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PEPERIKSAAN AKHIR TAHUN 2009

KIMIA – KERTAS 1

T6R

TINGKATAN : 6 RENDAH **MASA : $1\frac{3}{4}$ JAM**

Instuctions to candidates:

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

*There are **fifty** questions in this paper. For each question, four suggested answers are given. Choose **one** correct answer and indicate it on the multiple choice answer sheet provided. Answer **all** questions. Marks will not be deducted for wrong answers.*

This question paper consists of 11 printed pages and 1 blank page.

Section A

*Four suggested answers labelled **A, B, C** and **D** are given for each question. Choose **one** correct answer.*

1. An element Z forms the Z^{2+} ion with the configuration $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8$. If the relative atomic mass of Z is given by the expression $2x + 3$, where x is its proton number, calculate the number of neutrons in the nucleus of the atom of element Z.

   A. 26 B. 28 C. 29 D. 31

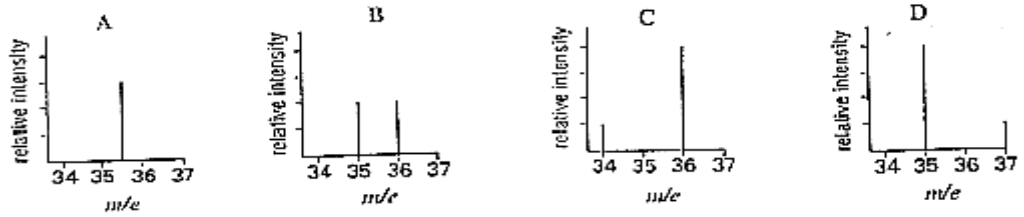
2. Which statement about relative atomic mass is correct?

   A. It is a ratio of masses
   B. It is measured in grams
   C. It is related to the number of atoms in a molecule
   D. It is the same as the mass of 1 mole of atoms.

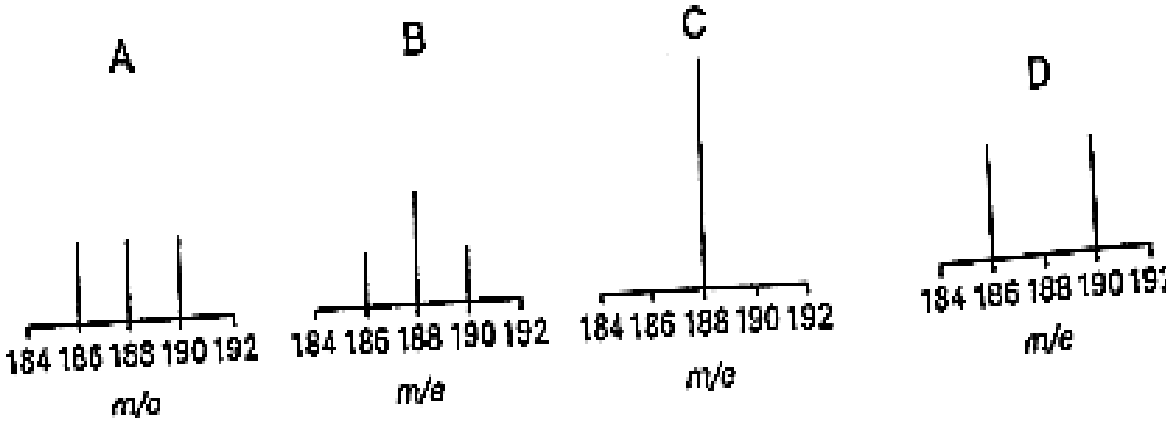
3. Copper has two isotopes, ^{63}Cu and ^{65}Cu. The relative atomic mass of copper is 63.34. What is the percentage of ^{63}Cu in the mixture?

   A. 31 B. 50 C. 63 D. 83

4. The relative atomic mass of chlorine is 35.5. Which of the following is the mass spectrogram of chlorine?



5. Bromine occurs naturally as two isotopes, $^{79}_{35}$Br and $^{81}_{35}$Br , in equal abundance. The mass spectrum for $^{12}C_2\ ^{1}H_4\ Br_2$ is obtained. How would the spectrum for m / e values above 184 appear?



