SECTION A (30 marks)
Answer **all** the questions in this section.

1 **(a)** Study the table below.

Cindy conducts a research about Particles **A** to **F**.

Particles **A**, **C**, **D** and **F** are atoms.
Particles **B**, **D** and **E** have the same number of electrons.

Particle	Atomic number	Nucleon number	No. of protons	No. of electrons	No. of neutrons
A	7	14			
B	8	16			
C	9	19			
D	10	20			
E	11	23			
F	12	24			

(i) With the given information about Particles **A** to **F**, complete the table above. [2]

(ii) Particle **B** can combine with Particle **E** to form a compound. Draw the 'dot' and 'cross' diagram for the compound using symbols of **B** and **E**. [2]
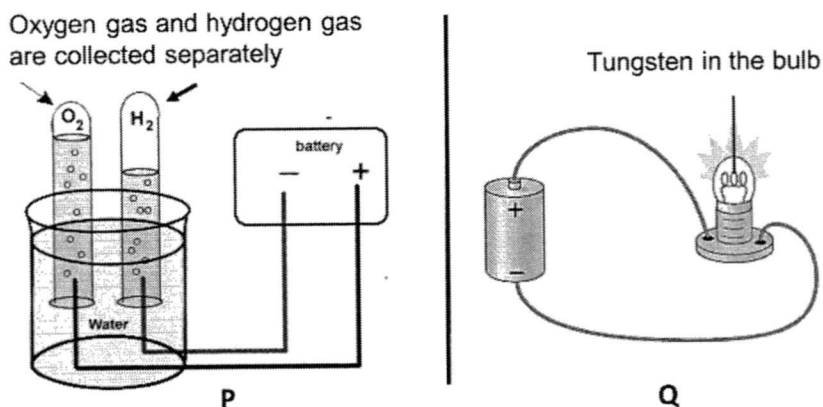
1 **(b)** Write the chemical equation for the reaction below.

sulfuric acid + iron(III) carbonate → iron(III) sulfate + water + carbon dioxide   [2]

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(c) The diagram below shows two setups. Setup **P** is electrolysis of water while Setup **Q** is a close circuit involving a battery and a light bulb.

State and explain the type of changes that occurred in **P** and **Q**.   [2]

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(d) Methane has a melting point of -182 °C and boiling point of -161 °C.
Using Kinetic Particle Theory, describe and explain the changes to the movement and arrangement of the particles when methane was heated and the temperature was at -182 °C.   [2]

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[Total: 10 marks]

2 **(a)** Compare the chemical digestion of starch and protein in the human digestive system. [2]

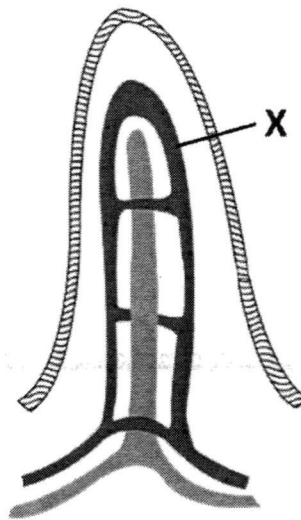..

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(b) The diagram below shows the structure of a villus.

Describe and explain the role of structure **X** in absorption of nutrients. [2]

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2 **(c)** Three petri dishes were filled with milk and other substances as shown in the table below. The three dishes and their content were incubated in 37°C for 2 hours. After 2 hours, only dish **A**'s contents has a change of appearance from cloudy to clear but both dish **B**'s and dish **C**'s contents remained cloudy.

Dish **A**	20 cm³ of milk + 3 cm³ of pepsin + 2 cm³ of dilute hydrochloric acid
Dish **B**	20 cm³ of milk + 3 cm³ of pepsin + 2 cm³ of water
Dish **C**	20 cm³ of milk + 3 cm³ of water + 2 cm³ of dilute hydrochloric acid

2 hours of incubation in 37°C
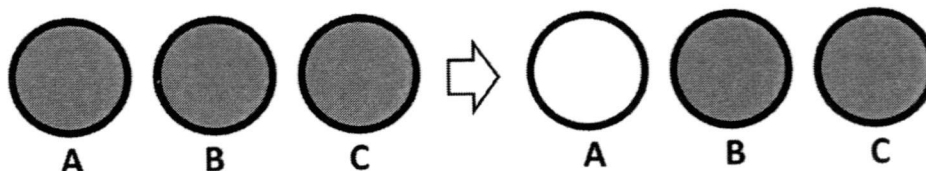
Using the information given above, explain what has happened. [2]

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[Total: 6 marks]

3 Draw a circuit diagram which includes the following.

   a) 3 dry cells connected in series with a variable resistor
   b) 3 light bulbs connected in parallel to the 3 dry cells and the variable resistor
   c) an open switch to switch off 2 light bulbs
   d) a voltmeter to measure the potential difference across the variable resistor [4]

[Total: 4 marks]

4 **(a)** The diagram below shows a simple food chain and its pyramid of energy.

