Candidate Name: ______________________

Class	Index No.

FUHUA SECONDARY SCHOOL

Secondary Two Express

Mid-Year Examination 2012

E

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SCIENCE

Additional Materials:
Writing paper & Electronic calculator

DATE : **11 May 2012**
TIME **0750h to 0950h**
DURATION **2 hours**

INSTRUCTIONS TO CANDIDATES

Section A
Answer **all** questions. Shade your answers in soft pencil on the OMR.

Section B
Answer **all** questions. Write your answers in the blanks provided.

Section C
Answer **all** questions on the writing paper provided.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **100**.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

PARENT'S SIGNATURE	FOR EXAMINER'S USE		Highest Mark:	Lowest Mark:
		/ 100		

Setter: **Paul Chandra Tjahjono** *Vetter:* **Ng Yong Sheng**

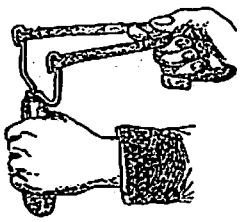
This question paper consists of 15 printed pages including this page.

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SECTION A: MULTIPLE CHOICE QUESTIONS (30 Marks)

Answer **all** questions. Shade your answers in soft pencil on the OMR.

1. The diagram below shows a student using a slingshot.



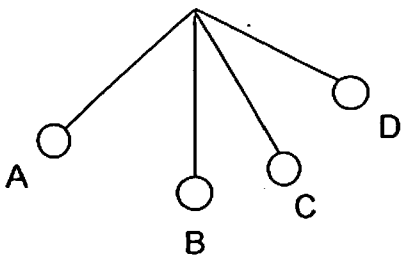
Which form of energy is possessed by the slingshot before it is released?

A chemical potential energy
B elastic potential energy
C gravitational potential energy
D kinetic energy

2. Which of the following is **not** a renewable source of energy?

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

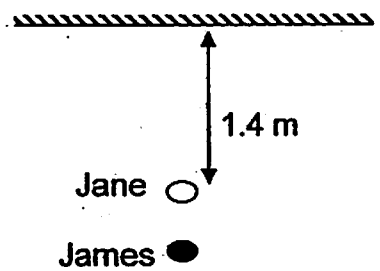
3. The diagram below shows the swinging of a simple pendulum. At which point, A, B, C or D is gravitational potential energy the **least**?



4. Which of the following actions does **not** conserve energy?

A Building wind turbines to generate electricity using wind.
B Developing more efficient technology to reduce energy loss to the surroundings.
C Installing solar panels on the rooftops of buildings to capture solar energy.
D Using charcoal instead of liquefied petroleum gas for cooking food.

5. Two students, James, of height 1.8 m, and Jane, of height 1.6 m, stand in front of a large plane mirror as shown in the figure below. James is 40 cm directly behind Jane.



How far is James' image in the mirror from Jane?

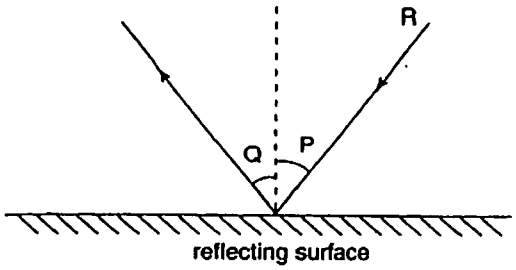
A 2.8 m
B 3.2 m
C 3.4 m
D 3.6 m

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6. Which of following shows **correctly** the speed of light in vacuum?

A 300 m/s B 330 m/s C 300 000 km/s D 330 000 km/s

7. Which of following **correctly** describes the relationship of angles **P** and **Q**?



A Angle **P** is larger than angle **Q**.
B Angle **P** is smaller than angle **Q**.
C Angle **P** is equal to angle **Q**.
D Sum of angle **P** and angle **Q** is 90°.

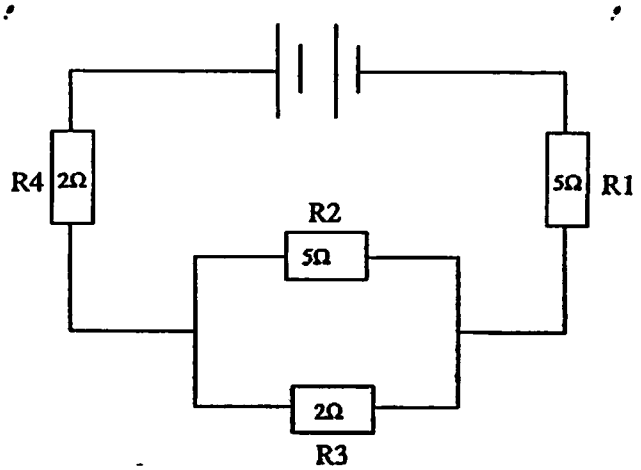
8. A ray of light passes from medium **X** into medium **Y**. If the refracted ray of light in medium **Y** bends away from the normal,

A medium **X** is optically denser than medium **Y**.
B medium **X** is optically less dense than medium **Y**.
C medium **X** and medium **Y** are of equal optical density.
D medium **X** is vacuum.

