Specimen Papers

SEC 45 Core Science

Table of Contents

Specimen Assessments: Controlled Paper Level 1-2

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER

SUBJECT:	**Core Science**
PAPER NUMBER:	**Level 1 – 2**
DATE:	
TIME:	2 Hours

Directions to Candidates

- The use of electronic calculators is permitted.
- You are requested to show your working and to write the units where necessary.

Useful information

- Standard temperature and pressure (stp): 0 °C and 1 atm
- The molar volume for gases at stp = 22.4 dm^3
- A Periodic Table which includes the symbol, the name, the atomic number and the relative atomic mass of each element, is printed on the back of this booklet.
- When necessary, take g, acceleration due to gravity, as 10 m/s^2.

Useful equations

$\rho = \dfrac{m}{V}$	$v = f\lambda$	$Q = m\,c\,\Delta\theta$	
$\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$	Unbalanced force = ma	$W = m\,g$	momentum = m v
$v = u + a\,t$	$s = u\,t + \dfrac{1}{2}\,a\,t^2$	$v^2 = u^2 + 2\,a\,s$	$s = (u + v)\dfrac{t}{2}$
$Q = I\,t$	$V = I\,R$	$P = I\,V$	$E = P\,t$
$R_{total} = R_1 + R_2$	$\dfrac{1}{R_{total}} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$	Efficiency = $\dfrac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
Area of a triangle = $\dfrac{1}{2}\,b\,h$	Area of a trapezium = $\dfrac{1}{2}\,(a + b)\,h$	Area of a circle = $\pi\,r^2$	

List of polyatomic ions and their charges	
Name	**Formula**
Ammonium	NH_4^+
Nitrate	NO_3^-
Sulfate	SO_4^{2-}
Carbonate	CO_3^{2-}
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-

Answer ALL questions in ALL sections.

SECTION A: This section carries 40 marks.

1. The following diagram represents the female reproductive system.
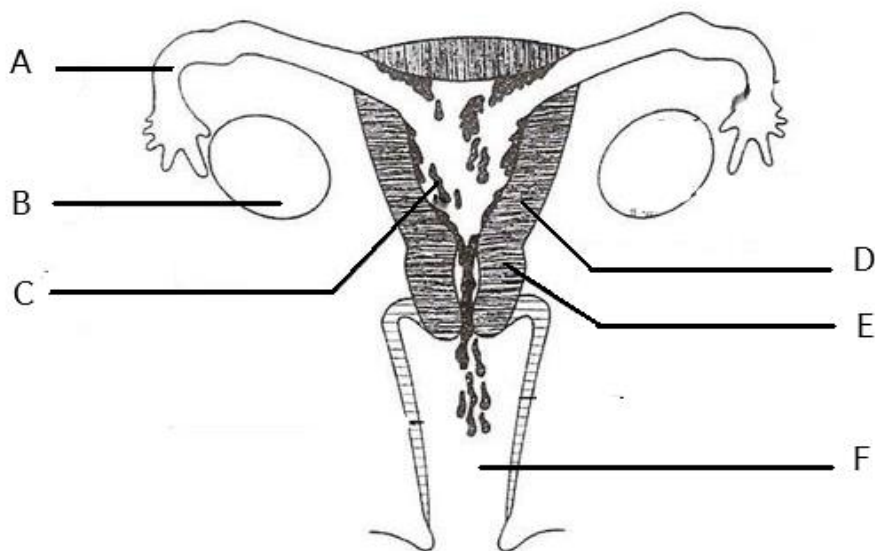
a. Name structures A – F.

A - _____   D - _____

B - _____   E - _____

C - _____   F - _____

(6)
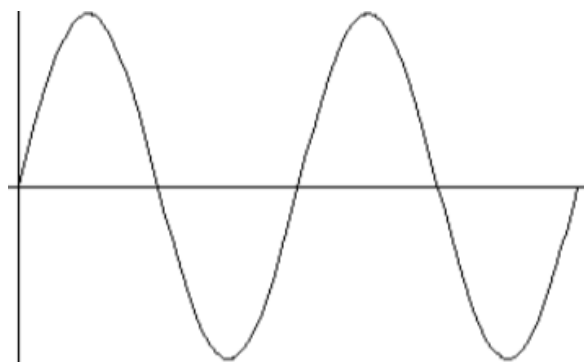
b. Name the stage of the menstrual cycle that the diagram above is representing. Explain what happens during this stage.

- Stage - _____ (1)

- Explanation - _____ (1)

(Total: 8 marks)

2. The following is a diagram of a wave.

a.   Name this type of wave.

_____ (1)

b.   On the diagram above, mark and label:

   i. the wavelength;   (1)

   ii. the amplitude.   (1)

c.   Give **TWO** examples of this type of wave.

_____

_____ (2)

d.   John is enjoying his walking holiday in the mountains when there is a thunderstorm.
     He sees the flash of light first, then hears the sound of thunder.

   i. Why does John see the light before he hears the thunder?

_____ (1)

   ii. Why does John hear a second sound of thunder?

_____ (1)

   iii. Why is the second sound quieter than the first?

_____ (1)

(Total: 8 marks)

3. a. i. Air is a mixture of gases. Name **ONE** component and give its percentage in air.

   Component: _____   (1)

   Percentage: _____   (1)

ii. Name **ONE** pollutant present in the atmosphere.

_____ (1)

b. Oxidation and reduction can be defined in more than one way.

   i. Define oxidation and reduction in terms of oxygen and hydrogen.

   Oxidation: _____

_____ (1)

   Reduction: _____

_____ (1)

   ii.   Define oxidation and reduction in terms of exchange of electrons.