Fox

↑

Rabbit

↑

Grass

| Fox (100 kJ) |
| Rabbit (1000 kJ) |
| Grass (10 000 kJ) |
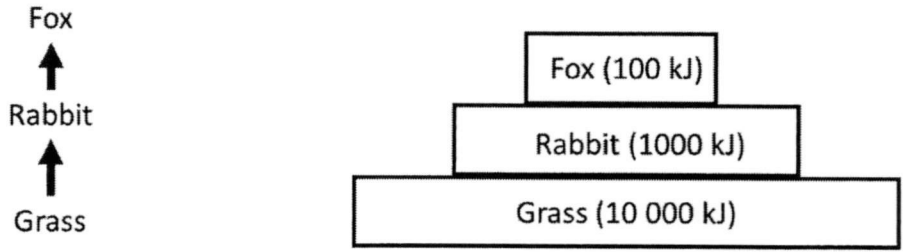
Explain the reason for the shape of the pyramid of energy. [2]

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(b) There is a species of flea that was found to suck the blood of rabbits for food. State the relationship of rabbit with fox and flea. [1]

Rabbit and fox: ....

Rabbit and flea: ....

(c) The graph below shows how the populations of rabbit and fox changed with time.
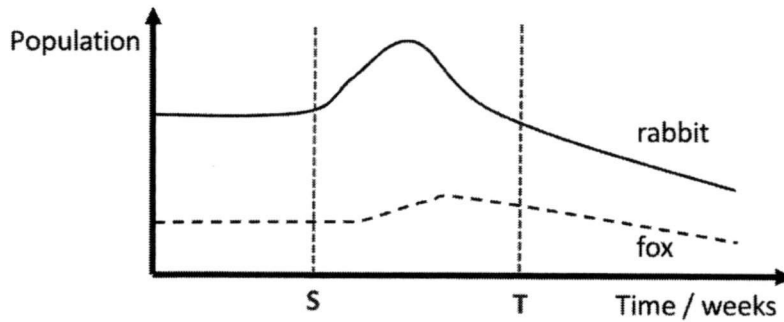
Explain what has happened between time **S** and **T**. [2]

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[Total: 5 marks]

5 (a) Ancient hunters would choose to put their ears on the ground to listen for approaching herds of animals instead of listening to their sounds through the air in order to detect these herds of animals fast enough to set up an ambush. Explain why it was so. [3]

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(b) A surface anti-submarine ship used sonar to detect the presence of an enemy submarine. The sound was emitted from the sonar in the ship, bounced off the surface of the submarine and reached the detector of the surface anti-submarine ship. The time between the emitting of the sound to the detection of the sound is 2.8 s. Assuming the speed of sound is 1800 m/s in water, calculate the distance between the surface anti-submarine ship and the enemy submarine. [2]

distance between anti-submarine ship and submarine = ...

[Total: 5 marks]

SECTION B (40 marks)
Answer **Q6** and any **3 other questions** in this section.

6 **(a)** The experiment shows the thermal decomposition of solid powder magnesium carbonate into magnesium oxide and carbon dioxide.
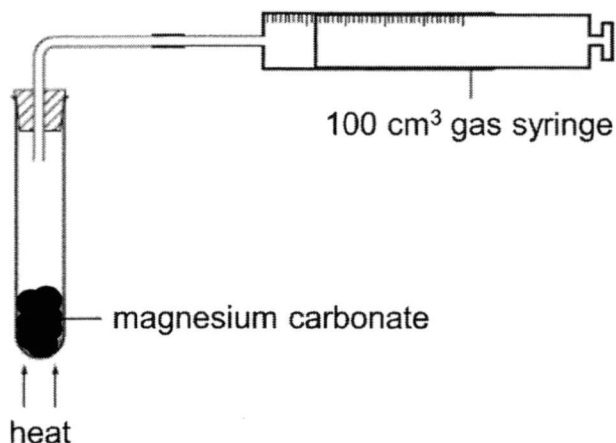
100 cm³ gas syringe

— magnesium carbonate

heat

The volume of carbon dioxide gas collected in the 100 cm³ gas syringe over a period of 7 minutes of strong heating was recorded in the table below.

Time / min	0	1	2	3	4	5	6	7
Volume of gas collected / cm³	0	0	7	15	25	30	32	32

(i) Explain why there was no gas collected in the first minute of heating. [1]

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(ii) Explain why there was no increase in the gas collected after 6 minutes of heating. [1]

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(iii) Describe how you would modify the set-up to verify that the gas produced was indeed carbon dioxide. [2]

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6 (b) The experiment shows the reaction of magnesium granules with dilute hydrochloric acid. The reaction mixture contained magnesium granules with excess of dilute hydrochloric acid. After 30 minutes, the volume of hydrogen gas produced was measured by the 100 cm^3 gas syringe. There was no more magnesium granules observed in the conical flask.

100 cm^3 gas syringe

conical flask
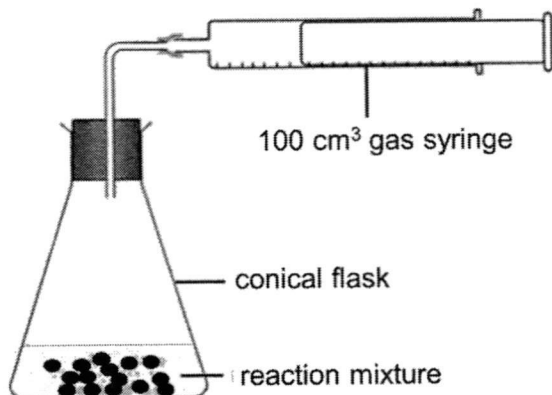
reaction mixture

(i) A pH meter was used to measure the pH of the mixture at the start and after the reaction has ended. The reading showed the mixture has a pH of 2 at the start and after the reaction has ended. Explain why it was so.   [1]

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(ii) The experiment was repeated with zinc instead of magnesium. Measures had been taken to ensure it was a fair test. The volume of hydrogen gas collected in the 100 cm^3 gas syringe 30 minutes was recorded in the table below. Generally, the more reactive a metal, the faster the reaction with an acid.

