Science (Chemistry)

Section A: Multiple Choice Questions (15 marks)

Answer **all** the questions in the table provided on page 6.

1 Which of the following is likely to be a pure compound?

A A blue powder which dissolves in water.

B A liquid which gives two fractions when distilled.

C Orange crystals which melt over the range 55 °C to 60 °C.

D Yellow crystals which melt at 58 °C.

2 Which of the following consist of **only** compounds?

(i) air (ii) oxygen (iii) steam (iv) carbon dioxide

A (i) and (ii)

B (ii) and (iii)

C (iii) and (iv)

D (iv) only

3 An ion $\mathbf{X}^+$ has 22 nucleons and 10 electrons. What does the nucleus of $\mathbf{X}^+$ contain?

	Protons	Neutrons
A	9	13
B	10	12
C	11	11
D	12	10

4 What would be the likely formula of the compound formed between elements X and Y which are found in Group III and V respectively?

A XY

B X_2Y_3

C X_3Y_2

D X_3Y_5

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5 How many atoms are shown by the formula $Pb(NO_3)_2$?

A 3
B 5
C 6
D 9

6 Metal Y forms a carbonate with the formula YCO_3. What will be the formula for the chloride of metal Y?

A YCl
B YCl_2
C YCl_3
D Y_2Cl_3

7 Which statement about atoms is **incorrect**?

A A nucleus always contains protons and neutrons.
B Nearly all the mass of the atom is concentrated in the nucleus.
C The number of neutrons can be equal to the number of electrons.
D The nucleus is very small in comparison with the total size of the atom.

8 Which of the following particles contains 8 neutrons, 8 protons and 10 electrons?

A A nitrogen ion
B A neon atom
C An aluminum ion
D An oxygen ion

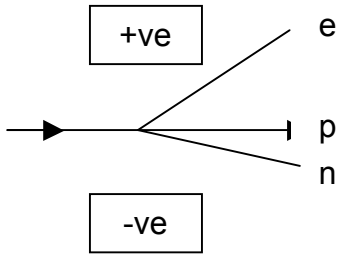
9 In which one of these substances below is there the smallest number of electrons shared?

A F_2
B CH_4
C CO_2
D H_2O

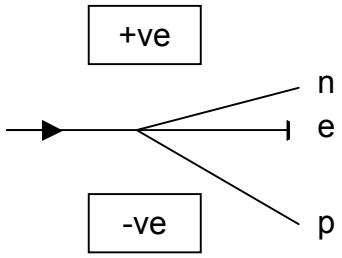
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10 A beam of particles is made up of protons (p), neutrons (n), and electrons (e). The beam is passed through a pair of positively-charged and negatively-charged plates.
Which of the following correctly show the path of the beam through the charged plates?

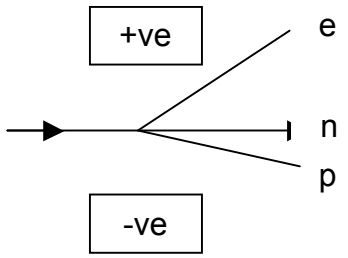
A



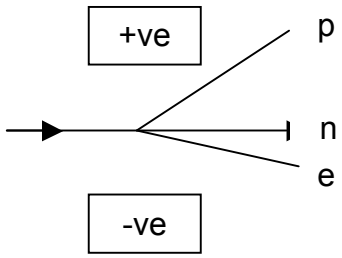
B



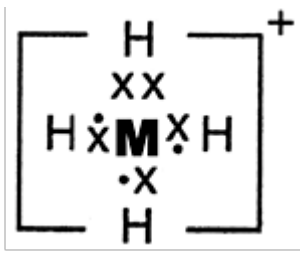
C



D



11 The ion $[\mathbf{M}H_4]^+$ can be represented by the "dot and cross" diagram shown below.



Only the valence electrons of each element are shown.
In which group of the Periodic Table does element **M** belong to?

A II
B III
C V
D VI

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12 Which of the following does not result in a chemical change?

A Adding sulfuric acid to magnesium

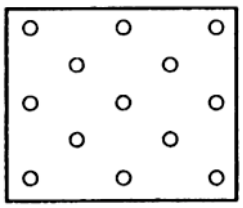
B Adding salt to a water

C Adding vinegar to sodium carbonate

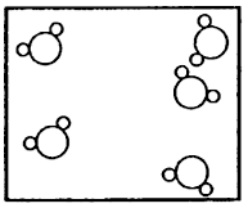
D Adding yeast to dough to bake a bread

13 Which diagram represents the element chlorine gas?

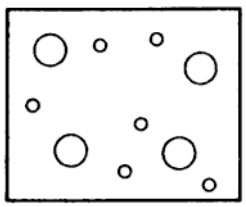
A



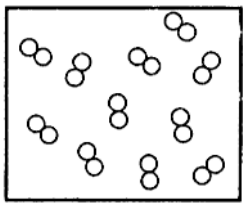
B



C



D



14 Which is the correct balanced equation for the reaction of sulfuric acid, H_2SO_4?

A $H_2SO_4 + BaCl_2 \rightarrow BaSO_4 + HCl$

B $H_2SO_4 + Mg \rightarrow MgSO_4 + H_2$

C $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

D $H_2SO_4 + NH_3 \rightarrow (NH_4)_2SO_4$

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15 The information given shows a process of decomposition taking place in a test tube upon strong heating.

$$\mathbf{P \rightarrow Q + R}$$

Which one of the following statements is **incorrect**?

