YUHUA SECONDARY SCHOOL

CANDIDATE NAME			
CLASS	2E	INDEX NUMBER	

END OF YEAR EXAMINATION 2014

Secondary Two Express

SCIENCE

PAPER 1 **1 hour**

ADDITIONAL MATERIALS: OTAS Sheet

Electronic Calculator

INSTRUCTIONS TO CANDIDATES

Do not open until you are told to do so.

Write in soft pencil.
Do **not** use staples, paper clips, highlighters, and glue or correction fluid.
Write your name, class and register number in the spaces provided at the top of this page and on the OTAS sheet provided.
There are **forty** questions in this paper. Answer **ALL** questions. For each question, there are four possible answers, **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in soft pencil on the separate OTAS sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

At the end of the examination, submit the OTAS and this question paper separately. A periodic table is attached on page 16.

Gravity is considered as 10 N/kg unless otherwise stated.

Values are to be left in 3 significant figures unless otherwise stated.

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1 Which of the following is **not** a chemical change?

A Heating an egg over a stove.
B Chopping a piece of garlic into smaller pieces.
C A plant carrying out photosynthesis.
D Adding urine to an acidic jellyfish wound.

2 The colour of universal indicator at different pH values is given below.

pH	1	4	11
Colour	Red	Yellow	Blue

What are the colours observed when a few drops of Universal indicator are added separately to dilute hydrochloric acid, vinegar and aqueous sodium hydroxide?

	Hydrochloric acid	**Vinegar**	**Sodium hydroxide**
A	Blue	Yellow	Red
B	Red	Yellow	Blue
C	Red	Blue	Yellow
D	Yellow	Red	Blue

3 Carbon monoxide is a pollutant emitted from car exhausts.
Why is it harmful to humans?

A It has no colour, taste or smell.
B It has a corrosive action on lung tissue.
C It forms a stable compound with blood.
D It combines with oxygen in the lungs.

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4 Which one of the following is an example of a reaction where matter and heat interact?

A Photosynthesis
B Respiration
C Electroplating
D Neutralisation

5 The proton number of aluminium, Al, is 27 and it is in Group III.
What is the likely formula for aluminium oxide?

A Al_2O
B Al_2O_3
C AlO
D AlO_2

6 The proton numbers of three elements are given below.

Element	**X**	**Y**	**Z**
Proton number	19	20	16

Which of the following sets correctly represents the ions formed by these elements?

A X^- , Y^{2+} , Z^{2+}
B X^+ , Y^{2-} , Z^{2+}
C X^+ , Y^{2+} , Z^{2-}
D X^{2-} , Y^+ , Z^{2-}

7 Which ionic equation represents the neutralisation of dilute nitric acid and potassium hydroxide?

A $KOH(aq) + HNO_3(aq) \rightarrow KNO_3(aq) + H_2O(l)$
B $OH^-(aq) + HNO_3(aq) \rightarrow NO_3^-(aq) + H_2O(l)$
C $K^+(aq) + NO_3^-(aq) \rightarrow KNO_3(aq)$
D $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

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8 A word equation is shown below.

Carbon + Carbon dioxide → Carbon monoxide

What is the balanced chemical equation for this reaction?

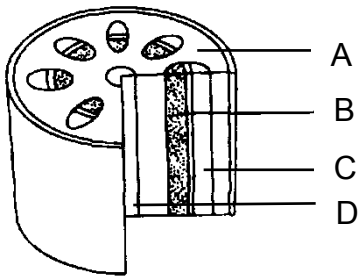
A $C + CO_2 \rightarrow 2CO$

B $2C + CO_2 \rightarrow 2CO$

C $2C + CO \rightarrow 2CO_2$

D $C + CO_2 \rightarrow C_2O_2$

9 The micrograph below shows a cross-section of part of a stem. Which tissue transports water and mineral salts?



10 Which of the following processes described below does **not** involve diffusion?

A The absorption of digested food substances from the small intestine to the bloodstream.

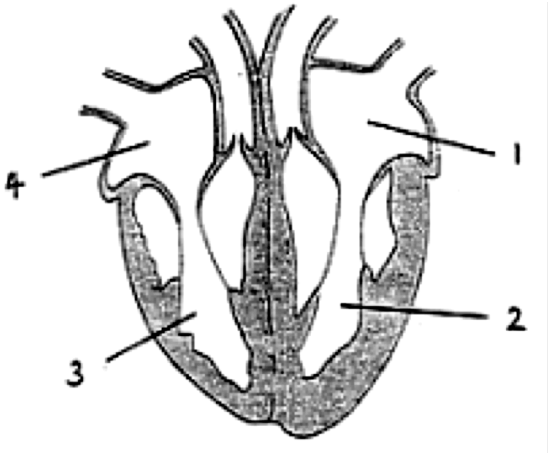
B The movement of gases in and out of a leaf.

C The transfer of carbon dioxide from the capillaries to the air sacs in the lungs.

D The transport of water molecules up the xylem vessels.

11 The diagram shows a section through a human heart. Which is the correct flow of blood through the heart from the rest of the body?

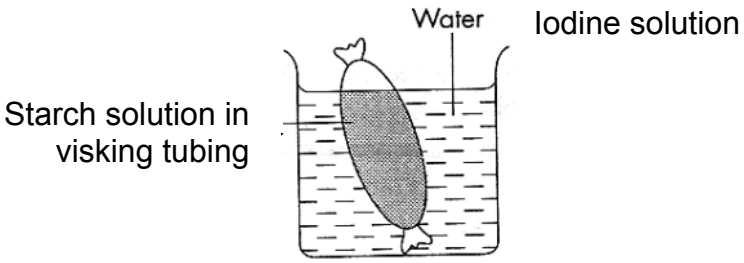
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A	1→2→3→4	B	3→4→2→1
C	4→3→1→2	D	1→2→4→3

12 The apparatus shown below was set up and left for two hours.

Which of the following shows the correct colouration after two hours?

