FUKIEN SECONDARY SCHOOL

S5 Final Examination (2020-2021)

Chemistry Paper 1

(2 hours 30 minutes)

Date: 17th June 2021 Name:_____

Time: 8:30a.m. - 11:00a.m. Class: _____ No.:_____

GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 45 minutes.
2. Section A consists of multiple-choice questions in this question paper, while Section B contains conventional questions printed separately in Question-Answer Book **B**.
3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book for Section B will be collected separately at the end of the examination.**
4. A Periodic Table is printed on the back of Question-Answer Book **B**. Atomic numbers and relative atomic masses of elements can be obtained from the Periodic Table.
5. The total mark of the paper is 120.

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. Write your name, class and class number in the spaces provided.
2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF SECTION A'** after the last question.
3. All questions carry equal marks.
4. **ANSWER ALL QUESTIONS.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
6. No marks will be deducted for wrong answers.

This section consists of two parts. There are 24 questions in PART I and 12 questions in PART II.

Choose the best answer for each question.

Candidates may refer to the Periodic Table printed on the back of Question-Answer Book B.

Part I

1. Which of the following statements concerning beryllium is correct?

   A. Each beryllium atom contributes four electrons in metallic bond formation.

   B. Beryllium is the most reactive alkaline earth metal.

   C. Beryllium exists as liquid at room temperature and pressure.

   D. Beryllium forms a covalent compound with chlorine.

2. Which of the following statements concerning calcium chloride solution is INCORRECT?

   A. It gives a brick-red flame in the flame test.

   B. It can be prepared by the neutralization of calcium oxide with hydrochloric acid.

   C. It reacts with aqueous ammonia to give a white precipitate.

   D. It reacts with dilute sulphuric acid to give a white suspension.

3. A sample of element M consists of three isotopes, ^{78}M, ^{79}M and ^{80}M. The ratio of the relative abundance of ^{78}M to ^{79}M is 1 : 2. Given that the relative atomic mass of element M is 78.8, what is the relative abundance of ^{78}M?

   A. 10%

   B. 30%

   C. 60%

   D. 90%

4. A hydrocarbon undergoes complete combustion in oxygen to give 13.2 g of carbon dioxide and 5.4 g of water. What is the empirical formula of the hydrocarbon?
(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0)

A. CH

B. CH_2

C. CH_3

D. C_3H_8

5. The following table shows the results of two experiments on metals X, Y and Z, and their oxides.

Experiment	X	Y	Z
Action of metal on zinc nitrate solution	no observable change	colourless gas bubbles evolve; a silvery grey solid forms	no observable change
Action of heat on metal oxide	a solid with metallic lustre forms	no observable change	no observable change

Which of the following shows the decreasing order of reactivity of the three metals?

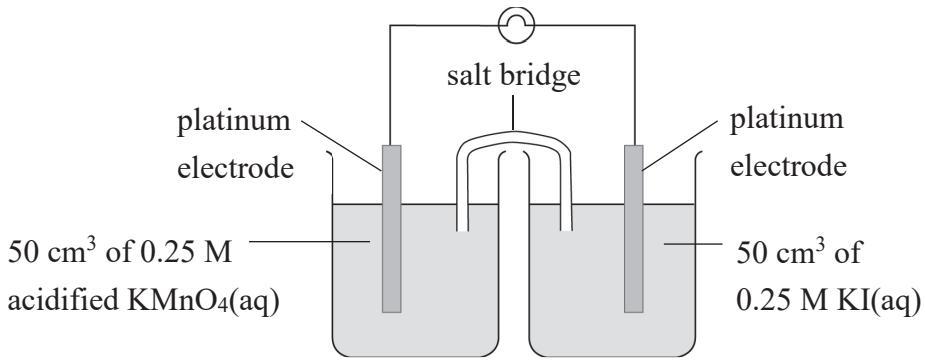
A. Y > Z > X

B. Z > Y > X

C. Y > X > Z

D. X > Z > Y

6. Consider the following chemical cell:



When the cell has been operating for some time, the concentration of $KMnO_4(aq)$ drops by 0.01 M. What is the concentration of KI(aq) at that time?

