SAMPEL PERCUMA

Soalan Sebenar STPM 2021 Kimia Semester 1 (962/1(U1) 2020, 962/1 2021)

Set penuh: Kertas Percubaan STPM

Sem 1 · Kimia

Sampel ini: 7 muka surat. Set penuh ada:

- 3 fail PDF
- Semester 1: kertas percubaan (trial) negeri, subjek yang dipilih + skema
- Blueprint 30 hari Semester 1 (setiap subjek)
- Semester 3: percubaan 2024, 10 subjek, banyak negeri, soalan + skema dalam satu fail

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962/1(U1) 2020 STPM
962/1 2021

SIJIL TINGGI PERSEKOLAHAN MALAYSIA

CHEMISTRY

KERTAS 1 (ULANGAN 1) 2020 DAN KERTAS 1 2021

MAJLIS PEPERIKSAAN MALAYSIA
(MALAYSIAN EXAMINATIONS COUNCIL)

1 Hour 30 Minutes

Instructions to candidates:

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE ALLOWED TO DO SO.

Answer **all** *questions in Section A.*

Answer **all** *questions in Section B.*

Answer **two** *questions only in Section C.*

All working should be shown. For numerical answers, units should be quoted wherever appropriate.

Answers may be written either in English or Malay.

Fill in your personal details on page 11.

Arahan kepada calon:

JANGAN BUKA KERTAS SOALAN INI SEHINGGA ANDA DIBENARKAN BERBUAT DEMIKIAN.

Jawab **semua** *soalan dalam Bahagian A.*

Jawab **semua** *soalan dalam Bahagian B.*

Jawab **dua** *soalan sahaja dalam Bahagian C.*

Semua kerja hendaklah ditunjukkan. Bagi jawapan berangka, unit hendaklah dinyatakan di mana-mana yang sesuai.

Jawapan boleh ditulis dalam bahasa Inggeris atau bahasa Melayu.

Isi maklumat diri anda pada halaman 11.

This question paper consists of 18 printed pages and 2 blank pages.
(Kertas soalan ini terdiri daripada 18 halaman bercetak dan 2 halaman kosong.)

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Section A [15 *marks*]

Answer **all** *questions.*

Indicate the correct answer on the Multiple-choice Answer Sheet provided.

1 In an experiment, 10 cm^3 of gas *W* requires 30 cm^3 of O_2 for a complete combustion. Both gases are at the same temperature and pressure. What is the molecular formula of gas *W*?

A CO **B** C_2H_4 **C** C_3H_6 **D** CH_3CHO

2 In one hydrogen atom, an electron is at the energy level $n = 4$. Which is true about the hydrogen atom?

A The hydrogen atom is in the ground state.

B The electronic configuration of the hydrogen atom is $1s^1$.

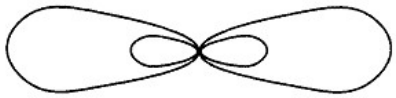
C The electron forms the third line in the Lyman series.

D The electron forms a red line in the emission spectrum.

3 Which atom has the most number of unpaired electrons in the ground state?

A Cr **B** Mn **C** Ni **D** As

4 Two orbitals are shown in the diagram below.



What is represented by both orbitals?

A *s* orbital **B** *p* orbital **C** *sp* orbital **D** sp^2 orbital

5 $SOCl_2$ is a chlorinating agent. Which statement is true about the chlorinating agent?

A $SOCl_2$ is a non-polar molecule.

B $SOCl_2$ has a trigonal planar.

C The bond angle of $SOCl_2$ is 109.5°.

D The sulphur atom in $SOCl_2$ uses sp^3 hybridised orbitals.

6 Which phenomenon is **not** affected by hydrogen bond?

A Ice has lower density than water.

B HF has higher boiling point than HCl.

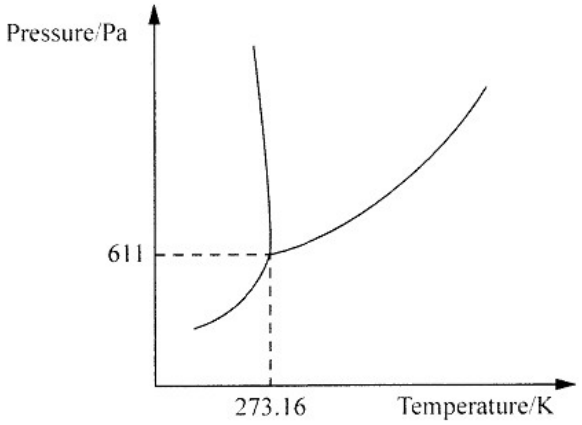
C 2-Nitrophenol is more volatile than 4-nitrophenol.