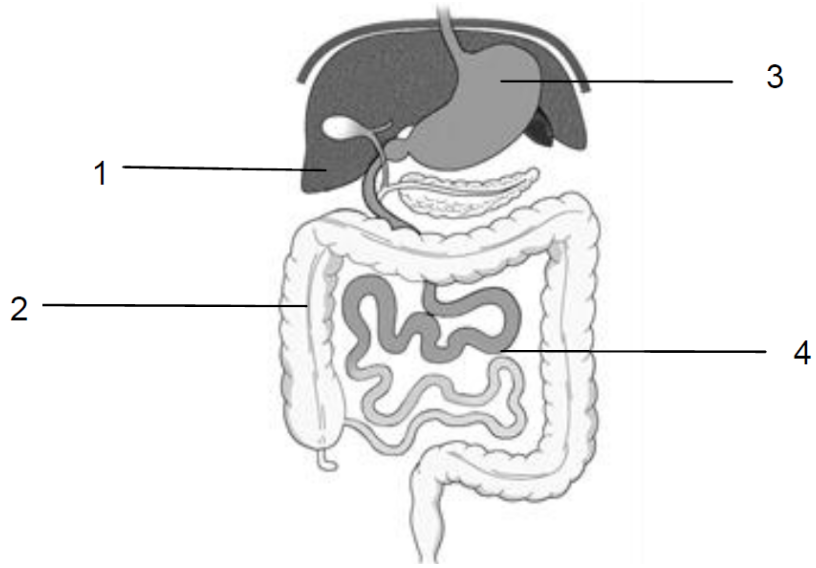


	In visking tubing	**In beaker**
A	Brown	Brown
B	Blue black	Brown
C	Blue Black	Blue black
D	Brown	Blue black

13 The diagram shows part of the human alimentary canal.

Which structure(s) is/are involved in protein digestion?

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A	3 only	B	2 and 3
C	3 and 4	D	4 only

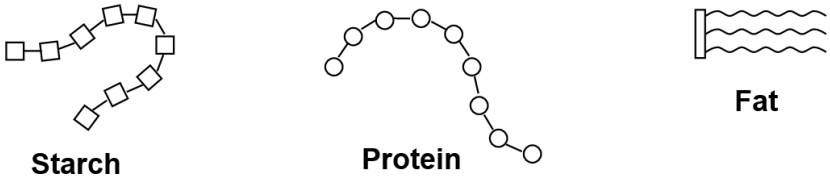
14 Which of the following substance(s) have to be digested before it is absorbed into the bloodstream?

I Amino acids
II Glucose
III Starch
IV Fatty acids

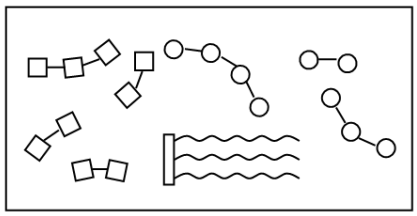
A	III only	B	II and III
C	III and IV	D	I and IV

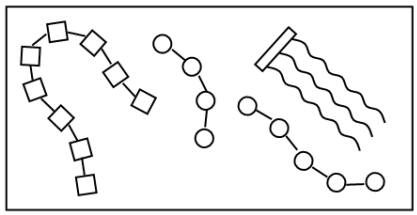
15 The molecules below represent molecules of starch, protein and fat.

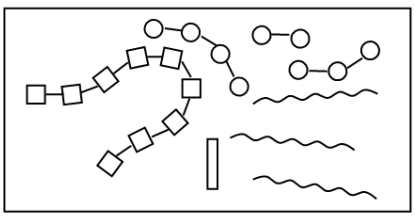
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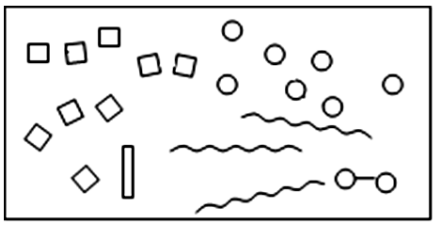


Which of the following diagrams best represent the products of digestion in the small intestine?

A 

C 

B 

D 

16 The table below shows the enzymes used in the digestive system. Which of the following is **incorrect**?

	Enzyme	**Used in**
A	Salivary amylase	Mouth
B	Lipase	Stomach
C	Carbohydrase	Small intestine
D	Protease	Stomach

17 A woman has contracted a sexually transmitted infection. Non-itchy rash appeared in her body which disappeared after some time and she suffered from a mild case of fever. Which of the following disease is the woman suffering from?

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A AIDS
B Chlamydia
C Gonorrhoea
D Syphilis

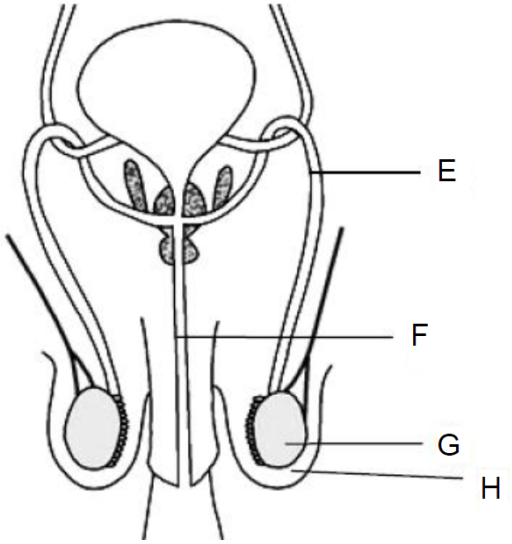
18 Which of following is true of human sexual reproduction?

I A zygote with 23 pairs of chromosomes is formed.
II An ovum divides into new cells.
III Fertilisation must occur.
IV The children are identical to their parents.

