



Final Examination
2017/2018 Academic Session

May/June 2018

JIK225 – Inorganic Chemistry I
[Kimia Takorganik I]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains **EIGHT** printed pages before you begin the examination.

Answer **FIVE (5)** questions. Answer the questions in English. You may also answer the questions in Bahasa Malaysia, but not a mix of both languages.

All answers must be written in the answer booklet provided.

Each question is worth 20 marks and the mark for each sub question is given at the end of that question.

In the event of any discrepancies in the exam questions, the English version shall be used.

*Sila pastikan bahawa kertas peperiksaan ini mengandungi **LAPAN** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.*

*Jawab **LIMA (5)** soalan. Jawab soalan-soalan dalam Bahasa Inggeris. Anda juga dibenarkan menjawab soalan dalam Bahasa Malaysia, tetapi campuran antara kedua-dua bahasa ini tidak dibenarkan.*

Setiap jawapan mesti dijawab di dalam buku jawapan yang disediakan.

Setiap soalan bernilai 20 markah dan markah subsoalan diperlihatkan di penghujung subsoalan itu.

Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.

Answer **FIVE (5)** questions.

Jawab **LIMA (5)** soalan.

1. (a). The elements of Group 14 show the transition from non-metal to metalloid to metal as the group is descended. Describe the changes in two physical and two chemical properties of the elements or their compounds that clearly shows the differences in the transition.

Unsur-unsur dalam Kumpulan 14 menunjukkan peralihan dari bukan logam ke metaloid ke logam apabila menuruni kumpulan. Perihalkan perubahan-perubahan dalam dua sifat fizikal dan dua sifat kimia unsur-unsur atau sebatian-sebatian ini yang dengan jelas menunjukkan perbezaan-perbezaan dalam peralihan ini.

(12 marks/markah)

- (b). Briefly describe the applications of nuclear chemistry in the medical field.

Perihalkan dengan ringkas aplikasi-aplikasi kimia nuklear dalam bidang perubatan.

(8 marks/markah)

2. (a). Discuss the acid-base properties of oxides within a group and across a period.

(Use Group 15 and the third period of the Periodic Table to illustrate your answer).

Bincangkan sifat asid-bes bagi oksida dalam suatu kumpulan dan sepanjang suatu kala.

(Gunakan Kumpulan 15 dan kala ketiga dalam Jadual Berkala untuk menggambarkan jawapan anda).

(15 marks/markah)

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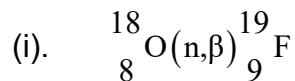
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- (b). (i). How much time is required for a 5.75 mg sample of ^{51}Cr to decay to 1.50 mg if it has a half-life of 27.8 days?
Berapakah masa yang diperlukan bagi suatu sampel 5.75 mg ^{51}Cr untuk menyusut ke 1.50 mg jika ia mempunyai setengah-hayat 27.8 hari?
- (ii). A wooden artifact has a ^{14}C activity of 24.9 counts per minute as compared to an activity of 32.5 counts per minute for a standard of zero age. If the half-life of ^{14}C is 5715 years, determine the age of the artifact.
Suatu artifak kayu mempunyai aktiviti ^{14}C sebanyak 24.9 hitungan per minit berbanding aktiviti sebanyak 32.5 hitungan per minit bagi suatu piawai berumur sifar. Jika setengah-hayat bagi ^{14}C adalah 5715 tahun, tentukan umur artifak tersebut.
- (5 marks/markah)
3. (a). How is the structure of diborane different from that of ethane?
Bagaimanakah struktur diborana berbeza daripada struktur etana?
- (10 marks/markah)
- (b). Give the formula and structure of the oxoanions of sulphur where the sulphur atom shows an oxidation state from +2 to +6.
Berikan formula dan struktur oksoanion sulfur yang mana atom sulfur menunjukkan keadaan pengoksidaan dari +2 hingga +6.
- (10 marks/markah)

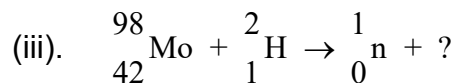
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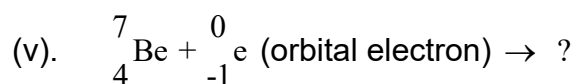
4. (a). Write down the complete and balanced nuclear equation for the following processes.



- (ii). positron emission by potassium-38

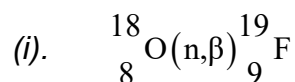


- (iv). plutonium-242 undergoes alpha decay

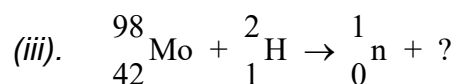


- (vi). β decay by bismuth-214

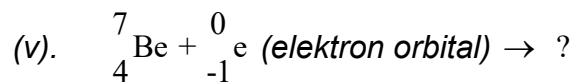
Tuliskan persamaan nuklear yang lengkap dan berimbang bagi proses berikut.



- (ii). *pemancaran positron oleh 38-kalium*



- (iv). *242-plutonium mengalami pereputan alfa*



- (vi). *pemancaran zarah β oleh bismuth-214*

(6 marks/markah)

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- (b). Briefly compare and contrast the structures of diamond and graphite. Use the difference in the bonding to account for the differences in their physical properties of these materials.