6. The mass spectrum of a metal Q is shown in Figure 1. What is the relative atomic mass of Q?

A. $\frac{(85 \times 23) + (87 \times 7.5)}{100}$

B. $\frac{(85 \times 21.5) + (87 \times 8.5)}{100}$

C. $\frac{(85 \times 23) + (87 \times 7.5)}{23 + 7.5}$

D. $\frac{(85 \times 21.5) + (87 \times 8.5)}{21.5 + 8.5}$

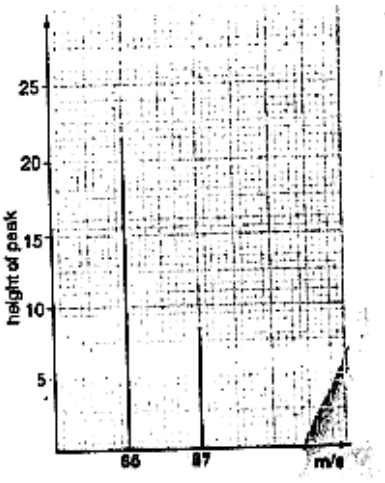


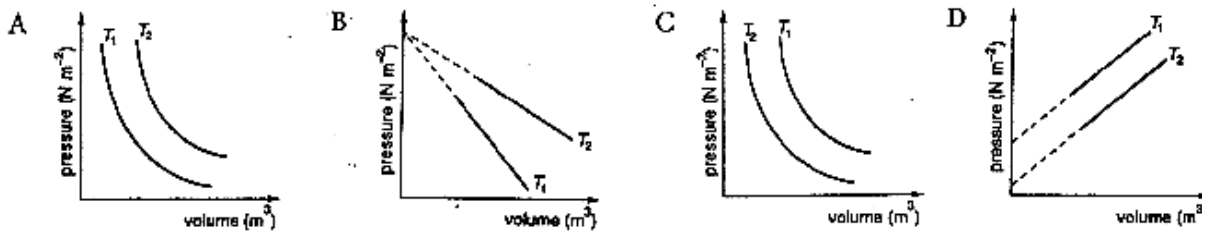
Figure 1

7. A mixture of 8.0g of a monoatomic gas X and an unknown quantity of diatomic gas Y has a volume of V m^3 at s.t.p. . When 20.0g of gas X is added to the mixture, under the same conditions, the volume of the mixture is 2V m^3. Calculate the quantity of gas Y in the mixture.
[Relative atomic mass : X = 4, Y = 1. Assuming that gas X does not react with gas Y]
A. 1g B. 2g C. 5g D. 6g

8. 4.4g of a gaseous hydrocarbon occupies the same volume as 3.2g of oxygen under the same conditions. The molecular formula of the hydrocarbon could be
A. CH_4 B. C_2H_2 C. C_2H_4 D. C_3H_8

9. At constant temperature and volume, an ideal gas X exerts a pressure of P atm, while hydrogen gas exerts a pressure of 1.01 P atm. Which of the following best explains this difference?
A. The movement of hydrogen molecules are random.
B. Intermolecular attractive force exist between hydrogen molecules.
C. The collisions between hydrogen molecules and the walls of the container are not elastic.
D. The total volume of the hydrogen molecules cannot be ignored when compared with the volume of the container.

10. Which of the following graphs represents correctly the relationship between the volume and pressure of a gas at different temperatures of T_1 K and T_2 K where $T_1 < T_2$?



11. A sample of ideal gas occupies 600cm^3 at 25 ^{O}C and 100k Pa. What is the volume of the gas at 70^{O}C and 250 kPa?