   Oxidation: _____

   Reduction: _____   (1)

(Total: 6 marks)

4. Below are two electrical circuits.
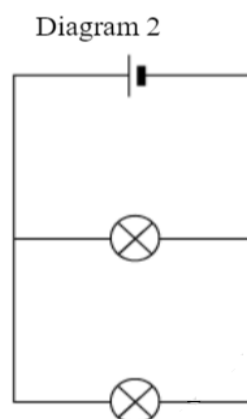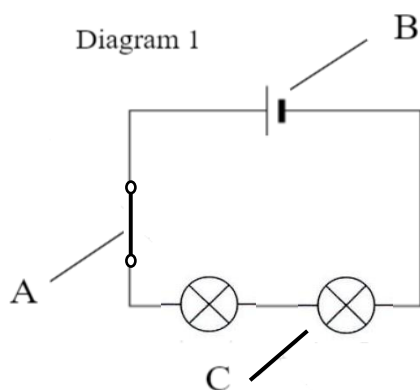
Diagram 1   Diagram 2

   a. Which components do A, B and C represent?

      A.   _____

      B.   _____

      C.   _____   (3)

b. Name the arrangement of the bulbs in Diagram 2. _____ (1)

c. A hair dryer transfers 48,000 J of energy in one minute. What is the power rating of the dryer?

_____

_____ (2)

(Total: 6 marks)

5. a. A solution is composed of a solute and a solvent.

    i.   Give a suitable example of a solute and its solvent in a solution.

       Solute: _____ (1)

       Solvent: _____ (1)

    ii.   Explain what is meant by the solubility of a substance.

_____

_____ (2)

b.   i.   Explain how catalysts affect chemical reactions.

_____ (1)

    ii.   Name **ONE** other factor that affects chemical reactions.

_____ (1)

(Total: 6 marks)

6. Solar energy and crude oil are examples of renewable and non-renewable sources of energy respectively.

a. i. Give **ONE** disadvantage of a renewable source of energy.

_____ (1)

   ii. Give **ONE** advantage of a non-renewable source of energy.

_____ (1)

   iii. Give **ONE** example of how fossil fuel consumption can be reduced.

_____ (1)

b. This Sankey diagram shows the energy input and output for an old diesel car engine.
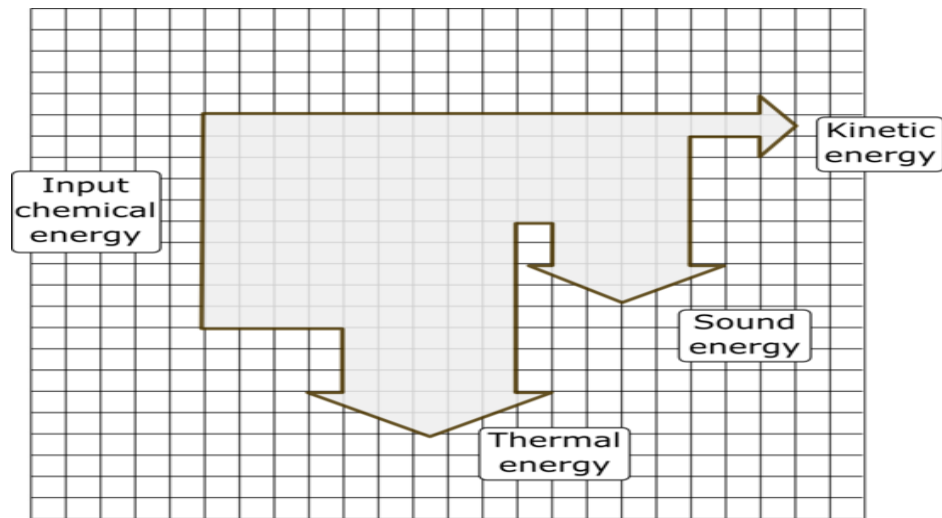
In the above Sankey diagram every grid represent 10KJ (Joules). Use the grid to calculate the following:

i.   total input (chemical) energy;   _____ (1)

ii. total output energy.   _____ (2)

(Total: 6 marks)

SECTION B: This section carries 15 marks.

7. Read the following passage and answer **ALL** the questions that follow.

1 Untreated sewage is sometimes released in the sea. This causes changes in the habitat and also effects the marine community. Seagrasses will be more shaded and will have a reduced capacity to perform photosynthesis.

   Changes in the biotic community can be used to assess the environmental status of a given
5 habitat. These changes can occur due to an increase or a decrease in pollution levels.

   When raw sewage stopped being poured in Wied Għammieq in 2011, a decrease in organic pollution and nutrient load to the marine waters in its vicinity was recorded. The bathing water quality classification of the area was changed from "Sufficient" to "Excellent".

   Some time ago another study was conducted at Wied Għammieq. Four locations were selected.
10 Two quadrats were sampled at each of the four sites and studied.

   a. Seagrasses perform photosynthesis to produce food. This food is stored as starch in the leaves.

   i. Write a word equation to summarise the process of photosynthesis.

   _____ (3)

   ii. Name the chemical that tests for the presence of starch in sea grass.

   _____ (1)

   iii. Identify the colours obtained when the chemical named in part a.ii. is in the presence / absence of starch.

   • Presence of starch - _____   (1)

   • Absence of starch - _____   (1)

   b. Name the ecosystem that is being described in the passage above.

   _____ (1)

   c. Complete the following table to list **TWO** biotic and **TWO** abiotic components of the ecosystem named in part b.

Biotic Component	Abiotic Component

(4)

d. Explain the meaning of the term "habitat" in line 1.

_____

_____ (2)

e. What are "quadrats" (line 10)?

_____

_____ (2)

(Total: 15 marks)

SECTION C: This section carries 45 marks.

Answer ALL questions in this section.

8. a. i. State the meaning of the terms scalar quantity and vector quantity.

Scalar quantity: _____ (1)

Vector quantity: _____ (1)

ii. Complete the following table by marking with an '**X**' whether each quantity is a scalar or a vector. (The first one has been done for you.)

