

KOTHARI INTERNATIONAL SCHOOL, NOIDA

CAMBRIDGE A LEVEL HOLIDAY HOME WORK

SUBJECT: COMPUTER SCIENCE

A. Create Presentation on Operating Systems. It should contain details as under :

1. Roles and Responsibilities of OS
2. Structure of an OS
3. Various Memory Management schemes adopted by OS

B. Create Presentation on Data Security containing details on

1. Encryption methods
2. Digital Signatures and digital Certificates
3. Quantum Cryptography

KOTHARI INTERNATIONAL SCHOOL, NOIDA

CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION SESSION 2023-24
SUMMER BREAK PRACTICE

Please Attempt the complete paper in 2 hours, time it if you go beyond.

SUBJECT: ENGLISH Max Marks: 80 TIME ALLOTTED: 2 hours

You will need: Insert (enclosed)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page. • Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined pages at the end of this booklet; the question number or numbers must be clearly shown.
- Dictionaries are **not** allowed.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

Section A: Shorter writing and reflective commentary

Question 1

You recently went to see a famous band playing live in a large stadium. You decide to write a diary entry about the experience.

(a) Write the text for the diary entry, using no more than 400 words. In your writing, focus on the atmosphere and sense of excitement. **[15]**

(b) Write a reflective commentary on your text, explaining how your linguistic choices contribute to fulfilling the task set. **[10]**

Section B: Extended writing

Answer **one** question.

EITHER

Question 2

Write a story which begins with the following sentence: *It was in the middle of the night when I finally made up my mind.* In your writing, create a sense of drama and tension. Write between 600 and 900 words. **[25]**

OR

Question 3

You are going to take part in a debate at school about whether teenagers should get jobs or relax during long school holidays. Your headteacher has asked you to open the debate by giving a speech on the topic. Write the text for the speech, discussing both points of view and giving your opinion. Write between 600 and 900 words. **[25]**

OR

Question 4

A museum in your town has recently re-opened after a major redevelopment, and you have visited it. Write a review of the museum, which will be published in your school magazine. Write between 600 and 900 words. **[25]**

Kothari International School
Summer BREAK- Holiday Assignment
Session - 2023-24
Cambridge A- LEVEL
ECONOMICS

Q.1. The differences in wage rates paid in different occupations are caused entirely by the differences in the elasticity of supply of labour. The way, therefore, to overcome the differences in wage rates is to increase the training available to workers.

Discuss whether economic analysis supports this argument. [25]

Q.2. (a) Explain what is meant by an inflationary gap. [12]

(b) Discuss the effectiveness of the policies a government might use to reduce an inflationary gap. [13]

Q.3. Whether a country can be classified as developed depends on the value of its GDP and the higher the GDP the better it is for the country.

Assess this opinion. [25]

Q.4. (a) Explain what is meant when it is said that there might be inefficiencies in the production of goods and in the allocation of resources. [12]

(b) Discuss whether the best way to overcome market failure is to control private enterprise by means of taxation.

CIRCULAR MOTION

1.

Total for Question 1: 10

(a) Define angular velocity.

[1]

(b) Calculate the angular velocity of a car travelling at 30 kmhr^{-1} around a roundabout whose radius is 50 m.

[3]

(c) Give three examples of situations in which centripetal forces arise, detailing precisely which forces contribute to the centripetal force.

[3]

- (d) Outline a simple experiment you could perform to explore circular motion. As well as describing the experimental setup, explain how you would calculate the centripetal force for different radii, speeds and masses. [3]

2. A cyclist is travelling around a bend with a radius of 15 m on a horizontal road. The frictional force is related to the reaction force from the ground and the coefficient of friction by the equation $F = \mu R$, where μ is the coefficient of friction and R is the reaction force.

Total for Question 2: 10

- (a) In dry conditions $\mu = 0.5$. Calculate the maximum speed at which the cyclist can travel if he is not to fall off. [3]

- (b) The reaction of the surface and the frictional force both act on the cyclist, but at a distance from the centre of mass. They therefore provide a torque. Qualitatively, explain why a cyclist leaning inwards when cycling around bends helps to prevent these torques destabilising the bike. [3]

- (c) Rosie is feeling particularly brave and decides to conduct an experiment to calculate the coefficient of friction when the road surface is wet. She uses five different bends, each with a different radius. For each, she records her speed at the point her wheels begin to slide. Using the data in the table below, plot a graph and calculate the coefficient of friction.

[4]

bend radius / m	speed / ms^{-1}
9	45
4.5	15
11	60
6.5	20
3	5

3. A conical pendulum is simply a mass suspended from a point that traces out a horizontal circle, rather than one that swings back and forth.

Total for Question 3: 10

(a) Draw a free-body diagram for the mass.

[1]

(b) What provides the centripetal force in this situation?

[1]

(c) Express the tension in the string in terms of the mass, the mass's velocity and the radius of the circle in which it moves.

[2]

(d) By balancing the weight with the tension in the string, show that the speed of the bob is given by $v = \sqrt{rg \tan \theta}$ [3]

(e) By considering the circumference of the circle traced out by the bob, determine whether or not the angular velocity depends on the bob's mass. Justify your answer. [3]

GRAVITATION 1

1. Kepler's laws were developed long before Newton's era and are based purely on empirical observation. From them it is possible to determine key orbit characteristics, especially if theoretical models are developed in accordance with observations.

Total for Question 1: 10

(a) State the following:

i. Kepler's first law.

[1]

ii. Kepler's second law.

[1]

iii. Kepler's third law.

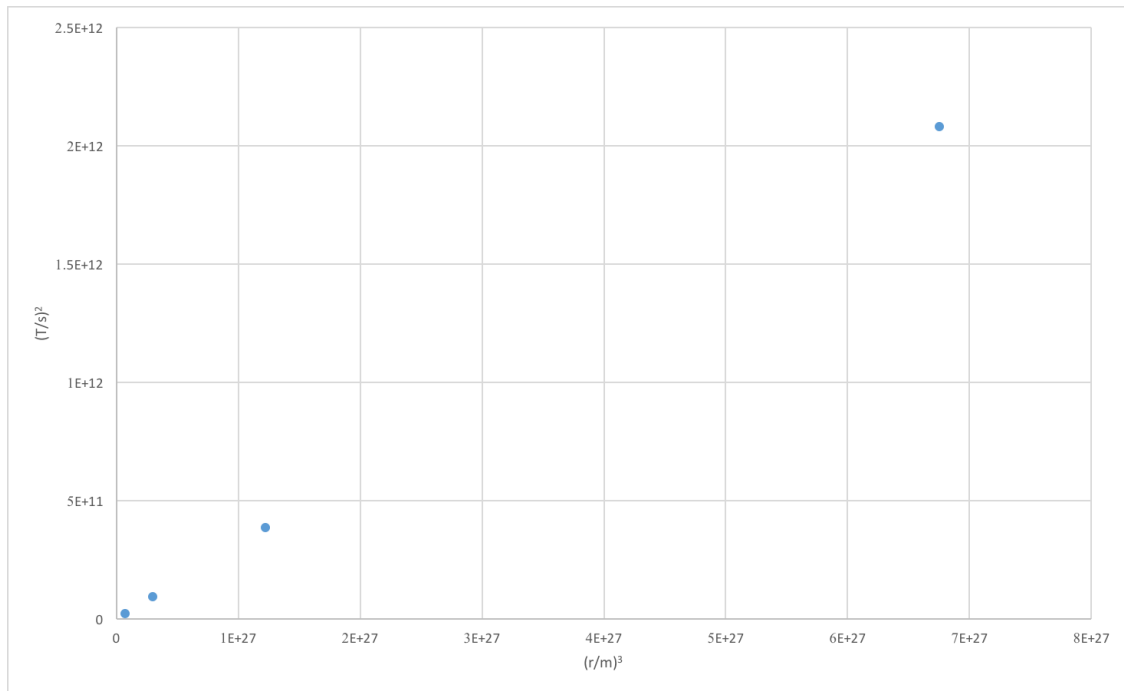
[1]

(b) What provides a planet's centripetal force?