A I and II only
B I and III only
C II and III only
D III and IV only

19 The diagram shows part of the reproductive system of a man.
What are the structures E, F, G and H?

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	E	F	G	H
A	Sperm duct	Urethra	Testis	Scrotum
B	Sperm duct	Urethra	Scrotum	Testis
C	Urethra	Sperm duct	Testis	Scrotum
D	Urethra	Sperm duct	Scrotum	Testis

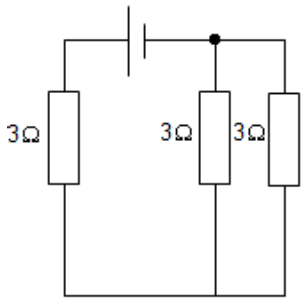
20 Which of the following birth control methods will alter the uterus lining?

A Condom
B Contraceptive pills
C Diaphragm
D Intra-uterine device

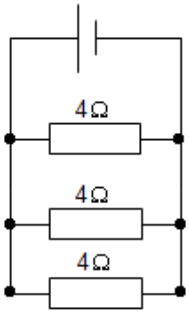
21 The diagram below shows 4 circuits. Which of the following circuit has the least resistance?

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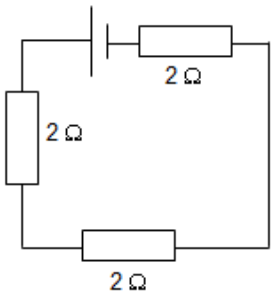
A



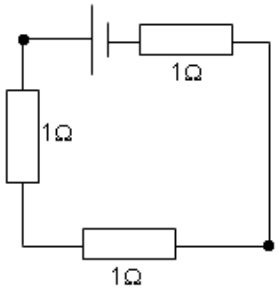
B



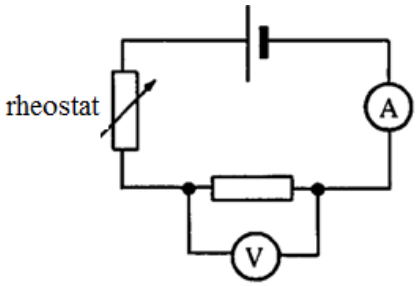
C



D



22 Which of the following shows how the ammeter reading will be affected if the resistance of the rheostat is increased while voltage remains unchanged?



	Ammeter reading
A	Decreases
B	Remains unchanged
C	Increases
D	Zero

23 Which of the following should the fuse of an electric appliance be connected to?

A	Earth wire	B	Live wire
C	Metal casing	D	Neutral wire

24 If the cost of 1 kWh of electricity is 80 cents, what is the total cost of operating the following electrical appliances for 3 hours?

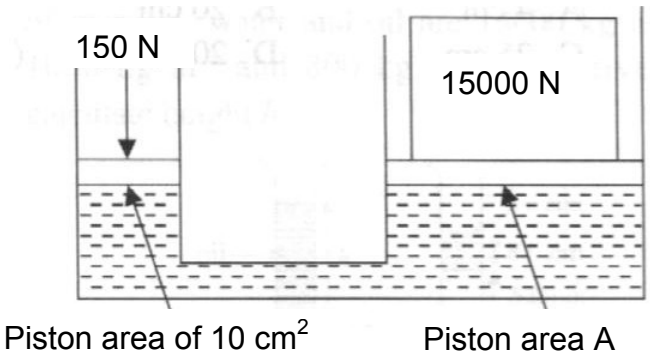
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electrical appliance	rating
television air-conditioner lamp	135 W 2.75 kW 100 W

A $7.16 B $12.24

C $73.40 D $429.80

25 A hydraulic press is being balanced by a 150 N force and a 15000 N mass as shown below.



Calculate the piston area A.

A 1 cm^2 B 10 cm^2

C 100 cm^2 D 1000 cm^2

26 Which of the following terms refer to gravitational force acting on an object?

A Density B Friction

C Mass D Weight

27 Which of the following shows a contact force?

A Standing firm on the ground unlike floating around in space

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B Separating metals and non-metals using a magnetic crane

C Swimming in the open sea against ocean waves

D Having an apple fall from a tree

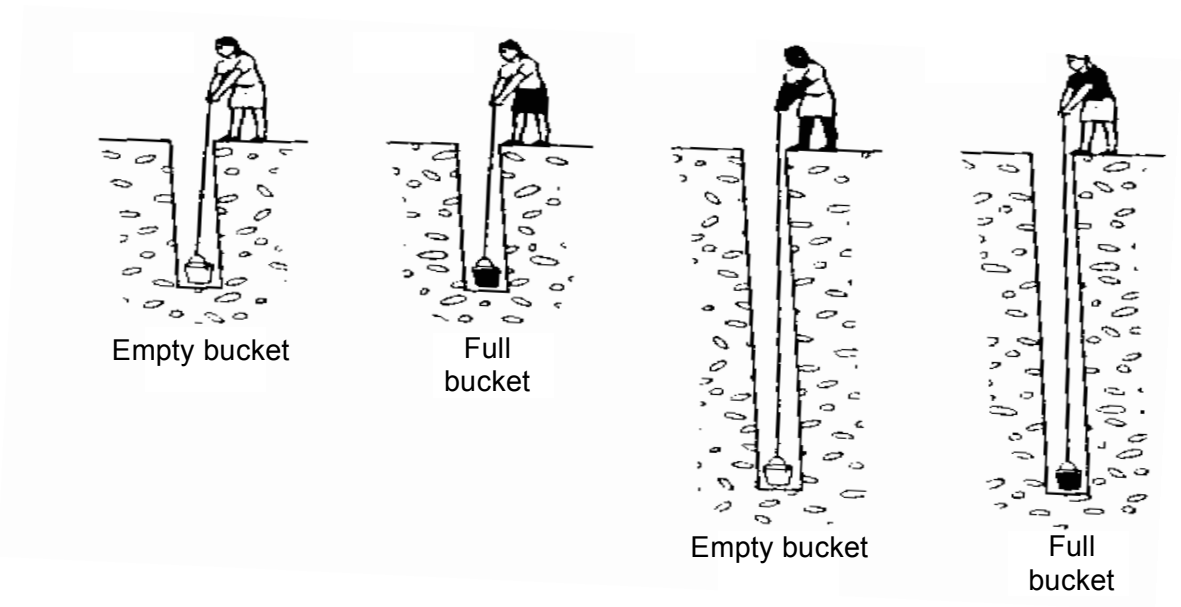
28 Which of the following destructive nature of forces is caused by the sudden release of the forces on the earth's crustal plates?