Quantity	Scalar	Vector
Length	**X**	
Mass		
Weight		
A distance of 10 m to the left		
Velocity		

(2)

b. i. State whether the following statements are True (T) or False (F).
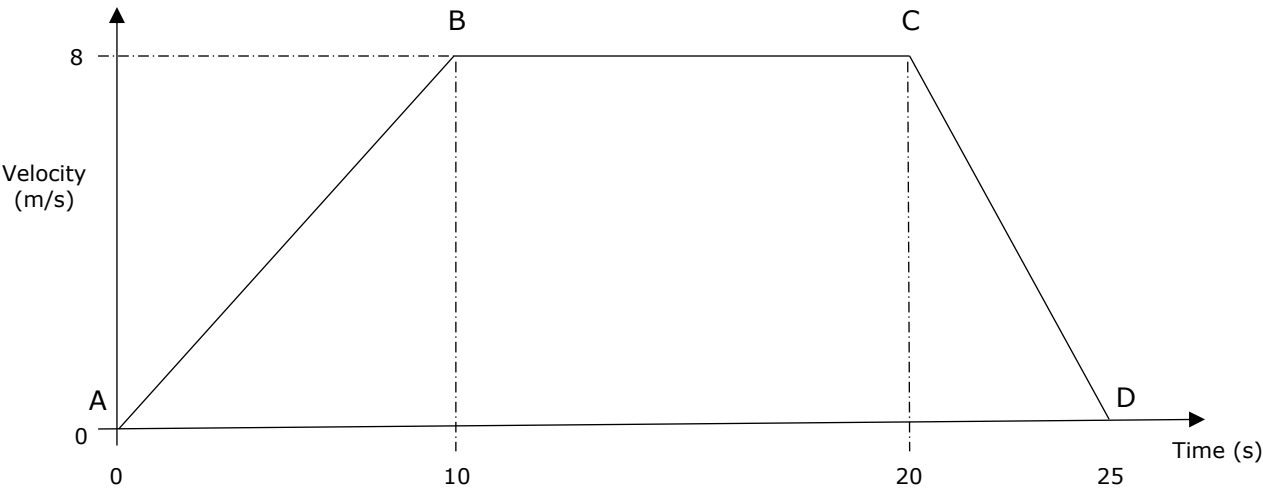
- Weight and mass are the same. _____
- Our weight is different on Earth and on the moon. _____
- Our mass is different on Earth and on the moon. _____
- Weight is measured in kilogrammes (kg). _____ (2)

ii. Find the weight of an object of mass 20 kg.

_____

_____ (2)

c. The following plot shows the journey of a car over a journey of 25 s.

i. The car moves for 25 s. Indicate what happens in section AB, section BC and section CD of the plot.

Section AB: _____ (1)

Section BC: _____ (1)

Section CD: _____ (1)

ii. Calculate the acceleration of the car in the first 10 s.

_____

_____ (2)

iii. If the mass of the car is 500 kg, find its momentum in the section BC.

_____

_____ (2)

(Total: 15 marks)

9. a. The presence of metals in compounds can be identified by carrying out a flame test.

i. Outline the procedure to carry out a flame test.

_____

_____ (2)

ii. Flame tests were carried out on four samples labelled A, B, C and D. The results were as follows: Sample A – lilac; Sample B – apple green; Sample C – crimson red; Sample D – brick red. Identify the metal present in each of the four samples.

Sample A: _____   Sample B: _____

Sample C: _____   Sample D: _____   (4)

b. A mixture of sand and water can be separated by filtration. Draw a labelled diagram of the apparatus used, indicating the filtrate and the residue. (6)

c. A sample of ink can be analysed to see its components.

  i. Name the technique that can be used.

_____ (1)

  ii. Explain briefly how results can be interpreted.

_____

_____ (2)

(Total: 15 marks)

10. a. There are many ways how we can feel unwell. List **FOUR** ways how you can get sick.

    1. _____

    2. _____

    3. _____

    4. _____   (4)

b. List **THREE** barriers the body uses to defend itself from getting infections and explain how they perform their function?

Barrier 1: _____ (1)

Explanation: _____

_____ (1)

Barrier 2: _____ (1)

Explanation: _____

_____ (1)

Barrier 3: _____ (1)

Explanation: _____

_____ (1)

c.   When pathogens manage to enter our body it is up to the white blood cells to remove them. Draw a diagram showing the steps involved.   (3)

d. Explain why a person will not get the chicken pox twice?

_____

_____ (2)

(Total: 15 marks)

END OF PAPER

PERIODIC TABLE OF THE ELEMENTS

1	2														3	4	5	6	7	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	63.5 **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	99 **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	210 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86

Key:

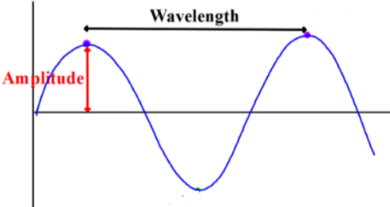| |
|---|
| a
X
Y
b |

relative atomic mass
SYMBOL
Name
atomic number

Specimen Assessments: Marking Scheme for Controlled Paper Level 1-2

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER MARKING SCHEME

SUBJECT:	**Core Science**
PAPER NUMBER:	**Level 1 – 2**
DATE:	
TIME:	2 Hours

Question			Suggested Answer	Marks	Remarks
1.	a.		A – Fallopian tube / oviduct	1	
			B – Ovary	1	
			C – Endometrium / lining of uterus	1	
			D – Uterus / wall of uterus	1	
			E – Cervix	1	
			F - Vagina	1	
	b.		Stage: Menstruation	1	
			Explanation: The endometrium is shed from the vagina	1	
			Total	**8**	
2.	a.		Transverse wave	1	
	b.			2	
	c.		Water / ocean waves, light waves	2	
	d.	i.	Light waves travel faster than sound waves	1	
		ii.	This is because sound waves are reflected by the mountains producing an echo.	1	
		iii.	This is because at such large distances there are 'losses' / unwanted energy transfers in energy	1	
			Total	**8**	
3.	a.	i.	Any component	1	
			and its respective percentage	1	
		ii.	Any acceptable answer	1	
	b.	i.	Oxidation: addition of oxygen; loss of hydrogen	1	
			Reduction: loss of oxygen; addition of hydrogen	1	
		ii.	Oxidation: loss of electrons; Reduction: gain of electrons	1	
			Total	**6**	

