SAMPEL PERCUMA

Modul G-CAKNA STPM 2021 Kimia Semester 1 (Set 2)

Set penuh: Kertas Percubaan STPM

Sem 1 · Kimia

Sampel ini: 8 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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Sampel bermula di muka surat sebelah

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(Nombor kad pengenalan) (Nombor pusat/angka giliran)

962/1 STPM 2021

MODUL G-CAKNA

CHEMISTRY 1 (KIMIA)
SET 2
One and a half hours (Satu jam setengah)

SIJIL TINGGI PERSEKOLAHAN MALAYSIA
(MALAYSIA HIGHER SCHOOL CERTIFICATE)

Instructions to candidates:
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.
There are **fifteen** *questions in Section A. For each question, four choices of answers are given. Choose* **one** *correct answer and indicate it on the Multiple-choice Answer Sheet provided. Read the instructions on the Multiple-choice Answer Sheet very carefully. Answer* **all** *questions. Marks will not be deducted for wrong answers.*
Answer **all** *questions in Section B. Write your answers in the spaces provided. Answer any* **two** *questions in Section C. All essential working should be shown. For numerical answers, unit should be quoted wherever appropriate.*
Begin each answer on a fresh sheet of paper and arrange your answers in numerical order.
Answers may be written in either English or Bahasa Malaysia.

Arahan kepada calon

JANGAN BUKA KERTAS SOALAN INI SEHINGGA ANDA DIBENARKAN BERBUAT DEMIKIAN
Ada **lima belas** *soalan dalam Bahagian A. Bagi setiap soalan, empat pilihan jawapan diberikan.Pilih* **satu** *jawapan yang betul dan tandakan jawapan itu pada Borang Jawapan Aneka Pilihan yang dibekalkan. Baca arahan pada Borang Jawapan Aneka Pilihan itu dengan teliti. Jawab* **semua** *soalan.*
Markah tidak akan ditolak bagi jawapan yang salah.
Jawab **semua** *soalan dalam Bahagian B. Tulis jawapan anda di ruang yang disediakan.*
Jawab mana-mana **dua** *soalan dalam Bahagian C. Semua jalan kerja yang sesuai hendaklah ditunjukkan. Bagi jawapan berangka, unit hendaklah dinyatakan di mana-mana yang sesuai. Mulakan setiap jawapan pada helaian kertas jawapan yang baharu dan susun jawapan anda mengikut tertib berangka.*
Jawapan boleh ditulis dalam bahasa Inggeris atau Bahasa Malaysia.

For examiner"s use (Untuk kegunaan pemeriksa)	
Section A	
Section B (*Bahagian B*)	
16	
17	
Section C (*Bahagian C*)	
Total (Jumlah)	

This question paper consists of 11 printed pages
(Kertas soalan ini terdiri daripada 11 halaman bercetak)

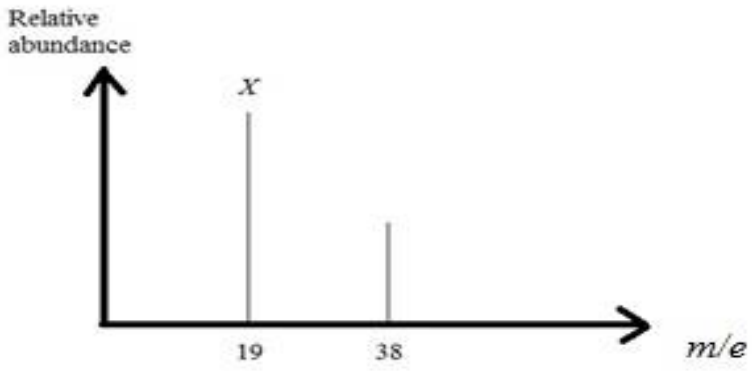
Section A [15 *marks*]

Answer **all** questions .

1 The proton number of ion Y is 16, its nucleon number is 33 and it has the same number of electrons and neutrons. What is the charge of ion Y?

A -2
B -1
C +1
D +2

2 The mass spectrum of an element is shown below.



Which of the statement is **true** about the elements ?

A The element has two isotopes
B Peak X is due to a dipositive ion
C The element is a diatomic molecule
D The relative atomic mass of the element is 38

6 Which molecule has the weakest intermolecular force?

A CH_4

B CH_3CH_2Cl

C CH_3COOH

D $CH_3CH_2CH_2OH$

7 Gas methane , CH_4 is collected in a 250 cm^3 volumetric flask at 25˚C until the pressure of the gas is 73.5 kPa. Calculate the density of the gas .
[R.A.M C=12.0 , H=1.0 , the gas constant, *R*, is 8.31 $JK^{-1}mol^{-1}$.]

A 227 g/m^3 **B** 328 g/m^3 **C** 475 g/m^3 **D** 566 g/m^3

8 Fullerene, $C_{60,}$ is one of carbon allotropes found in soot. Which statement about fullerene is **true**?

A Its carbon atom has sp^3 hybrid orbitals.

B Its molecule has delocalized electrons.