A **Q** could be a compound.

B **R** could be a compound.

C **P** could be an element.

D Both **Q** and **R** could be compounds.

Section A Answers

1	2	3	4	5	6	7	8	9	10

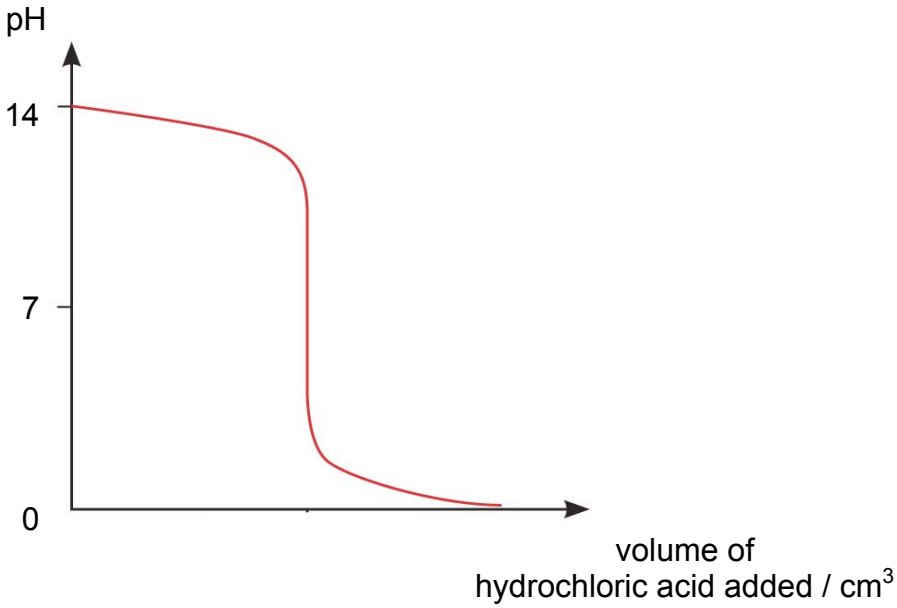
11	12	13	14	15

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Section B (15 marks)

Answer **all** the questions in the spaces provided.

1 In an experiment, hydrochloric acid was added from a burette to a conical flask containing aqueous sodium hydroxide. The pH of the resulting mixture was recorded as volume of hydrochloric acid was added. The graph below shows the results of the experiment.



(a) What is the name of this reaction?

……..... [1]

(b) From the graph above, which pH shows the end of the reaction between sodium hydroxide and hydrochloric acid?

……..... [1]

(c) The reaction between sodium hydroxide and hydrochloric acid produces sodium chloride and water. Write a balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

……..... [1]

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(d) At the beginning of the experiment, Universal Indicator was added to the solution.
State the colour of the Universal Indicator in the solution at the respective pH values. [2]

pH	Colour of the Universal Indicator
14	
7	

2 The table below shows the number of sub-atomic particles in five atoms, **V** to **Z**. These letters are not the symbol of the elements.

atom	number of protons	number of electrons	number of neutrons
V	7	7	8
W	7	7	7
X	9	9	10
Y	18	18	12
Z	13	13	14

(a) Which two atoms are isotopes?
Explain your answer. [2]

……

……

(b) Which atom does not react with other atoms to form compounds?
Explain your answer. [2]

……..

……..

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(c) State the type of bonding formed between atoms **W** and **X**.
Explain your answer. [2]

.....

.....

(d) Atoms **W** and **Z** form a compound.
Draw a 'dot-and-cross' diagram to show the bonding in the compound formed between the atoms of **W** and **Z**. [2]

(e) Two atoms **X** form a diatomic molecule.
Draw a 'dot-and-cross' diagram to show the bonding formed between the atoms of **X**. [2]

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Section C (20 marks)

Answer **all** the questions in the spaces provided.

3 The table shows the results of an experiment in which copper and copper carbonate were heated separately. In each case, **5.0 g** of the substance was heated.

Substance	Appearance before heating	Appearance after heating	Mass of substance after heating / g
copper	pink-brown	black	6.2
copper carbonate	green	black	3.2

(a) **(i)** When copper is heated in air, state whether a chemical or physical reaction has occurred. Explain your answer. [2]

……..

……..

(ii) Calculate the increase in mass for part **(a)(i)** of the question. [1]

(iii) Explain why there is an increase in mass after the copper sample has been heated. [1]

……..

……..

(iv) Write the word equation for part **(a)(i)** of the question. [2]

……..

……..

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(b) When green copper carbonate is heated, a black substance is formed together with a gas. When this gas is passed through limewater, a white precipitate is seen.

(i) Calculate the decrease in mass after the copper carbonate is heated. [1]

(ii) Explain the decrease in mass of copper carbonate. [2]

……..

……..

(iii) Identify the gas that evolved during the reaction. [1]

……..

……..

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4 Natasha carried out an investigation to identify substance **X** which is either calcium metal or calcium carbonate.

Test	Observation	Conclusion
Place a spatula of substance **X** into a test-tube. Add 5 cm^3 of hydrochloric acid into the test-tube.	Bubbles of gas are formed. Substance **X** disappears.	It is calcium metal.