[1]

(c) Derive an expression that gives a theoretical justification for Kepler's third law.

[3]



(d) The graph above shows the orbital properties of Jupiter's moons. Use it to calculate Jupiter's mass.

[3]

2. Satellites can also be analysed using the various laws of gravitation and circular motion. For this question, assume that Earth's mass is 6.0×10^{24} kg and that it has a radius of 6400 km.

Total for Question 2: 10

- (a) By equating gravitational and centripetal forces, show that the mass of a satellite in orbit does not affect its speed. [2]

- (b) Calculate the speed at which a satellite must be released into orbit if it is to maintain a height of 100 km above Earth's surface. [2]

- (c) Define a geostationary orbit. [3]

(d) Calculate the altitude of a geostationary orbit.

[3]

3. All vector fields have an associated scalar potential. For this question, assume Earth has a radius of 6400 km and a mass of 6.0×10^{24} kg.

Total for Question 3: 10

(a) Define, in words, the gravitational potential. [1]

(b) Given that the gravitational potential, V_g , is 63 MJkg^{-1} at Earth's surface, calculate the following:
i. V_g at infinity. [1]

ii. V_g at an altitude equal to Earth's radius. [1]

(c) Calculate the gravitational potential energy of a 10 kg ball at an altitude equal to three times Earth's radius. [2]

- (d) Sketch a graph to show how the magnitude of the gravitational force varies with the distance from the centre of the spherical object creating the field. What is represented by the area underneath the graph? [1]

- (e) The average kinetic energy of an H_2 molecule is given by the equation $\frac{1}{2}m\bar{c}^2 = \frac{3}{2}kT$, where m is the mass of the molecule, c is the r.m.s. speed, k is the Boltzmann constant and T is temperature. By calculating the r.m.s. speed and the escape velocity, determine whether or not a helium molecule at 300 K can escape Earth's atmosphere. The mass of one atom of helium is 6.6×10^{-27} kg. [4]

GRAVITATION 2

1.

Total for Question 1: 13

(a) Which two of the following statements are false? [2]

- i. Any object with mass will generate a gravitational field.
- ii. Gravitational fields require two masses.
- iii. A gravitational field is one of numerous fields that give rise to forces.
- iv. The strength of a planet's gravitational field is inversely proportional to the square of the distance from the surface.

(b) Describe what happens to the gravitational force between two objects A and B when:
i. Their separation doubles. [1]

ii. The mass of A halves. [1]

iii. The mass of A doubles and that of B halves. [1]

iv. The mass of B triples and the separation halves. [2]

- (c) Sketch, for each of the following, the pattern of field lines. For the first three, by distributing your field lines accordingly, make the relative field strengths clear. [6]
- i. A sphere of mass m .
 - ii. A sphere of mass M , where $m < M$.
 - iii. A point source of mass M .
 - iv. A small section of a planet's surface.

2. Zog is the only planet in its solar system. It has a radius of 150 km and is perfectly spherical.

Total for Question 2: 13

- (a) By considering Newton's Second Law and his Law of Gravitation, derive an expression for the gravitational field strength, g , of an object in terms of its mass, m , the distance from its centre of mass, r , and the gravitational constant, G . [2]

- (b) Kyle measures a gravitational acceleration of 0.5 ms^{-2} when his spaceship is 1.0 km from Zog's surface. Calculate the average density of Zog. [4]

Though Zog is small, it has an even smaller moon, whose radius is 5 km. The separation of their centres of masses is 200 km. The resultant gravitational field is zero at a distance of 40 km from Zog's surface.

(c) By equating the gravitational field strengths, calculate the mass of the moon.

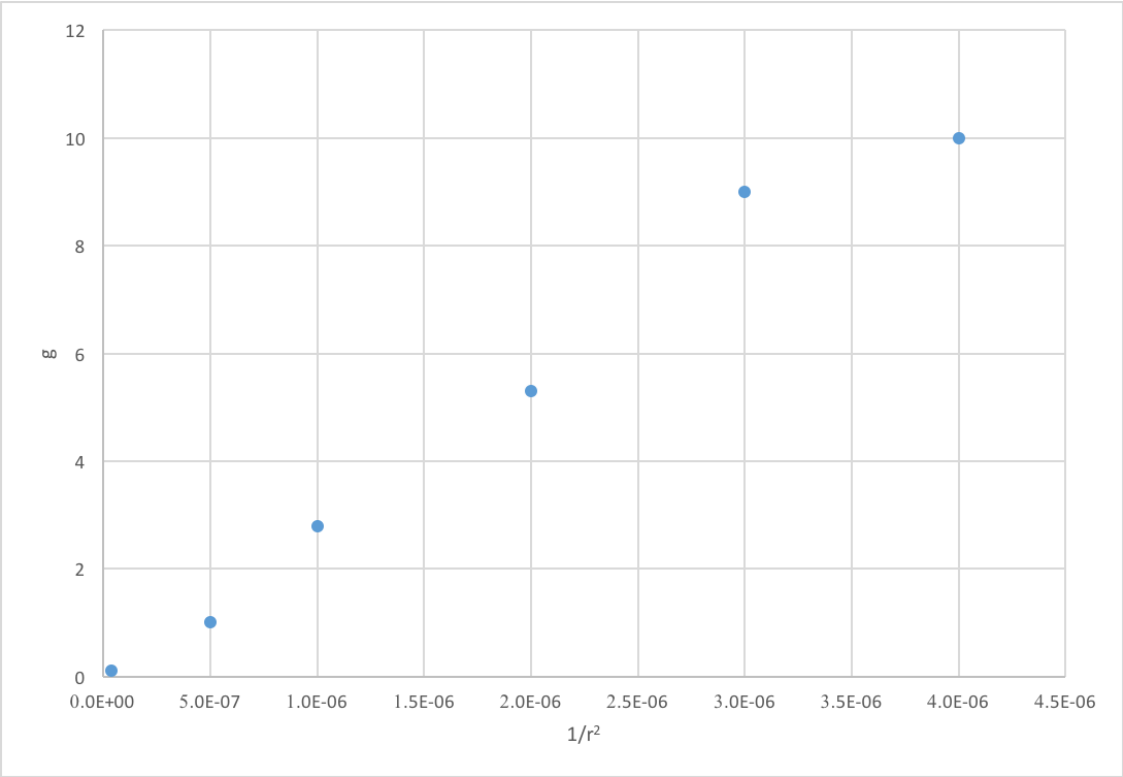
[4]

(d) Calculate the resultant field halfway between their surfaces, specifying in which direction the resultant force of attraction acts.