9. Jolene wore a white dress with black polka dots. Her sister wore a similar dress except that it is red with blue polka dots. In what colour light will their dresses appear to be of the same colour?

A White B Blue
C Green D Red

10. Four resistors R1, R2, R3 and R4 were placed at different positions in a circuit as shown below. Which two resistors will have the same current flow?

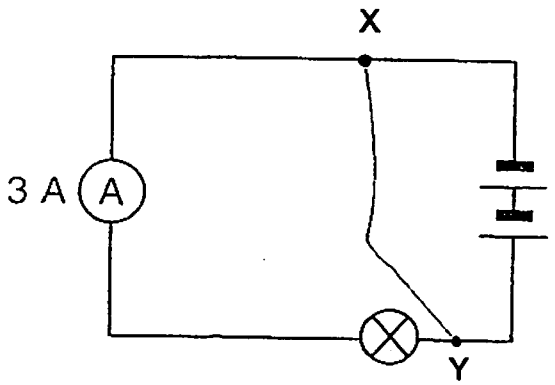


A R1 and R2 B R1 and R4 C R2 and R3 D R3 and R4

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11. Which of the following statements about the resistance of an electric circuit is **not** true?
    A An object with a greater resistance carries a greater amount of current in a circuit than that of a lower resistance.
    B Different metals have different resistivity.
    C The resistance becomes greater when the length of a conducting wire increases.
    D The SI unit of resistance is ohm (Ω)

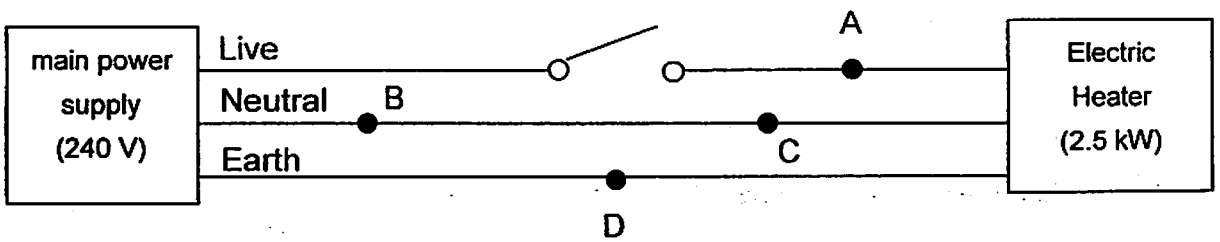
12. The diagram below shows an experimental set-up of an electric circuit.



What would happen to the electric circuit when a conducting wire is connected between points **X** and **Y**?
    A The brightness of the bulb and the reading of the ammeter remain the same.
    B The brightness of the bulb decreases but the reading of the ammeter becomes lesser than 3 A but greater than zero.
    C The brightness of the bulb decreases but the reading of the ammeter becomes more than 3 A.
    D The bulb does not light up and the reading of the ammeter becomes zero.

Answer questions **13** and **14** by using the information provided below.

The diagram below shows the three wires of an electrical main power supply connected to an electric heater which has a power rating of 2.5 kW.



13. Which of the following fuse ratings is most suitable for the circuit above?
    A 5 A B 10 A C 13 A D 15 A

14. Which position, **A**, **B**, **C** or **D**, should the fuse be fitted to such that the electric heater is protected in case a large current is drawn from the main power supply?

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15. A current of 2 A is supplied to an electric appliance. What is the current in each of the wires when the electrical application functions normally?

	Neutral Wire	Live Wire	Earth Wire
A	2	2	0
B	2	0	2
C	2	2	2
D	0	2	2

16. What is the purpose of boiling the leaf in water before testing it for starch?
    A To remove the chlorophyll.
    B To harden the leaf.
    C To remove the glucose.
    D To kill the leaf.

