



SADIQ PUBLIC SCHOOL

Do the right, fear no man

Class: H2

Homework Worksheet

Thursday, 8th February 2024

Subject: Physics

REVISION OF TOPIC: SIMPLE HARMONIC MOTION

Read and revise the chapter "Simple Harmonic Motion" from the text book "Cambridge International AS & A Level" and solve the following questions.

1. Define the following

Periodic motion [2]

Simple harmonic motion [2]

Critical damping [2]

A particle moves with simple harmonic motion in a straight line with amplitude 0.05 m and period 12 s. Find

- The maximum speed,
- The maximum acceleration, of the particle.

Write down the values of the constants P and Q in the equation

$$X/m = P \sin[Q(t/s)]$$

Which describes its motion.

2. A small mass executes s.h.m. about a point O with amplitude a and period T . Find the displacement from O at time $T/8$ after passing through O.

3. a) What is the frequency of a simple pendulum of length 1.0 m?

b) Find the frequency of the simple pendulum when it is in a lift which is accelerating upwards at 2.0 m s^{-2} .

c) What is its frequency if the lift falls freely?

4. Write down the conditions for the mass m to move in s.h.m.

5. A dock has a tidal entrance at which the water is 10 m deep at 12 noon, when the tide is at its lowest. The water is 30 m deep when the tide is at its highest, which follows next at 6.15p.m. A tanker needing a depth of 15 m, requires to enter the dock as soon as possible that afternoon. Calculate the earliest time it could just clear the dock entrance.

Subject: Chemistry

Lesson3- Organic Synthesis

A: Inquiry

For an organic molecule containing several functional groups:
identify organic functional groups using the reactions in the syllabus.

Devise multi-step synthetic routes for preparing organic molecules using the reactions

What do you think phenol is acidic? Or it is alkaline like NaOH? Why phenol is different from other alcohols?

B: Information:

- Analyse a given synthetic route in terms of type of reaction and reagents used for each step of it, and possible by-products
- The pharmaceutical industry is constantly searching for new drugs. Research chemists have discovered
- That most of these drugs contain at least one chiral centre. Remember that a molecule containing a carbon atom bonded to four different atoms or groups of atoms can exist as two nonsuperimposable mirror images. The carbon atom is called a chiral centre. These two mirror-image isomers are called enantiomers and they will be optically active. They differ only in their ability to rotate the plane of polarized light.

C. Practising

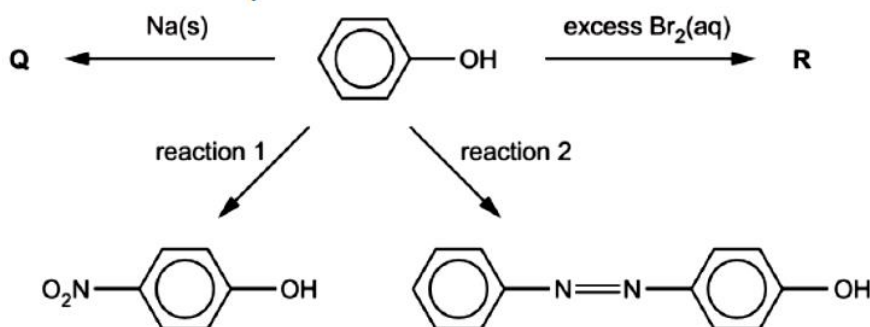
1- (a) Explain why phenol is brominated much more easily than benzene is brominated.

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..... [3]

(b) Iodine monobromide, I-Br, reacts with benzene in the presence of an AlBr₃ catalyst. Predict whether the organic product will be bromobenzene or iodobenzene. Explain your answer.

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..... [1]

(a) Fig. 7.1 shows some reactions of phenol.



(i) Give an equation for the reaction of phenol with Na(s).

..... [1]

(ii) Draw the structure of the organic product, R, formed when phenol reacts with an excess of Br₂(aq).

[1]

(iii) State the reagents and conditions for reaction 1 and reaction 2 in Fig. 7.1.

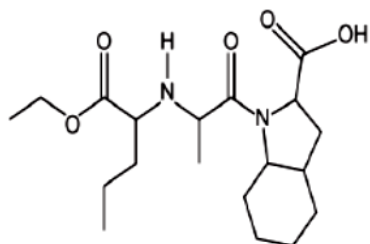
reaction 1

reaction 2

[2]

2- (a) Perindopril is a drug used to treat heart disease.

perindopril



(i) State the number of chiral carbon atoms present in one molecule of perindopril.