Metal used	magnesium	zinc
Volume of gas collected in 30 min / cm^3	60	40

Comment on the reactivity of magnesium as compared to zinc using the data given above. Explain your answer.   [2]

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6 (c) Peter read up in the Upper Secondary Chemistry textbook that "the reactivity of the metal affects the rate of thermal decomposition of the metal carbonate that the metal is part of." He wanted to find out how exactly the reactivity of the metal affects the rate of thermal decomposition of the metal carbonate that the metal is part of.

He repeated the experiment shown in part **(a)** while replacing magnesium carbonate with zinc carbonate. Measures had been taken to ensure it was a fair test.

The volume of carbon dioxide gas collected in the 100 cm^3 gas syringe over a period of 7 minutes of strong heating of zinc carbonate was recorded in the table below.

Time / min	0	1	2	3	4	5	6	7
Volume of gas collected / cm^3	0	0	13	25	32	32	32	32

<u>Using the data given</u> in part **(a)** and **(c)** and your answer in part **(b)**, suggest how exactly the reactivity of the metal affects the rate of thermal decomposition of the metal carbonate that the metal is part of. [3]

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[10 marks]

7 (a) A student used the setup shown in in the figure below to investigate water loss in a leafy shoot. As water is lost from the shoot the meniscus of the coloured water in the capillary tube moves to the left.
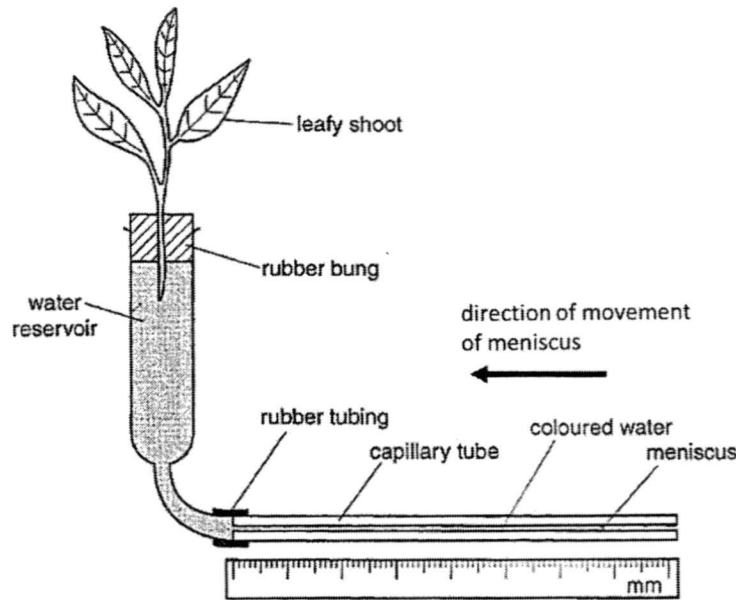
She measured how far the meniscus moved during ten minutes at each different temperature. The results were shown in the table below.

Temperature / °C	0	10	20	30	40
Movement / mm	3	17	29	38	45

(i) Explain how the change in temperature affected the distance which the meniscus moved.   [2]

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(ii) Predict and explain how the movement of the meniscus would be different between the two period of 6:00 am to 6:10 am and 12:00 pm to 12:10 pm, assuming the temperature of the surrounding of the setup remains the same.   [2]

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7 **(b)** A group of scientists invented an artificial heart that was designed for patients who are waiting for heart transplant. Each artificial heart has two chambers and four artificial valves. The artificial heart is powered by pumps that can either inflate or deflate the hydraulic bags in the chambers. Four artificial valves are installed to replace the original valves, which were removed along with the damaged part of the heart.

The figure shows two instances of the operation of the artificial heart. Firstly, the hydraulic bags in both chamber inflated (increase in volume) at the same time. Secondly, the hydraulic bags in both chamber deflated (decrease in volume) at the same time. The arrows indicate the direction of the flow of blood.
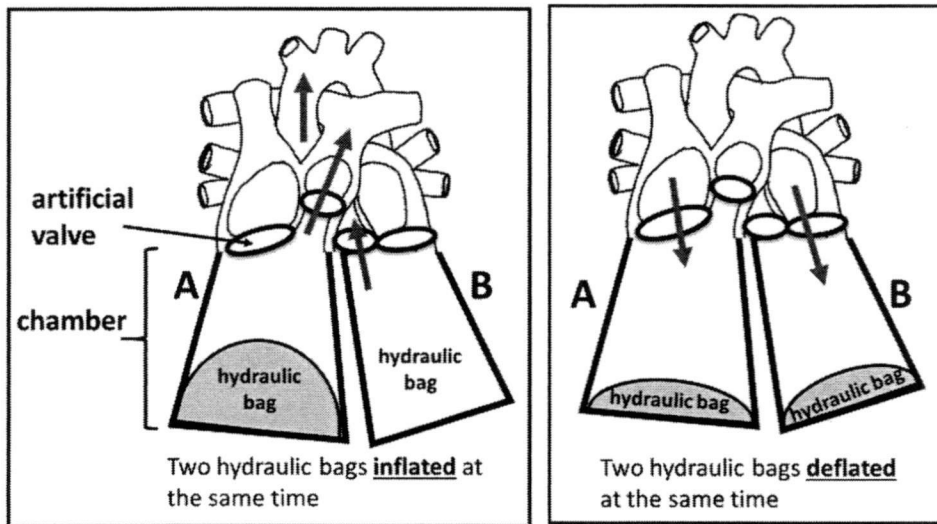
(i) State which chamber (**A** or **B**) generates the highest blood pressure. Explain the need for the chamber to generate the highest blood pressure. [1]