17. When a variegated leaf from a plant is tested with iodine solution after being exposed to sunlight, only green parts of the leaf show blue-black colour. Which of the following inferences can be made from this observation?
    A Only green parts of the leaf contain chlorophyll to carry out photosynthesis.
    B Only green parts of the leaf are able to store starch after photosynthesis.
    C Only green parts of the leaf contain chlorophyll to react with the iodine solution.
    D Only green parts of the leaf contain glucose to react with the iodine solution

18. Which of the following statements about gravitational force is **true**?
    A A satellite stays in orbit around the Earth because of the pull of gravitational force from the Moon.
    B Earth is the only planet which has gravitational force acting on all its objects.
    C The gravitational force can repel an object if its pole is placed opposite to the pole of the gravitational force.
    D The weight of an object decreases if it is placed in a location with a weaker gravitational force.

19. Which of one the following situations shows that a force is acting on the object?
    A A ball at rest.
    B A ball rolling with a constant speed on a frictionless surface.
    C A falling rock.
    D An asteroid moving with a constant speed in space.

20. A man standing on the floor exerts a larger pressure on the floor than when he is lying down. This is because the
    A force applied is greater when he is standing.
    B size of man is smaller when he is lying down.
    C floor on which he is standing is harder.
    D the area in contact with the floor is smaller when he is standing.

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21. A piece of rock was brought back from the Moon by an astronaut. Which of its properties would be different on Earth?

A Density B Mass C Volume D Weight

22. Ice formed on a frozen lake will break if the pressure on it is greater than 1.0 N/cm^2. If four boys with the following weights stood on the ice, which one will cause the ice to break?

	Weight of boy/N	Area of feet/cm^2
A	200	260
B	300	250
C	400	500
D	500	580

23. The moment of a force causes an object to
    A move forward.
    B move backward.
    C stop moving.
    D turn about a fixed point.

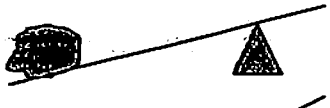
24. The turning effect of a force on a door is greater when it is applied at
    A a point near the hinges and perpendicular to the door.
    B a point near the hinges and parallel to the door.
    C a point far away from the hinges and perpendicular to the door.
    D a point far away from the hinges and parallel to the door.

25. Two equal forces acting on an object in opposite directions will be in equilibrium
    A only if they act on the same point on the object.
    B if they are separated by a distance.
    C when they are balanced by a third force.
    D when their moments about the same point are equal.

26. A nut can be loosen more easily with
    A a short spanner because a large turning effect can be produced.
    B a short spanner because a larger force can be produced.
    C a heavy spanner because a larger force can be produced.
    D long spanner because a large turning effect can be produced.

27. A crowbar is used to lift a heavy piece of rock. Which of the diagrams below shows the least force used for lifting the rock?

A 

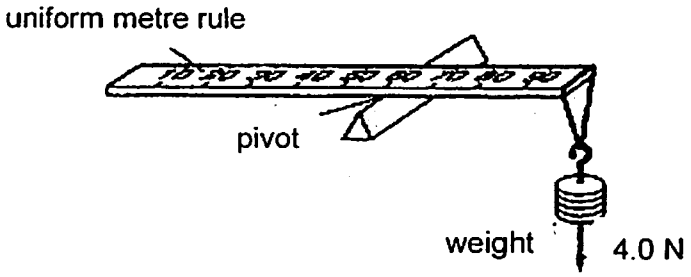
B 

C 

D 

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28. A uniform metre rule of weight 16.0 N is pivoted at the 60 cm mark. A 4.0 N weight is suspended from one end.



At the instant when the metre rule is horizontal, what is the value of the resultant turning moment about the pivot?

A zero
B 160 Ncm anticlockwise
C 160 Ncm clockwise
D 20 N downward

29. A construction worker uses a force of 1000 N to push a wheelbarrow full of sand but it does **not** move. How much work has he done?

A 0 J B 10 J C 100 J D 1000 J

30. A boy kicks a ball away in a football field. Which of the following is **true** about his work done?

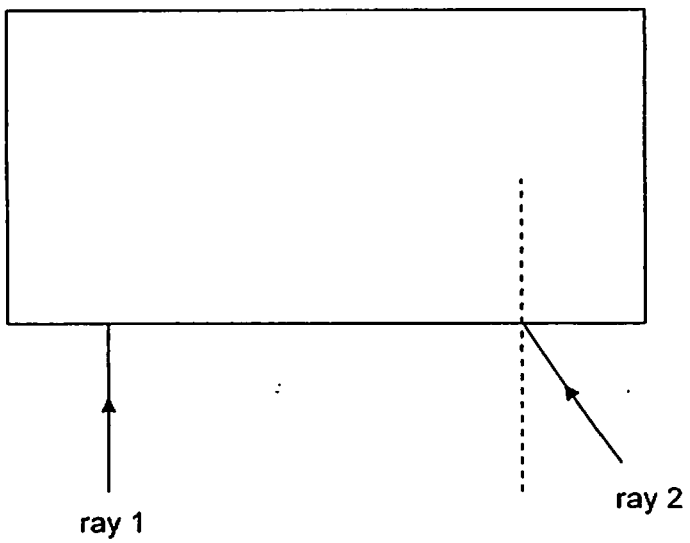
A The energy has transferred from one object to another.
B The energy is dissipated in the air.
C The work done produces twice the amount of heat energy.
D The boy does not perform any work.