Bandingkan dan bezakan secara ringkas struktur-struktur intan dan grafit. Gunakan perbezaan dari segi ikatan untuk menjelaskan perbezaan dalam sifat fizikal bahan-bahan ini.

(6 marks/markah)

- (c). Discuss the evidence that can classify hydrogen in Group 1 and that which can classify it in Group 17.

Bincangkan hujah-hujah yang boleh mengklasifikasikan hidrogen dalam Kumpulan 1 dan yang boleh mengklasifikasikannya dalam Kumpulan 17.

(8 marks/markah)

5. (a). The first element in each group of the Periodic Table has certain properties which distinguish it from the other elements in the group. Show how this statement is illustrated by the element lithium and its compounds.

Unsur pertama dalam setiap kumpulan dalam Jadual Berkala mempunyai sifat-sifat yang membezakannya daripada unsur-unsur lain dalam kumpulan tersebut. Tunjukkan bagaimana pernyataan ini digambarkan oleh litium dan sebatian-sebatiannya.

(10 marks/markah)

- (b). Give notes that describe and clearly differentiate the five types of radioactive decay. Your answer should include the nuclear equations and an example for each type of decay.

Berikan nota-nota yang menerangkan dan membezakan dengan jelas lima jenis penyusutan radioaktif. Jawapan anda harus mengandungi persamaan-persamaan nuklear dan suatu contoh bagi setiap jenis penyusutan.

(10 marks/markah)

6. (a). Discuss the classification of oxides based on its bonding and geometry. Give an example of an oxide in each class.

Bincangkan klasifikasi oksida berdasarkan pengikatan dan geometrinya. Berikan suatu contoh sebatian oksida bagi setiap kelas.

(12 marks/markah)

- (b). Compare and differentiate the physical and chemical properties of water and hydrogen sulphide.

Bandingkan dan bezakan sifat-sifat fizikal dan kimia air dan hidrogen sulfida.

(8 marks/markah)

APPENDIX

Elements with their Symbol and Atomic Number in alphabetical order

Symbol	Element	Atomic Number	Symbol	Element	Atomic Number
Ac	Actinium	89	Md	Mendelevium	101
Al	Aluminum	13	Hg	Mercury	80
Am	Americium	95	Mo	Molybdenum	42
Sb	Antimony	51	Ns	Neilsborium	107
Ar	Argon	18	Nd	Neodymium	60
As	Arsenic	33	Ne	Neon	10
At	Astatine	85	Np	Neptunium	93
Ba	Barium	56	Nh	Nihonium	113
Bk	Berkelium	97	Ni	Nickel	28
Be	Beryllium	4	Nb	Niobium	41
Bi	Bismuth	83	N	Nitrogen	7
Bh	Bohrium	107	No	Nobelium	102
B	Boron	5	Og	Oganesson	118
Br	Bromine	35	Os	Osmium	76
Cd	Cadmium	48	O	Oxygen	8
Ca	Calcium	20	Pd	Palladium	46
Cf	Californium	98	P	Phosphorus	15
C	Carbon	6	Pt	Platinum	78
Ce	Cerium	58	Pu	Plutonium	94
Cs	Cesium	55	Po	Polonium	84
Cl	Chlorine	17	K	Potassium	19
Cr	Chromium	24	Pr	Praseodymium	59
Co	Cobalt	27	Pm	Promethium	61
Cn	Copernicium	112	Pa	Protactinium	91
Cu	Copper	29	Ra	Radium	88
Cm	Curium	96	Rn	Radon	86
Ds	Darmstadtium	110	Re	Rhenium	75
Db	Dubnium	105	Rh	Rhodium	45
Dy	Dysprosium	66	Rg	Roentgenium	111
Es	Einsteinium	99	Rb	Rubidium	37
Er	Erbium	68	Ru	Ruthenium	44

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Eu	Europium	63	Rf	Rutherfordium	104
Fm	Fermium	100	Sm	Samarium	62
Fl	Flerovium	114	Sc	Scandium	21
F	Fluorine	9	Sg	Seaborgium	106
Fr	Francium	87	Se	Selenium	34
Gd	Gadolinium	64	Si	Silicon	14
Ga	Gallium	31	Ag	Silver	47
Ge	Germanium	32	Na	Sodium	11
Au	Gold	79	Sr	Strontium	38
Hf	Hafnium	72	S	Sulphur	16
Hs	Hassium	108	Ta	Tantalum	73
He	Helium	2	Tc	Technetium	43
Ho	Holmium	67	Te	Tellurium	52
H	Hydrogen	1	Tn	Tennesine	117
In	Indium	49	Tb	Terbium	65
I	Iodine	53	Tl	Thallium	81
Ir	Iridium	77	Th	Thorium	90
Fe	Iron	26	Tm	Thulium	69
Kr	Krypton	36	Sn	Tin	50
La	Lanthanum	57	Ti	Titanium	22
Lr	Lawrencium	103	W	Tungsten	74
Pb	Lead	82	U	Uranium	92
Li	Lithium	3	V	Vanadium	23
Lv	Livermorium	116	Xe	Xenon	54
Lu	Lutetium	71	Yb	Ytterbium	70
Mg	Magnesium	12	Y	Yttrium	39
Mc	Moscovium	115	Zn	Zinc	30
Mn	Manganese	25	Zr	Zirconium	40
Mt	Meitnerium	109			

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