D The boiling point of alcohol increases when the relative molecular mass increases.

7 Which property of graphite does **not** correspond correctly to its uses?

	Property	*Uses*
A	Inert	Electrode
B	Slippery	Lubricant
C	Good electrical conductor	Neutron moderator in nuclear reactors
D	High melting point	Furnace lining

8 A phase diagram of H_2O is shown below.



Which is true about the above phase diagram?

A An increase in pressure will decrease the freezing point of H_2O.

B An increase in pressure will decrease the boiling point of H_2O.

C Ice sublimes at a pressure higher than 611 Pa.

D H_2O exists as liquid at 611 Pa and 298 K.

9 The reaction equation between Br_2 and HCOOH is given below.

$$Br_2(aq) + HCOOH(aq) \longrightarrow 2HBr(aq) + CO_2(g)$$

The rate of disappearance of Br_2 at 50 s is 3.52×10^{-5} mol dm^{-3} s^{-1}. Which is true about the reaction?

A The rate of formation of HBr at 50 s is 7.04×10^{-5} mol dm^{-3} s^{-1}.

B The rate of disappearance of Br_2 at 100 s is 7.04×10^{-5} mol dm^{-3} s^{-1}.

C The concentration of HCOOH decreases by 3.52×10^{-3} mol dm^{-3}.

D The concentrations of reactants and products remain unchanged at equilibirum.

10 A student carries out a series of experiments to study the kinetic of the reaction,

$$X + Y \longrightarrow Z.$$

The data of the experiment at 360 K is given in the table below.

Experiment	$[X]$/mol dm^{-3}	$[Y]$/mol dm^{-3}	*Initial rate*/mol dm^{-3} s^{-1}
1	0.10	0.50	0.053
2	0.20	0.30	0.127
3	0.30	0.40	p
4	0.40	0.30	0.509

Which is **not** true about the kinetic of the reaction?

A The reaction is second order with respect to X.

B The overall reaction is second order.

C The rate constant of the reaction is 10.6 dm^6 mol^{-3} s^{-1}.

D The value of p is 0.38 mol dm^{-3} s^{-1}.

11 The equation of a reaction is given below.

$$P + Q \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} R + S \qquad \Delta H = \text{negative}$$

What would happen if a catalyst is added to the reaction?

A The entalphy change becomes more negative.

B The ratio of $\frac{k_1}{k_{-1}}$ increases.

C The yield of R and S increases.

D The activation energy decreases.

12 The equation for the reaction between hydrogen and bromine is given below.

$$H_2(g) + Br_2(g) \rightleftharpoons 2HBr(g) \qquad \Delta H = -72.4 \text{ kJ}$$

Which statement is true about the reaction?

A A catalyst increases the value of ΔH.

B The equilibrium position shifts to the right at lower pressure.

C The value of K_c increases with temperature.

D The values of K_c and K_p are equal.

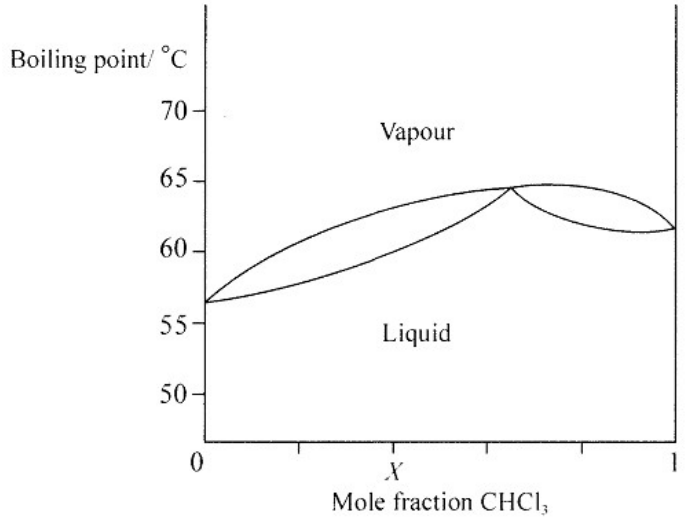
13 A mixture of 2.0 mol SO_2 and 1.0 mol O_2 reacts in the presence of a solid catalyst in a closed vessel at 1110 K and 9.0 kPa. The equation of the reaction is given below.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

If at equilibrium, 0.67 mol of SO_2 is converted to SO_3, what is the value of K_p for the reaction?