(a) Explain why Natasha cannot conclude that substance **X** is calcium metal from the test carried out. [1]

……

……

(b) Describe in detail the test Natasha should carry out in order to confirm that substance **X** is calcium metal. [2]

……

……

(c) Name and give the chemical formula of the salt formed from the reaction.

[2]

……

(d) Balance the following chemical equations.

(i) ___ Fe_2O_3 + ___ CO ⟶ ___ Fe + ___ CO_2 [1]

(ii) ___ $Ca(OH)_2$ + ___ HCl ⟶ ___ $CaCl_2$ + ___ H_2O [1]

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(e) The table shows information about the chlorides of some elements in Period 3.The elements are labelled **W**, **X**, **Y** and **Z**. You need not identify **W**, **X**, **Y** and **Z**.

element	formula of chloride	melting point / °C	boiling point / °C
W	**W**Cl_2	714	1418
X	**X**Cl	790	1407
Y	**Y**Cl_4	−70	58
Z	$\mathbf{Z}_2Cl_2$	−80	138

(i) Which of the elements, **W**, **X**, **Y** and **Z**, are likely to be non-metals?
Explain your answer.

[2]

…… ..

……..……

(ii) Arrange the elements in order of increasing atomic number. [1]

……..……

End of Chemistry Section

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The Periodic Table of the Elements

Group I	Group II						Group III	Group IV	Group V	Group VI	Group VII	Group 0
						1 H hydrogen 1						4 He helium 2
7 Li lithium 3	9 Be beryllium 4						11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12						27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

Key

relative atomic mass
atomic symbol
name
atomic number

*58-71 Lanthanoid series	140 Ce cerium 58	141 Pr Praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
†90-103 Actinoid series	232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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Section A: Multiple Choice Questions (15 marks)

Answer **all** the questions in the table provided on page 6.

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A A blue powder which dissolves in water.

B A liquid which gives two fractions when distilled.

C Orange crystals which melt over the range 55 °C to 60 °C.

D Yellow crystals which melt at 58 °C.

2 Which of the following consist of **only** compounds?

(i) air (ii) oxygen (iii) steam (iv) carbon dioxide

A (i) and (ii)

B (ii) and (iii)

C (iii) and (iv)

D (iv) only

3 An ion $\mathbf{X}^+$ has 22 nucleons and 10 electrons. What does the nucleus of $\mathbf{X}^+$ contain?

	Protons	Neutrons
A	9	13
B	10	12
C	11	11
D	12	10

4 What would be the likely formula of the compound formed between elements X and Y which are found in Group III and V respectively?

A XY

B X_2Y_3

C X_3Y_2

D X_3Y_5

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5 How many atoms are shown by the formula $Pb(NO_3)_2$?

A 3
B 5
C 6
D 9

6 Metal Y forms a carbonate with the formula YCO_3. What will be formula for the chloride of metal Y?

A YCl
B YCl_2
C YCl_3
D Y_2Cl_3

7 Which statement about atoms is incorrect?

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D The nucleus is very small in comparison with the total size of the atom.

8 Which of the following particles contains 8 neutrons, 8 protons and 10 electrons?

A An ion of nitrogen.
B An atom of neon.
C An ion of aluminium.
D An ion of oxygen.

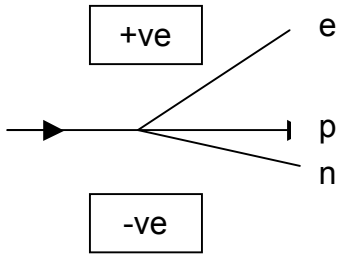
9 In which one of these substances below is there the smallest number of electrons shared?

A F_2
B CH_4
C CO_2
D H_2O

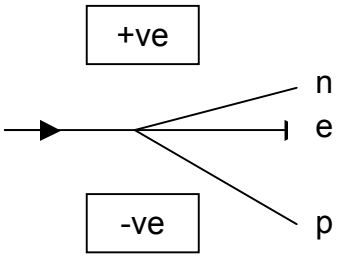
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10 A beam of particles is made up of protons (p), neutrons (n), and electrons (e). The beam is passed through a pair of positively-charged and negatively-charged plates. Which of the following correctly shor the path of the beam through the charged plates.

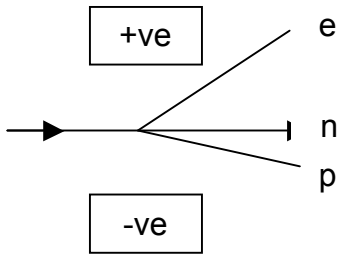
A



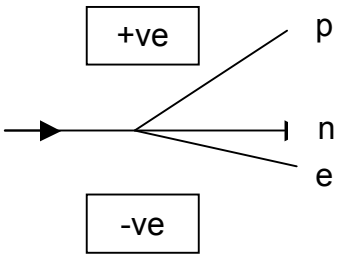
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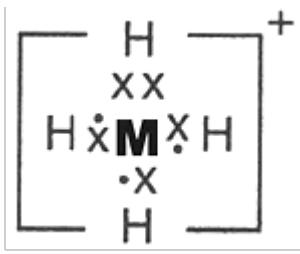
C



D



11 The ion $[MH_4]+$ can be represented by the "dot and cross" diagram shown below.



Only the valence electrons of each element are shown.

In which group of the Periodic Table does element M belong to?