[3]

3. The graph below shows how the measured gravitational field strength (ms^{-2}) varied with $1/r^2$ (r in m) in an experiment carried out by Zoe

Total for Question 3: 4



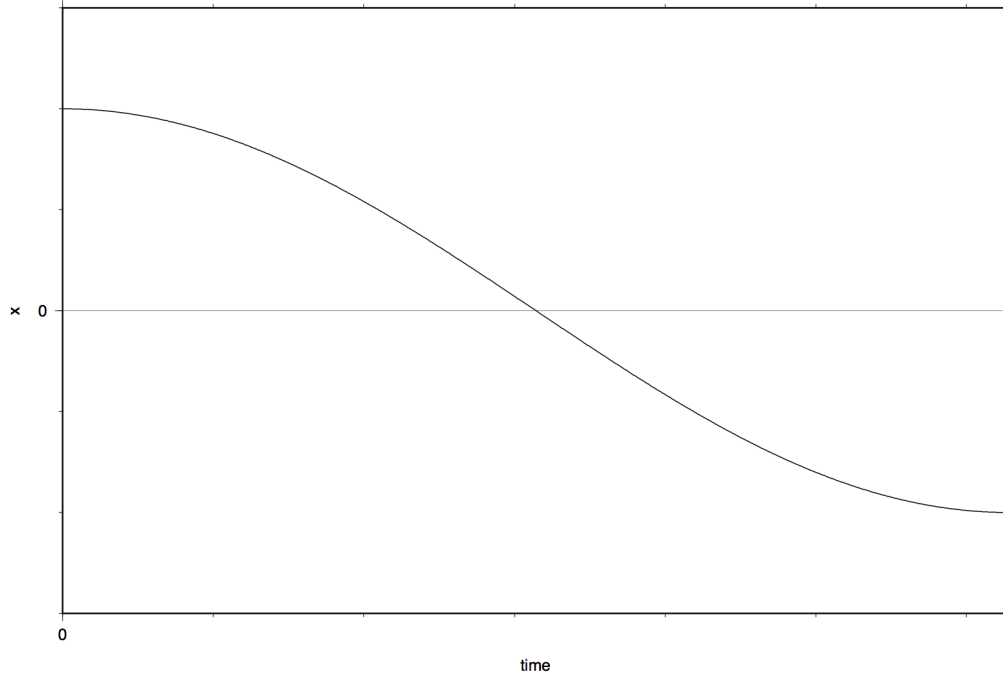
(a) Use the graph to calculate the mass of the object used.

[4]

OSCILLATION

1. The graph below shows the displacement of a spring, x , against the time since its release, t .

Total for Question 1: 6



- (a) On the plot above, sketch graphs of velocity versus time and acceleration versus time. Hence conclude whether or not the spring is in simple harmonic motion. Justify your conclusion. [3]

- (b) The period of a pendulum in simple harmonic motion is independent of its amplitude. How would you verify this statement experimentally? [3]

2. Geoff, a rock climber, is following his friend Marie up an overhanging cliff. Marie is attached to the rock and ensures that the rope between herself and Geoff is taut at all times. Unfortunately, Geoff falls off and subsequently swings. Unless otherwise stated, ignore air resistance.

Total for Question 2: 24

- (a) Geoff passes through the equilibrium position, for the second time, after 4.5 s. At this point, he is travelling at a speed of 5 ms^{-1} . Calculate the following:

i. The frequency of his oscillations.

[2]

ii. His velocity 2.25 s after he falls.

[3]

For a simple pendulum undergoing simple harmonic motion, $\omega^2 = \frac{g}{l}$, where l is the length of the pendulum, ω is the angular frequency and g is the acceleration due to gravity. For the small angles involved in simple harmonic motion, $\cos \theta \approx 1 - \frac{\theta^2}{2}$ and $\sin \theta \approx \theta$.

- (b) It can be shown geometrically that $\cos \omega t = \frac{l}{A} \sin \theta$, where x is Geoff's displacement, l is the rope's length, A is his initial displacement and θ is the angle between the rope and the vertical. Using this result, show that his kinetic energy is given by $\frac{1}{2}m\omega^2(A^2 - l^2\theta^2)$. [3]

- (c) By considering his vertical displacement, derive an expression for his potential energy in terms of l , g , θ and his mass, m . [3]

(d) Hence show that energy is conserved.

[3]

(e) Sketch, on a single set of axes, the variation of E_{total} , E_p and E_k with θ for $-\theta_{max} \leq \theta \leq \theta_{max}$.

[2]

- (f) Sketch, on a single set of axes, the displacements of a lightly damped and a critically damped simple pendulum as a function of time. In reality, after numerous oscillations, Geoff comes to rest. Is the damping in the system light, heavy or critical? [3]

- (g) In this case, the damping causes an exponential decrease in the amplitude of his displacements. Given that after 4 s the amplitude has reduced to 4.00 m, calculate the amplitude when $t = 8$ s. Use your answer to part a,ii as an initial amplitude. [2]

- (h) In other systems, oscillations can be forced. Briefly explain what is meant by the term resonance and when it might occur. You may find it helpful to provide a sketch. [3]

IDEAL GASES

1. Real gases have complex behaviours which are difficult to model accurately. One simplified model is the kinetic theory, according to which macroscopic properties temperature and pressure can be calculated from simple assumptions about the microscopic behaviour of atoms and molecules.

Total for Question 1: 9

(a) Calculate the molar mass of N_2O .

[1]

(b) State three assumptions of the kinetic theory of gases.

[3]

(c) Explain why a gas exerts a pressure.

[2]

(d) Explain how you would go about calculating the value of absolute zero using a water bath.

[3]

2. A box whose sides all measure 0.4 m contains one molecule of mass 7.6×10^{-26} kg bouncing elastically between opposite walls at 800 ms^{-1} .

Total for Question 2: 12

(a) State Boyle's Law.

[1]

(b) What is the change of momentum when the molecule collides with a wall?

[2]

(c) How many collisions occur with a given face in a period of 1.0 s?

[1]

(d) Calculate the average pressure on a single face.

[3]

- (e) When placed on the weighing scales, a different, sealed box measures 100 N. It contains methane (CH_4) at a pressure of 20 kPa and temperature of 25°C . Given that the box alone has a mass of 10 kg, calculate the volume of the box. [5]

3. This question is about the speed with which particles in an ideal gas move and about how this affects different particles' energies.

Total for Question 3: 9

- (a) A box containing fifty helium molecules measures $2.0 \times 0.5 \times 2.0$ m. If the r.m.s. speed of the particles is 1500 ms^{-1} , calculate the pressure inside the box. [3]

- (b) Using the ideal gas law ($pV = NkT$) and the equation for the r.m.s. speed of a molecule, show that the kinetic energy of a particle is given by $\frac{3}{2}kT$. [3]

- (c) What effect will doubling the absolute temperature of an ideal gas have on its internal energy? [3]
Justify your answer.

THERMAL PHYSICS

1.

Total for Question 1: 6

(a) Define thermal equilibrium.

[2]

(b) Why would a standard liquid-in-glass thermometer inserted into a mug of tea give an inaccurate insight into the initial temperature of the tea, even when thermal equilibrium has been reached? Is the reading randomly inaccurate, or is it systematically an over- or under-estimate?

[2]

(c) What transfer of heat, if any, happens when an 85°C metal rod is inserted into a 363 K vat of water?

[2]

2. The nature of solids, liquids and gases, and how they change with temperature, is best described by the kinetic theory, which states that all substances are a collection of atoms and molecules, each with a particular kinetic energy.