4.	a.		A. Wire	1	
			B. Cell / battery	1	
			C. Light bulb	1	
	b.		Parallel	1	
	c.		Power = Energy / time		
			= 48000 / 60	1	
			= 800 W	1	
			Total	**6**	
5.	a.	i.	Any solute	1	
			and respective solvent	1	
		ii.	The maximum amount of solute that can dissolve in a certain amount of solvent or solution at a certain temperature.	2	Reduce 1 mark for each parameter left out
	b.	i.	A catalyst is a substance that changes/alters the rate (speed) of a chemical reaction.	1	
		ii.	Temperature or surface area	1	
			Total	**6**	
6.	a.	i.	Any valid disadvantage	1	
		ii.	Any valid advantage	1	
		iii.	- Reduce, reuse, recycle, buying products with minimal packaging will help to reduce waste - Use less heat and air conditioning - replace your light bulbs with energy efficient ones - drive less and drive smart - buy energy-efficient products - use less hot water - Switch OFF appliances when not in use	1	Any one or equivalent to
	b.	i.	100 kJ	1	
		ii.	100 kJ	2	
			Total	**6**	
7.	a.	i.		3	
		ii.	Iodine	1	
		iii.	Blue / Blue-black	1	
			Yellow / Yellow-brown	1	
	b.		Marine / sea-water ecosystem	1	
	c.			4	

light energy

carbon dioxide + water ⟶ glucose + oxygen
chlorophyll

Biotic Component	Abiotic Component
Sea grass/alga/plankton	Sunlight/pH/salinity
Fish/sea urchins/bacteria	Water currents/nutrients

	d.		A habitat is a place where an organism or a community of organisms live	2	
	e.		Frames in the form of squares that are used in fieldwork/sampling studies	2	
			Total	**15**	
8.	a.	i.	Scalar: magnitude/size only	1	
			Vector: magnitude/size and direction	1	
		ii.	(table below)		
	b.	i.	False	½	
			True	½	
			False	½	
			False	½	
		ii.	W = m x g		
			= 20 x 10	1	
			= 200N	1	
	c.	i.	AB – Acceleration	1	
			BC – no acceleration / constant velocity	1	
			CD – deceleration	1	
		ii.	Acc = gradient		
			= (8-0) / (10-0)		
			= 8/10	1	
			= $0.8 m/s^2$	1	
		iii.	P = m x v		
			= 500 x 8	1	
			= 4000 kgm/s	1	
			Total	**15**	
9.	a.	i.	- Dip a clean wire loop into a sample of the compound being tested	1	
			- put the loop into the edge of the a Bunsen burner blue flame	1	
		ii.	A – Potassium	1	
			B – Barium	1	
			C – Lithium	1	
			D – Calcium	1	

Table for 8.a.ii:

Quantity	Scalar	Vector	
Length	**X**		½
Mass	**X**		½
Weight		**X**	½
A distance of 10 m to the left		**X**	½
Velocity		**X**	

	b.			2 marks for diagram 2 marks for labelling 1 mark for residue 1 mark for filtrate	
	c.	i.	Chromatography	1	
		ii.	The more soluble the component it is, the further it moves The various components separate into different spots	1 1	
			Total	**15**	
10.	a.		Air, water, food, contact (body fluids), animals	4	Any correct four
	b.		Skin, mucus and cilia in respiratory tract Tears Acid in stomach - prevent entry of pathogens	6	
	c.		 OR 	3	
	d.		Once the body learns how to fight the disease it will remember. If the body is invaded again, it will quickly produce antibodies and stop the disease before it infects the body.	1 1	
			Total	**15**	

Specimen Assessments: Controlled Paper Level 2-3

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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
SAMPLE PAPER

SUBJECT:	**Core Science**
PAPER NUMBER:	**Level 2 – 3**
DATE:	
TIME:	2 Hours

Directions to Candidates

- The use of electronic calculators is permitted.
- You are requested to show your working and to write the units where necessary.

Useful information

- Standard temperature and pressure (stp): 0 ^{o}C and 1 atm
- The molar volume for gases at stp = 22.4 dm^3
- A Periodic Table which includes the symbol, the name, the atomic number and the relative atomic mass of each element, is printed on the back of this booklet.
- When necessary, take g, acceleration due to gravity, as 10 m/s^2.

Useful equations

|		
$\rho = \dfrac{m}{V}$	$v = f\lambda$	$Q = m\,c\,\Delta\theta$
$\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$	Unbalanced force = ma $\qquad$ W = m g	momentum = m v
$v = u + a\,t$	$s = u\,t + \dfrac{1}{2}a\,t^2 \qquad v^2 = u^2 + 2\,a\,s$	$s = (u + v)\dfrac{t}{2}$
$Q = I\,t$	$V = I\,R \qquad P = I\,V$	$E = P\,t$
$R_{total} = R_1 + R_2$	$\dfrac{1}{R_{total}} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ $\qquad$ Efficiency = $\dfrac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
Area of a triangle = $\dfrac{1}{2}$ b h	Area of a trapezium = $\dfrac{1}{2}$ (a + b) h	Area of a circle = $\pi\,r^2$

List of polyatomic ions and their charges	
Name	**Formula**
Ammonium	NH_4^+
Nitrate	NO_3^-
Sulfate	SO_4^{2-}
Carbonate	CO_3^{2-}
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-

Answer ALL questions in ALL sections.

SECTION A: This section carries 40 marks.

1. The following graph represents the levels of the hormones oestrogen and progesterone in a female having a menstrual cycle of 28 days.

