Coaching Report

Participant	m r	**Student detail**	User_51
Group	ntc.it ats.genova.it	**Status**	Ended normally
Assessment name	Physical Chemistry 3 - EN V4	**Final Score**	1
Time Used	00:01:09	**Time limit (min)**	60
Date taken	15-09-2016 17:03:31		

Questions - presented: 30, answered: 30

1 **When the temperature of an ideal gas is quadrupled at constant pressure, the ratios (mean square speed)/(mean speed) and (mean square speed)/(most probable speed) are multiplied by**

Question type	Multiple Choice
Topic	State of Matter
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) 2
	1) 1
	2) 1/2
	3) 1/4

4) 4

2	Given that fusHm is the molar enthalpy of fusion, fusVm is the molar volume change on melting and dT is the change in temperature on melting resulting from a change in pressure by dP, which two of the following are valid ?

Question type	Multiple Response
Topic	Phase Equilibria
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) fusHm 0, fusVm 0, dP 0, dT 0
	1) fusHm 0, fusVm 0, dP 0, dT 0
	2) fusHm 0, fusVm 0, dP 0, dT 0
	3) fusHm 0, fusVm 0, dP 0, dT 0
	4) fusHm 0, fusVm 0, dP 0, dT 0

3	How many unpaired electrons are there in the ground state of the ion 24Cr2+ ?

Question type	Multiple Choice
Topic	Atomic Structure
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) 4
	1) 5

2) 3

3) 2

4	**At a certain temperature half of the gas HI is dissociated into H2(g) and I2(g). If we have initially 2mol of HI(g), the amount of substance of H2(g) at equilibrium will be**

Question type	Multiple Choice
Topic	Chemical Equilibria
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) 0.125 mol
	1) 0.25 mol
	2) 0.5 mol
	3) 1 mol
	4) 2 mol

5	**In a kinetics experiment for the thermal decomposition of C2H5Br in the gaseous phase, the plot of ln k vs. 1 / T was found to be linear, with slope equal to - 36285 K and an intercept at 1/ T = 0 equal to 41.3. If the rate constant k is expressed in s-1 and the temperature T in K, what is the activation energy of the reaction in kJmol-1 ?kJmol-1 Data: R = 8.314 Jmol-1K-1**

Question type	Numeric
Text	
Topic	Kinetics

Difficulty	1/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 301.5

6 **The Gibbs energy of a liquid may be approximated by G = G + nVm(P - P) where n is the amount of substance and G is the Gibbs energy at pressure P. Which two of the following are correct ?**

Question type	Multiple Response
Topic	Thermodynamics
Difficulty	1/3
Score	0.15
Score max	1
Answer choosen	S = 0
Answer	0) S = 0
	1) H = G
	2) S = nVmP / T
	3) S = - nVmP / T
	4) m = PVm

7 **1 mol of an ideal gas expands isothermally and reversibly at 298 K from p1 = 106 Pa to p2 = 105 Pa. What is the change in entropy of the system plus the surroundings in JK-1 ?JK-1**

Question type	Numeric

Text

Topic	Thermodynamics
Difficulty	1/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 0.0

8	**Complete the sentence: Adding a catalyst to a chemical reaction...**

Question type	Multiple Choice
Topic	Catalysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) ...changes its equilibrium constant 1) ...changes its activation energy 2) ...changes the rGof the reaction

9	**The molecularity of a reaction is**

Question type	Multiple Choice
Topic	Catalysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	the number of other species that collide
Answer	0) the number of other species that collide

1) the number of molecules that take part in the reactive collision

2) the number of molecules of the same species that take part in the collision

3) the concentration of the reactant species

4) the speed of the reactant molecules

10 **Choose the right two sentences:**

In the electrolysis of aqueous sodium chloride...

Data: $2H_2O + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$ E = - 0.828 V

$Na^+(aq) + e^- \rightarrow Na(s)$ E= - 2.71 V

$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$ E = 1.358 V

$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O$ E = 1.229 V

Question type	Multiple Response
Topic	Electrochemistry
Difficulty	1/3
Score	0.15
Score max	1
Answer choosen	chlorine gas is liberated at the anode
Answer	0) oxygen gas is liberated at the anode
	1) chlorine gas is liberated at the anode
	2) hydrogen gas is liberated at the cathode
	3) sodium metal appears at the cathode
	4) sodium metal appears at the anode

11 **An automobile headlight draws 6 A of current. The galvanic cell of a lead storage battery consumes Pb and PbO_2 as it operates. A typical electrode**

contains about 250 g of PbO2.Assuming that the battery can supply 6 A of current until all the PbO2 has been consumed, how long will it take for the battery to run down if the lights are left on after the engine is turned off ?