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[1]

(ii) Suggest one benefit and one disadvantage of producing a drug such as perindopril as a single pure optical isomer.

benefit

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disadvantage

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[2]

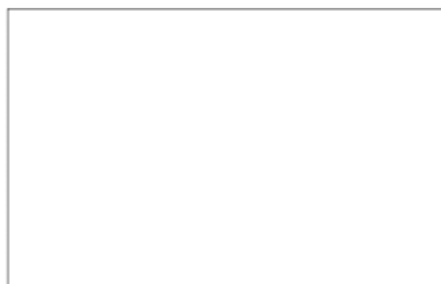
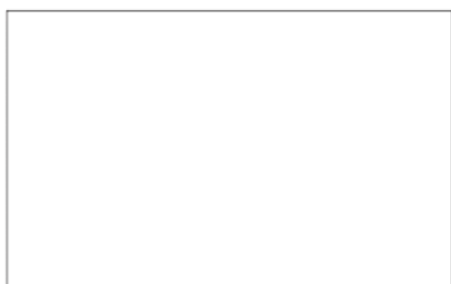
(i) Name all the functional groups in perindopril.

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[2]

(i) A sample of perindopril is hydrolysed with hot aqueous acid. Draw the structures of the three organic products of the complete acid hydrolysis of perindopril.





[3]

Energy and respiration (Revision)

A) Inquiry:

Combustion of carbohydrates, like in a fireplace, is a reduction-oxidation reaction in which the carbon atom is oxidized and the oxygen atom is reduced, producing water and carbon dioxide. Oxidative phosphorylation and glycolysis are also reduction-oxidation reactions that produce the same products.

Where do the cells of the body get energy from for carrying out activities?

B) Information

C) **Comparison of Anaerobic respiration in Mammalian cell and Yeast/Plant cells**

similarities

- 1 reduced NAD (used) in both;
- 2 NAD regenerated / glycolysis can continue, in both;

differences

	yeast / ethanol		mammalian tissue / lactate
3	decarboxylation	or	no decarboxylation
4	irreversible	or	reversible
5	two steps / pyruvate → ethanal → ethanol	and	one step / pyruvate → lactate
6	ethanal accepts H	and	pyruvate accepts H
7	ethanal dehydrogenase	and	lactate dehydrogenase

D)

Explain role of O₂ as final acceptor.

O₂ has highest affinity and lowest energy level so produces suction force for exergonic flow of electrons. In the absence of ½ O₂ no such force created so no energy released and no transfer of protons H⁺ and no protons available for ATP synthase to synthesize ATP from ADP, also FMN won't be reduced and so NAD⁺ not regenerated which is required for link reaction and Krebs cycle.

Role of NAD⁺

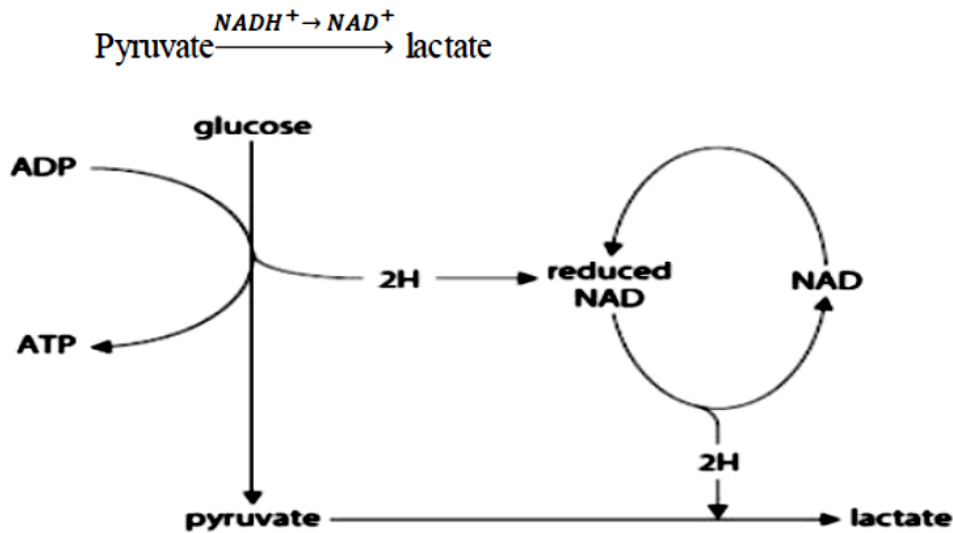
NAD⁺ is Co-enzyme for dehydrogenase so it is necessary for enzyme which carries out dehydrogenation. NAD⁺ accepts proton and electron and converted to NADH without loss of much energy. NADH⁺ carries high energy H⁺ in ETC at lower energy level so energy released and used to pump H⁺ ions into inter-membranous space to generate proton motive force used for oxidation phosphorylation. NAD⁺ is recycled so it's able to repeat cycle.