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(ii) State and explain the difference in blood composition of the blood in chamber **A** and **B**. [2]

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7   **(c)**   A student cut five similar-sized pieces of potato and weighed each one. He placed each piece of potato in a different concentration of sugar solution for 60 minutes. He then re-weighed each piece of potato. His results are shown in the table in the table below.

concentration of sugar (%)	mass of potato (g)		Percentage change in mass (%)
	start	end	
0.0	6.37	7.16	+12.4
0.2	6.12	6.58	+7.5
0.4	6.27	6.42	+2.4
0.6	6.26	6.10	−2.6
0.8	6.33	5.85	−7.6

i)   Plot the results on the grid and complete graph.

[2]
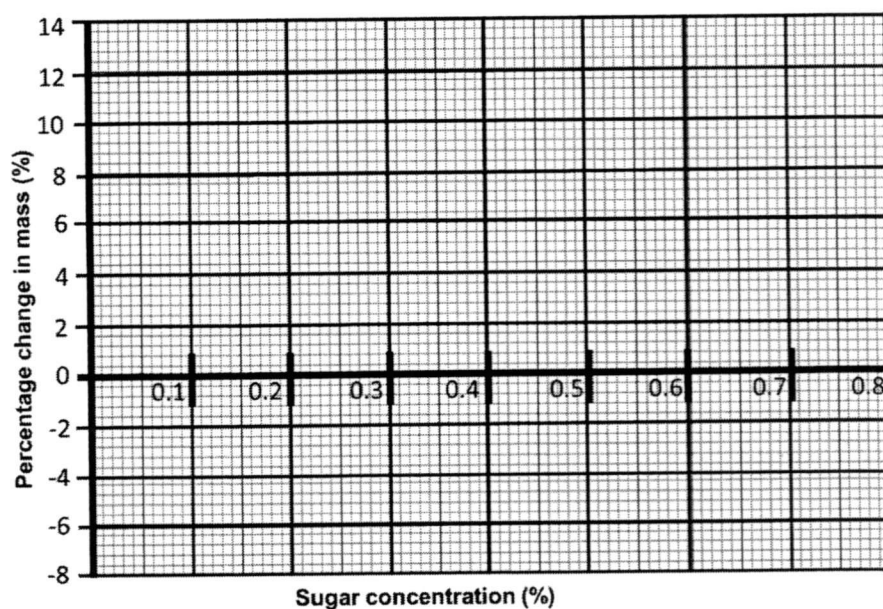
ii)   Using the graph above, state the percentage change to the mass of the potato piece placed in 0.3% sugar solution.

[1]

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[Total: 10 marks]

8 **(a)** Describe the processes in the formation of a zygote (fertilised egg) starting with the production of the sperms and the release of an egg. [4]

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(b) A pharmaceutical company invented a new cream that contains both spermicide and antibiotics. The company claimed that the cream alone is enough to prevent both pregnancy and the spread of sexually transmitted infections.

Comment on their claim and explain your answer. [3]

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8   (c)   The figure below shows the calendar of August and September 2017. A married couple used the calendar to track the menstrual cycle of the wife. She had the first day of menstruation on 3rd August (bolded and with *).

August 2017						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
		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	31		

September 2017						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
					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

State the range of dates in August and September which the couple should avoid sexual intercourse if they want to avoid pregnancy. Assuming the wife's menstrual cycle followed the standard duration, explain your answer.   [3]

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[Total: 10 marks]

9 **(a)** Complete a double-ray diagram to show what happens during a regular reflection on a water's surface where the eye can see the image of the top of the pole.   [3]

pole

eye

shore

water

image of
reflection of
the shore
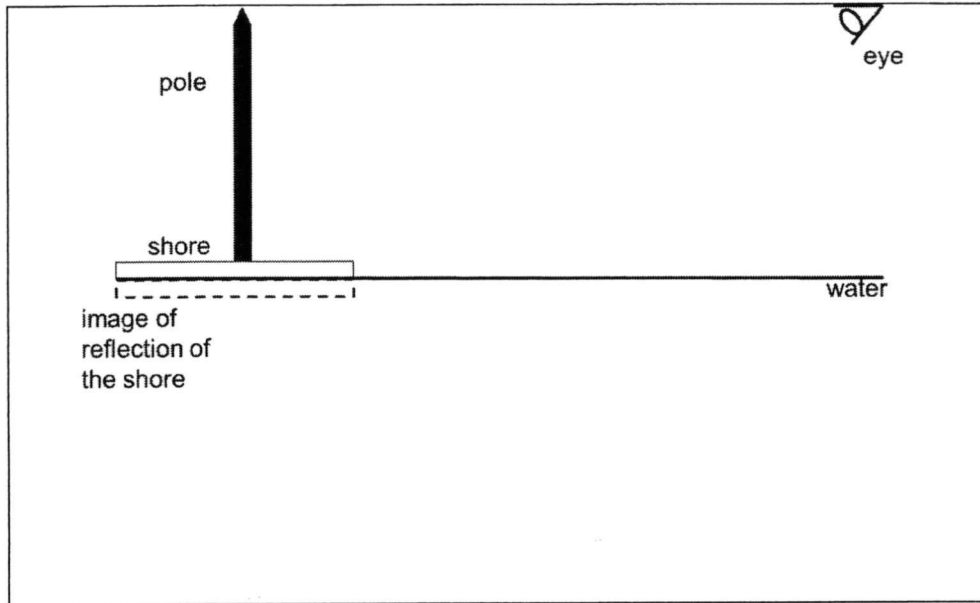
(b) The refractive index of the glass blocks shown below is 1.33. A red light ray is shown to enter one of the blocks. Complete the ray diagram **accurately**. You will have to label and state the value of the angles of incidence (i) and angles of reflection / refraction (r). You will have to show your calculations for angles of reflection / refraction (r) in the space given below.