Total for Question 2: 12

- (a) Compare and contrast the spacing, ordering and motion of atoms in solids and liquids. [2]

- (b) Explain, in the context of the kinetic model, why solid-liquid-gas transitions might occur. [3]

- (c) Outline a simple experiment that could be performed to demonstrate the key principles of the kinetic model - that matter is made up of atoms and molecules and that they have kinetic energy. [2]

(d) Define the internal energy of a substance. [1]

(e) Why is the electrostatic energy of a liquid or solid conventionally assigned a negative value? [1]

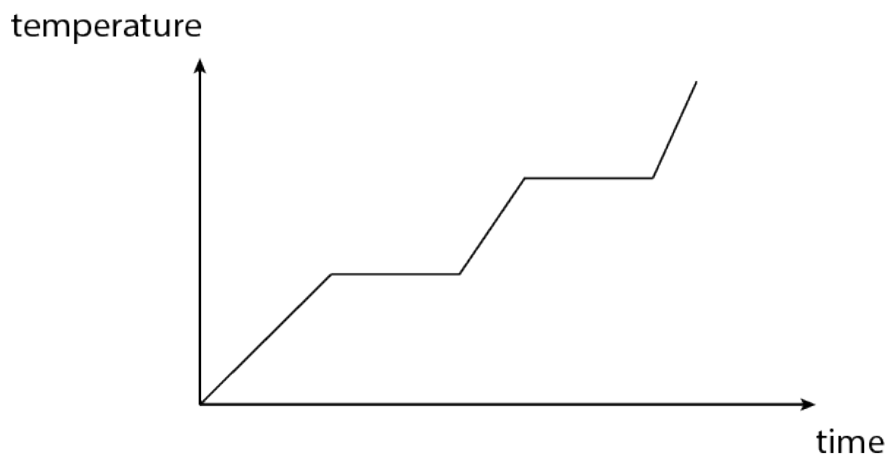
(f) State two ways in which a substance's internal energy can be increased. [2]

(g) Which of the following is correct? [1]

- i. At absolute zero the internal energy of a substance is zero.
- ii. At absolute zero the internal energy of a substance is negative.
- iii. At absolute zero the internal energy of a substance is positive.

3. The graph below shows the variation in temperature with time as a solid is heated using a hair dryer. The power of the hair dryer remains constant.

Total for Question 3: 12



- (a) Label the graph to show the following: the phase of the substance and its melting and boiling points. [2]

- (b) Why are the transitions not instantaneous? [2]

- (c) The freezing point of peanut oil varies, but is approximately 3°C . Its specific heat capacities above and below freezing are 2.40 and $2.65 \text{ kJkg}^{-1}\text{K}^{-1}$, respectively, and its latent heat of fusion is 60kJkg^{-1} . How long would it take for the 1000 W hairdryer to change 1 kg of the oil from a solid at 233 K to a liquid at 40°C ? [4]

- (d) Outline two methods that could be used to determine the specific heat capacity of a substance. [4]

KOTHARI INTERNATIONAL SCHOOL, NOIDA

SUBJECT: PSYCHOLOGY SESSION: 2023-24 GRADE: A LEVEL

HOLIDAY HOMEWORK

NAME OF THE TEACHER: Ms VANYA CHADHA

**MOVIE ANALYSIS
FORMAT**

Instructions

Watch a movie linked with a psychological disorder given in your syllabus, and do a movie analysis on it. Be as creative as you want to be, and do not restrict yourself. It can be typed or handwritten. And, it should include pictures as well as detailed explanation. The date of submission is 3 July, 2023.

FORMAT

COVER PAGE:-

PSYCHOLOGY PROJECT- MOVIE ANALYSIS: NAME OF THE MOVIE

(On the bottom right

corner-

Submitted by:

Write your name and grade & section)

PAGE 1

INTRODUCTION: Write about the general description of the psychological disorder portrayed in the movie. (300-500words)

PAGE 2-PAGE 3: SUMMARY OF THE MOVIE

Write a detailed summary, involving the instances of the chosen disorder.

PAGE 4-PAGE 5: SYMPTOMS OF THE DISORDER

Give a detailed description about the general as well as specific symptoms causes (shown in the movie) pertaining to the chosen disorder.

PAGE 6-PAGE 7: CAUSES OF THE DISORDER

Give a detailed explanation about the general as well as specific causes (shown in the movie) pertaining to the chosen disorder.

PAGE 8- 9: TREATMENT OF THE DISORDER

Write about the general as well as specific treatment (shown in the movie) pertaining to the chosen disorder.

PAGE 10- LEARNING FROM PROJECT

Share your learning from this project. (200-300words)

BEST WISHES! HAPPY LEARNING!

KOTHARI INTERNATIONAL SCHOOL, NOIDA
A LEVEL BUSINESS
HOLIDAY HOME WORK

African Publishing Company (APC)

APC is a public limited company. It was privatised by the government of Country X five years ago. APC's performance since privatisation is summarised in Appendix 1.

APC is a vertically integrated business. Its operations include:

- commissioning authors to write books
- computer typesetting of each book
- printing books on sustainably sourced paper
- transport and distribution of books to retailers.

The directors of the company are considering two growth strategies:

- **Strategy A:** Take over DSF, Country X's largest chain of bookshops. APC could then begin to focus on marketing and promoting its own books at prices decided by the company.
- **Strategy B:** Merge with a family-owned publishing business, PAN, in Country Y. APC's books could be printed in Country Y, where paper and labour costs are much lower than in Country X.

APC's directors will use data in Appendix 2 and Appendix 3 when making the strategic choice.

Dynamic business environment

APC used to be a traditional business, which did not quickly adopt new technology. However, recent changes in the industry have been transformational. They include: using computers to typeset books, computerised inventory control, automated printing presses, and advances in digital technology leading to high demand for tablet computers and e-book readers. The recently appointed operations director has introduced the latest book production and printing methods, at considerable cost to the business.

Appendix 1: Summary of APC's performance since privatisation

	5 years ago	This year
Profit after tax	\$13m	\$108m
Average APC book price	\$5	\$8
Number of APC books in publication	3 250	4 560
Average annual salary of employees	\$8 350	\$7 690
% increase in annual energy usage	12%	4%
Employee accidents on APC premises	125	64

CONTINUED

Appendix 2: Summary of economic forecasts for Country X and Country Y

Economic forecasts for next 5 years	Country X	Country Y
Average annual increase in real GDP	1.5%	3%
Average annual rate of inflation	4%	6%
Exchange rate index of country's currency against other currencies in 5 years (this year = 100)	110	88
Average annual rate of unemployment	5.5%	7%

Appendix 3: APC's estimates when comparing the two strategies

APC's estimates	Strategy A	Strategy B
Probability of success	85%	75%
Expected value (over 5 years)	\$15m	\$20m
Main driving force	Control over book marketing	Low production costs
Main constraining force	No retail experience	Culture clashes possible
Likely competitive rivalry	High	Low

Decision-making questions

- 1 Analyse **two** likely benefits to any one stakeholder group resulting from the privatisation of APC. [8]
- 2 Evaluate the likely impact on APC's future success of technological change. [16]

Business strategy question

- 1 Advise APC's directors which growth strategy, A or B, APC should choose. Justify your answer. [20]

Decision-making questions

1 Change of HRM strategy

Fast Vacuums (FV) make cordless vacuum cleaners. Millions of these are sold each year in 50 countries. The customer services team at FV is made up of 12 full-time employees. Their main job is to answer customer enquiries, complaints and guarantee claims, which are received by post, email and telephone.