A II

B III

C V

D VI

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12 Which of the following does not result in a chemical change?

A Adding sulfuric acid to magnesium.

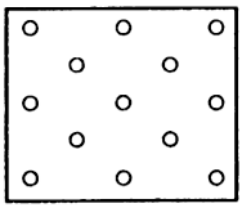
B Adding salt to a water.

C Adding vinegar to sodium carbonate.

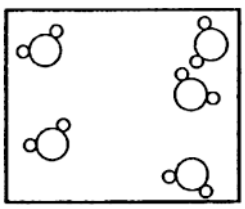
D Adding yeast to dough to bake a bread.

13 Which diagram represents the element chlorine gas?

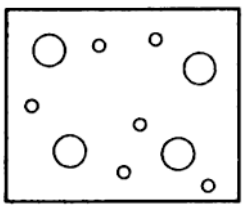
A



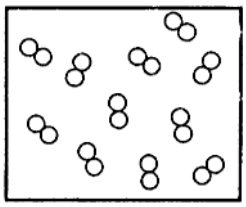
B



C



D



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14 Which equation is balanced?

A $H_2SO_4 + BaCl_2 \rightarrow BaSO_4 + HCl$

B $H_2SO_4 + Mg \rightarrow MgSO_4 + H_2$

C $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

D $H_2SO_4 + NH_3 \rightarrow (NH_4)_2SO_4$

15 The information given shows a process of decomposition taking place in a test tube upon strong heating.

P → Q + R

Which one of the following statements is incorrect?

A Q could be a compound.

B R could be a compound.

C P could be an element.

D Both Q and R could be compounds.

Section A Answers

1	2	3	4	5	6	7	8	9	10

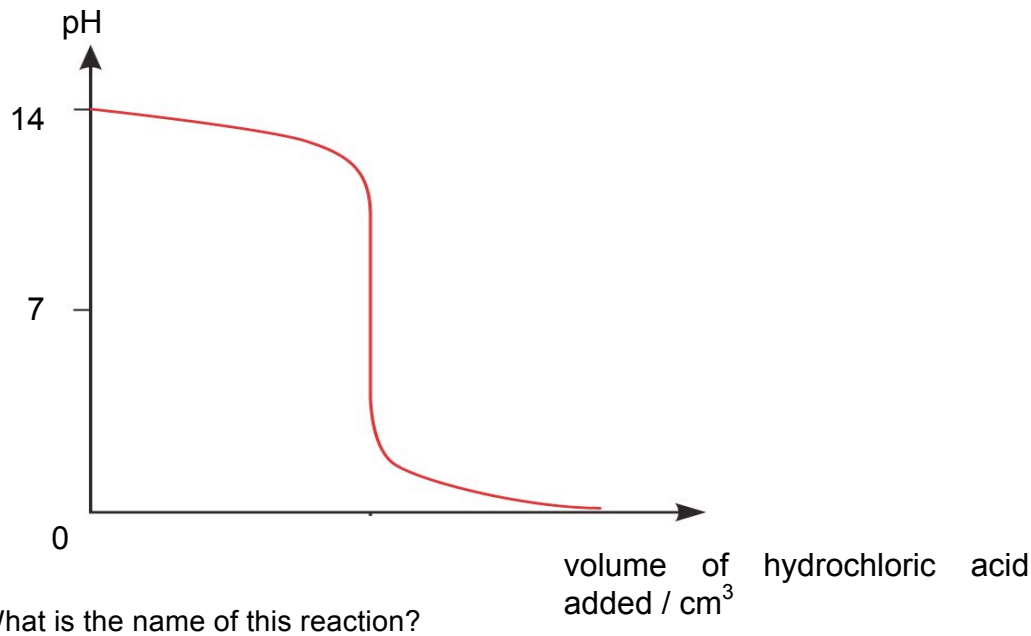
11	12	13	14	15

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Section B (15 marks)

Answer **all** the questions in the spaces provided.

1 **(a)** In an experiment, hydrochloric acid was added from a burette to a conical flask containing aqueous sodium hydroxide. The pH of the resulting mixture was recorded as volume of hydrochloric acid was added. The graph below shows the results of the experiment.



(a) What is the name of this reaction?

Neutralisation [1]

(b) From the graph above, which pH shows the end of the reaction between sodium hydroxide and hydrochloric acid?

7

(c) The reaction between sodium hydroxide and hydrochloric acid produces sodium chloride and water. Write a balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

$HCl + NaOH \text{ -----} NaCl + H_2O$ [1]

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(d) At the beginning of the experiment, Universal Indicator was added to the solution. State the colour of the Universal Indicator in the solution at the respective pH values. [2]

pH	substance(s) in the conical flask
14	Violet
7	Green

2 The table below shows the number of sub-atomic particles in five atoms, **V** to **Z**. These letters are not the symbol of the elements.

atom	number of protons	number of electrons	number of neutrons
V	8	8	9
W	8	8	10
X	9	9	10
Y	10	10	10
Z	11	11	12

(a) Which two atoms are isotopes? [1]

V and W. [1]
They have the same proton number but different number of neutrons. [1]

(b) Which atom does not react with other atoms to form compounds?
Explain your answer. [2]

Y. [1] Stable as it has full valence electron shell [1]

(c) State the type of bonding formed between atoms **W** and **X**.
Explain your answer. [2]

Covalent bond [1] Both W and X are atoms of non-metal elements. Hence, they wil share their valence electrons to achieve octet configuration.