A Volcanoes B Tsunamis

C Typhoons D Floods

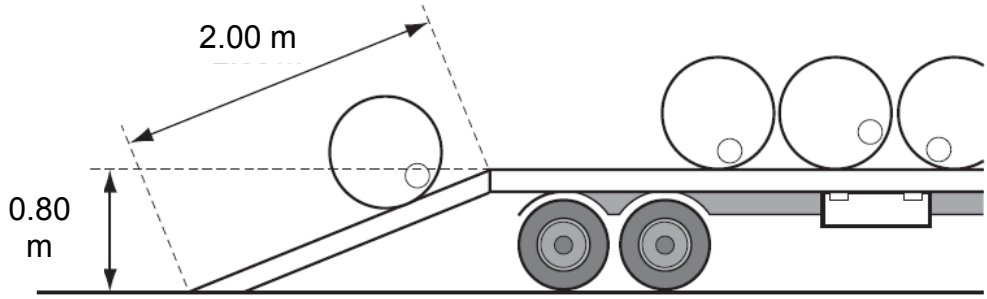
29 The diagram below shows 4 different ladies tasked to lift a bucket from the bottom of a well. Which of the following girls does the most work?

A B C D



30 A workman rolls a barrel of weight 2000 N up a plank of length 2.00 m and on to a lorry. The back of the lorry is 0.80 m above the horizontal surface of the road.

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What is the work done on the barrel against gravity?

A 1000 J
B 1600 J
C 2500 J
D 4000 J

31 A man lifts a box of mass 10 kg vertically upwards by 1.2 m. Given that it takes 3 s to do the work, what is the power generated by the man?

A 4 W
B 12 W
C 36 W
D 40 W

32 Which of the following sources of energy does not need a turbine to generate electricity?

A Geothermal energy
B Tidal energy
C Solar energy
D Wind energy

33 In which of the following scenarios does sound travel the fastest?

A Shouting across the classroom
B Sonar that measures that depth of the sea
C A vibration through the wall
D An explosion in space

34 What is the unit of measurement for the loudness of a sound?

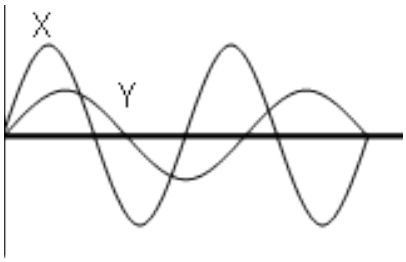
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A Amps
B Hertz
C Decibels
D Watts

35 Which one of the following is related to the frequency of a sound wave?

A Pitch
B Quality
C Volume
D Distance

36 The displacement-time graphs for two musical notes X and Y are shown below.

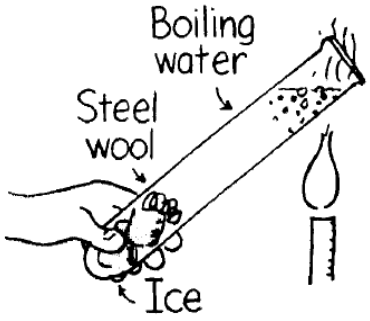


Which of the following deductions is correct?

A X is louder and of lower pitch.
B X is softer and of higher pitch.
C Y is softer and of lower pitch.
D Y is louder and of higher pitch.

37 Water in a boiling tube is boiling at the top while the size of the ice at the bottom of the tube remains unchanged. What does the experiment show?

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A Ice is a poor conductor of heat.

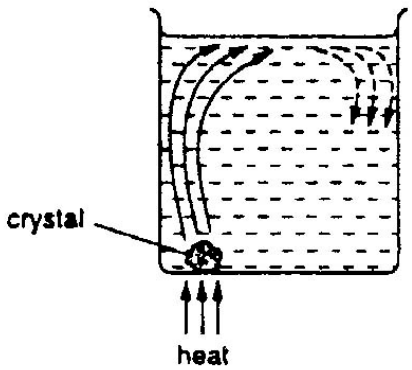
B Water is a poor conductor of heat.

C Steel wool is a good insulator of heat.

D Heat at the top has dissipated into the surrounding air.

38 The diagram shows a crystal being heated in a beaker of water. The crystal releases a dye which shows how the water circulates around the beaker.

Why does the water above the crystal rise?



A The water contracts and its density decreases.

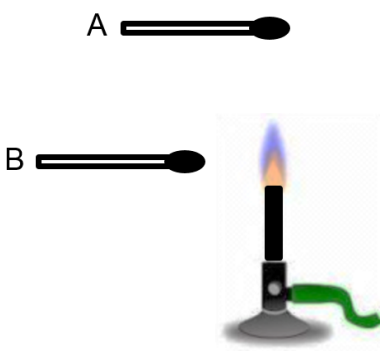
B The water contracts and its density increases.

C The water expands and its density decreases.

D The water expands and its density increases.

39 Which of the following is the reason why matchstick **A** will start burning at a further distance from the flame than matchstick **B**?

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A Heat conducts upwards faster than to the side.

B Heat radiates upwards faster than to the side.

C **A** gains heat both from convection and radiation whereas **B** gains heat only from radiation.

D **A** gains heat both from convection and conduction whereas **B** gains heat only from radiation.

40 Which of these decreases the rate of radiation from a hot object?

I Increasing smoothness and shininess of object

II Decreasing darkness of object

III Increasing temperature of object

A I only B I and II

C II and III D I and III

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 †															

*58-71 Lanthanoid series
†90-103 Actinoid 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
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

Key: a / X / b
a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

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YUHUA SECONDARY SCHOOL

CANDIDATE NAME			
CLASS	2E	INDEX NUMBER	

END OF YEAR EXAMINATION 2014

Secondary Two Express

SCIENCE

PAPER 2 1 hour 30 mins

ADDITIONAL MATERIALS: Electronic Calculator

INSTRUCTIONS TO CANDIDATES

Write your name, class and index number on all the work you hand in.
Write in blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do **not** use staples, paper clips, highlighters, and glue or correction fluid.