Asif, the HR manager, called a meeting with the customer service employees. He told them that the costs of FV's customer services department were too high, productivity was below that of similar service teams in other businesses and customer satisfaction targets were not being met.

Some employees asked, 'What targets? How is our work being monitored and measured?' Asif explained that management by objectives had been introduced last year, but that targets had not been shared with workers, to stop them competing with each other. He said this was going to change. From now on, customer service workers would discuss and agree daily and weekly targets for the number of customer queries to be answered each hour and the levels of customer satisfaction expected. These would be monitored by a new performance management program.

Asif also said that annual appraisal meetings would be replaced by computerised questionnaires. The customer services supervisor was retiring and would not be replaced. Instead a new chatbot would be introduced to allow the workers to ask questions about products, guarantee claims and other issues that customers commonly rang up about. All new recruits would be assessed by AI software to analyse their suitability. Asif was planning to replace time-consuming interviews of job applicants with a video-recorded conversation with a computer.

1 Analyse the potential benefits to FV of management by objectives. [8]

2 Evaluate whether FV should proceed with its plan to increase the use of IT within HRM. [12]

2 Human resources crisis in the Theatre Lighting (TL) factory

The customer complaints file on Bernardo's desk was bulging with letters received over the last few weeks. He had never known a period like it. Declining productivity and increasing absenteeism, especially of part-time workers, were the main causes of the problems of late delivery times and poor quality (see Table 16.12).

TL manufactures specialist lighting equipment for theatres and cinemas. Demand has increased in recent years as consumers' incomes have risen, and theatre and cinema attendance has been increasing. Company policy is to have a combination of full-time and part-time workers to give greater production flexibility and to keep labour costs under control. As unemployment is falling and the demand for skilled electrical workers is rising, it is more difficult for TL to recruit and retain the right number and skills of workers. New recruits have to be trained in the specialist skills required to produce TL's lighting equipment. TL pays competitive wages but there are few fringe benefits and no profit-sharing scheme is offered to production workers.

TL has not invested in automated production equipment. Each order from customers is for a different system. Some TL production employees have suggested that worker participation would help solve some of the delays in completing orders, but Bernardo has always preferred to take his own decisions.

	Last year	This year
Annual output (lighting units)	1 400	1 100
Total production employees (half on part-time contracts)	250	220
Average daily number of employees absent	50	76

Table 16.12: Output and employee data for TL

- 1
 - a Calculate labour productivity for:
 - i last year
 - ii this year. [4]
 - b Evaluate how TL could attempt to increase labour productivity. [12]
- 2
 - a Calculate employee absenteeism for:
 - i last year
 - ii this year. [4]
 - b Evaluate how TL could attempt to reduce employee absenteeism. [12]
- 3 Evaluate whether the profitability of TL could be improved by the use of a different HRM strategy. [16]

SELF-EVALUATION CHECKLIST

After studying this chapter, complete a table like this:

You should be able to:	Needs more work	Almost there	Ready to move on
Analyse the differences between alternative approaches to HRM, such as hard and soft approaches			
Evaluate the appropriateness of these different HRM approaches in business situations			
Calculate employee performance and analyse the causes and consequences of poor employee performance			
Evaluate strategies for improving employee performance			
Evaluate the usefulness of management by objectives			
Evaluate the changing role of IT and AI in HRM			

KOTHARI INTERNATIONAL SCHOOL, NOIDA
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
SESSION 2022-23, AS LEVEL – MATHEMATICS
PRACTICE ASSIGNMENT

- 1 Solve the equation $|2x - 3| = |5x + 1|$. [3]
- 2 Solve the inequality $|5x - 3| \geq 7$. [3]
- 3 Solve the inequality $|2x - 3| < |2 - x|$. [3]
- 4 Solve the equation $|x^2 - 14| = 11$. [4]
- 5 The polynomial $ax^3 - 13x^2 - 41x - 2a$, where a is a constant, is denoted by $p(x)$.
- a Given that $(x - 4)$ is a factor of $p(x)$, find the value of a . [2]
- b When a has this value, factorise $p(x)$ completely. [3]
- 6 The polynomial $6x^3 - 23x^2 - 38x + 15$ is denoted by $f(x)$.
- a Show that $(x - 5)$ is a factor of $f(x)$ and hence factorise $f(x)$ completely. [4]
- b Write down the roots of $f(|x|) = 0$. [1]
- 7 The polynomial $x^3 - 5x^2 + ax + b$ is denoted by $f(x)$. It is given that $(x + 2)$ is a factor of $f(x)$ and that when $f(x)$ is divided by $(x - 1)$ the remainder is -6 . Find the value of a and the value of b . [5]
- 8 The polynomial $x^3 - 5x^2 + 7x - 3$ is denoted by $p(x)$.
- a Find the quotient and remainder when $p(x)$ is divided by $(x^2 - 2x - 1)$. [4]
- b Use the factor theorem to show that $(x - 3)$ is a factor of $p(x)$. [2]
- 9 The polynomial $4x^4 + 4x^3 - 7x^2 - 4x + 8$ is denoted by $p(x)$.
- a Find the quotient and remainder when $p(x)$ is divided by $(x^2 - 1)$. [3]
- b Hence solve the equation $4x^4 + 4x^3 - 7x^2 - 4x + 3 = 0$. [3]
- 10 The polynomial $x^4 - 48x^2 - 21x - 2$ is denoted by $f(x)$.
- a Find the value of the constant k for which $f(x) = (x^2 + kx + 2)(x^2 - kx - 1)$. [3]
- b Hence solve the equation $f(x) = 0$. Give your answers in exact form. [3]
- 11 The polynomial $2x^4 + 3x^3 - 12x^2 - 7x + a$ is denoted by $p(x)$.
- a Given that $(2x - 1)$ is a factor of $p(x)$, find the value of a . [2]
- b When a has this value, verify that $(x + 3)$ is also a factor of $p(x)$ and hence factorise $p(x)$ completely. [4]
- 12 The polynomial $3x^3 + ax^2 - 36x + 20$ is denoted by $p(x)$.
- a Given that $(x - 2)$ is a factor of $p(x)$, find the value of a . [2]
- b When a has this value, solve the equation $p(x) = 0$. [4]
- 13 The polynomial $2x^3 + 5x^2 - 7x + 11$ is denoted by $f(x)$.
- a Find the remainder when $f(x)$ is divided by $(x - 2)$. [2]
- b Find the quotient and remainder when $f(x)$ is divided by $(x^2 - 4x + 2)$. [4]
- 14 The polynomial $ax^3 + bx^2 - x + 12$ is denoted by $p(x)$.
- a Given that $(x - 3)$ and $(x + 1)$ are factors of $p(x)$, find the value of a and the value of b . [4]
- b When a and b take these values, find the other linear factor of $p(x)$. [2]