A 0.11 kPa^{-1} **B** 0.22 kPa^{-1} **C** 0.33 kPa^{-1} **D** 9.0 kPa^{-1}

14 The liquid-vapour phase diagram for a mixture of $CHCl_3$ and CH_3COCH_3 is shown below.



Which is true about the phase diagram?

A The mixture shows positive deviation from Raoult's law.

B The volume of the mixture is greater than the total volume of pure liquids.

C The forces of attraction in pure liquids are weaker than that of in the mixture.

D The product of the fractional distillation for the mixture at composition X is pure $CHCl_3$.

15 The composition of 96% ethanol and 4% of water made up an azeotropic mixture. Which procedure should be used to obtain an absolute ethanol from the mixture?

A The mixture is repeatedly distilled.

B The mixture is fractionally distilled.

C The mixture is added with excess calcium oxide.

D The mixture is separated using a separating funnel.

Section B [15 *marks*]

Answer **all** *questions.*

Write the answers in the spaces provided.

16 A reaction between 8.3 g of an impure sample of barium peroxide, BaO_2 with 1.0 dm^3 of dilute sulphuric acid, H_2SO_4, produces hydrogen peroxide, H_2O_2, solution. The solution is filtered. Then, 24.85 cm^3 of a solution containing 3.0 g of potassium manganate(VII) in 1.0 dm^3 of water is required to complete the reaction with 25 cm^3 of the filtered product.

(*a*) Write a chemical equation for the reaction between BaO_2 and dilute H_2SO_4. [1]

.....

(*b*) The reaction between the manganate(VII) ion and the H_2O_2 is given below. [3]

$$2MnO_4^- + 5H_2O_2 + 6H^+ \longrightarrow 2Mn^{2+} + 8H_2O + 5O_2$$

Calculate the concentration of H_2O_2 in mol dm^{-3}.

(*c*) Calculate the percentage purity of BaO_2 in the sample. [3]

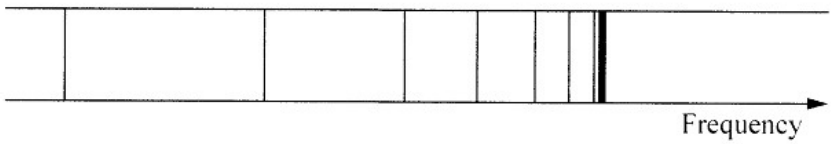
Please tear off along the perforated line.

Section C [30 *marks*]

Answer **two** *questions only.*

You may answer all the questions **but**, *only the first* **two** *answers will be marked. Write the answers on the answer sheets provided. Begin each answer on a new page of the answer sheet.*

18 (*a*) The Lyman series of emission spectrum of hydrogen atom is shown in the diagram below.



Draw an energy level diagram to show transitions of electrons for the first four lines of Lyman series which emit light of high energies. On the energy level diagram, indicate the transition of electron which emits light with the shortest wave length. Explain your answer. [6]

(*b*) Explain how electrons are filled in the orbitals of a sulphur atom by using Aufbau principle, Pauli exclusion principle and Hund's rule. [5]

(*c*) Calcium, chromium and cobalt are elements of Period 4 of the Periodic Table. Write the valence electronic configuration of the three elements. State **two** elements which are present in the same block. [4]

19 A mixture of 1.25 g nitrogen and 1.75 g krypton gas is placed in a 0.50 dm^3 flask at 45 °C.

(*a*) Calculate the total pressure in the flask and determine which gas would exert greater partial pressure. Explain your answer. [7]

(*b*) Sketch a graph to show how each gas affects the distribution of molecular speeds. [3]

(*c*) Which gas deviates the most from the ideal gas behavior at low temperature and high pressure? Explain your answer. [5]

20 (*a*) H_2O_2 decomposes to O_2 and H_2O. The rate equation for the decomposition of H_2O_2 at 50 °C is rate = $k[H_2O_2]$, where $k = 1.8 \times 10^{-5}\ s^{-1}$. The equation which relates the rate constant with the activation energy is $k = 4.8 \times 10^8 e^{-Ea/RT}$.

[Gas constant, R is 8.31 J K^{-1} mol^{-1}]

Calculate

(i) the half-life of H_2O_2 at 50 °C, [4]

(ii) the activation energy of the decomposition of H_2O_2 at 50 °C. [3]

(*b*) The rate equation for the decomposition of H_2O_2 in the presence of I^- is rate = $k[H_2O_2][I^-]$.

(i) Explain the role of I^- in the decomposition of H_2O_2. [6]

(ii) Compare the amount of O_2 obtained from the decomposition of H_2O_2 in the presence and absence of I^-. [2]

TAMAT SAMPEL

Suka sampel ini?

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