Explain anaerobic Respiration conditions in yeast and Human muscle tissue with O₂ debt.

During Anaerobic Respiration only glycolysis is carried out and there's net gain of 2 ATP per Glucose molecule. During glycolysis glyceraldehyde- 3- Phosphate is oxidized to form Bi-P-Glycerate. For oxidation NAD⁺ are required for dehydrogenase so it release H⁺ but in Anaerobic no electron and proton pass to NAD⁺ no ATP no NAD⁺ regenerate.

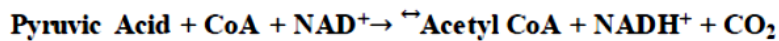
In Muscle Cells (Lactic Acid Fermentation) /O₂ debt.

During Anaerobic Respiration only glycolysis is carried out and Enzyme lactate dehydrogenase catalyze the reduction of pyruvate to lactate and transferring hydrogen of NADH⁺, so NAD⁺ are regenerated



Oxygen debt.

In liver the amount of O₂ which is required for this reversible reaction of lactate to convert it into pyruvate and pyruvate into Acetyl CoA /Glucose/Glycogen is called O₂ debt. The lactate converts it into pyruvate by lactate dehydrogenase by the oxidation of lactate.



If O₂ is available, pyruvate will take part in link Reaction carried in Matrix and as the result of this reaction CO₂ is produced in liver cells from where it transported to blood and decrease PH of blood increase the breathing rate and removed through lungs by expiration. In another case this pyruvate can be converted into glucose/glycogen by reversible reactions according to the need of liver cell by the use of O₂ it is also called oxygen debt.

Synthesising /absorbing the information

Write your own summary- notes in your notes book based on information you read in information section and what your book says about respiration and its steps.

E) Practicing. (Read your text book for detailed information)

Q.1 (a) Describe the importance of ATP in cells, giving two examples of processes in which it is used.

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..... [3]

Cells generate ATP by adding a phosphate group (Pi) to ADP.

During the complete oxidation of glucose, cells have two ways of doing this:

- substrate level phosphorylation
- oxidative phosphorylation

Figs 1.1 and 1.2 are diagrams that show the main details of these two processes (not drawn to the same scale).

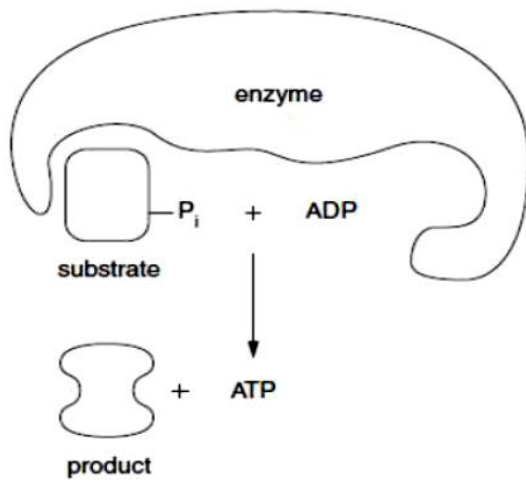


Fig. 1.1

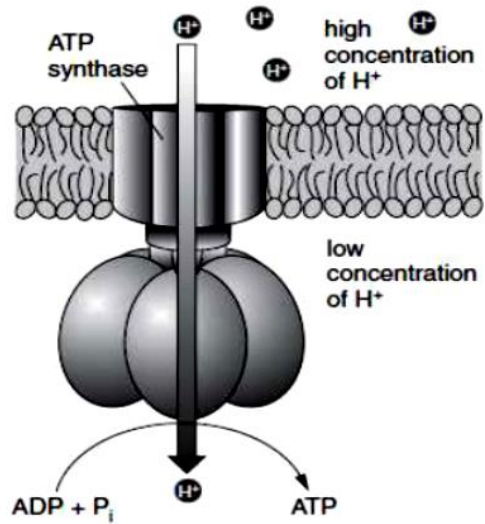


Fig. 1.2

(b) State precisely where these two processes occur in a cell.

substrate level phosphorylation

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oxidative phosphorylation

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[2]

(c) Compare the relative amounts of ATP produced by the two processes when a molecule glucose is completely oxidized.