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SECTION B: STRUCTURED QUESTIONS (40 Marks)

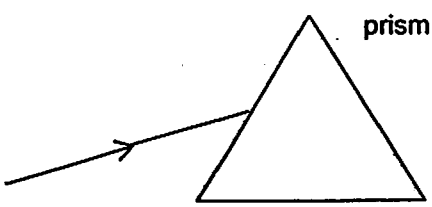
Write your answers in the blanks provided.

1. Two light rays pass into a glass block as shown. Complete the paths of the rays as they pass through and out of the glass block. [3]



2. (a) What is refraction of light? Why does it occur? [2]

(b) The diagram below shows a ray of white light entering a prism.

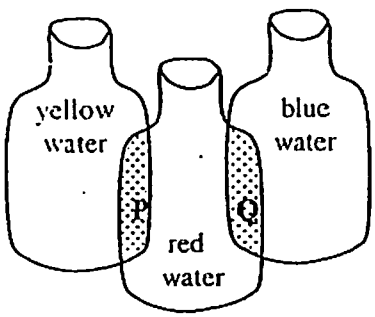


(i) Complete it to show how a spectrum is formed and labelled the rays at the end of the spectrum. [2]

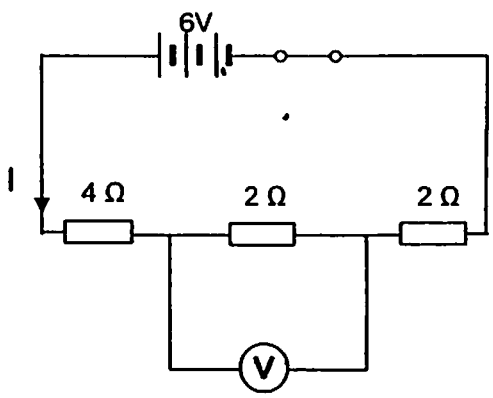
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(ii) Explain clearly what happens to the ray of light as it enters and leaves the prism. [3]

(c) Three glass jars of coloured water are placed in front of a white light source. They are arranged in such a way that they intersect at the sides of the jars. Explain the colours you see at P and Q. [2]



3.



For the circuit diagram shown above, find the

(a) electric current, I, [2]

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(b) potential difference, V, across the 2 Ω resistor. [1]

4. A 24V 12W lamp is operating normally. Calculate
(a) the current flowing through the filament of the lamp. [2]

(b) the resistance of the lamp. [1]

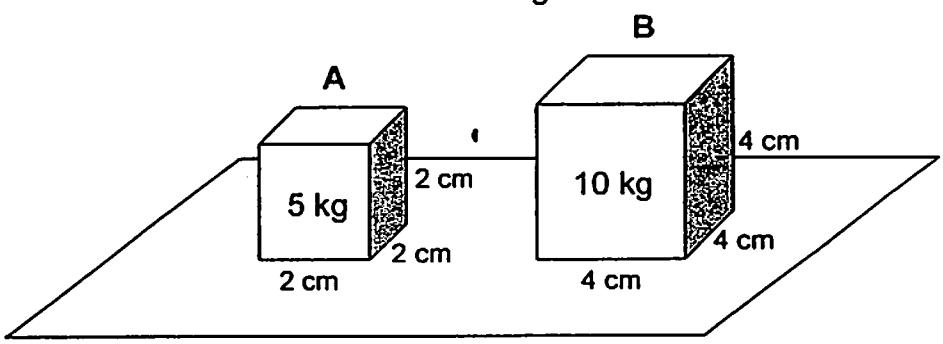
5. State **two** ways in which breathing and respiration are different. [2]

_____

_____

_____

6. Two cubes rest on the table as shown in the diagram below.



Cube A has a mass of 5 kg and sides of length 2 cm while cube B has a mass of 10 kg and sides of length 4 cm.
(a) What is the weight of cube A, given that *g* is 10N/kg? [1]

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(b) What is the pressure exerted on the table by cube **A**? [2]

(c) Which cube, **A** or **B**, exerts a greater pressure on the table? _____ [1]