- 15 The polynomial $6x^3 + x^2 + ax - 10$, where a is a constant, is denoted by $P(x)$. It is given that when $P(x)$ is divided by $(x + 2)$ the remainder is -12 .
- a Find the value of a and hence verify that $(2x + 1)$ is a factor of $P(x)$. [3]
- b When a has this value, solve the equation $P(x) = 0$. [4]
- 16 The polynomial $2x^3 + ax^2 + bx + 6$ is denoted by $p(x)$.
- a Given that $(x + 2)$ and $(x - 3)$ are factors of $p(x)$, find the value of a and the value of b . [4]
- b When a and b take these values, factorise $p(x)$ completely. [3]
- 17 The polynomials $P(x)$ and $Q(x)$ are defined as:
- $$P(x) = x^3 + ax^2 + b \quad \text{and} \quad Q(x) = x^3 + bx^2 + a.$$
- It is given that $(x - 2)$ is a factor of $P(x)$ and that when $Q(x)$ is divided by $(x + 1)$ the remainder is -15 .
- a Find the value of a and the value of b . [5]
- b When a and b take these values, find the least possible value of $P(x) - Q(x)$ as x varies. [2]
- 18 The polynomial $5x^3 - 13x^2 + 17x - 7$ is denoted by $p(x)$.
- a Find the quotient when $p(x)$ is divided by $(x - 1)$, and show that the remainder is 2. [4]
- b Hence show that the polynomial $5x^3 - 13x^2 + 17x - 9$ has exactly one real root. [3]
- 19 The polynomial $4x^3 + kx^2 - 65x + 18$ is denoted by $f(x)$.
- a Given that $(x + 2)$ is a factor of $f(x)$, find the value of k . [2]
- b When k has this value, solve the equation $f(x) = 0$. [4]
- c Write down the roots of $f(x^2) = 0$. [1]
- 20 The polynomial $2x^3 - 5x^2 + ax + b$, where a and b are constants, is denoted by $f(x)$. It is given that when $f(x)$ is divided by $(x + 2)$ the remainder is 8 and that when $f(x)$ is divided by $(x - 1)$ the remainder is 50.
- a Find the value of a and the value of b . [5]
- b When a and b have these values, find the quotient and remainder when $f(x)$ is divided by $x^2 - x + 2$. [3]
- 21 The polynomial $2x^3 - 9x^2 + ax + b$, where a and b are constants, is denoted by $f(x)$. It is given that $(x + 2)$ is a factor of $f(x)$, and that when $f(x)$ is divided by $(x + 1)$ the remainder is 30.
- a Find the value of a and the value of b . [5]
- b When a and b have these values, solve the equation $f(x) = 0$. [4]

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CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
SESSION 2022-23, AS LEVEL – MATHEMATICS
PRACTICE ASSIGNMENT

- 1 Solve the inequality $2^x > 7$, giving your answer in terms of logarithms. [2]
 2 Given that $\ln p = 2 \ln q - \ln(3 + q)$ and that $q > 0$, express p in terms of q not involving logarithms. [3]
 3 Solve the inequality $3 \times 2^{3x+2} < 8$, giving your answer in terms of logarithms. [4]
 4 Use logarithms to solve the equation

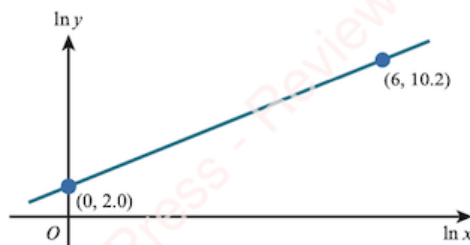
$$5^{x+3} = 7^{x-1},$$

 giving the answer correct to 3 significant figures. [4]

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- 5 Solve the equation $6(4^x) - 11(2^x) + 4 = 0$, giving your answers for x in terms of logarithms where appropriate. [5]
 6 Solve the equation $\ln(5x + 4) = 2 \ln x + \ln 6$. [5]

7



The variables x and y satisfy the equation $y = Kx^m$, where K and m are constants. The graph of $\ln y$ against $\ln x$ is a straight line passing through the points $(0, 2.0)$ and $(6, 10.2)$, as shown in the diagram. Find the values of K and m , correct to 2 decimal places. [5]

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- 8 i Given that $y = 2^x$, show that the equation

$$2^x + 3(2^{-x}) = 4$$

 can be written in the form

$$y^2 - 4y + 3 = 0.$$
 [3]
 ii Hence solve the equation

$$2^x + 3(2^{-x}) = 4,$$

 giving the values of x correct to 3 significant figures where appropriate. [3]

Cambridge International AS & A Level Mathematics 9709 Paper 21 Q5 June 2010

- 9 Given that $(1.2)^x = 6^y$, use logarithms to find the value of $\frac{x}{y}$ correct to 3 significant figures. [3]
 10 The polynomial $f(x)$ is defined by

$$f(x) = 12x^3 + 25x^2 - 4x - 12.$$

 i Show that $f(-2) = 0$ and factorise $f(x)$ completely. [4]
 ii Given that $12 \times 27^y + 25 \times 9^y - 4 \times 3^y - 12 = 0$, state the value of 3^y and hence find y correct to 3 significant figures. [3]

- 11 Solve the equation $|4 - 2^x| = 10$, giving your answer correct to 3 significant figures. [3]

Cambridge International A Level Mathematics 9709 Paper 31 Q1 June 2012

- 12 Use logarithms to solve the equation $e^x = 3^{x-2}$, giving your answer correct to 3 decimal places. [3]

Cambridge International A Level Mathematics 9709 Paper 31 Q1 November 2014

- 13 Using the substitution $u = 3^x$, solve the equation $3^x + 3^{2x} = 3^{3x}$ giving your answer correct to 3 significant figures. [5]

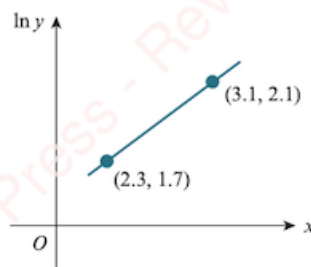
Cambridge International A Level Mathematics 9709 Paper 31 Q2 November 2015

- 14 The variables x and y satisfy the equation $5^y = 3^{2x-4}$.

a By taking natural logarithms, show that the graph of y against x is a straight line and find the exact value of the gradient of this line. [3]

b This line intersects the x -axis at P and the y -axis at Q . Find the exact coordinates of the midpoint of PQ . [3]

15



The variables x and y satisfy the equation $y = K(b^x)$, where K and b are constants. The graph of $\ln y$ against x is a straight line passing through the points (2.3, 1.7) and (3.1, 2.1), as shown in the diagram. Find the values of K and b , correct to 2 decimal places. [6]

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SESSION 2022-23, AS LEVEL – MATHEMATICS
PRACTICE ASSIGNMENT

- 1 Sketch the graph of $y = 3 \sec(2x - 90^\circ)$ for $0^\circ < x < 180^\circ$. [3]
- 2 By expressing the equation $\operatorname{cosec} \theta = 3 \sin \theta + \cot \theta$ in terms of $\cos \theta$ only, solve the equation for $0^\circ < \theta < 180^\circ$. [5]

Cambridge International A Level Mathematics 9709 Paper 31 Q3 June 2016

- 3 Given that $\cos A = \frac{1}{4}$, where $270^\circ < A < 360^\circ$, find the exact value of $\sin 2A$. [5]
- 4 Solve the equation $2 \tan^2 x + \sec x = 1$ for $0^\circ \leq x \leq 360^\circ$. [6]
- 5 Solve the equation $2 \cot^2 x + 5 \operatorname{cosec} x = 10$ for $0^\circ < x < 360^\circ$. [6]
- 6 a Prove that $\sin(x + 60^\circ) + \cos(x + 30^\circ) \equiv \sqrt{3} \cos x$. [3]
 b Hence solve the equation $\sin(x + 60^\circ) + \cos(x + 30^\circ) = \frac{3}{2}$ for $0^\circ < x < 360^\circ$. [3]
- 7 a Prove that $\sin(60^\circ - x) + \cos(30^\circ - x) \equiv \sqrt{3} \cos x$. [3]
 b Hence solve the equation $\sin(60^\circ - x) + \cos(30^\circ - x) = \frac{2}{5} \sec x$ for $0^\circ < x < 360^\circ$. [3]
- 8 i Show that the equation $\tan(x + 45^\circ) = 6 \tan x$ can be written in the form $6 \tan^2 x - 5 \tan x + 1 = 0$. [3]
 ii Hence solve the equation $\tan(x + 45^\circ) = 6 \tan x$, for $0^\circ < x < 180^\circ$. [3]