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[2]

(d) Only substrate level phosphorylation is possible in the absence of oxygen. Explain why oxidative phosphorylation is not possible in the absence of oxygen.

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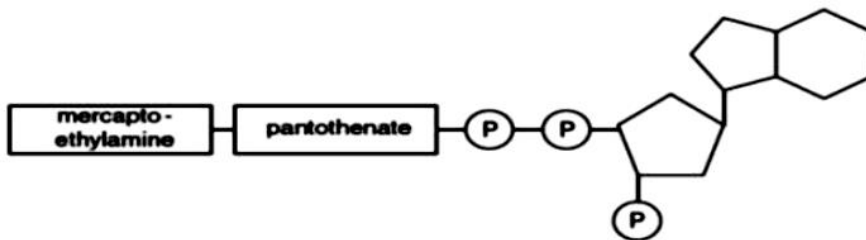
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[3]

[Total: 10]

2: (a) ATP and coenzyme A both play important roles in respiration.

Fig. 2.1 represents the molecular structure of coenzyme A.



(i) With reference to Fig. 2.1, state two structural similarities between coenzyme A and

ATP.

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2 [2]

(ii) Describe the role of coenzyme A in respiration.

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..... [3]

Q.1 The back-to-back stem-and-leaf diagram shows the values taken by two variables A and B .

	A		B	
(3)	3 1 0	15	1 3 3 5	(4)
(2)	4 1	16	2 2 3 4 4 5 7 7 7 8	(10)
(3)	8 3 3	17	0 1 3 3 3 4 6 6 7 9 9	(11)
(12)	9 8 8 6 5 5 4 3 2 1 1 0	18	2 4 7	(3)
(8)	9 9 8 8 6 5 4 2	19	1 5	(2)
(5)	9 8 7 1 0	20	4	(1)

Key: 4 | 16 | 7 means $A = 0.164$ and $B = 0.167$.

(i) Find the median and the interquartile range for variable A . [3]

(ii) You are given that, for variable B , the median is 0.171, the upper quartile is 0.179 and the lower quartile is 0.164. Draw box-and-whisker plots for A and B in a single diagram on graph paper. [3]

Q.2 The heights, x cm, of a group of young children are summarised by

$$\Sigma(x - 100) = 72, \quad \Sigma(x - 100)^2 = 499.2.$$

The mean height is 104.8 cm.

(i) Find the number of children in the group. [2]

(ii) Find $\Sigma(x - 104.8)^2$. [3]

Q.3 The amounts of money, x dollars, that 24 people had in their pockets are summarised by $\Sigma(x - 36) = -60$ and $\Sigma(x - 36)^2 = 227.76$. Find Σx and Σx^2 . [5]

Q4 Prices in dollars of 11 caravans in a showroom are as follows.

16 800 18 500 17 700 14 300 15 500 15 300 16 100 16 800 17 300 15 400 16 400

(i) Represent these prices by a stem-and-leaf diagram. [3]

(ii) Write down the lower quartile of the prices of the caravans in the showroom. [1]

^{SS} (iii) 3 different caravans in the showroom are chosen at random and their prices are noted. Find the probability that 2 of these prices are more than the median and 1 is less than the lower quartile. [3]

Subject: Computer

Lesson: This lesson is a continuation of "Object Oriented Paradigms", through past paper solving practise.

Inquiry

Why do programmers today do not prefer traditional imperative programming style. Name the powerful features of Object Oriented Programming which have empowered programmer in this era of technology.

Information

Object-Oriented Programming (OOP) is a programming paradigm based on the concept of "objects," which encapsulate data and behavior. It focuses on organizing code into reusable and modular structures called classes, where each class represents a blueprint for creating objects. OOP is designed to model real-world entities and their interactions, making it a powerful and flexible paradigm. Here are some key features of Object-Oriented Programming:

1). Classes and Objects:

Classes serve as templates or blueprints for creating objects. They define the properties (attributes) and behaviors (methods) that objects of that class will have.