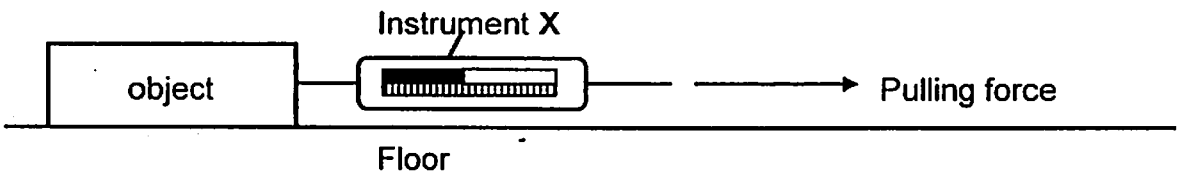
7. State the type of forces involved in each of the following situations. [3]

(a) A stone falls after being dropped from a cliff. _____

(b) Rolling a ball on the ground. _____

(c) A piece of iron sticks onto the door of a refrigerator. _____

8. The diagram below shows an experiment to measure the friction between the object and the surface of a floor.



(a) What is the name of the instrument **X**? [1]

_____

(b) On the diagram above, indicate the direction of the frictional force acting on the object. [1]

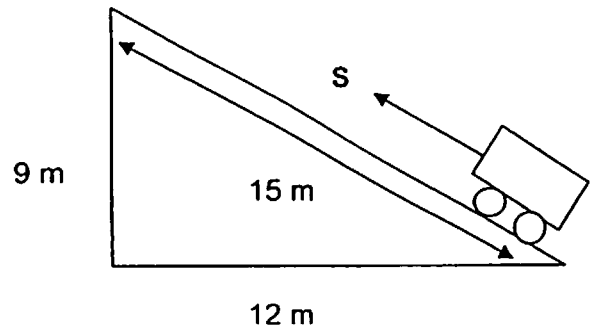
(c) State **one** way to decrease the friction in this experiment. [1]

_____

9. (a) A man walks up a flight of 15 steps which is of 15 cm high each. If the work done against gravity by the man is 2925 J, what is the weight of the man? [2]

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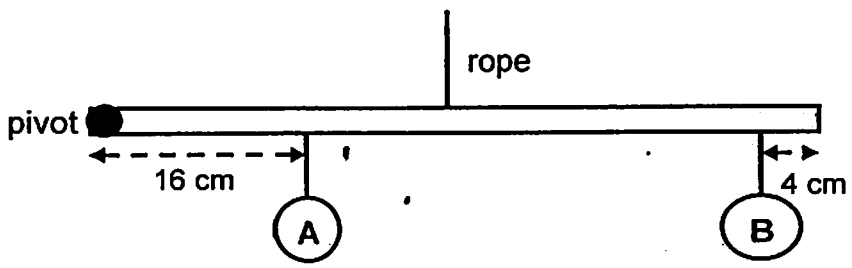
(b) A trolley weighing 0.18 kN is pulled up a slope by a rope with a force S. The distance moved by the trolley is as shown in the diagram. Assume that the surface that the trolley moved on is frictionless,



(i) What is the work done against gravity to pull the trolley up the slope? [1]

(ii) The force S provides the energy needed to pull the trolley to the top of the slope. Find the force S. [2]

10. The diagram below shows a uniform rod of length 0.50 m placed with loads A and B. A rope is tied in the middle to support and balance the rod in a horizontal position. Load A has a mass of 20 kg and load B has a mass of 35 kg.



(a) Determine the total clockwise moments caused by loads A and B. [3]

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(b) Hence, calculate the force exerted on the rope in order to maintain the rod in a horizontal position. [2]

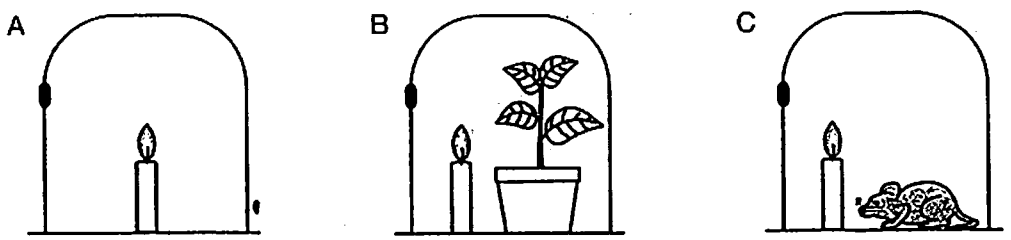
SECTION C: FREE RESPONSE QUESTION (30 Marks)

Answer **all** questions on the writing paper provided.

