fuel			
	С	petroleum fuel			
	D	cryogenic fuel			
	Ε	any of the above			
19.	Con poll state	his der the idealised graph of various lutants shown. Which one of the following ements concerning these species is <i>false</i> ? Hydrocarbons NO_2 O_1 O_2 O_3 O_2 O_3 O_2 O_3 O_2 O_3 O_4 O_2 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_2 O_3 O_4 O_4 O_2 O_3 O_4 O_4 O_2 O_3 O_4 O_4 O_5 O_4 O_4 O_4 O_2 O_3 O_4 O_4 O_5 O_4 O_4 O_4 O_5 O_4 O_4 O_4 O_4 O_4 O_4 O_4 O_4 O_4 O_4 O_5 O_4 O_4 O_5 O_4 O_4 O_5 O_4 O_5 O_4 O_4 O_5 O_5 O_4 O_5 O_5 O_4 O_5 O_5 O_4 O_5 O_5 O_4 O_5	1		
	A	NO and hydrocarbons are primary pollutants.			
	B	NO_2 and O_3 are secondary pollutants.			
	С	NO ₂ decomposes to form NO via: NO ₂ + $h\nu \rightarrow$ NO + O			
	D	When the concentrations of NO_2 and O_3 are very high, the nitrate radica NO_3 can form, leading to acid rain.	1,		
	Ε	The production of NO_2 and O_3 is considered to be bad for the atmosphere because they are both greenhouse gases.	re		
20.	Con	nsider the following reaction, for which the equilibrium constant, $K_c = 100$.	1		
		$N_2(g) + 2O_2(g) \implies 2NO_2(g)$			
	W	That is K_c for the reaction below?			
		$NO_2(g) \iff O_2(g) + \frac{1}{2}N_2(g)$			
	A	0.0100			
	B	0.100			
	С	1.00			
	D	10.0			
	Ε	100			

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21.	Wh	ich intermolecular f	Force is most imp	ortant in allowing Xe gas t	o liquefy?	Marks 1	
	A	dipole-dipole					
	B	hydrogen-bondin	g				
	С	ionic					
	D	instantaneous dip	ole-induced dipo	le			
	Ε	ion-dipole					
22.	. Which type of rocket fuel provides the best efficiency in terms of energy per mass of reactants.						
	A	solid fuel					
	B	hypergolic fuel					
	С	petroleum fuel					
	D	cryogenic fuel					
23.	The	reaction below has	reached equilibr	ium.		1	
		$Ag^{+}(aq) + Fe$	$e^{2+}(aq) \implies d$	$Ag(s) + Fe^{3+}(aq)$	$\Delta H < 0$		
	Wh	ich one of the follow	wing would cause	precipitation of more silv	er?		
	Α	warming					
	B	removing some o	f the solid silver				
	С	increasing the con	ncentration of Fe	²⁺ (aq) ions			
	D	increasing the con	ncentration of Fe	³⁺ (aq) ions			
	Ε	decreasing the co	ncentration of Fe	²⁺ (aq) ions			
24.	Con	sider the following	information:			1	
		$A + B \rightarrow C +$	D 🛆	$H^{\circ} = -10.0 \text{ kJ}$			
		$C \ + \ D \ \rightarrow \ E$	Δ	$H^{\circ} = 15.0 \text{ kJ}$			
	Wh	ich one of the follow	wing reactions wo	build have $\Delta H^{\circ} = -10 \text{ kJ}$?			
	A	$C + D \rightarrow A +$	В				
	B	$2C + 2D \rightarrow 2A$	A + 2B				
	С	$A + B \rightarrow E$					
	D	$^{1}/_{2}E \rightarrow ^{1}/_{2}C + ^{1}/_{2}C$	2D				
	Ε	$2E \rightarrow 2A + 2B$	6				

CHE	M190	01/1903 June 2008 E	Example Multiple Choice Qu	uestions						
25.	The entha	enthalpy change for which of the following processes alpy of formation of AgCl?	s represents the standard	Marks 1						
	A	$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$								
	B									
	С	$C \qquad AgCl(s) \rightarrow Ag(s) + \frac{1}{2}Cl_2(g)$								
	D	$Ag(s) + AuCl(s) \rightarrow Au(s) + AgCl(s)$								
	Ε	$Ag(s) + \frac{1}{2}Cl_2(g) \rightarrow AgCl(s)$								
26.	Cons	sider the following reaction and its equilibrium const	ant.	1						
		$A + 3B \iff 2C$ K	$C = \frac{1}{[A][B]^3}$							
	Wha	t reaction conditions could give rise to the observed	equilibrium expression?							
	A	A, B and C are in aqueous solution.								
	B	A, B and C are liquids.								
	С	A and B are liquids, C is a gas.								
	D	C is a gas, A and B are solids.								
	Ε	C is a solid, A and B are in aqueous solution.								
Ques for th	tions is pro	27 and 28 relate to the smelting of iron from iron of occess is:	xide. The overall reaction							
		$Fe_2O_3(s) + 3CO(g) \implies 2Fe(l) + 3CO(g)$	$O_2(g)$							
27.	Wha	t is the role of the CO(g) in this reaction?		1						
	A	A catalyst								
	B	An oxidant								
	С	A reductant								
	D	A fuel								
	Ε	A solvent								
28.	What incre	ll pressure were	1							
	A	The reaction would move to the left.								
	B	The reaction would move to the right.								
	С	The equilibrium would not change.								
	D	Not sufficient information to decide.								