Objects are instances of classes. They encapsulate data (attributes) and behavior (methods) related to a specific entity or concept.

2). Encapsulation:

Encapsulation is the bundling of data and methods that operate on the data into a single unit, i.e., a class. It hides the internal implementation details of an object and exposes only what is necessary.

3). Inheritance:

Inheritance allows a new class (subclass or derived class) to inherit properties and behaviors from an existing class (superclass or base class). This promotes code reuse and facilitates the creation of a hierarchical structure of classes.

4). Polymorphism:

Polymorphism allows objects of different classes to be treated as objects of a common base class. It enables the use of a single interface to represent different types of objects or behaviors. Polymorphism is achieved through method overloading and method overriding.

5). Abstraction:

Abstraction involves simplifying complex systems by modeling classes based on the essential properties and behaviors relevant to the problem domain. It allows developers to focus on what an object does rather than how it achieves its functionality.

6). Association:

Association represents relationships between classes or objects. It can be a one-to-one, one-to-many, or many-to-many relationship. Associations are used to model connections between different entities in a system.

7). Composition:

Composition is a form of association where one class contains an object of another class. It allows for the creation of complex objects by combining simpler ones.

Synthesising/Absorbing the information

- Revise your book contents pages 501 - 521
- Watch youtube video: <https://youtu.be/pTB0EiLXUC8>
- Add on important aspect discussed into your revision notes.

Practising

Attempt the following questions based on “Object Oriented Paradigm”.

Q. 1.

A payroll program is to be written using an object-oriented programming language. An Employee class is designed. Two subclasses have been identified:

- HourlyPaidEmployee who is paid a monthly wage calculated from their hourly rate of pay and the number of hours worked during the month
- SalariedEmployee who is paid a monthly wage which is one 12th of their annual salary

(a) Draw an inheritance diagram for these classes.

[3]

(b) The design for the Employee class consists of:

- properties
EmployeeName
EmployeeID
AmountPaidThisMonth
- methods
SetEmployeeName
SetEmployeeID
CalculatePay

Write **pseudocode** for the class definition of the superclass Employee.

Programming language

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..... [5]

(c) (i) State the properties and/or methods required for the subclass HourlyPaidEmployee.

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..... [4]

(ii) State the properties and/or methods required for the subclass SalariedEmployee.

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..... [2]

(d) Name the feature of object-oriented program design that allows the method CalculatePay to be declared in the superclass Employee.

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..... [1]

Q. 2.

A sports club stores data about its members. A program is to be written using an object-oriented programming language.

A Member class is designed. Two subclasses have been identified:

- FullMember
- JuniorMember

(a) Draw an inheritance diagram for these classes.

[3]

(b) The design for the Member class consists of

- properties
MemberName
MemberID
SubscriptionPaid
- methods
SetMemberName
SetMemberID
SetSubscriptionPaid

Write **program code** for the class definition of the superclass Member.

Programming language

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[5]

(c) Additionally a DateOfBirth property is required for the JuniorMember class.

(i) Write **program code** for the class definition for the subclass JuniorMember.

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..... [3]

(ii) Write **program code** to create a new instance of JuniorMember. Use identifier

NewMember with the following data:

name Ahmed with member ID 12347, born on 12/11/2001, who has paid his subscription. [3]

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Q. 3.

A college has two types of student: full-time and part-time.

All students have their name and date of birth recorded.

