DIPLOMA   PROGRAMME

MOCK EXAMINATION

2020

Name :

CHEMISTRY

STANDARD   LEVEL

PAPER 1

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 the last page of this examination paper.**

- **The maximum mark for this examination paper is [30 marks].**

1. Which sample has the greatest mass?

A. 1 mol of SO_2

B. 2 mol of N_2O

C. 2 mol of Ar

D. 4 mol of NH_3

**2. Why do gases deviate from the ideal gas law at high pressures?**

A. Molecules have finite volume.

B. Cohesive forces increase the volume from the ideal.

C. Increasing pressure increases the temperature of the gas.

D. Collisions between molecules occur more frequently as pressure increases.

3. Which statements about the isotopes of chlorine, $^{35}_{17}Cl$ and $^{37}_{17}Cl$, are correct?

I. They have the same chemical properties.

II. They have the same atomic number.

III. They have the same physical properties.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

4. Which electron transition emits radiation of the longest wavelength?
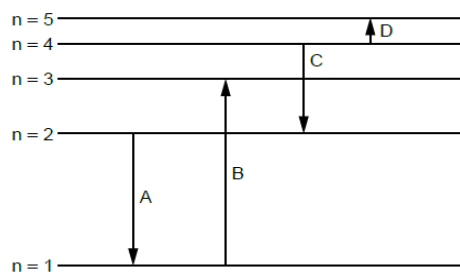
5. Which statement about the electromagnetic spectrum is not correct?

A. The wavelength of ultraviolet radiation is shorter than infrared radiation.

B. The frequency of visible radiation is higher than the frequency of ultraviolet radiation.

C. The energy of infrared radiation is lower than the energy of ultraviolet radiation.

D. Wavelength is inversely proportional to frequency.

6. **In which mixture is NaOH the limiting reagent?**

   A.   0.20 mol NaOH + 0.10 mol H_2SO_4

   B.   0.10 mol NaOH + 0.10 mol H_2SO_4

   C.   0.20 mol NaOH + 0.10 mol HNO_3

   D.   0.10 mol NaOH + 0.10 mol HNO_3

7. **Which element is a metalloid?**

   A. Co

   B. As

   C. Cs

   D. Es

8. **Which statements about atomic structure and the periodic table are correct?**

I. An element in group 2 has 2 electrons in its valence (outer) energy level.

II. An element in period 3 has electrons in 3 energy levels.

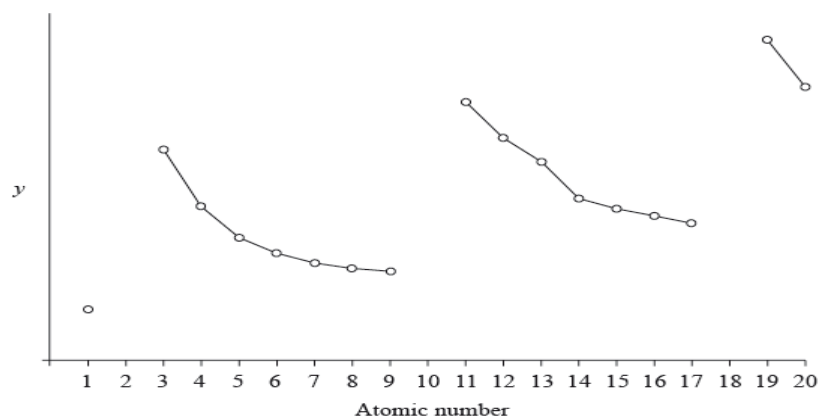**III. The element in group 2 and period 3 has an atomic number of 12.**

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

9. **Which solution forms when phosphorus(V) oxide, P_4O_{10}, reacts with water?**

3

	Product	pH of solution
A.	H_3PO_3	< 7
B.	H_3PO_3	> 7
C.	H_3PO_4	< 7
D.	H_3PO_4	> 7

10. Which physical property of elements is represented by y on the graph below?

A. First ionization energy

B. Ionic radius

C. Atomic radius

D. Electronegativity

11. What are the correct formulas of the following ions?

	Nitrate	Phosphate	Carbonate	Ammonium
A.	NO_3^-	PO_4^{3-}	CO_3^-	NH_3^+
B.	NO_3^{2-}	PO_3^{2-}	CO_3^{2-}	NH_3^+
C.	NO_3^-	PO_4^{3-}	CO_3^{2-}	NH_4^+
D.	NO_3^{2-}	PO_3^{2-}	CO_3^{2-}	NH_4^+

12. **The formula of gallium phosphate is** $GaPO_4$. **What is the correct formula of gallium sulfate?**

A. $GaSO_4$

B. GaS

C. $Ga_2(SO_4)_3$

D. Ga_2S_3

13. **Which substance can form intermolecular hydrogen bonds in the liquid state?**

A. CH_3OCH_3

B. CH_3CH_2OH

C. CH_3CHO

D. $CH_3CH_2CH_3$

14. Which substance is made up of a lattice of positive ions and free moving electrons?

A. Graphite

B. Sodium chloride

C. Sulfur

D. Sodium

15. **5.35g of solid ammonium chloride, NH₄Cl(s), was added to water to form 25.0g of solution. The maximum decrease in temperature was 14 K. What is the enthalpy change, in kJmol⁻¹, for this reaction?** (Molar mass of NH₄Cl = 53.5gmol⁻¹; the specific heat capacity of the solution is 4.18 Jg⁻¹K⁻¹)

A. $\Delta H = +\dfrac{25.0 \times 4.18 \times (14+273)}{0.1 \times 1000}$

B. $\Delta H = -\dfrac{25.0 \times 4.18 \times 14}{0.1 \times 1000}$

C. $\Delta H = +\dfrac{25.0 \times 4.18 \times 14}{0.1 \times 1000}$

D. $\Delta H = +\dfrac{25.0 \times 4.18 \times 14}{1000}$

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16. A simple calorimeter was set up to determine the enthalpy change occurring when one mole of ethanol is combusted. The experimental value was found to be -867 kJ mol^{-1}. The Data Booklet value is $-1367 \text{ kJ mol}^{-1}$ (at 298 K and 1.01×10^5 Pa).