A. 0.05 M

B. 0.15 M

C. 0.20 M

D. 0.24 M

7. W

\hich of the following molecules is planar?

A. CF_4

B. NCl_3

C. SF_6

D. SCl_2

8. If 64 g of oxygen gas contains N atoms, how many atoms does 64 g of sulphur dioxide gas contain? (Relative atomic masses: O = 16.0, S = 32.0)

   A. N

   B. 2N

   C. $\frac{3}{4}$ N

   D. $\frac{4}{3}$ N

9. Which of the following pairs of molecules can form hydrogen bonds with each other?

   A. CH_3CH_2F 和 CH_3CH_2OH

   B. $CH_3CH_2NH_2$和 CH_3CH_2Cl

   C. CH_3CHO 和 $HCOOCH_3$

   D. CH_3COCH_3和 CH_3CHO

10. Which of the following standard enthalpy changes CANNOT be determined directly from experiment?

    A. Standard enthalpy change of combustion of hexane

    B. Standard enthalpy change of formation of ethanoic acid

    C. Standard enthalpy change of formation of sodium oxide

    D. Standard enthalpy change of combustion of ethanol

11. 20 cm^3 of 0.30 M $LSO_4(aq)$ is mixed with 180 cm^3 of 0.10 M $L_3(PO4)_2$. What is the concentration of $L^{2+}(aq)$ in the resultant solution?

    A. 0.06 M

    B. 0.12 M

    C. 0.30 M

D. 0.40 M

12. Which of the following statements concerning petroleum is INCORRECT?

A. It formed from ancient marine organisms.

B. It is a mixture of hydrocarbons.

C. It is a non-renewable energy source.

D. It is rich in alkenes.

13. 1.47 g of an acid (relative molecular mass = 102.0) is dissolved completely in 25.0 cm^3 of distilled water. This solution requires 28.80 cm^3 of 0.50 M potassium hydroxide solution for complete neutralization. What is the basicity of the acid?

A. 1

B. 2

C. 3

D. 4

14. Which of the following pairs of substances can be distinguished by using acidified potassium dichromate solution?

A. Hex-1-ene and hept-1-ene

B. Magnesium nitrate solution and calcium nitrate solution

C. Cyclohexane and cyclohexanol

D. Polystyrene and polyvinyl chloride

Directions: Questions 15 and 16 refer to cyanidation of gold, which is involved in gold extraction. Gold in gold ore can dissolve in water in the presence of sodium cyanide and oxygen. The chemical equation of the cyanidation is shown below:

$$xAu(s) + yNaCN(aq) + O_2(g) + zH_2O(l) \rightarrow xNaAu(CN)_2(aq) + xNaOH(aq)$$

15. Which of the following combinations is correct?

	x	y	z
A.	4	8	2
B.	2	4	4
C.	4	4	2
D.	2	8	4

16. Which of the following statements concerning the cyanidation are correct?

(1) The oxidation number of Au in $NaAu(CN)_2$ is +1.

(2) This is a redox reaction.

(3) The oxidation number of Na remains unchanged.

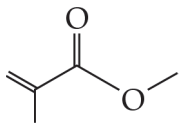
A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

17. Consider the following carbon compound:



Which of the following statements concerning the carbon compound are correct?

(1) It can undergo addition polymerization.

(2) It can be used to produce polyester.

(3) It can decolorize acidified potassium permanganate solution.