A. $600 \times \frac{25}{70} \times \frac{250}{100}$

B. $600 \times \frac{343}{298} \times \frac{100}{250}$

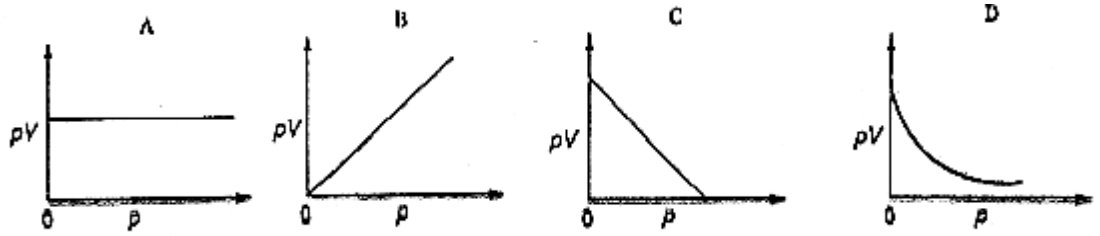
C. $600 \times \frac{298}{343} \times \frac{100}{250}$

D. $600 \times \frac{298}{343} \times \frac{250}{100}$

12. A closed vessel contains 5 moles of nitrogen and 8 moles of oxygen at a total pressure of P atm. What is the partial pressure of oxygen in the mixture? [O=16, N = 14]

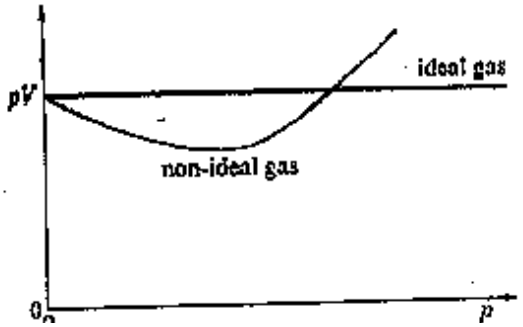
A. $\frac{5(2X14)}{8(2X16)}$ P atm B. $\frac{8}{5+8}$ P atm C. 8P D. (8-5) P atm

13 Which of the following graphs is correct for a fixed mass of an ideal gas at constant temperature?



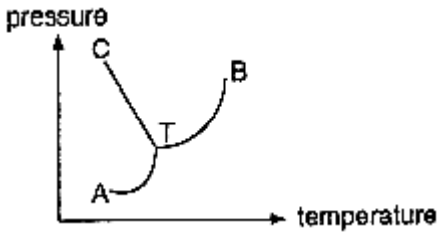
14. The value of pV is plotted against p for two gases, an ideal gas and a non-ideal gas, where p is the pressure and V is the volume of the gas . Which of the following gases shows the greatest deviation from ideality ?

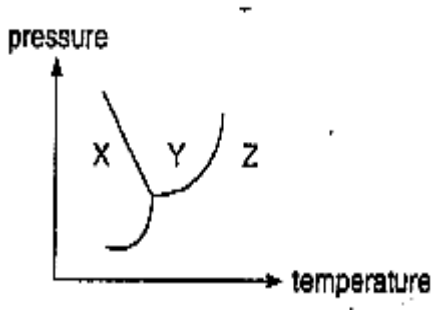
A. ammonia
B. ethene
C. methane
D. nitrogen



15. The phase diagram of water is shown below. Which of the following represents the variation of the melting point of ice with pressure?

A. The line AT
B. The line TB
C. The line TC
D. The point T



16. 

The phase diagram of a pure substance is given above. Which of the following represent the area X, Y and Z?

	X	Y	Z
A	Solid	Liquid	Gas
B	Gas	Liquid	Solid
C	Gas	Solid	Liquid
D	Liquid	Solid	Gas

17. Figure 2 shows the phase diagram of a substance. What is the physical state of the substance at the conditions marked 'P' in Figure 2?
    A. Solid
    B. Liquid
    C. Gas
    D. Liquid in equilibrium with gas

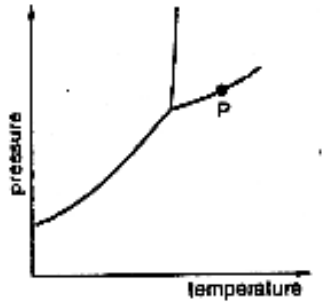


Figure 2

18. The first ionisation energy of an element M is the energy
    A. absorbed when M (g) forms M^+ (g)
    B. absorbed when M (l) forms M^+ (g)
    C. liberated when M (g) forms M^+ (g)
    D. liberated when M^+ (g) forms M^{2+} (g)