C Its bond angle is smaller than that of graphite.

D Its density is higher than that of diamond.

9 The reaction of acidified aqueous potassium iodide with aqueous hydrogen peroxide is as follows :

$$2I^-(aq) + H_2O_2(aq) + 2H^+(aq) \longrightarrow I_2(aq) + 2H_2O(l) \qquad \Delta H = -23 \text{ kJ}$$

The following steps may be involved in the mechanism of the reaction.

$$H_2O_2 + I^- \xrightarrow{slow} H_2O + OI^-$$

$$OI^- + H^+ \xrightarrow{fast} HOI$$

$$HOI + H^+ + I^- \xrightarrow{fast} I_2 + H_2O$$

What could be the unit of the rate constant, *k*?

A s^{-1} **B** $dm^3mol^{-1}s^{-1}$ **C** $dm^6mol^{-2}s^{-1}$ **D** $mol\ dm^{-3}s^{-1}$

13 The auto ionisation of water is an endothermic process. The ionic product of water, K_W, is 1.0×10^{-14} mol^2 dm^{-6} at 298 K and increases ten times when the temperature is increased to 334 K.

What is the pH of water at 334 K ?

A 13 **C** 7.5

B 7.0 **D** 6.5

14 An equal number of moles of two solutions are mixed together. Which pair of solutions will yield a buffer solution?

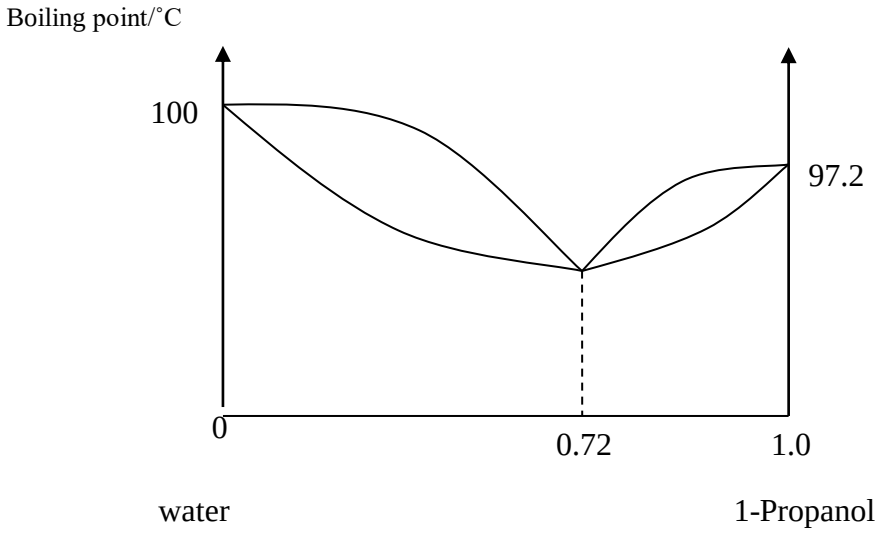
A H_2SO_4(aq) and $NaHSO_4$(aq)

B CH_3COOH (aq) and NaOH (aq)

C NaOH(aq) and CH_3COONa(aq)

D CH_3COOH(aq) and CH_3COONa (aq)

15 The liquid-vapour phase diagram of a mixture of 1-propanol and water is shown below.



What is the first distillate obtained if a solution which contains equal masses of 1-propanol and water is fractionally distilled?

A A mixture with 0.72 mole fraction of 1-propanol
B A mixture with 0.77 mole fraction of water
C 1-Propanol
D Water

Section B [15 *marks*]
*Answer **all** questions.*

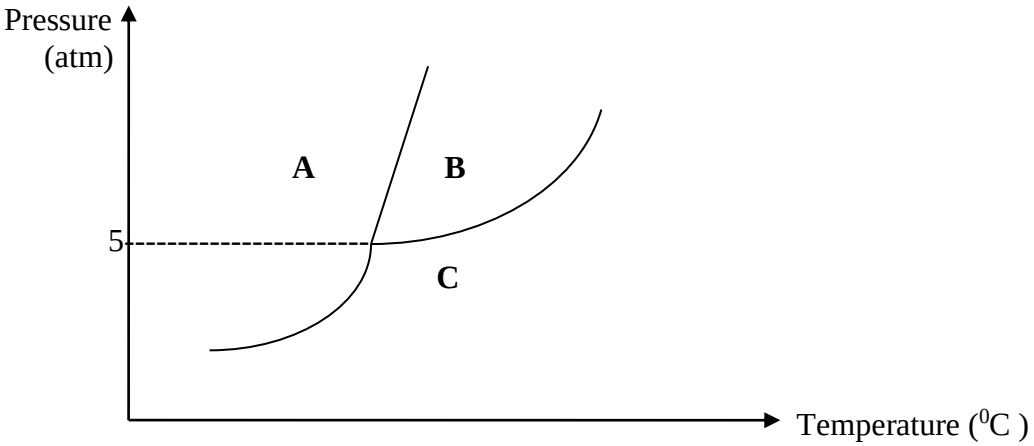
Write the answers in the spaces provided.