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(d) Atoms **W** and **Z** form a compound.

Draw a 'dot-and-cross' diagram to show the bonding in the compound formed between the atoms of **W** and **Z**. [2]

Ionic Bond with transfer of electron [1]

1 W, 2 Z with octect configuration [1]

(e) Two atoms **W** form a diatomic molecule.

Draw a 'dot-and-cross' diagram to show the bonding formed between the atoms of **W**. [2]

Covalent bond [1]

Sharing of 2 electron from each atom [1]

Section C (20 marks)

Answer **all** the questions in the spaces provided.

3 The table shows the results of an experiment in which copper and copper carbonate were heated separately. In each case, **5.0 g** of the substance was heated.

Substance	Appearance before heating	Appearance after heating	Mass of substance after heating / g
Copper	pink-brown	black	6.2
Copper carbonate	green	black	3.2

(a) **(i)** When copper is heated in air, state whether a chemical or physical reaction has occurred. Explain your answer. [2]

Chemical change [1]

This is because there is a change in the mass [1/2] and colour[1/2] from the original reactant

(ii) Calculate the increase in mass for part **(a)(i)** of the question. [1]

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The increase is (6.2 – 5) = 1.2 g [1]

(iii) Explain why there is an increase in mass after the copper sample has been heated. [1]

On heating, copper reacts with oxygen in the air to form a new substance.

(iv) Write the word equation for part **(a)(i)** of the question. [2]

copper + oxygen → copper oxide

Correct reactants – [1]
Correct product – [1]

(b) When green copper carbonate is heated, a black substance is formed together with a gas. When this gas is passed through limewater, a white precipitate is formed in it.

(i) Calculate the decrease in mass after the copper carbonate is heated. [1]

The decrease is (5 – 3.2) = 1.8 g [1]

(ii) Explain the decrease in mass of copper carbonate. [2]

On heating, copper carbonate undergoes thermal decomposition.

The decrease in mass is due to the gas (carbon dioxide) formed has escaped into the surrounding air and only the black solid (copper oxide) remains in the test tube.

(iii) Identify one of the products formed at the end of the reaction. [1]

Carbon dioxide or Copper oxide

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2 Natasha carried out an investigation to identify substance X which is either calcium metal or calcium carbonate.

Test	Observation	Conclusion
Place a spatula of substance **X** into a test-tube. Add 5 cm^3 of hydrochloric acid into the test-tube.	Bubbles of gas are formed. Substance **X** disappears.	It is calcium metal.

(a) Explain why Natasha cannot conclude that substance X is calcium metal from the test carried out. [1]

Both calcium metal and calcium carbonate produce gas when reacted with acid. [1]

(b) Describe in detail the test Natasha should carry out in order to confirm that substance X is calcium metal. [3]

Test: use a lighted splint and placed near the gas. If flame extinguish with "pop" sound [1] , hydrogen gas [1]is present thus can conclude that substance X is a metal.

(c) Name and give the chemical formula of the salt formed from the reaction. [1]

Calcium Chloride, $CaCl_2$

Balance the following chemical equations. [1]

(i) $Fe2O3 + 3 CO \quad 2Fe + 3CO2$

(ii) $Ca(OH)2 + 2 HCl \quad CaCl2 + 2 H2O$

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(d)

What instrument can be used to verify the pH value of the solutions? The table shows information about the chlorides of some elements in Period 3.The elements are labelled **W**, **X**, **Y** and **Z**. You need not identify **W**, **X**, **Y** and **Z**.

element	formula of chloride	melting point / °C	boiling point / °C
W	**W**Cl_2	714	1418
X	**X**Cl	790	1407
Y	**Y**Cl_4	−70	58
Z	$\mathbf{Z}_2Cl_2$	−80	138

(i) Which of the elements, **W**, **X**, **Y** and **Z**, are likely to be non-metals? Explain your answer.

Y and Z **[1]**. Since the chlorides have low melting and boiling points, this means that they are most likely to be covalent compounds **[1]** with simple molecular structures.

(ii) Arrange the elements in order of increasing atomic number. [1]

X, W, Y, Z **[1]**

End of Paper

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The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	0
							1 H hydrogen 1									4 He helium 2
7 Li lithium 3	9 Be beryllium 4										11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12										27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum * 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium † 89															

Key

relative atomic mass
atomic symbol
name
atomic number

*58-71 Lanthanoid series	140 Ce cerium 58	141 Pr Praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
†90-103 Actinoid series	232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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Class | Register Number

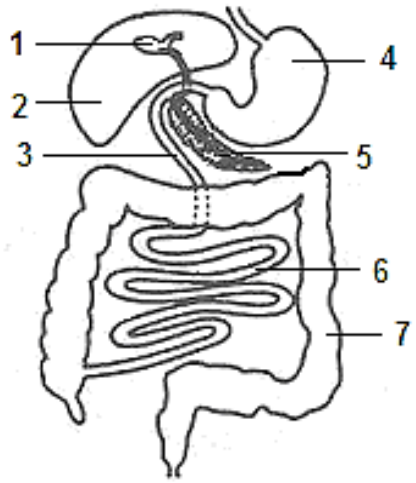
Candidate Name _____

Science (Biology)

Section A: Multiple Choice Questions (15 marks)

Answer **all** the questions in the table provided on page 20.