[4]
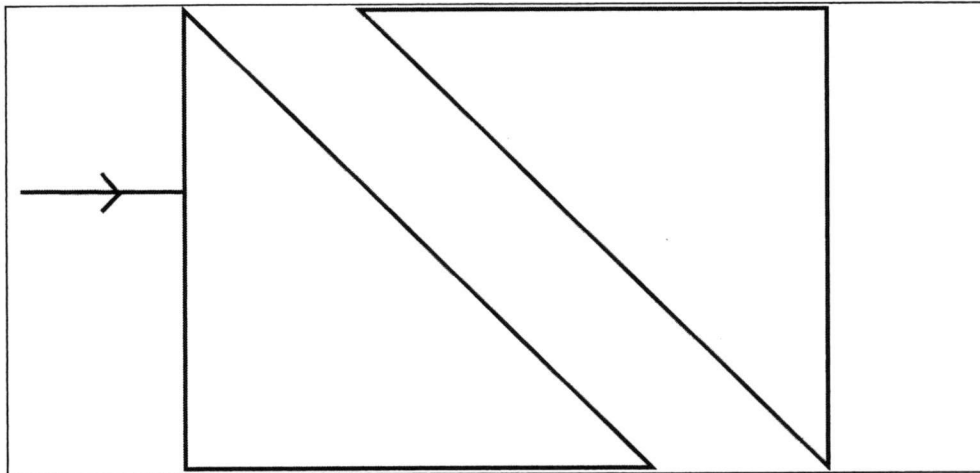
Calculation:

9 **(c)** **(i)** Calculate the critical angle of glass block with a refractive index of 1.67.

[1]

critical angle of glass block = ...

(ii) A laser pointer shines a light ray into a semi-circular block of glass. Draw a single light ray to represent what happened to the light as it exits the pointer to entering into the glass block and emerges from the glass block. The glass block has a refractive index of 1.67. You will have to label and state the value of the angle of incidence (i) and angle of reflection / refraction (r).

[2]

laser pointer
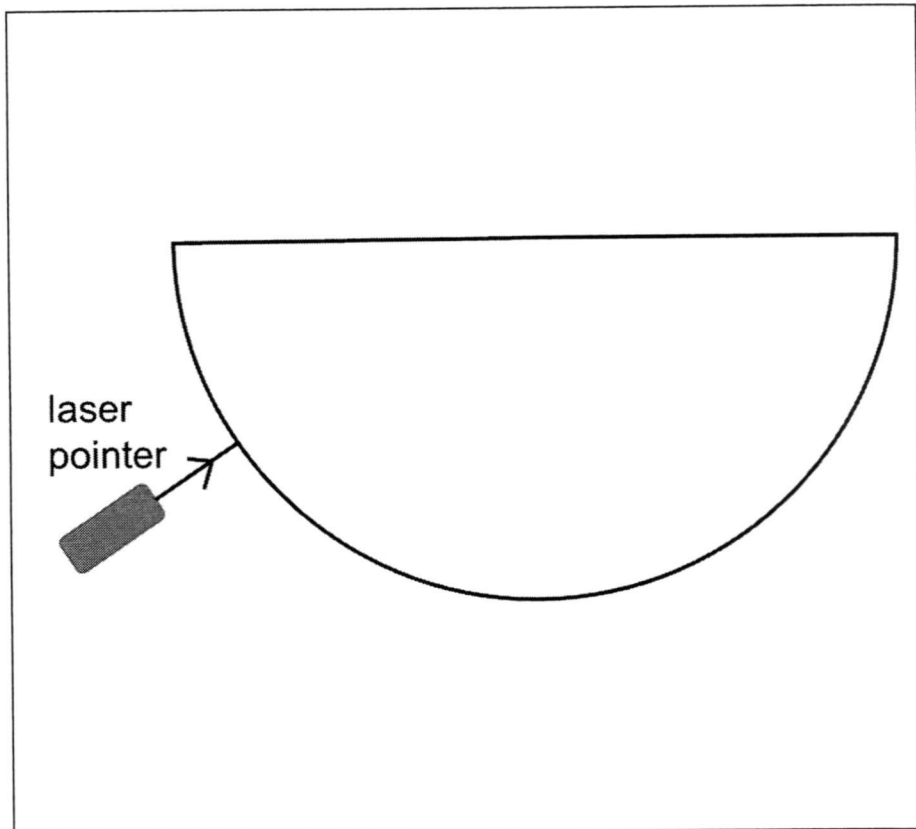
[Total: 10 marks]