Question type	Multiple Choice
Topic	Electrochemistry
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) 2.3 hours
	1) 4.5 hours
	2) 9.3 hours
	3) 16.3 hours

12 The hybrid orbitals resulting from hybridization of atomic orbitals s and p may be described as

1 = A (s + p)2 = B (s - p)

Determine the normalization constant A for the hybrid orbital 2.

Question type	Multiple Choice
Topic	Molecular Structure
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	1 / 2
Answer	0) 1 / 21/2

1) 1 / 22

2) 1 / 2

3) 21/2

4) 21/2 / 2

13 **The interaction between two H2O molecules is stronger than that between two CO2 molecules. Which of the following is the best explanation ?**

Question type	Multiple Choice
Topic	Molecular Structure
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The dipole moment of H2O is bigger than that of CO2
	1) H2O is a bent molecule but CO2 is linear
	2) H is less electronegative than C
	3) H2O contains H but CO2 does not

14 **Which two of the following statements are true ? The harmonic approximation is adopted.**

Question type	Multiple Response
Topic	Spectroscopy
Difficulty	1/3
Score	0.00
Score max	1

Answer choosen	not ok
Answer	0) The vibrational energy of a diatomic molecule is proportional to (v + 1/2), where v is a quantum number 1) The vibrational energy of a diatomic molecule is proportional to (v + 1)2 2) The vibrational frequency of a diatomic molecule XY is inversely proportional to the mass of atom X 3) The vibrational frequency of XY is inversely proportional to the square root of the mass of X 4) The vibrational frequency of XY depends on k1/2, where k is a force constant 5) The fundamental vibration of nitrogen cannot be observed, as the molecule has no dipole moment

15	**In which part of the spectrum is the Balmer series of lines observed ?**

Question type	Multiple Choice
Topic	Spectroscopy
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) Visible

1) Infrared

2) Far infrared

3) Ultraviolet

16 **The plot of the inverse of the reaction rate (1 / v) for the enzyme-catalysed hydrolysis of cane sugar as a function of 1 / [S], where [S] is the substrate concentration, is linear with slope equal to 0.001 moldm-3 and intercept at 1 / [S] = 0 equal to 0.037 mm-3min. What is the Michaelis constant in moldm-3 ?moldm-3**

Question type	Numeric
Text	
Topic	Kinetics
Difficulty	2/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 0.027

17 **The reaction 2A B is second order in A and its half-life is equal to 1 min. If the initial concentration of A is 1 molkg-1, what is the rate constant in kgmol-1s-1?kgmol-1s-1**

Question type	Numeric
Text	
Topic	Kinetics
Difficulty	2/3
Score	0.0

Score max	1
Answer choosen	not ok
Answer	0) 0.0083

18 **Consider three aqueous solutions containing m molkg-1 NaCl in the first, m molkg-1 NaCl + m molkg-1 Na2SO4 in the second and 2m molkg-1 NaCl + 2m molkg-1 Na2SO4 + 2m molkg-1 ZnSO4 in the last one. The ratio of the ionic strength of the second solution to the first one is x and that of the third solution to the second one is y, where**

Question type	Multiple Choice
Topic	Electrochemistry
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) x = y = 4
	1) x = y = 2
	2) x = 4, y = 16
	3) x = 2, y = 4
	4) x = 4, y = 8

19 **At 25C a certain chemical reaction is slow, but as soon as an appropriate homogeneous catalyst is added, the reaction rate triples. What is the most likely change in activation energy of the reaction ?**

Question type	Multiple Choice
Topic	Catalysis

Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	It increases by 0.9 kJ/mol
Answer	0) It does't vary
	1) It increases by 0.9 kJ/mol
	2) It decreases by 0.9 kJ/mol
	3) It decreases by 2.7 kJ/mol
	4) It increases by 2.7 kJ/mol

20 **Consider the molecular energy-level diagrams for the diatomic molecules C2 and N2 in their respective ground states. For which molecule(s) will the bonds in the cation X2+ and in the anion X2- be of roughly equal energies ?**

Question type	Multiple Choice
Topic	Molecular Structure
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) C2
	1) N2
	2) None
	3) Both C2 and N2

21 **The molar absorptivity of chlorobenzene in n-heptane solution at 256 nm is = 1.22103m2mol-1. Calculate the concentration of chlorobenzene in a n-heptane solution if its transmission coefficient at 256 nm in a 2 cm cell is 0.296.10-5 M**