During the experiment some black soot formed.

Which statements are correct?

I. The percentage error for the experiment can be calculated as follows:

$(1367 - 867) \times 100\%$

II. The difference between the two values may be due to heat loss to the surroundings.

III. The black soot suggests that incomplete combustion occurred.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

17. Which combination is correct about the energy changes during bond breaking and bond formation?

	Bond breaking	Bond formation
A.	exothermic	exothermic
B.	exothermic	endothermic
C.	endothermic	exothermic
D.	endothermic	endothermic

18. **Copper catalyses the reaction between zinc and dilute sulfuric acid.**

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

Why does copper affect the reaction?

A. Decreases the activation energy

B. Increases the activation energy

C. Increases the enthalpy change

D. Decreases the enthalpy change

19. **What is the effect of increasing temperature on the equilibrium?**
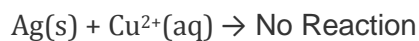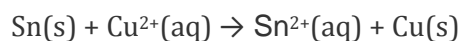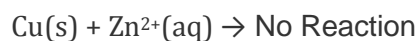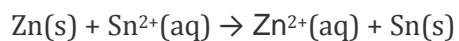
$$ClNO_2(g) + NO(g) \rightleftharpoons ClNO(g) + NO_2(g) \qquad \Delta H^\circ = -18.4\,kJ$$
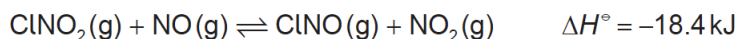
	Position of equilibrium	K_c
A.	moves to left	decreases
B.	moves to left	no change
C.	moves to right	no change
D.	moves to right	increases

20. **Which is correct for the chromium isotope $_{24}^{53}Cr$?**

A. 24 neutrons and 53 nucleons

B. 24 protons and 29 nucleons

C. 24 protons and 29 neutrons

D. 24 electrons and 53 neutrons

21. **What is the order of decreasing reactivity of the metals (most reactive first)?**

$Zn(s) + Sn^{2+}(aq) \rightarrow Zn^{2+}(aq) + Sn(s)$

$Cu(s) + Zn^{2+}(aq) \rightarrow No\ Reaction$

$Sn(s) + Cu^{2+}(aq) \rightarrow Sn^{2+}(aq) + Cu(s)$

$Ag(s) + Cu^{2+}(aq) \rightarrow No\ Reaction$

A. Zn > Cu > Sn > Ag

B. Sn > Zn > Ag > Cu

C. Ag > Cu > Zn > Sn

D. Zn > Sn > Cu > Ag

22. **Which electron configuration is correct for the Ca ion, Ca^{2+}?**

A. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

B. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$

C. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^4$

D. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6$

23. **Element X is in Group I of the Periodic Table. X reacts with element Y to form an ionic compound.**

Which equation shows the process that takes place when X forms ions?

A $X + e- \rightarrow X+$

B $X - e- \rightarrow X-$

C $X + e- \rightarrow X-$

D $X - e- \rightarrow X+$

24. **In athletics, banned drugs such as nandrolone have been taken illegally to improve performance.**
Nandrolone has the molecular formula $C_{18}H_{26}O_2$.
What is the relative molecular mass, M_r, of nandrolone?
(Relative atomic mass: H = 1; C = 12; O = 16)
A 46

B 150

C 274

D 306

8

25. **Which periodic trend is described correctly?**

	Trend in	Down the group (top to bottom)	Across the period (left to right)
A.	atomic radius	increases	increases
B.	ionic radius	decreases	increases
C.	first ionization energy	decreases	decreases
D.	electronegativity	decreases	increases

26. **Which of the following are van der Waals' forces?**

I.   Dipole-dipole forces
II.   Hydrogen bonds
III.   London (dispersion) forces

    A. I and II only
    B. I and III only
    C. II and III only
    D. I, II and III

27. **Some white anhydrous copper(II) sulfate powder is put into a beaker of water and stirred.**

What would show that the process was exothermic?

A A blue solution is formed.

B The beaker feels cooler.

C The beaker feels warmer.

D The powder dissolves in the water.

28. **Which species are produced at each electrode during the electrolysis of molten lead(II) bromide, $PbBr_2(l)$?**

	Negative electrode (cathode)	Positive electrode (anode)
A.	$Br^-(l)$	$Pb^{2+}(l)$
B.	$Pb^{2+}(l)$	$Br^-(l)$
C.	$Br_2(g)$	$Pb(l)$
D.	$Pb(l)$	$Br_2(g)$

29. **Which statement is correct for a voltaic but not for an electrolytic cell?**

  A. An electrolyte is required.

  B. The anode is where oxidation occurs.

  C. Ions move in the electrolyte.

  D. Electrons flow from the negative electrode to the positive electrode.

30. **Which are appropriate units for the rate of a reaction?**

A. $\mathrm{mol\ dm^{-3}s^{-1}}$

B. $\mathrm{mol\ dm^{-3}s}$

C. $\mathrm{mol\ dm^{-3}}$

D. s