10 **(a)** The figure below shows an electrical circuit.
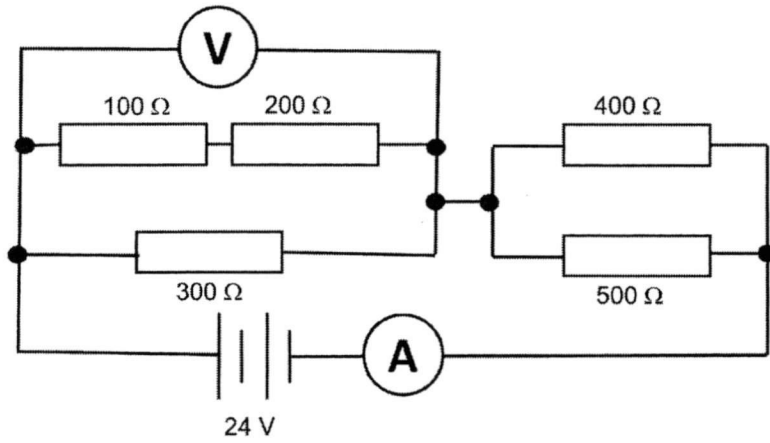
(i) Calculate the reading of the ammeter. [3]

Ammeter reading = ...

(ii) Calculate the reading of the voltmeter. [1]

Voltmeter reading = ...

10 (b) The electric oven has a power rating of 1250 W. Given that the cost of using 1 kWh of electricity is 28 cents, calculate the cost of electricity used by the electric oven when it is used for 2 hours and 30 minutes. [2]

cost of electricity = ...

(c) The diagram below shows a three pin plug and a simplified circuit diagram of an electric toaster, which has a metal case.
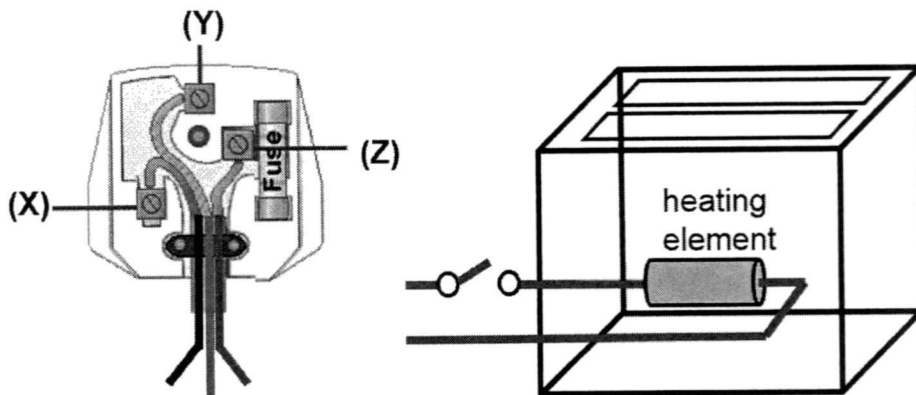
(i) State the name and colour of each of the wire in the three pin plug. [2]

Wire	Name	Colour
X		
Y		
Z		

(ii) In the diagram above, complete the circuit by connecting each of the wire to the electric toaster. [2]

[Total: 10 marks]

END OF PAPER

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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

Paper 1

1	B	6	B	11	B	16	B	21	B	26	C
2	D	7	D	12	D	17	C	22	A	27	D
3	D	8	A	13	A	18	D	23	D	28	B
4	B	9	C	14	B	19	B	24	D	29	C
5	C	10	A	15	C	20	C	25	C	30	B

Paper 2

Q		Answers	m	Remarks & Comments
1	ai	(see table below)	2	Many get either 0 or 1 mark due to incorrect no. of electrons or neutrons.
	aii	B^{2-} ion drawn correctly and with correct charge [1] E^{+} ion drawn correctly and with correct charge [1] (If student use Na and O, -1 mark max)	2	"Poorly answered. Incorrect responses are 1. Draw only one E ion 2. Mix up B with E 3. The ions from E are next to each other in B and not spaced out in opposite sides"
1	b	$3H_2SO_4 + Fe_2(CO_3)_3 \rightarrow Fe_2(SO_4)_3 + 3H_2O + 3CO_2$ • Correct formulae for all substances [1] • Balanced equation [1] (only award 2nd mark if 1st mark is given)	2	Poorly answered. Some think that SO4 is sulfuric acid. Many can't balance the equation.

Question 1 ai table:

Particle	Atomic number	Nucleon number	No. of protons	No. of electrons	No. of neutrons
A	7	14	7	7	7
B	8	16	8	10	8
C	9	19	9	9	10
D	10	20	10	10	10
E	11	23	11	10	12
F	12	24	12	12	12