Levels of Oestrogen and Progesterone during a 28 day menstrual cycle.
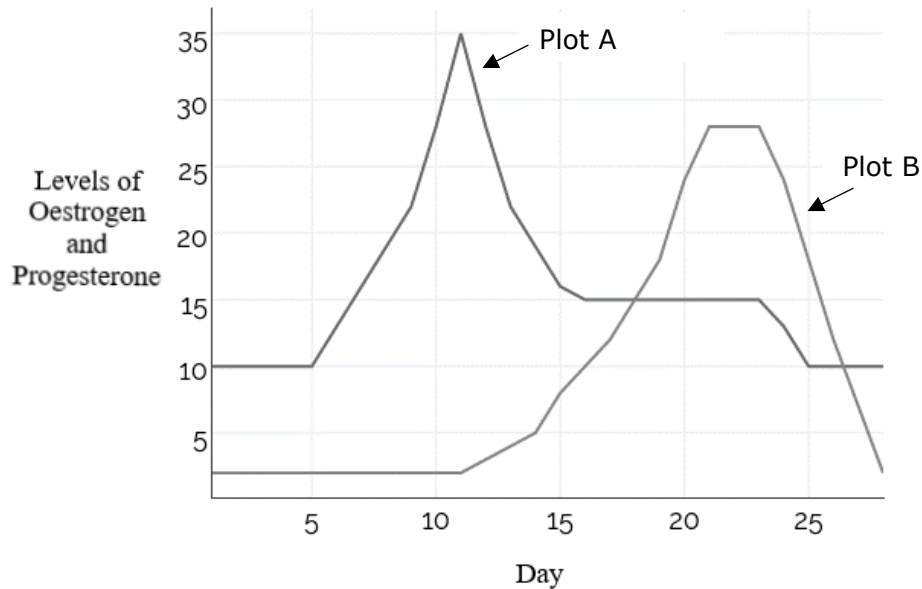
a. Name the gland that produces the hormones oestrogen and progesterone.

_____ (1)

b. From the graph above, state the plot that indicates the change in level of progesterone.

_____ (1)

c. State what happens to the progesterone level when a female becomes pregnant. Give **ONE** reason for your answer.

_____

_____ (2)

d. Name a birth control method that may prevent sexually transmitted infections (STIs).

_____ (1)

e. Name **ONE** viral sexually transmitted infection.

_____ (1)

(Total: 6 marks)

2. A mosquito beats its wings approximately 360,000 times in 1 minute and flies at a speed of 6.5 m/s. The speed of sound of wing beats is 330 m/s.

a. Calculate:

i. the frequency of the sound waves produced by the mosquito;

_____

_____ (2)

ii. the wavelength of the sound wave produced by the mosquito;

_____ (1)

iii. the time taken for a mosquito to travel 1500 m.

_____ (1)

b. A dog whistle is a training tool that has been used for a very long time. It has a piercing sound which is emitted at a frequency of 23,000 Hz to 54,000 Hz and is carried a long distance. This makes it a great tool if you need to control your dog at a distance or if you need to get your dog's attention in a noisy situation.
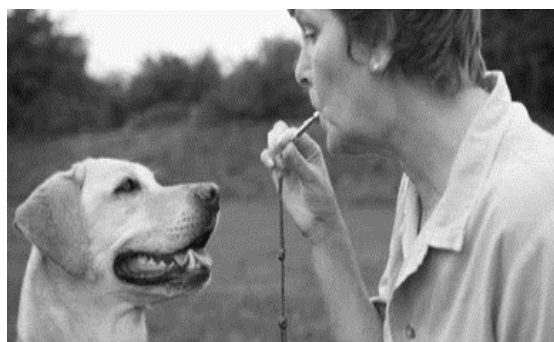
i. Explain how sound travels from the whistle to the dog.

_____

_____ (2)

ii. Some people might complain that if many dog owners use these whistles in parks or other open spaces, they would disturb the tranquillity of these areas with all the noise produced. Do you agree? Explain.

_____

_____ (2)

(Total: 8 marks)

3. a. i.   Name an atmospheric pollutant.

_____ (1)

   ii. Describe **ONE** effect of the pollutant mentioned in part a. i. on ecosystems and/or biodiversity.

_____ (1)

b. i. Define oxidation and reduction in terms of exchange of electrons.

_____

_____ (1)

   ii. Consider the chemical reaction: $C + O_2 \longrightarrow CO_2$

   Using oxidation numbers, deduce which element is being oxidised and which element is being reduced.

_____

_____

_____ (2)

   iii. Give the valency of carbon in CO_2. Show your reasoning.

_____

_____ (1)

(Total: 6 marks)

4. The hair dryer shown has a plastic casing and a heating element of rating 900 W, 240 V.

a. Calculate the current flowing through the heating coil when it is being used.

_____

_____ (2)

b. Calculate the cost of running the dryer for 30 minutes if 1 kWh costs 17 c.

_____

_____

_____ (3)

c. A circuit breaker is a safety feature found in homes. Explain its function.

_____

_____ (1)

(Total: 6 marks)

5. a. Solution A was prepared by dissolving 50 g of common salt (sodium chloride) in 500 mL of solution, while solution B was prepared by dissolving 64 g of common salt in 1 L of solution.

    i. Calculate the concentration of solution A in g/L.

_____

_____ (1)

    ii. Calculate the concentration of solution B in g/L.

_____

_____ (1)

    iii. Name the more concentrated solution.

_____ (1)

b. Sketch the reaction profile of an exothermic reaction. Indicate the activation energy on the plot. (3)

(Total: 6 marks)

6. Solar energy and crude oil are examples of renewable and non-renewable sources of energy respectively.

f. i. Give **ONE** disadvantage of a renewable source of energy.

_____ (1)

    ii. Give **ONE** advantage of a non-renewable source of energy.