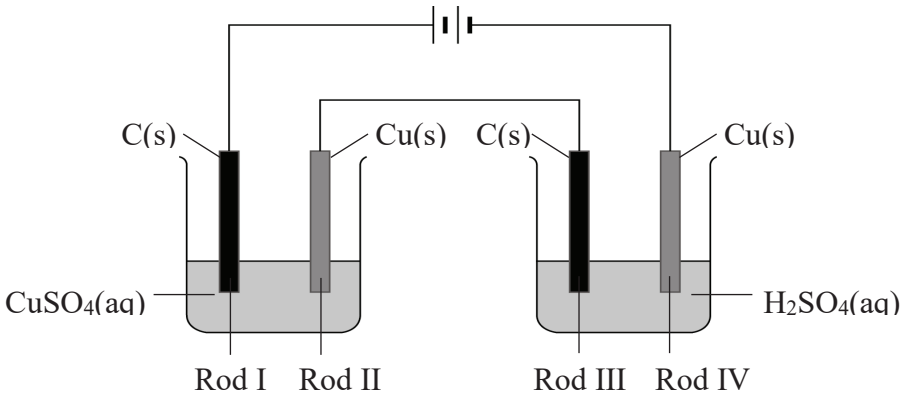
A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

18. Consider the following electrolytic cells:



Which of the following observations can be made during electrolysis?

(1) The colour intensity of $CuSO_4(aq)$ decreases.

(2) Colourless gas bubbles form on Rod III.

(3) Rod IV becomes thicker.

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

19. Consider two monobasic acids A and B. A 1 M solution of acid A has a pH of 1 and a 1 M solution of acid B has a pH of 2. Which of the following statements is/are correct?

(1) A is a stronger acid than B.

(2) B is a stronger acid than A.

(3) The concentration of hydrogen ions in A is 10 times greater than that in B.

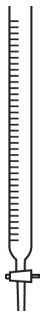
A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

20. The diagram below shows a burette used in the school laboratory.



Which of the following statements concerning the use of burette in a titration experiment is/are correct?

(1) A burette can hold exactly 50.00 cm^3 of solution only.

(2) A burette should be rinsed with distilled water and then with the titrant.

(3) The jet of burette should be filled with the titrant before titration.

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

21. Which of the following statements concerning quartz is/are correct?

(1) Quartz contains delocalized electrons.

(2) All atoms in quartz are held together by strong covalent bonds.

(3) Quartz sublimes at high temperatures.

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

22. Which of the following hazard warning labels should be displayed on a bottle of alcohol-based hand sanitizer?

(1) 

(2) 

(3) 

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

23. In an investigation, two magnesium pellets are added to two acid solutions separately. The initial temperatures of the acid solutions are both 25°C.

Experiment 1	80 cm^3 of 2.0 M HCl and 0.5 g of Mg
Experiment 2	60 cm^3 of 1.5 M HCl and 0.5 g of Mg

Which of the following statements concerning the two experiments are correct?

(Relative atomic mass: Mg = 24.3)

(1) Magnesium is the limiting reactant in both experiments.

(2) The heat released in Experiment 1 and that in Experiment 2 are equal.

(3) The reaction mixture in Experiment 1 can reach a higher temperature.

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

24. Consider the following statements and choose the best answer:

1st statement	2nd statement
Copper metal can be extracted by heating copper(II) oxide in air.	Nitrogen in air reduces copper(II) oxide to copper.

A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.

B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.

C. The 1st statement is false but the 2nd statement is true.

D. Both statements are false.

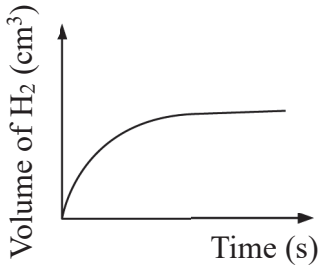
END OF PART I

Part II

25. 5.0 g of zinc dust is allowed to react with 20 cm^3 of 1.0 M HCl(aq).

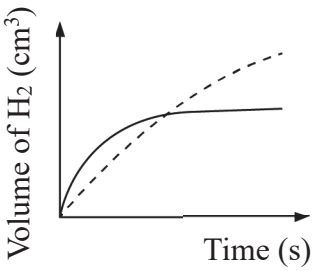
$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

The volume of hydrogen produced is recorded during the reaction. The result obtained is shown in the graph below.