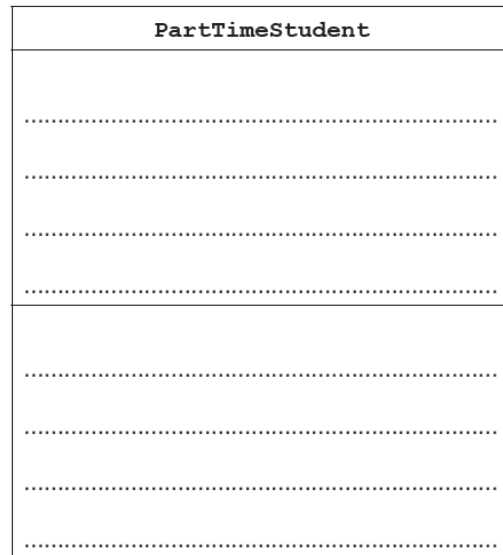
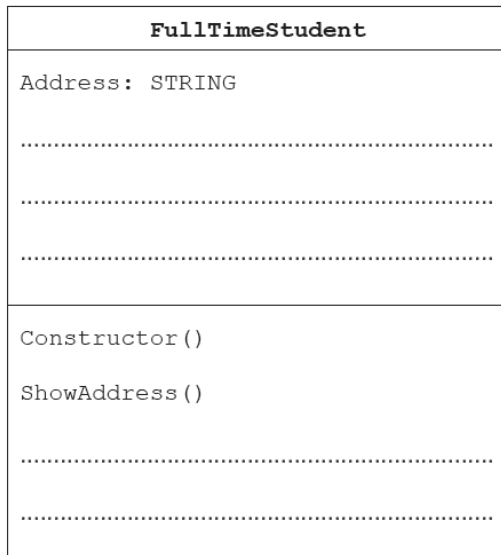
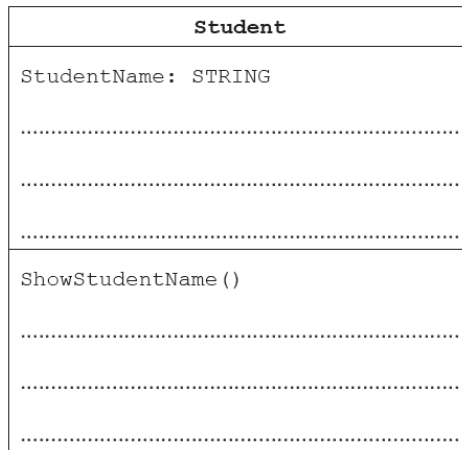
A full-time student has their address and telephone number recorded.

A part-time student attends one or more courses. A fee is charged for each course. The number of courses a part-time student attends is recorded, along with the total fee and whether or not the fee has been paid.

The college needs a program to process data about its students. The program will use an objectoriented programming language.

(a) Complete the class diagram showing the appropriate properties and methods.

[7]



(b) Write program code:

(i) for the class definition for the superclass Student.

Programming language [2]

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(ii) for the class definition for the subclass FullTimeStudent.

Programming language [3]

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(iii) to create a new instance of FullTimeStudent with:

- identifier: NewStudent
- name: A. Nyone
- date of birth: 12/11/1990
- telephone number: 099111

Programming language [3]

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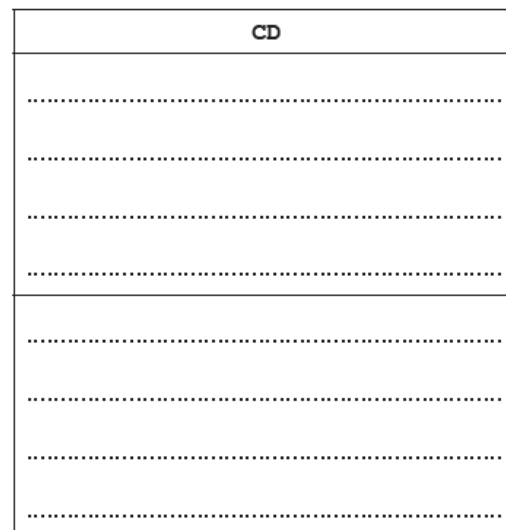
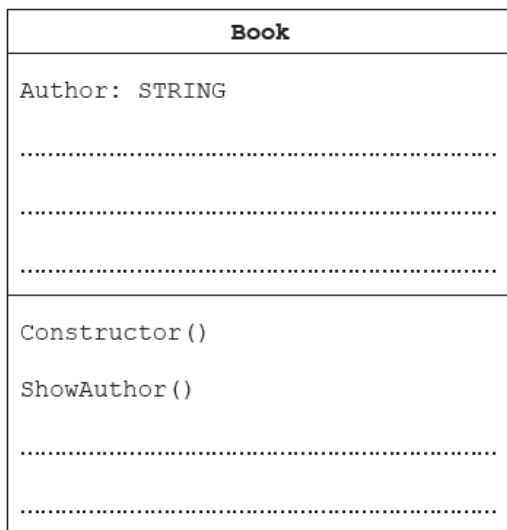
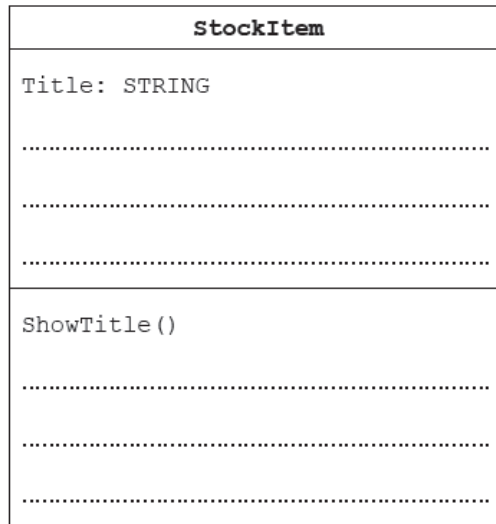
Q. 4.