16. (a) Draw the Lewis structures and predict their shapes : [6]

Molecules	**Lewis structure**	**Shape**
CH_4		
PCl_3		
SCl_2		

(b) The CH_4, PCl_3 and SCl_2 molecules show their difference in its *shapes* and *bond angles*. Explain why this difference occurs. [2]

17. The phase diagram of carbon dioxide is given below:



a) What is meant by triple point ? [1]

---

b) State the physical state of carbon dioxide at **A** and **C** [2]

---

c) At temperature and pressure above its critical point , CO_2 exist as supercritical fluid. Mark on the above phase diagram , the region that corresponds to the supercritical state of CO_2 [1]

d) State two major differences between the phase diagram of CO_2 and water [2]

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e) State one use of dry ice [1]

Section C [30 marks]

Answer any **two** *questions in this section*.

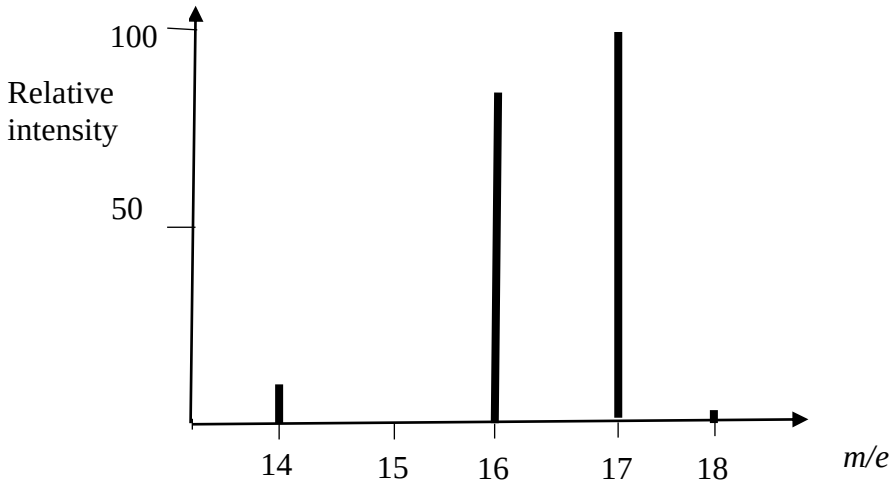
18 (a) 1.554 g of a chloride of titanium was dissolved in water and treated with excess aqueous silver nitrate . The silver chloride precipitate was filtered, washed, dried and weighed. The mass of the precipitate was found to be 4.302 g.
[R.A.M Cl=35.5 , Ti =47.9 , Ag=108]

(i) Calculate the mass of chlorine in 4.302 g of silver chloride [1]

(ii) Calculate the formula of the chloride of titanium. [3]

(iii) If 100 cm^3 of 0.50 mol dm^{-3} of the chloride of titanium were treated with excess silver nitrate, calculate the maximum mass of silver chloride formed.[3]

(b) Compound Y is made up of 82.35 % N and 17.65 % H atoms. Its mass spectrum is shown below.



(i) Determine the chemical formula of compound Y. [3]

(ii) Identify the ions which cause the peaks at *m/e* = 16 and *m/e* = 18. Explain your answer. [5]

19. (a) Sketch a labelled energy level diagram to illustrate the electronic transition corresponding to the formation of the first five lines in the Lyman series of the emission spectrum of the hydrogen atom. [3]

(b) State two characteristics of the Lyman series. [2]

(c) The Lyman series in an emission spectrum of the hydrogen atom shows a convergence limit at frequency 3.27 X 10^{15}Hz.

Calculate the ionization energy of hydrogen atom in kJ mol^{-1}. [3]

[The Planck's constant, h= 6.63 x 10^{-34} Js; Avogadro's constant, N_A = 6.02 x 10^{23} mol^{-1}]

(d) Hund's rule, Pauli exclusion principle and Aufbau principle are used to determine the electronic configuration of an atom.

(i) State the rules and the principles. [3]

(ii) Describe how the two principles are applied to the oxide ion, O^{2-} [2]

(iii) Draw a labelled diagram to illustrate the shape of all the orbitals containing the valence electrons of the oxide ion, O^{2-}. [2]

20 (a) $CH_3COOH(l) + C_2H_5OH(l) \rightleftharpoons CH_3COOC_2H_5(l) + H_2O(l)$

According to the above equation , 0.7 mol ethanoic acid,0.6 mol ethanol , 0.5 mol ethyl ethanoate and 0.3 mol water are mixed together. When a chemical equilibrium is established, only 0.4 mol of ethanoic acid remained unreacted.

(i) Determine Kc for this reaction. [4]

(ii) Explain why acidified water and not pure water is used in this reaction. [1]

(iii) If the experiment is repeated using 0.1 mol ethanoic acid, 0.2 mol ethanol, 0.5 mol ethyl ethanoate and 0.5 mol water, what is the amount of ethanoic acid (in mol) left after equilibrium is attained ? [6]

TAMAT SAMPEL

Suka sampel ini?

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