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**CHEMISTRY
STANDARD LEVEL
PAPER 1**

Thursday 8 May 2008 (afternoon)

45 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The periodic table is provided for reference on page 2 of this examination paper.

The Periodic Table

1 2 3 4 5 6 7 0

Atomic Number		Element										Atomic Mass																										
1	H 1.01													2 He 4.00																								
3	Li 6.94	4	Be 9.01										5	B 10.81	6	C 12.01	7	N 14.01	8	O 16.00	9	F 19.00	10	Ne 20.18														
11	Na 22.99	12	Mg 24.31										13	Al 26.98	14	Si 28.09	15	P 30.97	16	S 32.06	17	Cl 35.45	18	Ar 39.95														
19	K 39.10	20	Ca 40.08	21	Sc 44.96	22	Ti 47.90	23	V 50.94	24	Cr 52.00	25	Mn 54.94	26	Fe 55.85	27	Co 58.93	28	Ni 58.71	29	Cu 63.55	30	Zn 65.37	31	Ga 69.72	32	Ge 72.59	33	As 74.92	34	Se 78.96	35	Br 79.90	36	Kr 83.80			
37	Rb 85.47	38	Sr 87.62	39	Y 88.91	40	Zr 91.22	41	Nb 92.91	42	Mo 95.94	43	Tc 98.91	44	Ru 101.07	45	Rh 102.91	46	Pd 106.42	47	Ag 107.87	48	Cd 112.40	49	In 114.82	50	Sn 118.69	51	Sb 121.75	52	Te 127.60	53	I 126.90	54	Xe 131.30			
55	Cs 132.91	56	Ba 137.34	57 †	La 138.91	72	Hf 178.49	73	Ta 180.95	74	W 183.85	75	Re 186.21	76	Os 190.21	77	Ir 192.22	78	Pt 195.09	79	Au 196.97	80	Hg 200.59	81	Tl 204.37	82	Pb 207.19	83	Bi 208.98	84	Po (210)	85	At (210)	86	Rn (222)			
87	Fr (223)	88	Ra (226)	89 ‡	Ac (227)																																	

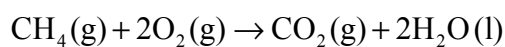
†

58	Ce 140.12	59	Pr 140.91	60	Nd 144.24	61	Pm 146.92	62	Sm 150.35	63	Eu 151.96	64	Gd 157.25	65	Tb 158.92	66	Dy 162.50	67	Ho 164.93	68	Er 167.26	69	Tm 168.93	70	Yb 173.04	71	Lu 174.97
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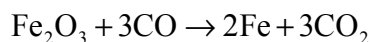
‡

90	Th 232.04	91	Pa 231.04	92	U 238.03	93	Np (237)	94	Pu (242)	95	Am (243)	96	Cm (247)	97	Bk (247)	98	Cf (251)	99	Es (254)	100	Fm (257)	101	Md (258)	102	No (259)	103	Lr (260)
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1. How many molecules are present in a 9.0 g sample of water?
- A. 0.5
B. 1.0
C. 6.0×10^{23}
D. 3.0×10^{23}
2. What volume of carbon dioxide is formed when 8 g of methane burns completely at room temperature and pressure? (1 mole of a gas occupies 24 dm^3 at room temperature and pressure.)



- A. 8 dm^3
B. 12 dm^3
C. 16 dm^3
D. 24 dm^3
3. 28 g of metal M reacted with 8 g of oxygen to form an oxide with the formula MO. What is the relative atomic mass of M?
- A. 14
B. 28
C. 56
D. 112
4. What is the maximum mass of iron that can be produced from the reduction of 80 tonnes of iron(III) oxide ($M_r = 160$), based on this equation?



- A. 28 tonnes
B. 56 tonnes
C. 84 tonnes
D. 112 tonnes

5. Which species represent a pair of isotopes?

Species	Number of protons	Number of electrons	Number of neutrons
L	12	12	12
M	13	13	13
P	13	10	13
Q	12	12	14

- A. L and M
- B. L and P
- C. P and Q
- D. L and Q
6. Bromine exists as the isotopes ^{79}Br and ^{81}Br . What is the percentage of ^{79}Br in a sample with a relative atomic mass of 79.9?
- A. 40%
- B. 45%
- C. 50%
- D. 55%
7. Which properties decrease in value when descending group 1?
- I. Atomic radius
- II. Ionization energy
- III. Electronegativity
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

8. The ionization energies of three consecutive elements in the periodic table are 1680, 2080 and 494 kJ mol⁻¹ respectively. Which of the following shows the elements with these values?
- A. O F Ne
B. F Ne Na
C. Ne Na Mg
D. Na Mg Al
9. Which substance will **not** conduct an electric current?
- A. C(s)(graphite)
B. NaF(l)
C. CaO(s)
D. KI(aq)
10. Which of the following liquids is non-polar?
- A. Water
B. Hexane
C. Propanone
D. Ethanol
11. The following substances all contain a nitrogen to nitrogen bond: N₂, N₂H₄, N₂H₂. Which shows them in **increasing** order of nitrogen to nitrogen bond length (smallest first)?
- A. N₂H₄, N₂H₂, N₂
B. N₂, N₂H₂, N₂H₄
C. N₂H₂, N₂H₄, N₂
D. N₂H₄, N₂, N₂H₂

12. Which molecules have a bond angle of 109.5° or less?
- I. NH_3
 - II. CO_2
 - III. CHCl_3
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
13. The temperature of 1 dm^3 of a gas is increased from 32°C to 64°C at constant pressure. What is the new volume in dm^3 ?
- A. 1.1
 - B. 1.3
 - C. 1.6
 - D. 2.0
14. Which statement about evaporation is correct?
- A. The liquid must be heated for evaporation to occur.
 - B. The liquid must be at its boiling point for evaporation to occur.
 - C. High energy particles leave the surface of the liquid as evaporation occurs.
 - D. The liquid becomes warmer as evaporation occurs.