no. of protons & no. of electrons correct [1]
no. of neutrons correct [1]
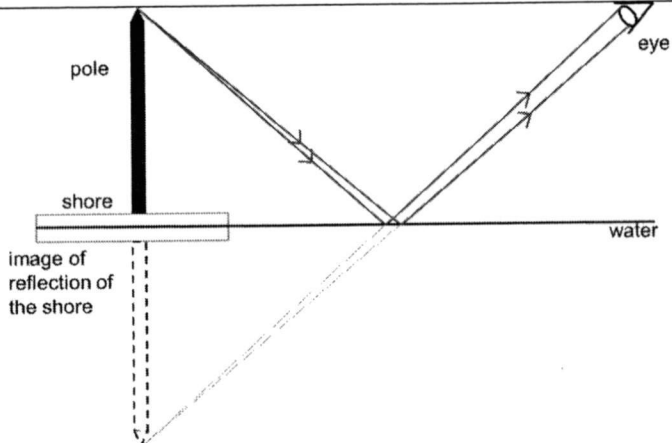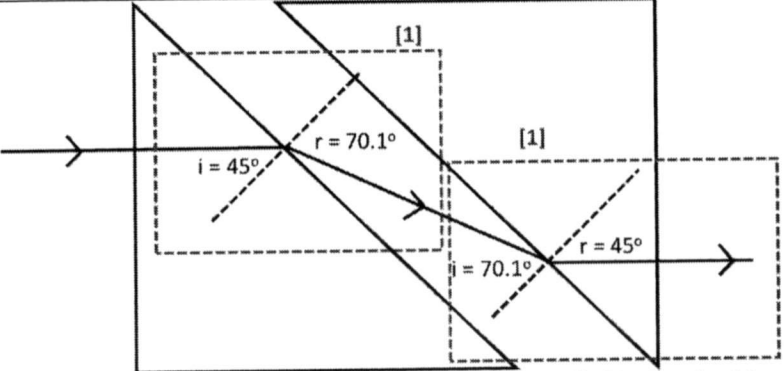
	c	1. Electrolysis of water is a **chemical change** but lighting up of a light bulb is a **physical change**. [1] 2. During electrolysis, **new products were formed** (water breaks down into hydrogen and oxygen). During lighting up a light bulb, the **tungsten in the bulb remained as tungsten**. [1]	2	Some think that type or changes is energy conversion.	
	d	1. At **-182 °C**, the particles **gained enough energy** to **overcome the forces of attraction**. [1, describe] 2. The particles break free from **vibrating** at **fixed positions** and can **slide over each other** in **random arrangement** / a **not orderly arranged** manner. [1, explain]	2	Many think that it is kinetic energy (should be potential energy) needed to overcome forces of attraction.	
2	a	1. Starch chemical digestion starts in the **mouth** but protein chemical digestion starts in the **stomach.** [1] 2. Both involve **enzymes**. / Both involves the **breaking down** of **large molecules** into **simpler molecules**. [1]	2	Many mention that both are digested in small intestines. Not acceptable answer.	
	b	1. Structure X (capillaries) enable t[...] and **amino acids** [1, describe]; 2. by **continuous transport** of simp[...] **maintain** a **steep concentration** gradient. [1, explain] (allow any phrasing to the same effect)		answered. Incorrect responses are [...] transport [...] surface area to volume ratio"	
	c	1. Milk **protein** in dish **A** has been **broken down** but **not** in dishes **B** and **C**. [1] 2. Dish **A** contains **hydrochloric acid** which **activates** the **pepsin** (in sec 2 notes) / **provides** the **optimum pH** for pepsin (allow sec 3 knowledge) . Dish B **lacks hydrochloric acid** and dish C **lacks pepsin**. [1]	2	Many get 1 mark as they don't write about dish B and C.	
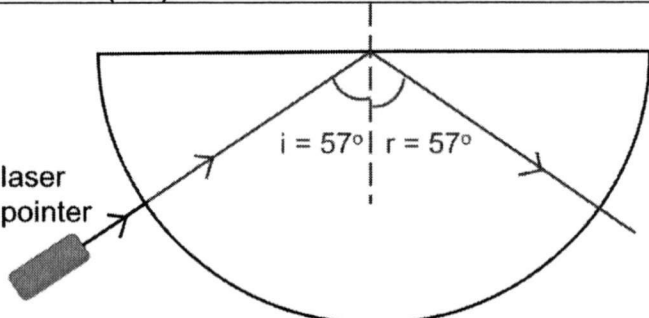
5	a	1. Sound travel **faster** through **solid** than through a **gas**. [1] 2. Solid particles are very **closely packed** and **pass** the **energy** to the next particle **rapidly**. [1] 3. Gas / Air particles are **far apart** from each other and **pass** the **energy** to the next particle **slowly**. [1]	3	Many get at most 2 marks as they don't describe why sound travels slower in air.
	b	2 d = speed of sound x time d = ½ (**1800** m/s x **2.8** s) [1] = **2520 m** [1]	2	Many don't realise it is echo and forget to divide by 2. Incorrect response is 5040 m.
6	ai	The **temperature** of magnesium carbonate was **not high enough** for thermal decomposition to take place.	1	Many get it correct.
	aii	**All magnesium carbonate** has been thermally **decomposed**. / The **thermal decomposition** was **completed**.	1	Some think that only carbon dioxide gas can extinguish lighted splinter.
	aiii	1. **Bubble / pass** the **gas produced** into a test tube of **limewater**. [1] 2. **White precipitate** should form in the limewater. [1] (reject: limewater turns chalky / milky.)	2	Some think that only carbon dioxide gas can extinguish lighted splinter.
	bi	There was **excess hydrochloric acid**. / **Not all hydrochloric acid** has been **used** up. / **Some** of the **hydrochloric acid** has **not** been **used** in the reaction.	1	Many get it correct.
	bii	1. **Magnesium** is **more reactive** than **zinc**. [1] 2. **More** hydrogen gas, **60 cm³**, was produced in **30 min** when **magnesium** was used while only **40 cm³** of hydrogen gas was produced when **zinc** was used. [1]	2	Many get only 1 mark as they never use data to explain their answer.