1. (a) A cyclist is riding a mountain bike during a race.
   (i) State the form of energy associated with a moving mountain bike. [1]
   (ii) What energy change occurs when the cyclist travels up a slope? [1]
   (iii) What is meant by the term "*conservation of energy*"? [2]
   (iv) Explain how the energy change of the cyclist as he travels up a slope illustrates the conservation of energy? [1]

   (b) (i) State **two** disadvantages of using fossil fuels. [2]
   (ii) Give **two** ways of conserving energy. [2]
   (iii) Give **one** reason why tidal energy is not available to every country in the world. [1]

2. (a) Study the experimental set-up shown below.

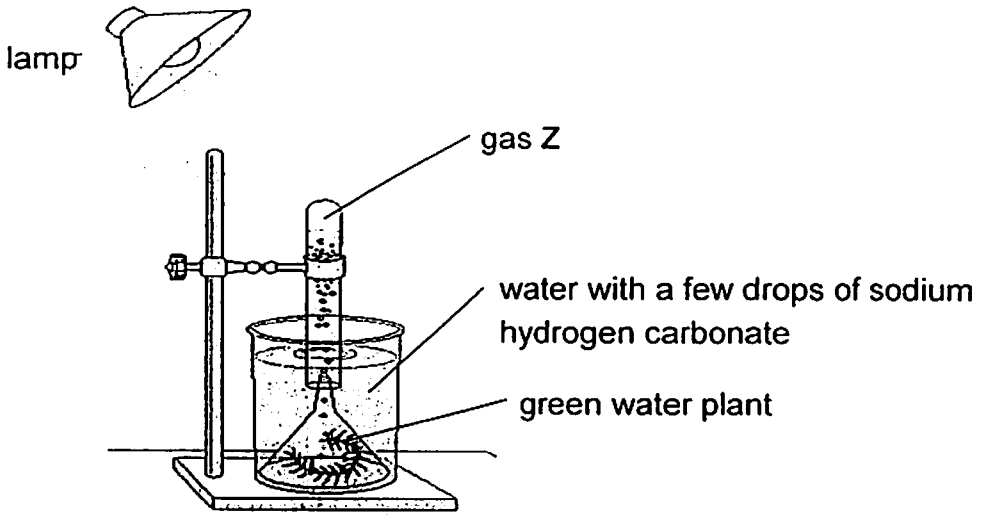


Equal amounts of air were pumped into bell jars **A**, **B** and **C** respectively. This experiment is carried out in bright sunlight.

   (i) List the bell-jars in order of the longest to the shortest time taken for the flame to be extinguished. [1]
   (ii) Provide an explanation for your order of bell jars in (a)(i). [2]

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(b) The figure below shows an experiment being carried out to investigate the process of photosynthesis.



(i) State the conditions necessary for photosynthesis to take place. [2]

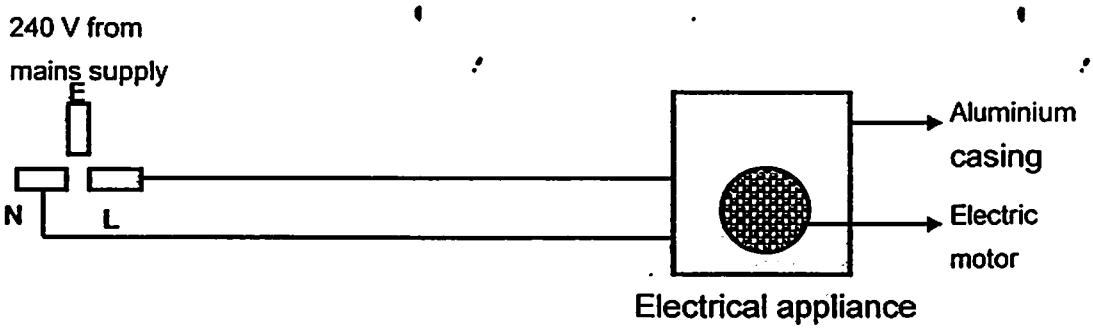
(ii) Suggest the name of gas Z. [1]

(iii) Sodium hydrogen carbonate is said to release a gas that aids photosynthesis. Name this gas. [1]

(iv) Another similar experiment is carried out except that sodium hydrogen carbonate is **not** added into the water. Do you think the volume of gas Z produced would be the same, more or lesser as compared to the experiment above? Explain your answer. [2]

(v) Write down the equation for photosynthesis [1]

3. The diagram shows the wiring system between the electrical appliance and the mains supply of 240 V in a household. The body of the electrical appliance is made of aluminium casing. The electrical appliance has a power rating of 3 kW.