19. What is the electronic configuration for Cr^{3+} ?
    A. [Ar] $3d^1\ 4s^2$ B. [Ar] $3d^2\ 4s^2$ C. [Ar] $3d^3\ 4s^0$ D. [Ar] $3d^4\ 4s^0$

20. The successive ionisation energies, in kJ mol^{-1} , of an element in the Periodic Table are given below :

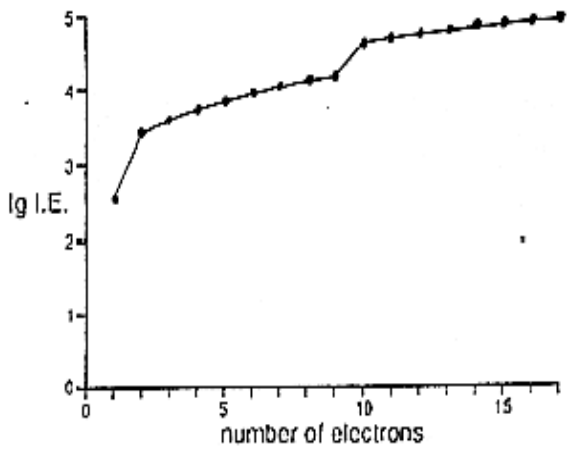
    940 (first) , 2080 , 3090 , 4140 , 7030 , 7870, 16000, 19500

    In which group in the Periodic Table is the element likely to be located?

    A. Group 13 B. Group 14 C. Group 15 D. Group 16

21. The graph shows the logarithm, lg, of the ionisation energies for the outermost seventeen electrons in an atom of an element **X**. Which of the following could be **X** ?

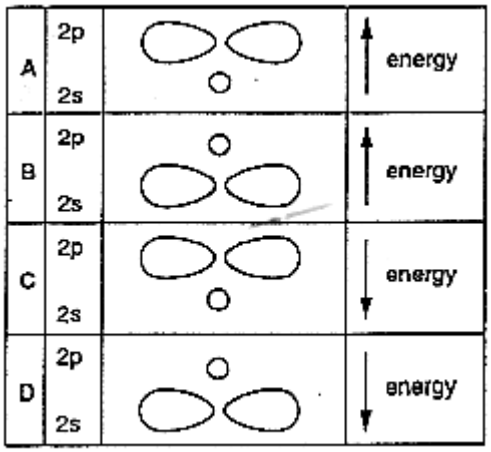
A. argon
B. calcium
C. chlorine
D. potassium



22. What is the total number of atomic orbitals in an atom with the principle quantum number $n = 3$?

A. 3 B. 13 C. 14 D. 18

23. Which diagram best shows the shapes and relative energies of 2*s* and 2*p* orbitals in carbon?

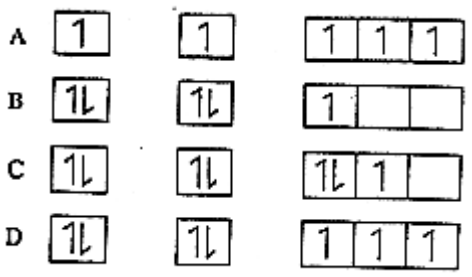


24. Galium has the electronic configuration [Ar]$3d^{10}4s^{2}4p^{1}$ where [Ar] represents the configuration of argon. In which order are the electrons lost in forming the Ga^{2+} ion ?

	1st	2nd	3rd	4th
A	3*d*	4*p*	4*s*	4*s*
B	3*d*	4*s*	4*s*	4*p*
C	4*s*	4*s*	4*p*	3*d*
D	4*p*	4*s*	4*s*	3*d*

25. The orbitals of a nitrogen atom may be represented as shown.

Which diagram represents the arrangement of electrons in the ground state of the atom?



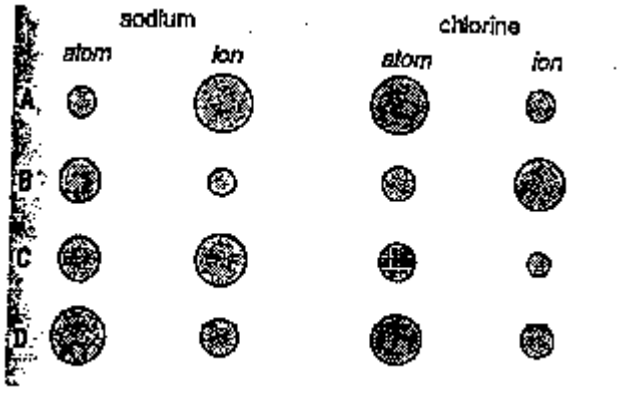
26. Among which of the following pairs of the Period 3 elements is the difference in boiling points the greatest?