15. The heat produced when 0.01 mol of ethanol was burned raised the temperature of 100 g of water by 20°C. The specific heat capacity of water is 4.2 J g⁻¹ K⁻¹.

Which is the correct expression for the magnitude of the enthalpy of combustion of ethanol in J mol⁻¹?

- A. $\frac{100 \times 4.2 \times 20}{0.01}$
- B. $\frac{100 \times 4.2 \times 0.01}{20}$
- C. $\frac{4.2 \times 20 \times 0.01}{100}$
- D. $\frac{20 \times 100 \times 0.01}{4.2}$

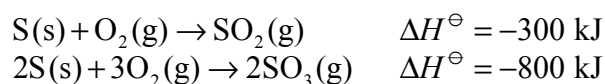
16. Which change does **not** lead to an increase in entropy?

- A. Mixing nitrogen and oxygen gases at room temperature
- B. Cooling steam so that it condenses to water
- C. Heating hexane to its boiling point
- D. Dissolving sugar in water

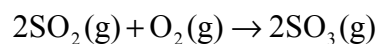
17. Which combination is correct for an endothermic reaction taking place in solution?

	ΔH	Temperature of solution
A.	+	increases
B.	+	decreases
C.	-	increases
D.	-	decreases

18. The enthalpy changes for two reactions are shown below.

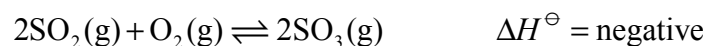


What is the enthalpy change for this reaction in kJ?



- A. -200
- B. -500
- C. -1100
- D. -1400
19. In the collision theory, what is important in determining whether a collision results in a chemical reaction?
- I. The kinetic energy of the molecules
II. The orientation of the molecules
III. The collision frequency of the molecules
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
20. Which units could be used for the rate of a chemical reaction?
- A. $\text{mol dm}^{-3} \text{ min}$
- B. $\text{mol}^{-1} \text{ min}^{-1}$
- C. $\text{dm}^3 \text{ min}$
- D. $\text{mol dm}^{-3} \text{ min}^{-1}$

21. Which change will increase the equilibrium concentration of sulfur trioxide in this reaction?



- A. Decreasing the concentration of oxygen
- B. Increasing the pressure
- C. Using a catalyst
- D. Increasing the temperature
22. Which change increases the pH of a solution from 3 to 6?
- A. Doubling the $[\text{H}^+]$
- B. Halving the $[\text{OH}^-]$
- C. Decreasing the $[\text{H}^+]$ by a factor of 1000
- D. Decreasing the $[\text{OH}^-]$ by a factor of 1000
23. Which pair of compounds, in aqueous solution, could be used to make a buffer solution?
- A. CH_3COOH and HCl
- B. HCl and NaOH
- C. HCl and NH_4Cl
- D. HCOOH and NaOH
24. In which species does chromium have an oxidation number of +3?
- A. CrO_4^{2-}
- B. $\text{Cr}_2\text{O}_7^{2-}$
- C. CrO_3
- D. $\text{Cr}(\text{OH})_3$

25. In which reaction does hydrogen act as an oxidizing agent?
- A. $\text{Ca} + \text{H}_2 \rightarrow \text{CaH}_2$
 - B. $\text{F}_2 + \text{H}_2 \rightarrow 2\text{HF}$
 - C. $\text{C}_2\text{H}_2 + \text{H}_2 \rightarrow \text{C}_2\text{H}_4$
 - D. $\text{O}_2 + 2\text{H}_2 \rightarrow 2\text{H}_2\text{O}$
26. Which of these occur during the electrolysis of molten sodium chloride?
- I. Electrons flow through the connecting wires
 - II. Molten sodium forms at the positive electrode
 - III. Reduction occurs at the negative electrode
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III
27. How many structural isomers are there with the formula C_5H_{12} ?
- A. 2
 - B. 3
 - C. 4
 - D. 5

28. Which is the correct formula of 2,3-dichloro-2-methylpentane?
- A. $\text{CH}_3\text{CCl}(\text{CH}_3)\text{CHClCH}_2\text{CH}_3$
 - B. $\text{CH}_3\text{CH}(\text{CH}_3)\text{CCl}_2\text{CH}_2\text{CH}_3$
 - C. $\text{CH}_3\text{CCl}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
 - D. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHClCHClCH}_3$
29. What type of reaction occurs when hexanedioic acid and 1,6-diaminohexane react together to form nylon?
- A. Addition
 - B. Condensation
 - C. Esterification
 - D. Substitution
30. What product results from the reaction of $\text{CH}_3\text{CH}=\text{CH}_2$ with Br_2 ?
- A. $\text{CH}_3\text{CHBrCH}_2\text{Br}$
 - B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
 - C. $\text{CH}_3\text{CHBrCH}_3$
 - D. $\text{CH}_3\text{CH}_2\text{CHBr}_2$
-