_____ (1)

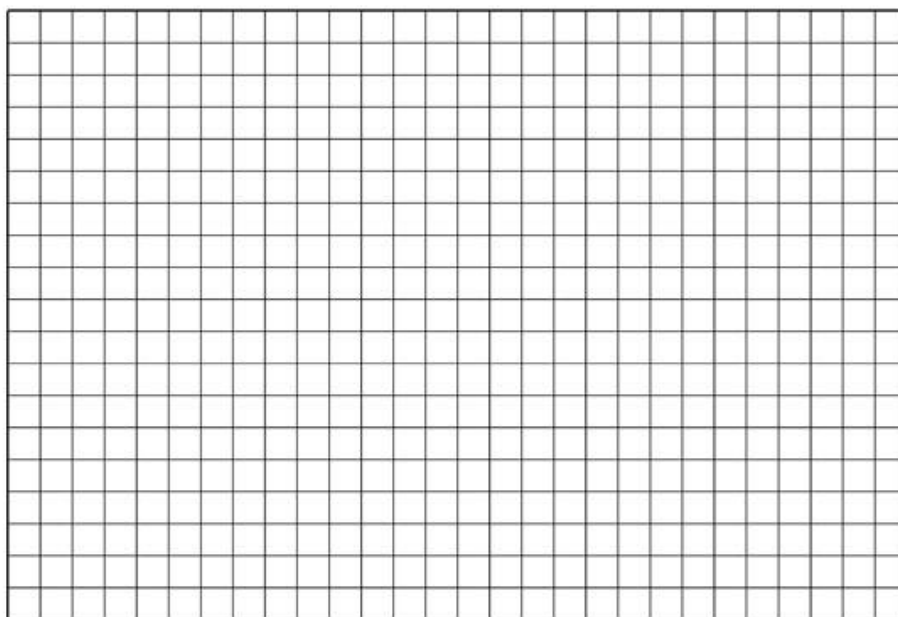b. Suggest **TWO** ways in which unwanted energy transfers can be reduced so that our houses remain warm in winter.

_____

_____ (2)

c. A kettle uses 1200 J of electrical energy. 900 J of thermal energy is used to heat the water. 300 J of thermal energy is wasted and lost to heat the surroundings.

i. Draw a Sankey diagram in the space provided to represent the energy transfer.   (2)

ii. Calculate the efficiency of the kettle.

_____

_____ (2)

(Total: 8 marks)

SECTION B: This section carries 15 marks.

7. Read the following passage and answer **ALL** the questions that follow.

Influence of Sewage Effluent on Rocky Shore Biotic Assemblages

1   Sewage is defined by the United Nations Environment Programme as a collection of solids, organic matter, nutrients, pathogens, toxic organic chemicals, heavy metals and fats, oils and grease.

When sewage is released in the sea ecosystem, it causes changes in the habitat such as the
5   increase in nutrients and the introduction of particulates in the sea. It also effects the marine community such as the shading of seagrasses which lead to a reduced capacity to perform photosynthesis, and the promotion of eutrophic conditions due to the high amounts of nutrients.

Changes in the biotic community can be used to assess the environmental status of a given habitat. These changes can occur due to an increase or a decrease in pollution levels.

10   Following the decommissioning of the Wied Għammieq raw sewage outfall in 2011, a decrease in organic pollution and nutrient load to the marine waters in its vicinity was recorded. The bathing water quality classification of the area was changed from "Sufficient" to "Excellent".

Four years after the cessation of the raw sewage discharge, another study was conducted. Four locations at different distances from the previous sewage outfall site at Wied Għammieq were
15   selected. Two quadrats were sampled at each of the four sites and studied.

Adapted extract from Attard M., *Influence of Sewage Effluent on Rocky Shore Biotic Assemblages;*
in Biology Symposium Abstracts 2016, UOM

a. Explain the meaning of the term "ecosystem" in line 4.

_____

_____ (2)

b. List **TWO** ways by which the discharge of untreated sewage may affect the abiotic component of the marine ecosystem.

_____

_____ (2)

c. The release of untreated sewage "lead[s] to a reduced capacity to perform photosynthesis" (lines 6-7).

i. Write a word equation to summarise the process of photosynthesis.

_____ (2)

ii. Explain why untreated sewage reduces the capacity of seagrass to photosynthesise.

_____

_____ (2)

d. What are "quadrats" (line 15)?

_____

_____ (1)

e. How can quadrats be used in field studies?

_____

_____ (2)

f. Predict the changes in the populations of bacteria and fish when comparing studies prior to and after the cessation of raw sewage input at Wied Għammieq. Explain your predictions.

_____

_____

_____

_____

_____

_____ (4)

(Total: 15 marks)

SECTION C: This section carries 45 marks.

Answer ALL questions in this section.

8. a. i. Explain how the mass and weight of an object are related.

_____

_____

_____ (2)

   ii. The weight of an object of given mass on Earth is different from its weight on the moon, while it has no weight in space. Explain.

_____

_____

_____ (2)

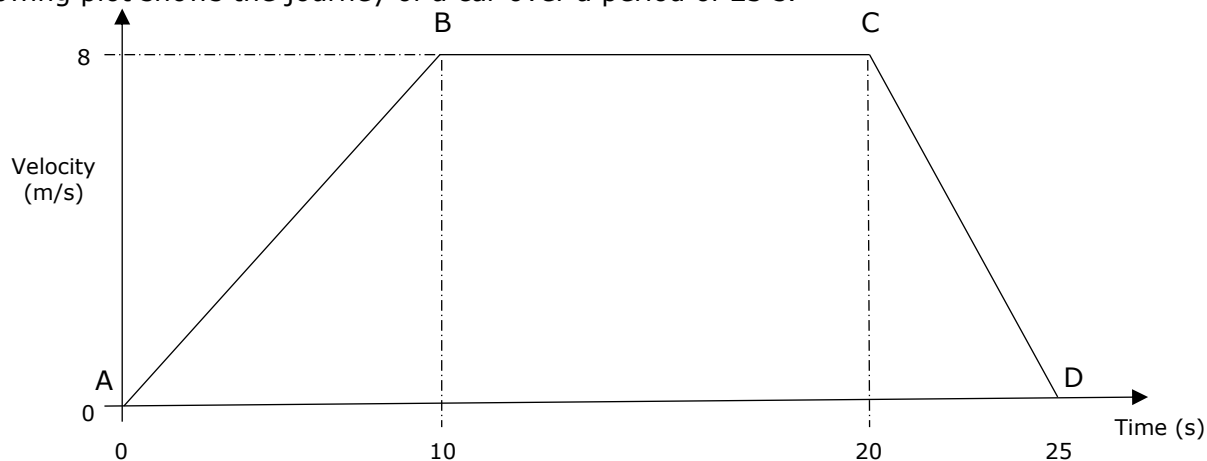   iii. Find the weight (on Earth) of an object of mass 20 kg.

_____

_____ (2)

b.   The following plot shows the journey of a car over a period of 25 s.

   i. Section AB shows that the car accelerates in the first 10 s. Describe, in terms of acceleration, what happens in:

- section BC;

_____

_____ (1)

- section CD.