A. Silicon and argon
B. Sodium and argon
C. Sodium and silicon
D. Aluminium and chlorine

27. In Mendeleev's Periodic Table, the elements are arranged in order of

A. increasing atomic size
B. increasing proton number
C. increasing relative atomic mass
D. metallic and non-metallic properties

28. Which of the following sets of diagrams best indicates the relative atomic radii of the atom and ion of sodium and of chlorine?



29. Which of the following physical properties are that of a transition element?

	Melting point / ^{O}C	Boiling point / ^{O}C	Density / g cm^{-3}	Electric conductivity
A.	327	1750	11.3	good
B.	650	1150	1.7	good
C.	1539	2800	7.9	good
D.	1410	2500	2.3	weak

30. Which of the following pairs of orbitals, when overlapped with one another forms the strongest single covalent bond ?

A. 1*s* and 1*s* B. 1*s* and 2*s* C. 1*s* and 2*p* D. 1*s* and 3*p*

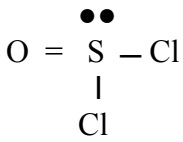
31. Which of the following properties best characterises metals with metallic bonds?
A. High density
B. High melting point
C. Low electronegativity
D. Electric conductor in the solid state.

32. Which of the following fluorine compounds has a dipole moment greater than zero?
A. SF_6 B. SnF_4 C. CH_3F D. CF_4

33. The electronegativies of some atoms are given below.
H : 2.1, C : 2.5 , Cl : 3.0 , O : 3.5 , F : 4.0
Which of the following bonds is most polar ?

A. O — F B Cl — H C. C — F D. F —F

34. What is the shape of the molecule with the structural formula

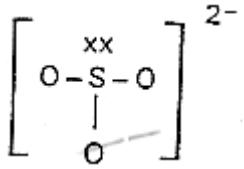


A. Tetrahedral B. Trigonal planar C. Octahedral D. Pyramidal

35. The C_2H_2 molecule is linear. What can be deduced from this about the numbers of σ and π bonds present in the molecule?

	σ	π
A.	2	2
B	2	3
C	3	1
D.	3	2

36. The SO_3^{2-} may be represented as



What is the O — S — O bond angle?
A. 90^0 exactly B. about 107^0 C. about 109.5^0 D. 120^0 exactly

37. Compounds X and Y have the following properties.
(i) Both are covalent
(ii) Both have the same type of intermolecular attractive force
(iii) The boiling point of X is higher than the boiling point of Y.

The compounds X and Y are

	X	Y
A	HF	HCl
B	HF	NH_3
C	HCl	HI
D	HBr	NH_3

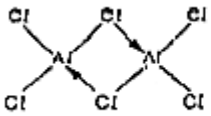
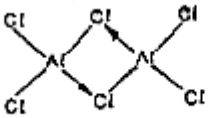
38. Which of the following is correct regarding dinitrogen tetroxide, N_2O_4 ?

A. It is polar
B. It has a 'V' shape
C. It is formed from NO_2
D. It has one unpaired electron

39. The boiling points of water and ammonia are 373 K and 240 K respectively. Which of the following statements best explains why the boiling point of water is higher than the boiling point of ammonia?

A. Oxygen is more electronegative than nitrogen.
B. The bond between oxygen and hydrogen is stronger than the bond between nitrogen and hydrogen.
C. The hydrogen bonds between water molecules are stronger than the hydrogen bonds between ammonia molecules.
D. There is Van der Waals forces between water molecules but not between ammonia molecules

40. Aluminium chloride sublimes at 178^0C. Which structure best represents the species in the vapour at this temperature?