CHE	EM19	01/1903 June 2008	Example Multiple Choice Questio	ons			
29.	The pote	figure below shows a $Zn^{2+} Zn$ and $Sn^{2+} Sn$ voltaic centials are on the separate data sheet.	cell. Relevant electrode Mar 2	·ks			
		Zn Zn^{2+} So_4^{2-} Sn^{2+} So_4^{2-} So_4^{2-}	Sn				
	Wh	ich one of the following best describes the chemical	operation of the cell?				
	Α	The Zn electrode is the cathode; Zn is being oxid electrons travel from right to left.	ised;				
	B	The Zn electrode is the anode; Zn is being oxidis electrons travel from left to right.	ed;				
	С	The Sn electrode is the anode; Zn^{2+} is being reduelectrons travel from left to right.	ced;				
	D	The Sn electrode is the cathode; Sn is being oxid electrons travel from right to left.	ised;				
	Ε	The Zn electrode is the anode; Sn ²⁺ is being reduelectrons travel from right to left.	ced;				
30.	Cor	sider the following reaction.	1				
		$2Fe^{3+}(aq) + Sn^{2+}(aq) \implies 2Fe^{2+}(aq)$	+ $Sn^{4+}(aq)$				
	Which one of the following is the correct expression for the Nernst equation for this reaction?						
	A	$E = E^{\circ} - \frac{RT}{2F} \times 2.303 \log \frac{[\text{Fe}^{2+}]^2 [\text{Sn}^{4+}]}{[\text{Fe}^{3+}]^2 [\text{Sn}^{2+}]}$					
	B	$E = E^{\circ} - \frac{RT}{2F} \times 2.303 \log \frac{[\text{Fe}^{3+}]^2 [\text{Sn}^{2+}]}{[\text{Fe}^{2+}]^2 [\text{Sn}^{4+}]}$					
	С	$E = E^{\circ} - \frac{RT}{F} \times 2.303 \log \frac{[\text{Fe}^{2+}]^2 [\text{Sn}^{4+}]}{[\text{Fe}^{3+}]^2 [\text{Sn}^{2+}]}$					
	D $E = E^{\circ} - \frac{RT}{F} \times 2.303 \log \frac{[\text{Fe}^{3+}]^2 [\text{Sn}^{2+}]}{[\text{Fe}^{2+}]^2 [\text{Sn}^{4+}]}$						
	E	$E = E^{\circ} - \frac{RT}{F} \times 2.303 \log \frac{[\text{Fe}^{2+}][\text{Sn}^{4+}]}{[\text{Fe}^{3+}][\text{Sn}^{2+}]}$					
L							

31.	Why	Why do lead-acid batteries maintain an approximately constant voltage?								
	A	They never run down.								
	B	No aqueous species appear in the equation for the overall cell reaction.								
	С	Their E° values are very high.								
	D	They are primary batteries.								
	Ε	The concentrations of reagents in the half cell reactions remain approximately constant.								
32.	Whie	ch one of the following statements is correct?	1							
	A	In anodic inhibition, corrosion of a metal is minimised by forming an impermeable barrier at its surface.								
	B	In cathodic protection, corrosion of a metal is minimised by forming a contact to another metal with a higher reduction potential.								
	С	In fuel cells oxidation and reduction occur at the same electrode.								
	D	Iron corrodes in oxygen-free water.								
	Ε	Iron corrodes more rapidly in salty water because the electrochemical potential is higher.								
33.	Why	do mercury batteries and silver batteries maintain a constant voltage?	1							
	Α	They never run down.								
	B	No aqueous species appear in the equation for the overall cell reaction.								
	С	Their E° values are very high.								
	D	They are primary batteries.								
	Е	The concentrations of reagents in the half cell reactions remain approximately constant.								
34.	Usin poter	Ising the relevant half cell reduction potentials calculate the standard electrode otential for the hydrogen fuel cell.								
	A	0.83 V								
	B	1.77 V								
	С	0.68 V								
	D	2.07 V								
	Е	1.23 V								





Answers

Question	1	2	3	4	5	6	7	8	9	10
Answer	В	А	В	D	В	Е	В	С	С	D
Question	11	12	13	14	15	16	17	18	19	20
Answer	D	D	D	D	D	А	С	В	Е	В
Question	21	22	23	24	25	26	27	28	29	30
Answer	D	D	С	Е	Е	Е	С	С	В	А
Question	31	32	33	34	35	36	37	38	39	40
Answer	E	Α	В	Е	D	В	А	А	С	Е