_____

_____ (1)

ii. Calculate the acceleration of the car in the first 10 s.

_____

_____ (2)

iii. Find the total distance travelled during the whole 25 s of the car's journey.

_____

_____

_____ (3)

iv. Calculate the average velocity of the car.

_____

_____ (2)

(Total: 15 marks)

9. a. The presence of metals in compounds can be identified by carrying out a flame test.

i. Outline the procedure to carry out a flame test.

_____

_____ (2)

ii. Flame tests were carried out on four samples labelled A, B, C and D. The results were as follows:
Sample A – lilac; Sample B – apple green; Sample C – crimson red. Identify the metal present in each of the following samples:

Sample A: _____

Sample B: _____

Sample C: _____ (3)

b. A sample of ink can be analysed to see its components.

i. Name the technique that can be used.

_____ (1)

ii. Draw a labelled diagram of the apparatus used. (2)

iii. Explain briefly how results can be interpreted.

_____

_____

_____ (2)

c. There is simple and fractional distillation.

   i. What is the purpose of the process of distillation?

_____

_____ (1)

   ii. Give **ONE** example where simple distillation and **ONE** example where fractional distillation are used.

_____

_____ (2)

   iii. Distinguish between instances where simple and fractional distillation are used.

_____

_____ (2)

(Total: 15 marks)

10. The table shows the percentage of protein, fat and minerals found in the same mass of meat from different animals.

Meat	Protein (%)	Fat (%)	Minerals (%)
Beef	19.0	17.0	0.9
Chicken	21.0	2.5	1.1
Lamb	17.5	20.0	1.0
Pork	16.0	25.0	0.9
Rabbit	21.0	3.5	1.5

a.

   i. Which meat contains the least protein?

_____ (1)

   ii. Calculate how many grammes of protein are present in 1 kg of rabbit meat. Show your working.

_____

_____ (2)

b. Which type of meat would provide the most energy?

_____ (1)

c. Give **TWO** uses of fat in the human body.

1. _____ (1)

2. _____ (1)

d. Name the mineral found in meat that is needed to make haemoglobin.

_____ (1)

e. Starch and glucose are carbohydrates found in living organisms. Complete the table to show some of the properties of starch and glucose. Insert a tick (✓) if the property applies or a cross (✗) if it does not.

Carbohydrate	Soluble in water	Found in animal cells	Broken down by carbohydrase	Small molecule	Tests positive with iodine solution
Starch					
Glucose					

(5)

f. Give **ONE** function of the following terms:

i. saliva;

_____ (1)

ii. bile;

_____ (1)

iii. teeth.

_____ (1)

(Total: 15 marks)

END OF PAPER

PERIODIC TABLE OF THE ELEMENTS

1	2																	3	4	5	6	7	0
																							4 **He** Helium 2
7 **Li** Lithium 3	9 **Be** Beryllium 4						1 **H** Hydrogen 1											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	63.5 **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	99 **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	210 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86

Key:

a
X
Y
b

relative atomic mass
SYMBOL
Name
atomic number

Specimen Assessments: Marking Scheme for Controlled Paper Level 2-3

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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
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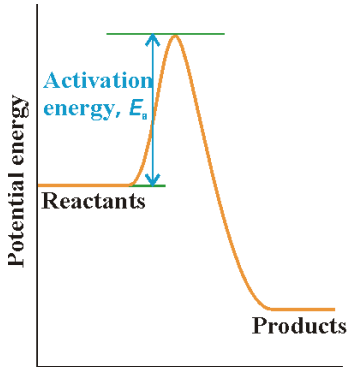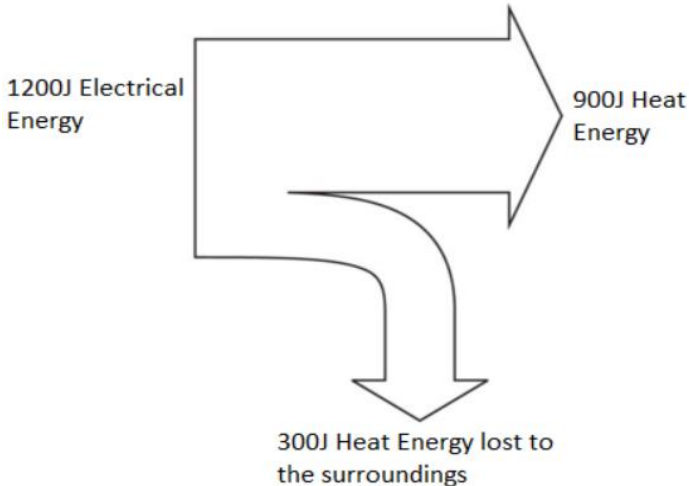**SECONDARY EDUCATION CERTIFICATE LEVEL**
SAMPLE PAPER MARKING SCHEME

SUBJECT: **Core Science**
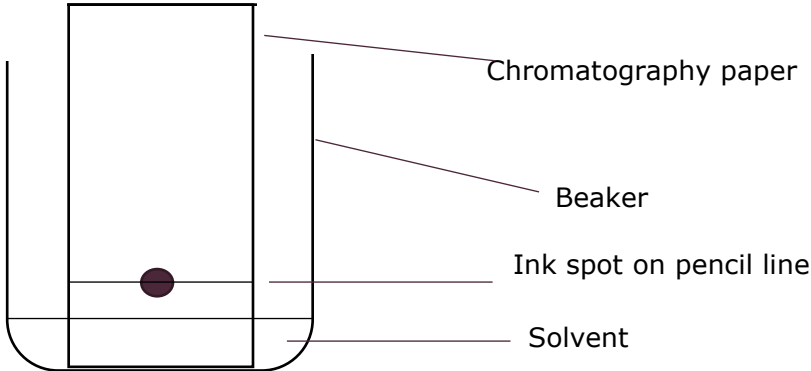PAPER NUMBER: **Level 2 – 3**
DATE:
TIME: 2 Hours