Section A (30 marks)

Answer **ALL** the questions in the spaces provided on the question paper.

Section B (30 marks)

Answer any **THREE** questions on the lined pages.

Number of marks allocated is given in [ ] at the end of each question or part question.

A copy of the Periodic Table is printed on page 18.

Section A	30
Section B	30
Total	60

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Section A [30 Marks]

Answer **ALL** the questions in the spaces provided on the question paper.

1 This table shows some information about atoms of the elements **X**, **Y** and **Z**. (The letters do not represent the atomic symbols of the elements.)

element	ion	atomic number	number of neutrons	Nucleon number	electronic configuration
X	X^{2-}		16	32	2.8.6
Y		4		9	2.2
Z	Z^{+}	11	12	23	

(a) **(i)** Complete the table above. [2]

(ii) Give the formula of the compound formed by **X** and **Z**. [1]

……..

(b) For each of the following equations, you are required to

- Predict the reactants
- Write the balanced chemical equation with state symbols
- Write the net ionic equation

(i) Magnesium + ……. → Magnesium + …….. [1]
……. Sulfate ……...

(ii) Balanced chemical equation with state symbols [1]

……..

(iii) Net ionic equation with state symbols [1]

……..

2 **(a)** Figure 2.1 shows a human red blood cell, viewed under a

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microscope. Figure 2.2 shows the same human red blood cell after it has been placed into a more concentrated salt solution.

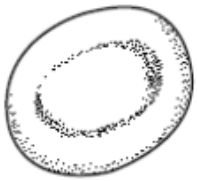


Figure 2.1



Figure 2.2

Explain how osmosis has produced the effect in the cell in Figure 2.2. [2]

……

……

(b) Figure 2.3 shows a human heart and the flow of blood in it.

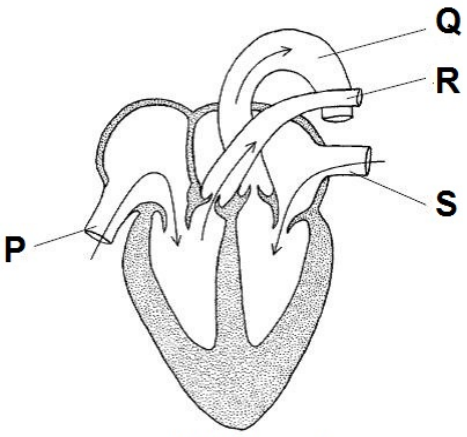


Figure 2.3

Identify the blood vessels that carry oxygenated blood and deoxygenated blood. [2]

Oxygenated blood: ……..……..

Deoxygenated blood: ……..

3 Figure 3 shows a circuit where E is a battery of 12.0 V. Bulb X is rated at

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6 V, 9 W. Bulb Y and Z are identical with the same ratings.

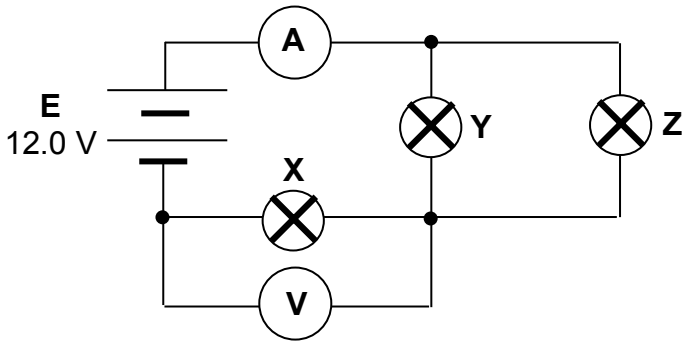


Figure 3

If the voltmeter has a reading of 6 V,

(a) **(i)** calculate the reading of the ammeter. [2]

(ii) calculate the resistance of Bulb **X**. [2]

(iii) calculate the total cost of switching on the circuit for 8 days, given that the cost of electricity is $1.20 per kWh. [2]

(iv) Explain how a fuse works and the type of electrical hazard it [2]

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can prevent.

……..

……..

……..

4 Figure 4 shows two teachers and three students pulling in opposite directions on the rope during a game of tug of war.

Each student pulls with a force of 250 N and each teacher pulls with a force of 400 N.

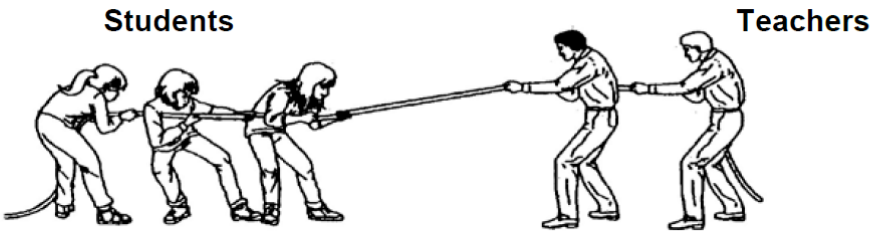


Figure 4

(a) **(i)** What is the resultant force on the rope? [2]

Resultant force: …… N

(ii) Who will win the tug of war? [1]

……..

(iii) If the winners of the tug of war moved a total of 0.8 m, calculate [2]

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the work done by the winners.

Work done: ……. J

(b) The picture below shows a person perform a stunt by lying on a bed of nails. [2]



Explain why people can perform the “bed of nails” stunt without being hurt.

……..……..

……..……..

……..……..

……..……..

5 Figure 5 shows a model of a hydroelectric power station.

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Water from the reservoir flows through the turbine. The turbine turns a generator. The generator is used to operate a lamp.