A. 
B. 
C. $Al\bullet + 3Cl\bullet$
D. $Al^{3+}(Cl^-)_3$

For each of the questions in this section one or more of the three numbered statements **1** to **3** may be correct. Decide whether each of the statements is or is not correct. The responses **A** to **D** should be selected on the basis of the following.

A	B	C	D
1 only is correct	1 and 2 only are correct	2 and 3 only are correct	1,2 and 3 are correct.

41. The nucleon number of an atom

1. is almost the same as the relative isotop mass of the atom
2. is the mass of one atom
3. represents the number of neutrons in the atom.

42. A radioactive element W disintegrates according to the following scheme.

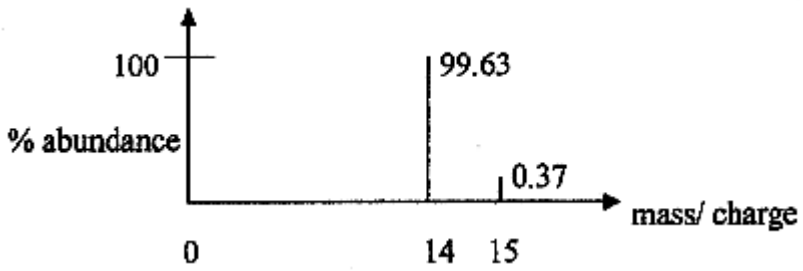
$$W \xrightarrow{\alpha} X \xrightarrow{\beta} Y \xrightarrow{\alpha} Z$$

Which of the following statements are correct regarding the disintegration above?

1. X and Y have the same nucleon number.
2. W, X, Y and Z are from different groups in the Periodic Table
3. The number of neutrons in Y is the same as the number of neutrons in Z.

A	B	C	D
1 only is correct	1 and 2 only are correct	2 and 3 only are correct	1,2 and 3 are correct.

43.

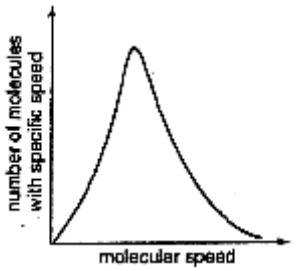


A	B	C	D
1 only is correct	1 and 2 only are correct	2 and 3 only are correct	1,2 and 3 are correct.

The mass spectrum of an element X is shown above. From the mass spectrum , it can be concluded that,

1. element X consists of two isotopes with relative isotopic mass of 14 and 15
2. the nucleon number of X is 14.5
3. the isotopes of X have different number of protons.

44. Figure 3 shows the distribution of molecular speeds for a sample of nitrogen gas at 273K. When the temperature is raised to 473K



1. the peak of the curve becomes higher
2. the peak of the curve shifts to the right
3. the area under the curve does not change

45. Dry ice is used as refrigerant in the food industry because

1. its melting point is well below 0^0C.
2. it is non-toxic and non-carcinogenic
3. it does not melt to form a messy liquid at room conditions.

46. Which of the following are correct with respect to the Lyman series in the line spectrum of atomic hydrogen?

1. It is formed by the transition of electrons between higher energy levels and lower energy levels.
2. It is a convergence series.
3. It is in the ultra-violet region.

A	B	C	D
1 only is correct	1 and 2 only are correct	2 and 3 only are correct	1,2 and 3 are correct.

47.

Element	Ionisation energy / kJ mol^{-1}			
	first	second	third	fourth
Y	494	4560	6940	9540
Z	418	3070	4600	5860

The table below lists the first, second, third and fourth ionisation energy for elements Y and Z. Which of the following are true for the elements Y and Z?

1. Both are Group 1 elements
2. The first ionisation energies for both the elements correspond to the removal of the 1*s* electron
3. The atoms of Y are larger than the atom of Z

48 Which of the following organic compounds are polar molecules?

1. Chloromethane , CH_3Cl
2. Trichloromethane , $CHCl_3$
3. Tetrachloromethane, CCl_4

49 Which of the following compounds contains ionic bonds?

1. Sodium chloride 2. Aluminium chloride 3. Silicon (IV) chloride

50 A metal ion can be formed most easily if

1. the charge on the metal ion is high
2. the metal ion has a low ionisation energy
3. the size of the atom is large.

END OF QUESTION PAPER

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…….

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