(a) Determine the current flowing through the electric motor of the appliance when it functions normally. [1]

(b) The appliance is turned on for 9 000 s each day. What is the total cost of energy consumption in a week if the cost for each unit of electricity in households is 25 cents? (Note: Give your answer to the nearest cent.). [3]

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(c) (i) Explain why the connection between the mains supply and the electrical appliance can be hazardous to the users if the wire L touches the aluminium casing when it is faulty. [2]

(ii) Suggest how the hazards of electricity in (c)(i) can be avoided. [2]

(iii) Name a circuit breaker that works with what you have suggested in (c)(ii) and describe its functions. [2]

End of Paper

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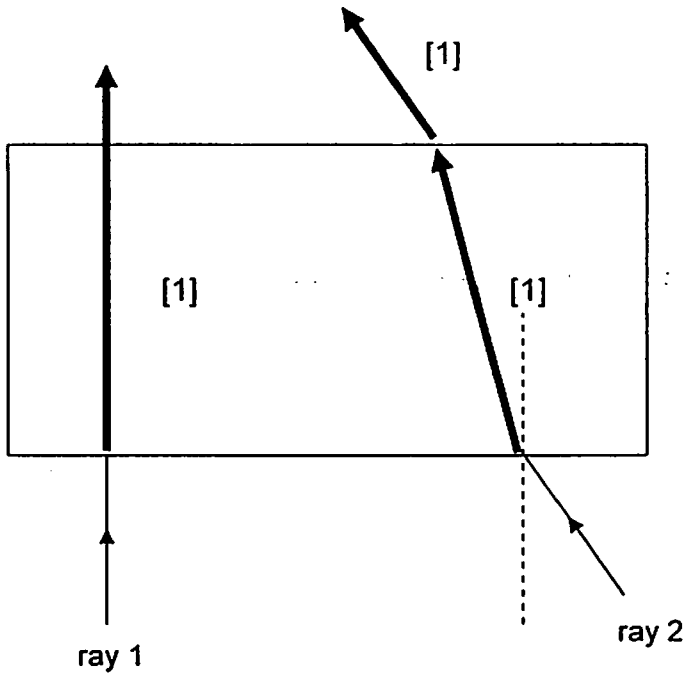


Section A

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

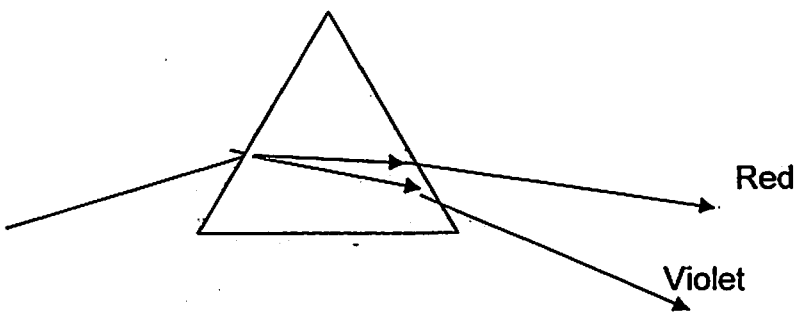
Section B

Q1



Q2 (a) It is the bending of light (1/2) as it travels from one medium to another medium of different optical densities.(1/2)
The difference in speeds of light in the 2 media causes the bending. [1]

(b) (i)



Correct light ray and labeling for red [1]
Correct light ray and labeling for red [1]

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(ii) Different colours in white light travel at different speed through the glass [1]
And therefore bends at different angles [1]
thus splitting into a different spectrum. [1]

(c) P : red – only the red component of yellow light can pass through
Q: black– the blue light is absorbed by the red solution

Q3

(a) I = V/R
= 6/(4+2+2) [1]
= 6/8
= 0.75 A [1]

(b) V = IR
= 0.75 x 2
= 1.5 V [1]

Q4

(a) I = P/V
= 12/24 [1]
= 0.5 A [1]

(b) Resistance of lamp = V/I
= 24/0.5
= 48 Ω [1]

Q5

Breathing involves the exchange of gases whereas respiration involves the release of energy from food. [1]
Breathing takes place in the lungs whereas respiration takes place in every living cell. [1]

Q6

(a) Weight = 5 x 10 = 50 N [1]
(b) Area of cube A = 0.02 x 0.02
= 0.004 m^2 [1]
P = F/A
= 50 / 0.004
= 12500 N/m^2 (or 12.5N/cm^2) [1]
(c) Cube A [1]