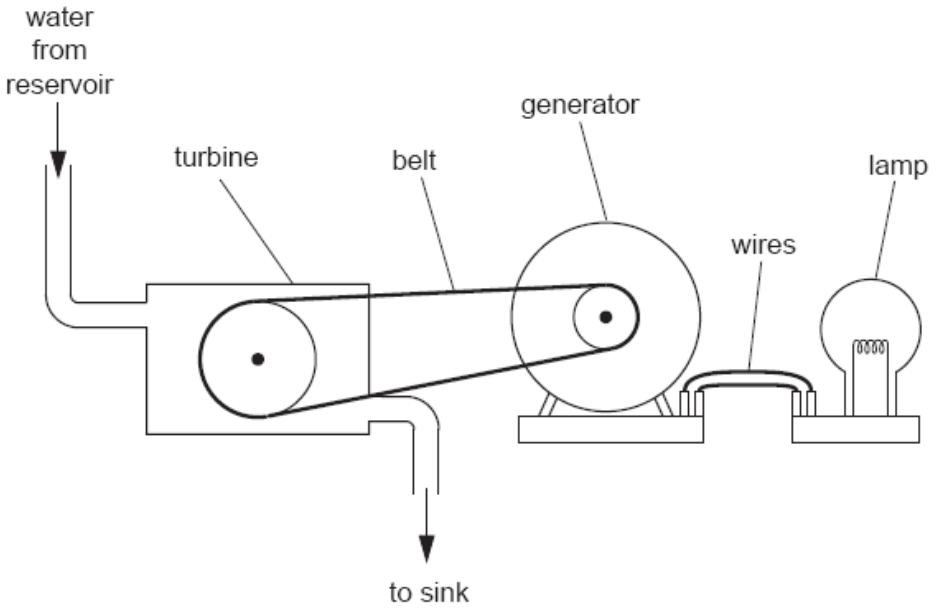


Figure 5

(a) **(i)** State the energy conversions that take place from the water in the reservoir to the lamp that is shining. [1]

……..

……..

(ii) Suggest the advantage of using hydroelectrical power instead of fossil fuels. [1]

……..

……..

(iii) Suggest a harmful effect of using hydroelectrical power. [1]

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……..

……..

(b) The water from the reservoir fall to the turbine through a height of 75 cm. The mass of the water flows through the turbine in 5.0 secs is 2.0 kg. Calculate the power delivered to the turbine. [2]

Power = ……. W

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Section B [30 marks]

Answer **THREE** out of four questions in the spaces provided on the question paper.
Begin each question on a new page.

6 (a) Study the word equation given below.
Magnesium + Oxygen → Magnesium oxide

(i) Explain why this chemical reaction is called an oxidation. [1]

(ii) Name the type of energy necessary to cause this chemical reaction to take place.

(iii) Silver bromide solution is usually stored in dark bottles in the laboratory. Suggest a reason for doing so. [3]
Write a word equation to support your answer.

(b) In year 2090, Singapura is severely affected by air pollution.

- Citizens living in Singapura suffered from shortness of breath, headaches and fatigue.
- Statues and cars parked in open spaces were found to be corroded after it rained. Fishes were also found to be dead in the Jurong lake.

(i) Suggest the air pollutant which causes the citizens suffer from the above. Explain your suggestion. [2]

(ii) Suggest the cause of the death of the fishes and corrosion of statues and cars. [2]
Suggest and explain how air pollutants can lead to the cause stated above.

(iii) Suggest how you can test the lake water to check its acidity. [2]
Suggest an observation for the test used to check acidity.

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7 (a) Figure 7.1 shows part of the human digestive system. The small intestine is labelled.

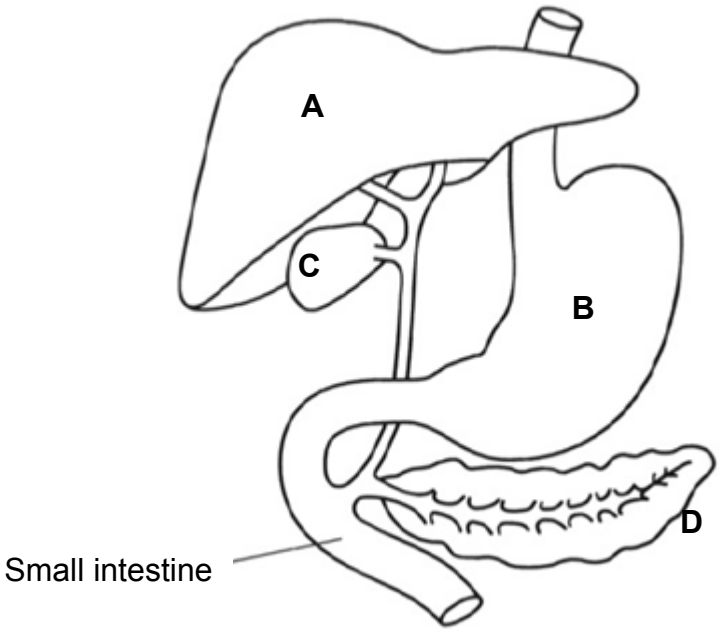


Figure 7.1

(i) Identify the parts labelled A, B, C and D. [2]

(ii) Describe the digestion of a meal made up of egg and rice through the alimentary canal. Include in your answer the name of enzymes, substances digested and products formed. [4]

(iii) Explain how the small intestine is adapted to absorption. [2]

(b) Explain why it is not advised for humans to consume raw meat and/or partly cooked food. [2]

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8 Figure 8 shows the side view of the human female reproductive system.