Cambridge International AS & A Level Mathematics 9709 Paper 21 Q3 June 2010

- 9 a Prove that $\tan(x + 45^\circ) - \tan(45^\circ - x) \equiv 2 \tan 2x$. [4]
 b Hence solve the equation $\tan(x + 45^\circ) - \tan(45^\circ - x) = 6$ for $0^\circ < x < 180^\circ$. [3]
- 10 i Express $3 \cos \theta + \sin \theta$ in the form $R \cos(\theta - \alpha)$, where $R > 0$ and $0^\circ < \alpha < 90^\circ$, giving the exact value of R and the value of α correct to 2 decimal places. [3]
 ii Hence solve the equation $3 \cos 2x + \sin 2x = 2$, giving all solutions in the interval $0^\circ \leq x \leq 360^\circ$. [5]

Cambridge International AS & A Level Mathematics 9709 Paper 21 Q7 November 2013

- 11 a Prove that $\cos(60^\circ - x) + \cos(300^\circ - x) \equiv \cos x$. [3]
 b Hence
 i find the exact value of $\cos 15^\circ + \cos 255^\circ$ [2]
 ii solve the equation $\cos(60^\circ - x) + \cos(300^\circ - x) = \frac{1}{4} \operatorname{cosec} x$ for $0^\circ < x < 180^\circ$. [3]
- 12 a Prove the identity $\frac{2 \sin 2\theta - 3 \cos 2\theta + 3}{\sin \theta} \equiv 4 \cos \theta + 6 \sin \theta$. [3]
 b Express $4 \cos \theta + 6 \sin \theta$ in the form $R \cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$.
 Give the exact value of R and the value of α correct to 2 decimal places. [4]
 c Write down the greatest value of $\left(\frac{2 \sin 2\theta - 3 \cos 2\theta + 3}{\sin \theta} \right)^2$. [1]
- 13 i Express $4 \sin \theta - 6 \cos \theta$ in the form $R \sin(\theta - \alpha)$, where $R > 0$ and $0^\circ < \alpha < 90^\circ$.
 Give the exact value of R and the value of α correct to 2 decimal places. [3]
 ii Solve the equation $4 \sin \theta - 6 \cos \theta = 3$ for $0^\circ \leq \theta \leq 360^\circ$. [4]
 iii Find the greatest and least possible values of $(4 \sin \theta - 6 \cos \theta)^2 + 8$ as θ varies. [2]

SUMMER BREAK HOLIDAY HOMEWORK

A LEVEL

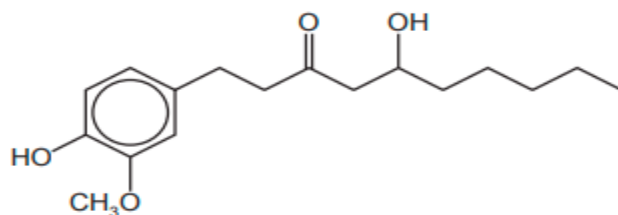
CHEMISTRY

Organic Chemistry

Q.1

The root of the ginger plant contains compounds with medicinal and flavouring properties. Three of the more important compounds are gingerol, shogaol and zingerone.

(a) The structure of gingerol is shown. The $\text{CH}_3\text{O}-$ group in gingerol is unreactive.



gingerol

Gingerol reacts with acidified potassium dichromate(VI).

State the *type of reaction* and the functional group change which occurs during this reaction.

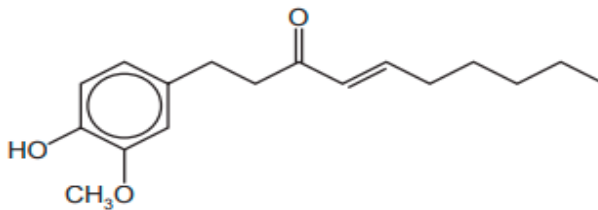
type of reaction

functional group change

from to

[1]

(b) The structure of shogaol is shown.



shogaol

(i) State the *type of reaction* needed to convert gingerol into shogaol.

..... [1]

(ii) State the reagents and conditions needed to convert gingerol into shogaol.

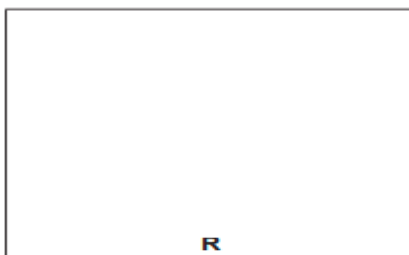
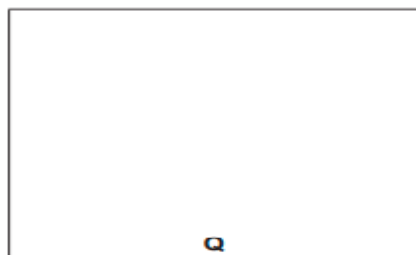
reagents

conditions

[1]

- (iii) Shogaol reacts with hot, concentrated acidified manganate(VII) ions to form two organic products, **Q** and **R**.

Draw the structures of **Q** and **R**.



[2]

- (c) Zingerone is formed from gingerol.

Some reactions of zingerone are shown.

Complete the table to identify the functional groups in zingerone.

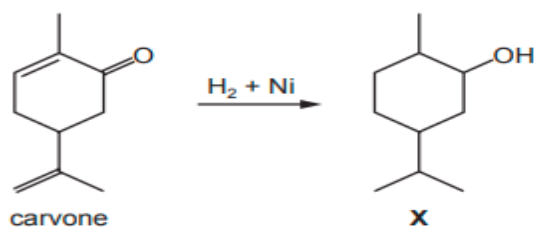
reagent and conditions	observation	functional group in zingerone indicated by the observation
benzenediazonium chloride, 5 °C, alkaline solution	red ppt.	
2,4-dinitrophenylhydrazine	orange ppt.	
warm with Tollens' reagent	no change	

[2]

[Total: 7]

Q.2

Carvone occurs in spearmint and a stereoisomer of carvone occurs in caraway seeds. Treating either isomer with hydrogen over a nickel catalyst produces a mixture of isomers with the structural formula **X**.