Question type	Numeric
Text	
Topic	Spectroscopy
Difficulty	2/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 2.17

22 **A solution consisting of 1.00 mol of benzene and 2.00 mol of toluene is reversibly mixed with a solution consisting of 3.00 mol of benzene and 4.00 mol of toluene, at 298.15 K and 1 bar. Assume all solutions to be ideal. Indicate which of the following is the entropy change for this process.**

Question type	Multiple Choice
Topic	Thermodynamics
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	2788 Jmol-1
Answer	0) 5576 Jmol-1
	1) 2RTln 2
	2) 2788 Jmol-1
	3) 8364 Jmol-1
	4) 1 - 1*= RTln x

23 **Consider two atoms A and B, both from the second period (Li-Ne). If A is**

substantially more electronegative than B, which two of the following statements are correct ?

Question type	Multiple Response
Topic	Atomic Structure
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The atomic radius is larger for A than for B 1) The atomic number is higher for A than for B 2) The first ionization energy (or ionization potential) is higher for A than for B 3) The effective nuclear charge, Zeff or Z*, is lower for A than for B

24 **Two operators and commute. Which of the following statements is true ?**

Question type	Multiple Response
Topic	Atomic Structure
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The eigenvalues A of and E of are identical

1) The eigenfunctions of and of are identical

2) The eigenvalues A and E have the same numerical value but opposite signs

25 **The critical volume of CH4 is 99 cm3mol-1. What is the approximate radius of its molecules if this gas obeys the van der Waals equation at the critical region ?Data: NA = 6.0221023 mol-1 nm**

Question type	Numeric
Text	
Topic	State of Matter
Difficulty	2/3
Score	0.0
Score max	1
Answer choosen	the animal non drying fats.
Answer	0) .235

26 **Two gases, A and B, are in two different vessels under conditions such that the product PV is the same for both gases. If A is an ideal gas and B is a van der Waals gas at temperature below its critical temperature (Tc = 8a / 27Rb), then the temperature of B is...**

Question type	Multiple Choice
Topic	State of Matter
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	higher or lower than that of A depending on P

Answer	0) lower than that of A 1) equal to that of A 2) higher or lower than that of A depending on P 3) higher or lower than that of A depending on V 4) higher than that of A

27 **The equilibrium constant of the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ can be expressed in terms of mole fractions (K_x). Which of the following is correct ?**

Question type	Multiple Choice
Topic	Chemical Equilibria
Difficulty	2/3
Score	0.30
Score max	1
Answer choosen	Kx is proportional to P2
Answer	0) Kx varies linearly with P 1) Kx is independent on P 2) Kx is proportional to P2 3) Kx is inversely proportional to P2 4) Kx varies linearly with 1 / P

28 **Tin exists in two crystalline forms:**

Vm / kgmol-1	**fH / KJmol-1**	**fG / KJmol-1**	**Sm / JK-1mol-1**	
Sn (white)				
0.01630	**0**	**0**	**51.55**	
Sn (grey)				
0.0206				

- 2.09

0.13

44.14

Consider the transition Sn (white) Sn (grey), and say which form of tin is more stable at high pressure.

Question type	Multiple Choice
Topic	Chemical Equilibria
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	Sn (white), because trsG is positive (0.13 kJmol-1)
Answer	0) Sn (white), because trsG is positive (0.13 kJmol-1) 1) Sn (white), because trsG is more positive at high pressure 2) Sn (grey), because trsS is negative (- 7.41 JK-1mol-1) 3) Sn (grey), because trsH is negative (- 2.09 kJmol-1)

29 **When an involatile solute is added to a solvent, the chemical potential of a solvent can be expressed as**

s(l) = s*(l) + RT ln xS

Which one of the following is correct ?

Question type	Multiple Choice
Topic	Phase Equilibria
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The solvent chemical potential in the solution is lower than in the vapour 1) The solvent chemical potential in the solution is higher than in the vapour 2) The solvent chemical potential in the solution is higher than that of the pure solvent 3) The solvent chemical potential in the solution is lower than that of the pure solvent

30 **Sea water may be modeled as an aqueous solution 0.50 m in NaCl and 0.05 in MgSO4. Assuming that sea water is an ideal solution, estimate the osmotic pressure at 298 K.**

Question type	Multiple Choice
Topic	Phase Equilibria
Difficulty	2/3
Score	0.00

Score max	1
Answer choosen	not ok
Answer	0) = 13.5 bar
	1) = 54 bar
	2) = 25 bar
	3) = 1 bar
	4) = 27 bar