6	c	1. The **more reactive / higher reactivity** the **metal**, the **lower** the **rate of thermal decomposition** of the **metal carbonate** that the metal is part of. [1] 2. **Magnesium carbonatethermally decomposed slower** than zinc carbonate, thus magnesium carbonate **has lower rate of thermal decomposition**. [1] 3. Thermal decomposition of **magnesium carbonate** produced **32 cm³** of **carbon dioxide** in **6 minutes** but thermal decomposition of **zinc carbonate** produced **32 cm³** of carbon dioxide in **4 minutes**. [1]	3	Poorly answered. Never use data to explain their answer.
7	ai	1. As **temperature increased**, the **rate of evaporation** of water from the leaves **increased**, thus the **rate of transpirationincreases**. [1] 2. The **volume of water absorbed** by the **shoot increases** and the **distance** which the **meniscus moved increases**. [1]	2	Accept: As **temperature increased**, the **distance** which the **meniscus moved increases**. [1] Some miss out transpiration.
	aii	1. The **distance** which the **meniscus moved** will be **greater** in **12:00pm to 12:10 pm** than in **6:00 am to 6:10 am**. [1] 2. The **light intensity** is **greater** in **12:00 pm to 12:10 pm**than in **6:00 am to 6:10 am**, caused **stomata** to **open** and the **rate of transpirationincreases**. [1]	2	Some miss out opening of stomata.
	bi	**B. It needs to **pump blood** over a **long distance** to **rest of the body**. [1]	1	Many get it correct.
	bii	1. Blood in chamber **B** will be **oxygenated (higher in oxygen content)** and blood in chamber **A** will be **deoxygenated (lower in oxygen content)**. [1] 2. Blood returns from **rest of body**, where **oxygen is used**, and flow into right atrium and into chamber **A** while blood returns from **lungs, where oxygen enters the red blood cells** and flow into left atrium and into chamber **B**. [1]	2	Mention of "right / left atrium" is not an essential marking point. Some miss out the movement of blood flow.

	ci		2	Some don't draw a single (best-fit) straight line graph; some leave it blank.
		All points correct – 1m clean straight line – 1m (allow ECF if points are plotted wrong but has line of best fit)		
	cii	5 ± 0.2 (accept answer according to student's graph)	1	Some leave it blank.
8	(a)	1. **Testis produces / Testes produce sperms** and **sperms** will be **stored temporarily** in the **coiled tubes** (epididymis). [1] 2. **Ovary releases** an **egg** into the **oviduct**. [1] 3. During **sexual intercourse**, the sperms travel from the coiled tube to the **sperm duct** and through the **urethra** of the **penis** and deposited into the **vagina**. The sperms travel through the **cervix**, into the **uterus** and into the **oviduct**. [1] 4. **One spermfused** with the **egg** to form a zygote. [1]	4	
	(b)	1. The cream alone is enough to **prevent pregnancy** but **not** the **spread of sexually transmitted infections**. [1] 2. Spermicide can **kill** the **sperms** and **prevent fertilisation**. [1] 3. The antibiotics **can only kill bacteria** but **not viruses**. Thus **Human Immunodeficiency Virus** can still be **passed / transmitted**. [1]	3	Accept: **Human Immunodeficiency Virus** can still transmitted by sharing of needles / contact with blood / unchecked blood transfusion. [1]

	(c)	1. **13th to 18th Aug&10th Sep to 15th Sep** [1] 2. **Ovulation** on **16th Aug** and **13th Sep** [1] 3. **Sperm** can **survive** up to **3 days** while **egg** can **survive** up to **2 days**. [1]	3	

9	(a)	 1. Correct incident rays with correct arrows indicated& dotted lines. [1] 2. Correct reflected rays with correct arrows indicated& dotted. [1] 3. Correct image, in dotted line. [1]	3	
	(b)	 check: all 4 angles & emergent ray to be parallel to the incident ray no arrows drawn (-1m)	4	

		1.33 = sin r / sin i
		r = sin^{-1} **(1.33 x sin 45°)**
		  = 70.1° (3.s.f) [1]
		
		1.33 = sin i / sin r
		r = sin^{-1} **(sin 70.1° / 1.33)**
		  = 45.0 ° (3.s.f) [1]		

(ci)	n = 1 / sin c
	c = sin^{-1} (1/n)
	  = sin^{-1} **(1/1.67)**
	= 36.78 °
	  = 36.8° (3 sf)
		1	

(cii)	 i = 57° r = 57° laser pointer 1. Correct incident rays with correct arrows indicated and correctly measured and indicated r value of 57°. [1] 2. Correct reflected rays with correct arrows indicated and correctly indicated r value of 57°. [1]	2	

10	ai		3	

$R_1 = 1/[1/300 + 1/(100 + 200)] = 150\ \Omega$ [1]

$R_{eff} = R_1 + R_2 = 150 + 1/(1/400 + 1/500) = 372\ \Omega$ [1]

$I = V/R_{eff} = 24\ V / 372\ \Omega = 0.064516\ A = \textbf{0.0645 A (3sf)}$ [1]

	aii	$V_1 = I_1 \times R_1 = 0.064516\ A \times 150\ \Omega = 9.6774\ V = \textbf{9.68 V (3sf)}$	1	

	b	$E = Pt = \textbf{1250}\ W \times \textbf{2.5}\ h\ /\ \textbf{1000} = \textbf{3.125 kWh}$ [1] cost = 3.125 kWh x \$0.28/kWh = \$0.875 = **\$0.88 / 88 cents** [1] (reject 3sf as money cannot be counted in 0.5 cents)	2	

	ci			2	

Wire	Name	Colour
X	neutral wire	blue
Y	earth wire	green and yellow
Z	live wire	brown

- All names correct [1]
- All colours correct [1]

cii		2	

Z connected to switch and X connected correctly [1]
Y connected to the exterior metal case of the toaster. [1]