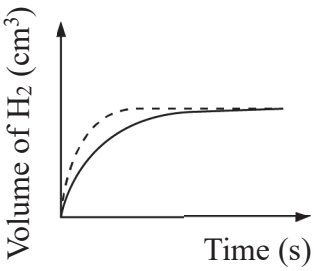


Which of the following graphs correctly shows the result obtained if 20 cm^3 of 1.0 M $H_2SO_4(aq)$ is used in place of 20 cm^3 of 1.0 M HCl(aq)?
(Relative atomic mass: Zn = 65.4)

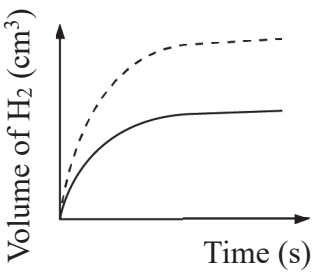
A.



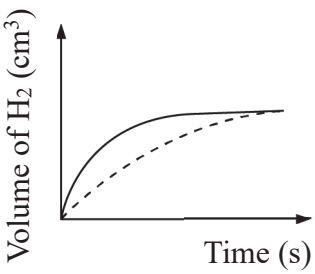
B.



C.



D.



26. Which of the following correctly shows the oxides of some Period 3 elements arranged in decreasing order of melting point?

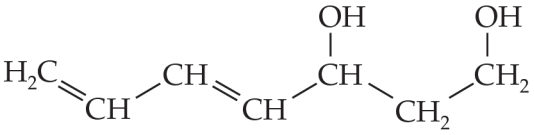
A. $SiO_2 > Na_2O > P_4O_{10} > SO_2$

B. $SiO_2 > Na_2O > SO_2 > P_4O_{10}$

C. $Na_2O > SiO_2 > P_4O_{10} > SO_2$

D. $Na_2O > SiO_2 > SO_2 > P_4O_{10}$

27. What is the systematic name of the following compound?



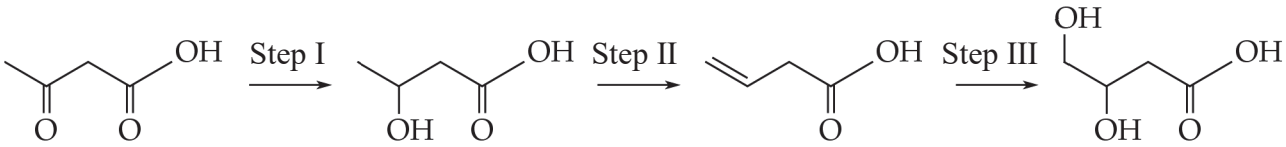
A. Hexa-4,6-dien-1,3-diol

B. Hepta-4,6-dien-1,3-diol

C. Hexa-1,3-dien-5,7-diol

D. Hepta-1,3-dien-5,7-diol

28. Consider the following conversions:



Which of the following combinations of steps is correct?

	Step I	Step II	Step III
A.	$LiAlH_4$, dry ether; then $H^+(aq)$	NaOH(aq), heat	$K_2Cr_2O_7(aq)/H^+(aq)$, heat
B.	$LiAlH_4$, dry ether; then $H^+(aq)$	Conc. H_2SO_4, heat	$K_2Cr_2O_7(aq)/H^+(aq)$, heat
C.	$NaBH_4(aq)$	Al_2O_3, heat	cold dilute $KMnO_4(aq)/H^+(aq)$

D. $NaBH_4(aq)$ Conc. H_2SO_4, heat $NaOH(aq)$, heat

29. Which of the following statements about the conversion of propanamide to propan-1-ol are correct?

(1) The minimum number of steps for the conversion is three.

(2) A carboxylic acid is one of the intermediate compounds.

(3) Lithium aluminium hydride is one of the reagents for the conversion.

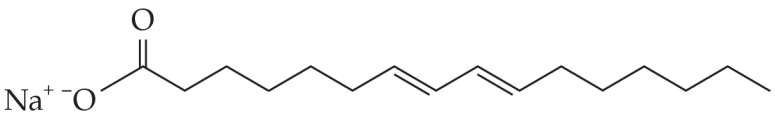
A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

30. The structure of a detergent particle is shown below.



Which of the following statements concerning the detergent is INCORRECT?