1 The diagram below shows part of the digestive system in human.



Digestion of proteins occur in structures

A 2 and 3

B 3 and 4

C 4 and 5

D 6 and 7

2 Specially formulated soap powders boast of their ability to remove oily stains completely. Which type of substance do you think could be found in these soap powders?

A Amylase

B Protease

C Lipase

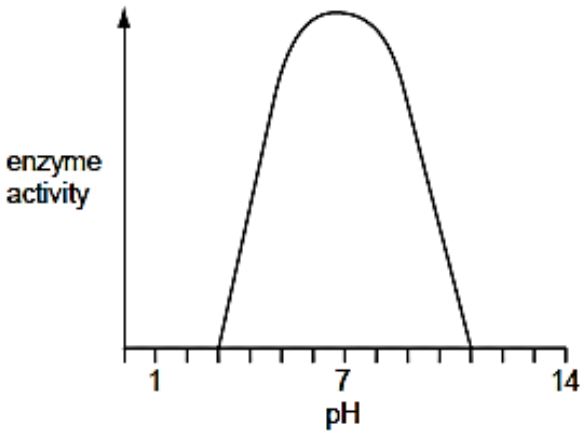
D Maltase

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3 Which enzyme and condition is responsible for the digestion of starch in the small intestine?

	Enzyme	Condition
A	Lipase	Alkaline
B	Amylase	Acidic
C	Protease	Acidic
D	Amylase	Alkaline

4 The graph shows the activity of an enzyme.



What does the graph show about the activity of the enzyme?

A It is denatured at high temperatures.

B It is most active in acidic conditions.

C It is most active in neutral conditions.

D It is unaffected by pH.

5 Which of the following can pass through the cell membrane?

A Starch and glucose

B Protein and maltose

C Polypeptides and amino acids

D Glycerol and amino acids

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6 An unknown food was tested with three various food tests. The result is recorded as below.

Test	Result
Iodine test	Blue black colour observed.
Biuret test	Blue solution observed.
Ethanol Emulsion Test	Cloudy white emulsion observed.

What nutrients does the food contain?

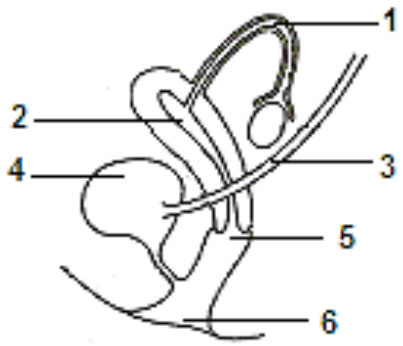
A Protein and fats only.

B Starch and fats only.

C Starch and protein only.

D Starch, protein and fats.

7 The diagram below shows the side view of the reproductive system of a woman.



Where do these three processes normally occur?

	Sperms deposition	Fertilization	Implantation
A	5	2	4
B	6	3	5
C	5	1	2
D	6	3	4

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8 Offspring of sexual reproduction will _____

A have only half the number of chromosomes as their parents.

B have twice as many chromosomes as their parents.

C have the same number of chromosomes as their parent.

D look exactly the same as either one of their parents.

9 Non identical twins are twins that are genetically different from each other. How can such twin arise?

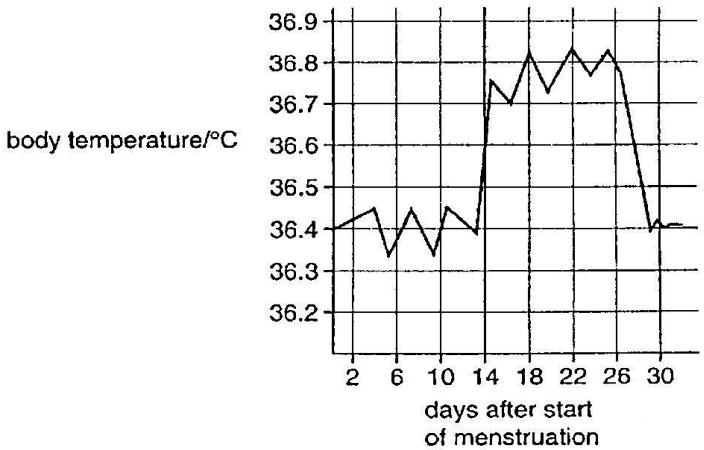
A Two sperm cells fertilising the same egg.

B Two sperm cells fertilising two separate eggs.

C Two eggs being fertilised by one sperm cell.

D One zygote dividing into two cells that each develops into a foetus.

10 The graph shows how a woman's body temperature varies during her menstrual cycle.



What happens to her body temperature when she ovulates?

A It falls from about 36.8°C to about 36.4°C.

B It remains at about 36.4°C.

C It remains at about 36.7°C.

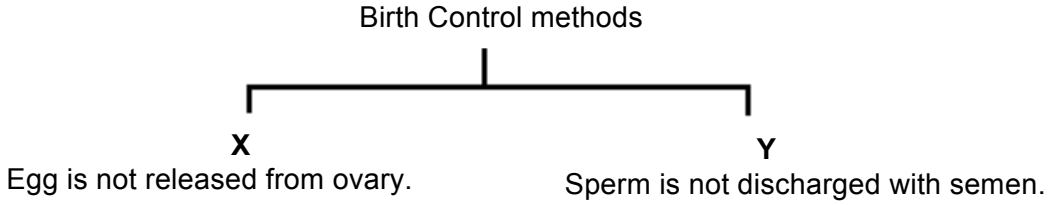
D It rises from about 36.4°C to about 36.8°C.