Q7

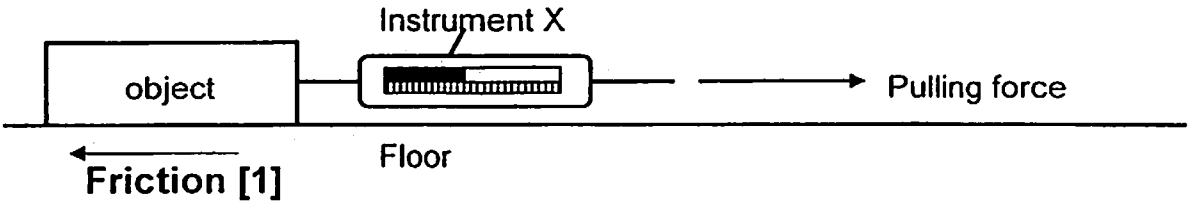
(a) Gravitational Force [1]
(b) Frictional Force [1]
(c) Magnetic Force [1]

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Q8

(a) Spring Balance [1]

(b)



(c) Add oil to the surface of the floor. [1]
(or any other suitable lubricant to reduce friction)

Q9

(a) Work done = F x d
2925 = F x (15 x 0.15) [1]
F = 1300 N [1]

(b) (i) W = F x d
= 180 x 9
= 1620 J [1]

(ii) Work done pushing the trolley up the ramp = Work done lifting up the trolley against gravity
S x 15 = 1620 [1]
S = 108 N [1]

Q10

(a) Total clockwise moments = $(F_1 \times d_1) + (F_2 \times d_2)$
= (20 x 10 x 0.16) [1] + (35 x 10 x 0.46) [1]
= 32 + 161
= 193 Nm [1]

(b) When in horizontal position,
Total anti-clockwise moments = Total clockwise moments
F x d = 193 [1]
F x 0.25 = 193
F = 644 N [1]



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Section C

Q1

(a) (i) Kinetic Energy [1]

(ii) Kinetic energy → Gravitational potential energy [1]

(iii) No energy is created or destroyed. [1]
Total amount of energy is the same throughout. [1]

(iv) The amount of kinetic energy lost is exactly converted into gravitational potential energy gained as the cyclist travels up the slope. [1]
(if only state KE → GPE when cycling up [1/2] only)

(b) (i) Burning of fossil fuels will cause air pollution. [1]
(harmful [1/2]; non-renewable [0])
There is a limited supply of fossil fuels. [1]

(ii) Switch off the lights when not in use.
Switch off electrical appliances when not in use.
Use energy-saving light bulbs.
Use fan instead of air-conditioner.
Accept any 2 answers, [1] each
(use energy saving appliances or use renewable energy without giving examples [1/2] only)

(iii) Not all countries have suitable sites for tidal barrages (if put dam then have to be specific; cannot mix up with hydroelectricity) [1]

Or

Building a barrage affects a very wide coastal region; too expensive, etc...

Q2

(a) (i) B, A, C

(ii) In B plant photosynthesize [1/2], producing oxygen [1/2].
In A oxygen only used for burning [1/2]
In C rats also respire [1/2], using oxygen

Or

(ii) B take the longest time as the plant photosynthesize [1/2], producing oxygen [1/2].
C takes the shortest time as the rats also respire [1/2], using oxygen

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(b) (i) Light energy (or sunlight) [1]
Chlorophyll [1]
(ii) Oxygen [1]
(iii) Carbon dioxide [1]
(iv) Volume of gas Z would be lesser. [1]
Carbon dioxide is needed for photosynthesis. [1/2]
The carbon dioxide presence is only due to respiration of the plant or existing dissolved carbon dioxide in water. [1/2]

Or

Lesser carbon dioxide [1/2] available for photosynthesis [1/2]

(v) carbon dioxide + water –chlorophyll & sunlight → glucose + oxygen
(anything missing [0]; sugar instead of glucose[1/2])

Q3
(a) P = IV
I = P/V
= 3000 /240
= 12.5 A [1]

(b) E = Pt (convert to 2.5h [1])
= 3 x (9000/3600) x 7
= 3 x 2.5 x 7
= 52.5 kWh [1]
Cost = 52.5 x 0.25
=$13.13 [1]

(c) (i) Current will flow through the casing because it is a conductor of electricity. [1]
The casing becomes 'live' and the user will receive an electric shock if he were to touch on the casing [1]
(ii) Place an earth wire between the socket marked E to the aluminium casing. [1]
It conducts the leakage of current to the ground. [1]
(iii) Residual Current Circuit Breaker. [1]
(RCCB or ELCB orresidual circuit breaker [1/2])
It breaks the circuit when current flowing through the earth wire exceeds 30 mA or when there is faulty equipment being used. [1]

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