Question			Suggested Answer	Marks	Other Remarks
1	a		Ovary	1	
	b		Plot B	1	
	c		Progesterone level increases	1	
			It maintains the lining of the uterus until birth	1	
	d		Abstinence / Use of a condom	1	
	e		HIV / AIDS / Genital warts	1	
			Total	**6**	
2	a	i	360000 / 60	1	
			6000 Hz	1	
		ii	$V = f \times \lambda$		
			$330 = 6{,}000 \times \lambda$; $0.055\ m = \lambda$	1	
		iii	$S = d/t$		
			$6.5 = 1500 / t$; $230.8\ s = t$	1	
	b	i	Sound travels in air as longitudinal waves in a series of compressions and rarefactions which travel in the same direction as the wave.	1 1	
		ii	No,	1	
			this sound is well above the audible range in humans which ranges from 20Hz to 20000Hz	1	
			Total	**8**	
3	a	i	Any one atmospheric pollutant (oxides of nitrogen; oxides of sulfur; particulate matter; or ozone in the lower atmosphere)	1	
		ii	ONE corresponding effect	1	
	b	i	Oxidation = loss of electrons; reduction = gain of electrons	1	
		ii	C (O.N. = 0) + O_2 (O.N. = 0) > C (O.N. = +4) O_2 (O.N. = -2)		
			C = oxidised, O.N. increases from 0 to +4	1	
			O = reduces, O.N. decreases from 0 to -2	1	
		iii	Valency of C = 4 (1), O = C = O where C has four bonds	1	
			Total	**6**	

4	a		P = I x V 900 = I x 240 3.75 A = I	1 1	
	b		E = P x t E = 0.9 kW x 0.5 hrs E = 0.45 kWh Cost = 0.45 kWh x 17 c = 7.65c	1 1 1	
	c		A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit.	1	
			Total	**6**	
5	a	i	50 g in 500 mL → 100 g/L	1	
		ii	64 g in 1 L → 64 g/L	1	
		iii	Solution A		
	b			1 = axes 1 = plot 1 = active-ation energy	
			Total	**6**	
6	a	i	Any valid disadvantage	1	
		ii	Any valid advantage	1	
			Double glazing Size and position of windows	1 1	Any other acceptable measure
		i		2	

		ii	Efficiency = Power output/Power input x 100% Efficiency = 900 W / 1200 W x 100% Efficiency = 75%	1 1	
			Total	**8**	
7	a		An ecosystem refers to the interactions between all living organisms and their interactions with the physical environment.	1 1	
	b		Any two of: • increase in nutrients in the sea; or • introduction of particulates in the sea; or • reduction in light penetration; or • reduction in oxygen; or • change in pH.	2	Other valid replies
	c	i		2	
		ii	• Sewage will reduce light penetration in the sea • Light intensity is a limiting factor to photosynthesis, (or decrease in light intensity will reduce the rate of photosynthesis)	1 1	
	d		Frames in the form of squares that are used in fieldwork / sampling studies.	1	
	e		• To identify all the organisms present in that quadrat. • To count the organisms present in that quadrat and estimate the total number of organisms present in a particular site.	1 1	Other acceptable answers
	f		• Bacteria population increases – there will be the release of bacteria when untreated sewage is discharged in the sea. On finding ideal conditions such as nutrients and water, bacteria will reproduce rapidly. • Fish population increases – there will be the release of nutrients which will enhance the plants' growth. This enables the fish to find more food. OR • Fish population decreases – the release of particulates reduces light penetration and thus limiting photosynthesis and reducing the amount of producers in the food web.	4	
			Total	**15**	
8	a	i	Weight is the product of mass and acceleration due to gravity (mass multiplied by acceleration due to gravity; = mass x acceleration due to gravity)	1 1	'gravity' not accepted as a correct answer
		ii	As the acceleration due to gravity on the moon is lower than that on earth, the weight on the moon would be lower As the acceleration due to gravity in space is zero, then the weight in space is zero	1 1	

		iii	W = mg W = 20 x 10 W = 200 N	2	(1 for answer, 1 for units)
	b	i	section BC; no acceleration	1	
			section CD. Deceleration (or negative acceleration)	1	
		ii	acceleration = gradient = (8 – 0) / (10 – 0) = 8 / 10 = 0.8 m/s^2	2	(1 for answer; 1 for units)
		iii	A = (a + b / 2) h A = (10 + 25 / 2) 8 A = (35 / 2) 8 = 140 m	1 2*	* (1 for answer; 1 for units)
		iv	Average vel = distance / time = 140 / 25 = 5.6 m/s	2	(1 for answer; 1 for units)
			Total	**15**	
9	a	i	• dip a clean wire loop into a sample of the compound being tested • put the loop into the edge of a Bunsen burner blue flame	1 1	
		ii	Sample A: potassium Sample B: barium Sample C: lithium	1 1 1	
	b	i	Chromatography	1	
		ii	 Chromatography paper Beaker Ink spot on pencil line Solvent	2	Deduct ½ mark for each missing item.
		iii	The more soluble the component is, the further it moves	1	
			The various components separate into different spots	1	
	c	i	To separate the components of a mixture of liquids	1	
		ii	A suitable example of a simple distillation (e.g. water and ethanol)	1	
			A suitable example of a fractional distillation (e.g. crude oil)	1	
		iii	Simple distillation – when the boiling points of the liquids to be separated are widely different	1	
			Fractional distillation – when the boiling points of the liquids to be separated are close	1	
			Total	**15**	

10	a	i	Pork	1	
		ii	21.0% x 1000 g	1	
			= 210 g	1	
	b		Pork	1	
	c		Energy	1	
			Insulation	1	
	d		Iron	1	
	e		(table below)	5	Award one mark for each correct column.
	f	i	Help digest food using carbohydrase / moisten food	1	
		ii	Emulsification	1	
		iii	Increases surface area/breakdown food into smaller bits	1	
			Total	**15**	

Carbohydrate	Soluble in water	Found in animal cells	Broken down by carbohydrase	Small molecule	Tested for using iodine solution
Starch	✗	✗	✓	✗	✓
Glucose	✓	✓	✗	✓	✗