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11 Which of the following characteristics are common for both a boy and a girl when they reach puberty?

A Widening of hips
B Height increase
C Growth of facial and pubic hair
D Body becoming muscular

12 The figure below shows a classification of birth control methods.



Which one of the following birth control methods achieves the results **X** and **Y**?

	X	**Y**
A	Ligation	Vasectomy
B	Pills	Vasectomy
C	Pills	Condom
D	IUD	Spermicide

13 Which of the following is **not** associated with abortion?

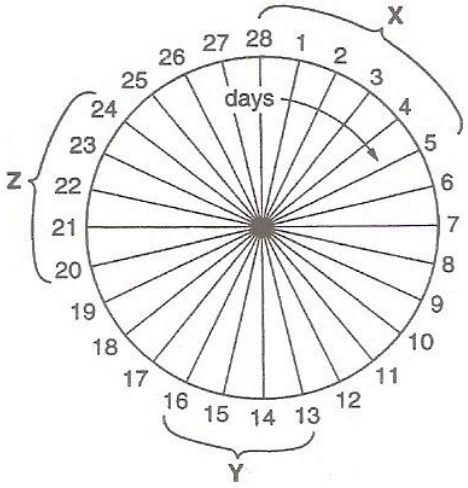
A Increased chance of becoming sterile
B Higher chance of contracting sexually transmitted infection
C Injury to uterus
D Feelings of guilt and depression

14 Gonorrhoea and syphilis are different form each other because gonorrhoea _____.

A is caused by a bacteria while syphilis is caused by a virus
B only affects the male while syphilis affects both male and female
C is treatable and syphilis is not
D affects mainly the reproductive organs while syphilis affects the whole body

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15 The diagram represents the menstrual cycle.



Which events may occur at **X, Y** and **Z**?

	X	**Y**	**Z**
A	Implantation	Ovulation	Menstruation
B	Menstruation	Ovulation	Implantation
C	Ovulation	Implantation	Menstruation
D	Ovulation	Menstruation	Implantation

Section A Answers

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15

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Section B (15 marks)

Answer **all** the questions in the spaces provided.

1 The table below shows the nutrients present in 100g of three food samples, **A**, **B**, and **C**.

Nutrient	Grams in food **A**	Grams in food **B**	Grams in food **C**
Protein	10.9	5.3	1.8
Fat	0.7	3.5	30.0
Carbohydrate	80.3	4.0	50.0
Calcium	0.2	1.75	0.1
Fibre	6.0	3.0	0.0
Water	4.0	88.0	78.0
Vitamins present	A, B_1	A, B_1,C, D	A, B_1,C, D

(a) Which food is recommended for [1]

(i) growth and repair _____

(ii) bone growth _____

(b) Explain why a diet of **only** food **B** would not meet the need of adults. [2]

_____

_____

_____

(c) If a person is having a diet of **only** food **C**, predict the health implications that the person may face. Explain your answer. [2]

_____

_____

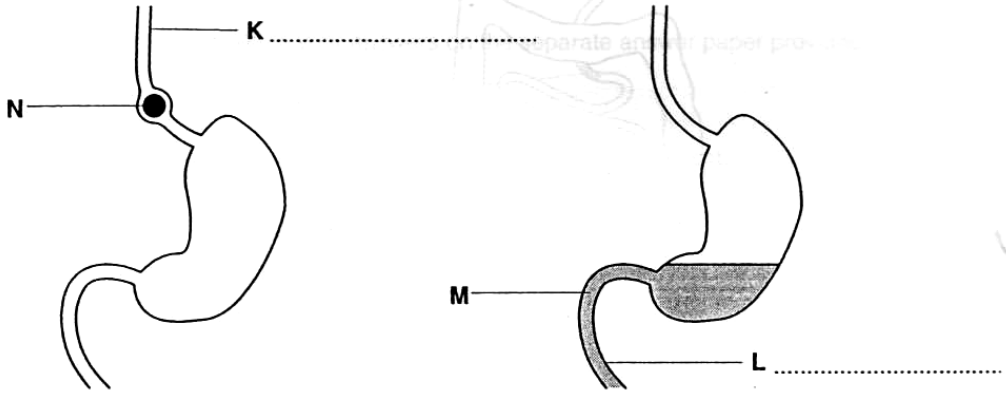
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2 The diagram below shows some food just before it enters the stomach and the same food as it leaves the stomach four hours later.



(a) On the diagram, label structures **K** and **L**. [1]

(b) The food consisted solely of lean meat and potatoes. By placing ticks in the appropriate boxes below, show how the major components of the food compare at positions **M** and **N**. [3]

	More at **M** than at **N**	Less at **M** than at **N**	Almost the same at **M** and **N**
Starch			
Protein			
Fibre			

(c) Name the region of the alimentary canal which will contain fibre in the highest proportion and give reason for your answer. [1]

_____

_____

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3 The diagram below shows a calendar page on which a woman has circled the date of her first day of menstruation.