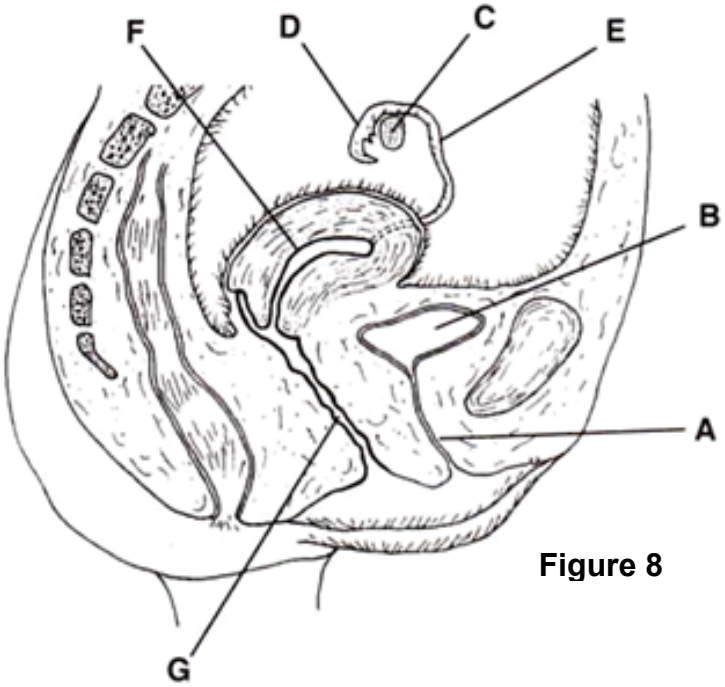


Figure 8

(a) Using the letters in the diagram, indicate the site where: [4]

(i) ova are produced.

(ii) fertilisation normally occurs.

(iii) embryo is implanted.

(iv) sperms are deposited during ejaculation.

(b) Outline the steps of fertilisation. [3]

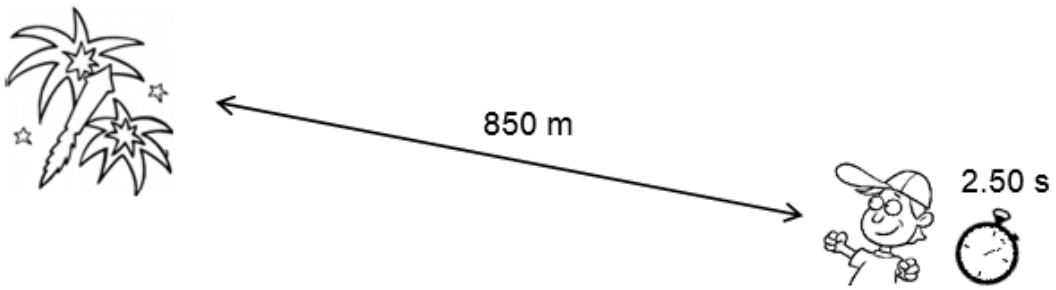
(c) Suggest one change that only boys experience during puberty. [1]

(d) Discuss the harmful effects of abortion. [2]

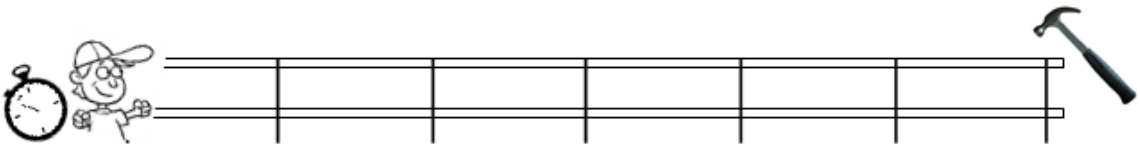
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9 (a) Louis set up experiment **A** as shown below to determine the speed of sound. He started his stopwatch when he saw the fireworks explode and stopped his stopwatch when he heard the sound of the explosion.
In experiment **B**, Louis took the time taken for sound of a knocking hammer to travel through a metal railing.

(i) Suggest how the speed of sound in experiment **A** and **B** will differ. [2]
Explain the difference.



Experiment A



Experiment B

(ii) The sound produced in experiment **A** is loud and low pitch whereas the sound produced in experiment **B** is soft and high pitch. [1]
Explain the difference in terms of vib ration of the sounds waves.

(iii) Describe how the parts of the ear help Louis to hear the sounds. [3]

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(b) **(i)** Paper steamboat is a very popular Japanese cuisine where the food is placed in paper and cooked over the flame. [2]

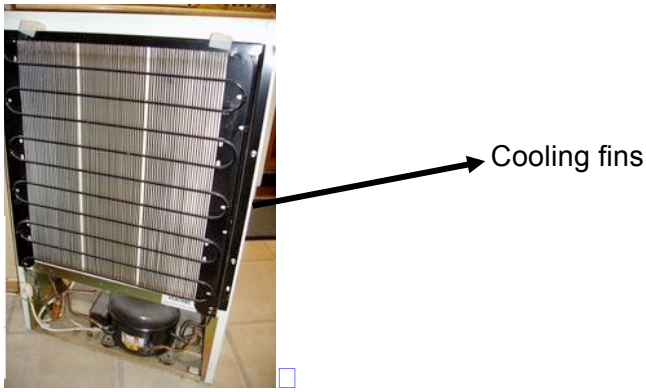
Explain, using knowledge of the process of thermal energy transfer, why the paper will not catch fire easily.



Paper Steamboat

(ii) The diagram below shows the back view of a refrigerator. [2]

Explain why cooling fins of a refrigerator are made from aluminium and painted black.



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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 †															

*58-71 Lanthanoid series

†90-103 Actinoid 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
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

Key: a / X / b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

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PAPER 1

1. B	**2. B**	**3. C**	**4. B**
5. B	**6. C**	**7. D**	**8. A**
9. B	**10. D**	**11. C**	**12. B**
13. C	**14. A**	**15. D**	**16. B**
17. D	**18. B**	**19. A**	**20. D**
21. B	**22. A**	**23. B**	**24. A**
25. D	**26. D**	**27. C**	**28. B**
29. D	**30. B**	**31. D**	**32. C**
33. C	**34. C**	**35. A**	**36. C**
37. B	**38. C**	**39. C**	**40. B**

Section A: [30 Marks]

Answer **ALL** the questions in the spaces provided on the question paper.