A. It can reduce the surface tension of water.

B. It is a soapless detergent.

C. It can be produced by alkaline hydrolysis of vegetable oil.

D. It can undergo catalytic hydrogenation.

31. Which of the following statements concerning Al_2O_3 and $Zn(OH)_2$ are correct?

(1) They both react with HCl(aq).

(2) They both react with NaOH(aq).

(3) They are both insoluble in water.

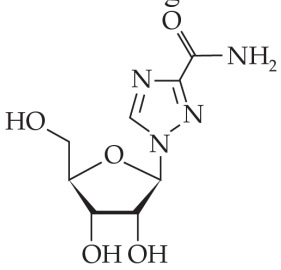
A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

32. Ribavirin is a drug used for treating SARS in 2003. Its structure is shown below.



Which of the following statements concerning ribavirin is/are correct?

(1) There are two chiral carbon atoms in it.

(2) It undergoes esterification when heated with a carboxylic acid and a catalyst.

(3) It undergoes acid hydrolysis with a dilute acid to form an alkylammonium ion.

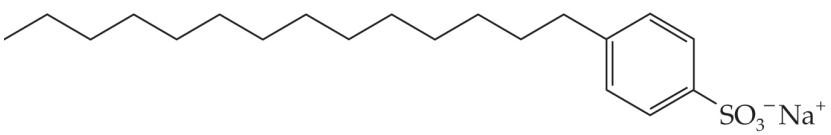
A. (1) only

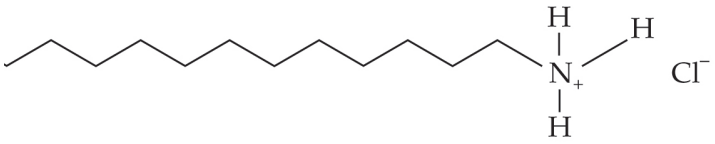
B. (2) only

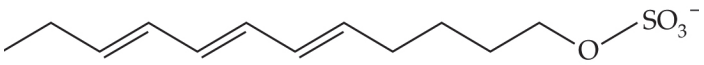
C. (1) and (3) only

D. (2) and (3) only

33. Which of the following compounds can be used as active ingredients of detergents?

(1) 

(2) 

(3) 

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

34. Consider the following reaction:

$3T(g) + 2U(g) \rightarrow V(g)$

90 cm^3 of T(g) reacts with 50 cm^3 of U(g) and all gas volumes are measured at 298 K and 1 atm. Which of the following statements concerning the reaction are correct?

(Molar volume of gas at room temperature and pressure = 24 $dm^3\ mol^{-1}$)

(1) The volume of the resultant gaseous mixture is 25 cm^3.

(2) The number of moles of gases in the reaction system decreases.

(3) At start, the number of moles of T is 3.75×10^{-3} mol.

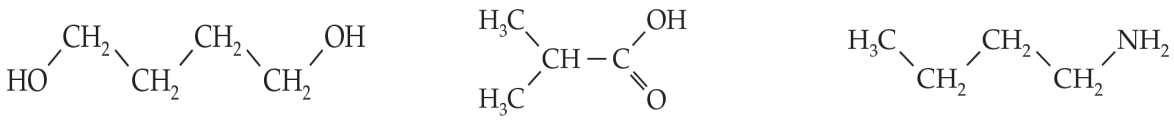
A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

35. The figure shown below is the decreasing order of boiling points of compound P, Q and R.



P > Q > R

Which of the following statements are the correct explanations for the above order of boiling points?

(1) The molecules of P form more hydrogen bonds than the molecules of Q.

(2) Comparing with the molecules of P, the molecular shape of Q results in weaker van der Waals' forces between its molecules.

(3) The molecules of Q form more hydrogen bonds than the molecules of R.

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

36. Consider the following statements and choose the best answer:

1st statement	2nd statement
The progress of the reaction between acidified potassium permanganate solution and sodium sulphite solution can be followed by using a colorimeter.	As the reaction proceeds, the concentration of purple permanganate ions decreases.

A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.

B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.

C. The 1st statement is false but the 2nd statement is true.

D. Both statements are false.