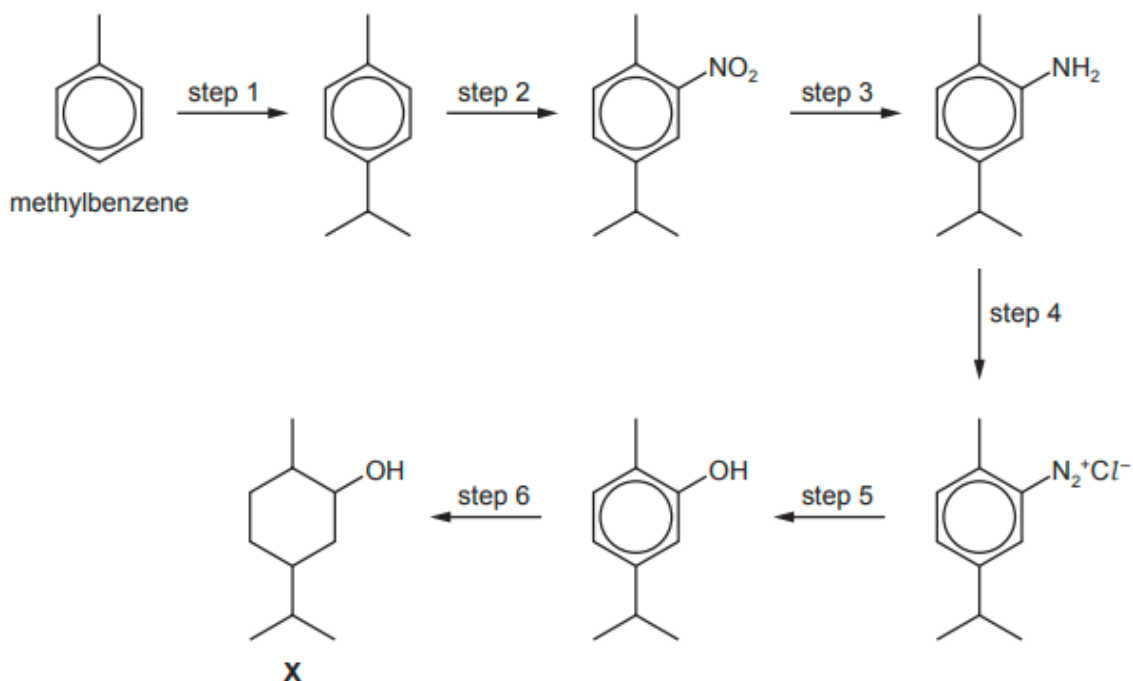
- (a) (i) State the type of stereoisomerism carvone can show. Explain your answer.

.....
 [1]

- (ii) Write an equation, using molecular formulae, for this conversion of carvone to **X**.

..... [2]

X can be synthesised from methylbenzene by the following route.



(b) (i) Name the mechanism in step 1.

..... [1]

(ii) What type of reaction is occurring in the following steps?

step 3

step 5

[2]

(iii) Suggest reagents and conditions for each of the following steps.

step 1

step 2

step 3

step 4

[6]

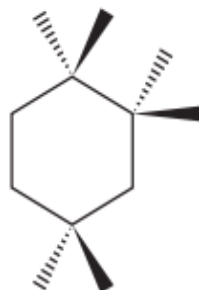
(c) During step 6, hydrogen is added to the benzene ring to produce the cyclohexane ring in **X**. The six hydrogen atoms are all added to the **same side** of the benzene ring.

(i) State the reagents and conditions needed for this reaction.

..... [1]

(ii) Complete the part structure to show the structure of the isomer of **X** that would most likely be obtained during this reaction.

X



[2]

[Total: 15]

- 7 Compounds **W**, **X**, **Y** and **Z** are isomers of each other with the molecular formula C_8H_7ClO . All four isomers contain a benzene ring. Only **one** of the isomers contains a chiral centre. The results of six tests carried out on **W**, **X**, **Y** and **Z** are shown in the table.

test		observations with each isomer			
		W	X	Y	Z
1	add cold $AgNO_3(aq)$	white ppt. forms immediately	none	white ppt. forms very slowly	none
2	heat with $NaOH(aq)$, then add dilute $HNO_3 + AgNO_3(aq)$	white ppt.	none	white ppt.	none
3	add $NaOH(aq) + I_2(aq)$	none	pale yellow ppt.	none	none
4	warm with Fehling's solution	none	none	red ppt.	none
5	add cold, dilute, acidified $KMnO_4(aq)$	no change	no change	no change	decolourises
6	add $Br_2(aq)$	no change	no change	no change	decolourises and forms white ppt.

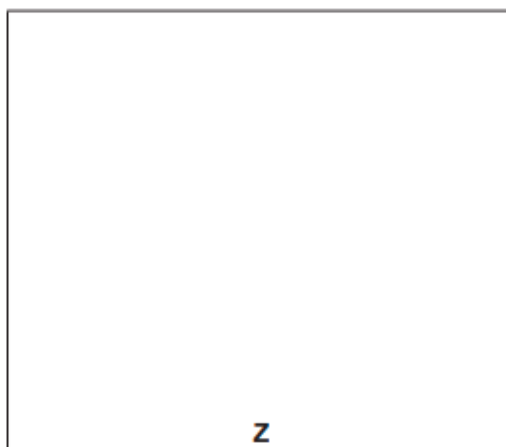
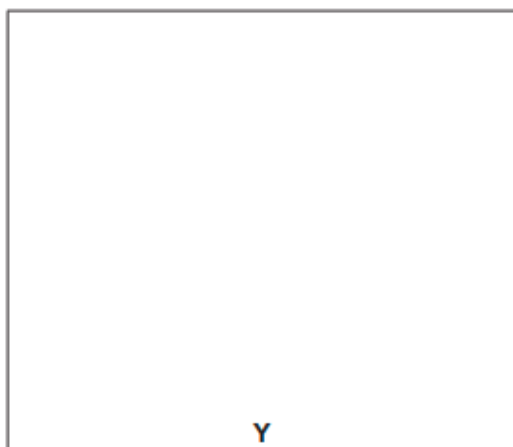
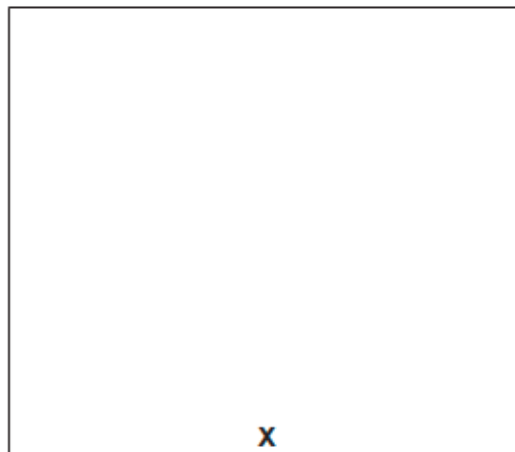
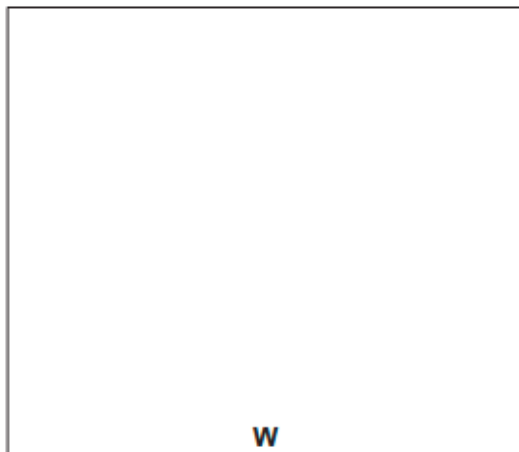
- (a) Use the experimental results in the table above to determine the group(s), in addition to the benzene ring, present in the four isomers **W**, **X**, **Y** and **Z**.

Complete the table below, identifying the group(s) present in each isomer.

group(s) in compound			
W	X	Y	Z
.....
.....
.....

(b) Isomers **W**, **X**, **Y** and **Z** all have the molecular formula C_8H_7ClO .

(i) Use the information in (a) to suggest a structure for each of these isomers and draw these in the boxes.



[4]

(ii) Draw a **circle** around the chiral centre in **one** of the above structures.

[1]

[Total: 10]