June						
M	**T**	**W**	**T**	**F**	**S**	**S**
	1	2	3	(4)	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

(a) On which date would she expect the menstruation to end? [1]

_____

(b) On which date would she expect her next menstruation to begin? [1]

_____

(c) If the woman decided to use natural method of birth control, when is the period that she should abstain from sexual intercourse? [1]

_____

(d) Describe the events that take place if an egg is not fertilised in the woman's body. [2]

_____

_____

_____

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Section C (20 marks)

Answer **all** the questions in the spaces provided.

4 (a) Milk is an important source of protein and fat in the diet of many people. [5]
Describe how the nutrients in milk are digested in the human gut.

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(b) The table compares the mass of protein and fat found in a sample of whole milk and skimmed milk.

nutrient	mass/ g per 100 g	
	whole milk	skimmed milk
protein	3.4	3.5
fat	3.9	0.1

Using information in the table, explain why a person with a damaged liver might be recommended to drink skimmed milk rather than whole milk. [3]

(c) X'tra Slim pill is a new product that is introduced for people with obesity. The product is found to contain amylase inhibitor and lipase inhibitor. (An inhibitor will denature enzymes) Suggest how this product helps in reducing body weight. [2]

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5 **(a)** Compare human male and female sex cells in terms of numbers and movement. In each case, **suggest reasons** for the differences you describe. [4]

(b) Describe the role of placenta during the development of the foetus. [2]

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(c) Sexually transmitted infections (STI) are dangerous because they can cause serious health problems or even death. One of the sexually transmitted infections is caused by a virus. [4]

State the full name of this STI and virus. Describe its effects on the human body.

_____

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END OF PAPER

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Secondary 2 Express Science Biology SA2 Answer Scheme

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	C	D	C	D	B	C	C	B	D	B	B	B	D	B

	Section B	
1(a)(i)	Food A [1/2] Food B [1/2]	1
(b)	Food B is low in carbohydrate. [1] The diet is insufficient to provide the amount of energy [1/2] needed for an adult's daily acitivity. [1/2]	2
(c)	Constipation [1/2] , low in fibre intake [1/2] Coronary heart diseases or obesity [1/2] , high in fat intake [1/2] *Medical conditions must be correct for explanation to be awarded marks.*	2
2(a)	K : oesophagus [1/2] L : Small intestine [1/2]	1
2(b)		3
2(c)	Large intestine[1/2] Fibre is unable to be digested in human body. [1/2] *Reject: Anus* *Large intestine / rectum must be mentioned for explanation to be awarded marks.*	1
3(a)	8th June	1
3(b)	2nd July	1
3(c)	14th June – 20th June *Reject: fertile period, Day 11-17.*	1
3(d)	The egg will die. [1] The thick uterus wall and blood capillaries will break down[1/2] Dead egg, broken uterus wall and blood is discharged from the vagina during menstruation. [1/2] *Must describe the events. Simply mentioned dead egg is not accepted.*	2
	Section C	
4(a)	Protein is digested into polypeptide by protease 1 in the stomach. [1] Protein is digested into polypeptide by protease 1 in the small intestine. [1] Polypeptide is digested into amino acids by protease 2 in the small intestine. [1] In the small intestines, bile emulsify fats to increase the surface area of fat molecules for lipase to work on it.[1]	5

	More at M than at N	Less at M than at N	Almost the same at M and N
Starch			/
Protein		/	
Fibre			/

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	Fat is digested into fatty acids and glycerol by lipase in the small intestine.[1]	
4(b)	A damaged liver is unable to produce bile to emulsify fat in milk.[1/2] Emulsified fats has greater surface area for lipase to digest them faster [1/2] Person with damaged liver is less able to digest fats completely [1/2] Skimmed milk contains less fat to digest [1/2] Protein content in both milk are about the same [1/2] So skimmed milk is just as nutritious as whole milk. [1/2]	3
4(c)	Due to the inhibitors amylase and lipase will be denatured and cannot digest starch and lipids. [1/2] So no glucose and fatty acids and glycerol would be absorbed by body[1/2] Body will make use of its stored fats or glycogen to produce energy leading to weight loss [1]	2
5(a)	Only one ovum is released every 28 days but millions of sperms are released each time. [1] Large number of sperm is released to increases the chances of fertilization. [1] Sperm can move with the help of its tail but ovum is unable to move on its own. [1] Sperms have to be motile because it has to find its way in the female system, up the uterus to reach the oviduct for fertilization [1] COMPARISION MUST BE SIDE BY SIDE .	[4]
5(b)	Placenta's role is to enable exchange of substances between the foetus and the mother [1/2] Placenta allows glucose and oxygen to diffuse from the mother's blood into the foetus's blood. [1] It also allows carbon dioxide and waste products to diffuse from the foetus blood to mother's blood.[1]	2
5(c)	Acquired Immune Deficiency Syndrome [1] , Human Immunodeficiency virus [1] HIV virus attacks the white blood cells which help the body to fight infections. [1] When the body's immune system is weaken, these symptoms appear : - Frequent tiredness - Loss of appetite - Loss of weight - Prolonged fever - Night sweats - Skin rash - Persistent diarrhoea - Frequent flu *(½ mark for at least 2 symptoms mentioned above)* 8-10years later, patient may die due to lung infection, cancer of blood vessels, Kaposi sarcoma, brain infection and tuberculosis. *(½ mark for at least 2 symptoms mentioned above.)*	4

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