1(a)(i)

element	ion	atomic number	number of neutrons	Nucleon number	electronic configuration
X	**X^{2-}**	**16**	16	16	2.8.6
Y	**Y^{2+}**	4	**5**	9	2.2
Z	**Z^{+}**	11	12	23	**2.8.1**

[2] **2 correct 1 m**

(a)(ii) Z_2X **[1]**

(b)(i)
- Sulfuric acid **[1]**
- Hydrogen gas **[1]**

(ii) $Mg\ (s) + H_2SO_4\ (aq) \rightarrow MgSO_4\ (aq) + H_2\ (g)$ **[1]**

(iii) $Mg\ (s) + 2\ H^+\ (aq) \rightarrow Mg^{2+}\ (aq) + H_2\ (g)$ **[1]**

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2(a)	Movement of water molecules from a region of higher water potential (inside the cell) to a region of lower water potential (concentrated salt solution) through a partially permeable membrane.	**[1]** **[1]**
	•	
(b)	Oxygenated: Q, S Deoxygenated: P, R	**[1]** **[1]**
3(a)(i)	I = P / V = 9 W / 6 V = 1.5 A	**[1]** **[1]**
(a)(ii)	R = V / I = 6 V / 1.5 A (ecf) = 4 Ω	**[1]** **[1]**
	•	
(a)(iii)	P = IV = 1.5 A x 12.0 V = 18 W (ecf) Cost = (18/1000) x (8 x 24) x 1.20 (ecf) = $ 4.15	**[1]** **[1]**
(a)(iv)	• Fuse melts and breaks the circuit when the current is too high. • Prevent overloading/electric fires	**[1]**
4(a)(i)	Total force of students = 250 x 3 = 750 N Total force of teachers = 400 x 2 = 800 N Resultant force = 800 – 750 = 50 N in direction of teachers/ to the right.	**[1]** **[1]**
(a)(ii)	Teachers	**[1]**
(a)(iii)	W = F X D W = 800 N X 0.8 (ecf for this step if (a)(i) is wrong)	 **[1]**

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	= 640 J	**[1]**
(b)	• Their weight is spread out over the area in contact with the nails. • Surface area is increased which causes pressure to be decreased.	**[1]** **[1]**
5(a)(i)	Gravitational potential energy → Kinetic Energy → Electrical Energy → Light Energy (if student includes heat energy, accept)	**[1]**
(a)(ii)	No air pollution /renewable	**[1]**
(a)(iii)	• Causes deforestation to clear land space to build hydroelectric power station OR • Causes death of fishes when they are sliced by the turbine blades.	**[1]**
(b)	• Power = work done / time = [0.75 x (2.0/10)] / 5.0 =3.0 W	 **[1]** **[1]**

Section B: (30 marks)

Answer **THREE out of FOUR** questions in the spaces provided on the question paper.

6(a)(i)	• There was a gain of oxygen	**[1]**
(a)(ii)	• Heat energy	**[1]**
(a)(iii)	Exposure to light will decompose silver bromide into silver, which produces dark areas on the flim. light Silver bromide → silver + bromine	**[1]** **[1]**

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(b)(i)	Carbon monoxide. Carbon monoxide binds with haemoglobin to prevent the transport of oxygen, leading to shortness of breath, headaches and fatigue.	**[1]** **[1]**
(b)(ii)	Acid rain Sulfur dioxide and nitrogen dioxide dissolve in rainwater to form acid rain.	**[1]** **[1]**
(b)(iii)	Check acidity with any one of the following and corresponding observations: • pH meter – 0 <pH< 7 • blue litmus paper; turns red • universal indicator; turns red, orange or yellow • natural indicators such as red cabbage, hydrangea; pink for red cabbage and blue for hydrangea.	**[2]** **1m for test** **1m for results**
7(a)(i)	A: Liver B: stomach C: gall bladder D: pancreas All correct 2m, 1 wrong 3m, 2 wrong 1m	**[2]**
(a)(ii)	• Rice contains starch/carbohydrates, which are digested in the mouth by amylase to form maltose. • Maltose is further digested in the small intestine by maltase to form glucose. • Egg contains proteins, which are digested in the stomach by protease to form polypeptides. • Polypeptides are further digested in the small intestine by protease to form amino acids.	**[4]**
(a)(iii)	• 7 metres long/long; increases surface area to volume ratio to	**[2]**

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	increases rate of diffusion of digested food molecules OR • One cell thick wall; shortens the distance between intestinal contents and blood vessels so that absorption can happen faster.	
(b)	• Bacteria are found in raw or partly cooked food. • Bacteria can cause infections when they enter the intestine or produce toxins that are absorbed in the blood stream to make humans ill.	**[1]** **[1]**
8(a)	(i) C (ii) E (iii) F (iv) G	**[1]** **[1]** **[1]** **[1]**
8(b)	• Sperms deposited in the vagina swim up to the oviduct to meet the ovum • head of sperm enters ovum and changes the membrane of the ovum so that no other egg can enter. • Nucleus of sperm fuses with nucleus of ovum to form zygote.	**[1]** **[1]** **[1]**
8(c)	• Breaking of voice/deepening of voice • Production of male hormones and sperms • Growth of facial hair • Any other acceptable answers	**[1]**
8(d)	• Cause depression from guilt • Cause damage or infection of uterus; excess bleeding or cause female to be unable to be pregnant in future • Any other acceptable answers	**[1]** **[1]**
9(a)(i)	• Speed of sound in A will be slower than in B. • Sound travels faster in a denser medium which is the metal	**[1]** **[1]**

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	railing as compared to air.	
(a)(ii)	Sound produced in A is of lower frequency/lesser number of vibrations per second and has larger vibrations as compared to B. OR Sound produced in B is of higher frequency/greater number of vibrations per second and has smaller vibrations as compared to B.	**[1]**
(a)(iii)	• The outer ear help to collect the sound waves and directs them to the ear drum and cause it to vibrate • Middle ear contains small bones to magnify vibrations. • Inner ear contains nerve cells which change the vibrations to electrical signals and carries them to the brain.	**[1]** **[1]** **[1]**
9(b)(i)	• heat is conducted away from the paper to the water [1] • which is then transferred away by convection current [1] ; paper will not get hot enough to burn	**[2]**
9(b)(ii)	• made of aluminium as it is a good conductor of heat • painted black as black surfaces are good radiators of heat.	**[1]** **[1]**

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