A lending library stocks two types of item for loan: books and CDs.

All stock items have a title, the date the item was acquired and whether the item is currently out on loan. Books have an author and ISBN. CDs have an artist and play time in minutes.

The library needs a program to process data about the stock items. The program will use an object-oriented programming language.

(a) Complete the class diagram showing the appropriate properties and methods.



[7]

(b) Write program code

(i) for the class definition for the superclass StockItem.

[3]

Programming language

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(ii) for the class definition for the subclass Book.

[3]

Programming language

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(iii) to create a new instance of Book with:

- identifier NewBook
- title "Computers"
- author A.Nyone
- ISBN 099111
- acquired on 12/11/2001
- not out on loan

Programming language [3]

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Q. 5.

A bank has a range of customer accounts, which includes current accounts and savings accounts. All accounts have:

- an account number
- a balance (amount of money in an account).

A current account has a level (bronze, silver or gold). A monthly fee (\$) is taken from each account. Savings account customers pay a regular amount (\$) into their account. The payment interval is a number of weeks (for example, 4).

An object-oriented program will be written to process data about the accounts.

(b) Write **program code** to declare the Account class.

[5]

Programming language

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(c) Write **program code** to declare the SavingsAccount class. Do not write any get or set methods.

Programming language

[5]

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Subject: Business Studies

Topic: Financial statements

Reinforce the concept of accounting statements through text book and lecture given in class and attempt following questions.

Constructing the main accounting statements:

Q1. Construct a statement of profit or loss for Lancashire Traders Ltd from the following data for the year ending 31 March 2021:

Units sold- 5000 items @ \$11.00

Opening inventories \$3000

Corporation tax rate 20%

Interest paid \$1000

Purchases of materials \$40000

Closing inventories \$8000

Overhead expenses \$12000

Dividends \$4000.

Q2. Construct a statement of financial position for Namibia Logistics Ltd as at 30 September 2021 from the following data:

Bank (long-term) loans \$5 million

Vehicles \$10 million

Offices \$2 million

Equipment \$1 million

Inventories \$1 million

Cash \$0.2 million

Trade payables \$1 million

Overdraft \$2.5 million

Trade receivables \$3 million

Share capital \$6 million

Retained earnings \$2.7 million

Subject: Accounting

Analysis and Communication of Accounting Information

Inquiry

Stakeholders are very much interested in the final accounts of a business. Do you know that analyzed data is more meaningful than final accounts? Are you able to analyze data with the help of certain formulas?

Information

- Without ratios, financial statements would be largely uninformative to all but the very skilled. With ratios, financial statements can be interpreted and usefully applied to satisfy the needs of the reader. Suppose you want to know which company gets the 'best' profit. Simply inspecting these figures and trying to decide which performance was the best, and which was the worst, is virtually impossible. To bring the same basis of comparison to each company we need some form of common measure i.e. ratios.
- Ratios need very careful handling. They are extremely useful if used and interpreted appropriately, and very misleading otherwise.
- Ratio analysis is a first step in assessing an entity. It removes some of the mystique surrounding the financial statements and makes it easier to pinpoint items which it would be interesting to investigate further.

Synthesising /Absorbing

Students write your own summary- notes in your notes book based on information given above.

Practice

Solve the Question No. 4 (From P33 – summer 2019)

Assessment

- (i) Give three benefits of calculating ratios. [3]
- (ii) Explain two limitations of financial ratios.[2]
- (iii) Write formulas of the following:[5]
 - Earnings per share
 - Dividend per share
 - Gearing ratio
 - Price earnings ratio
 - Interest cover ratio

Wage determination in perfect markets

Inquiry:

How wages are determined in perfectly competitive markets?

How does a change in the labour supply affect the market equilibrium?

How does an increase in the demand for labour affect the market equilibrium?

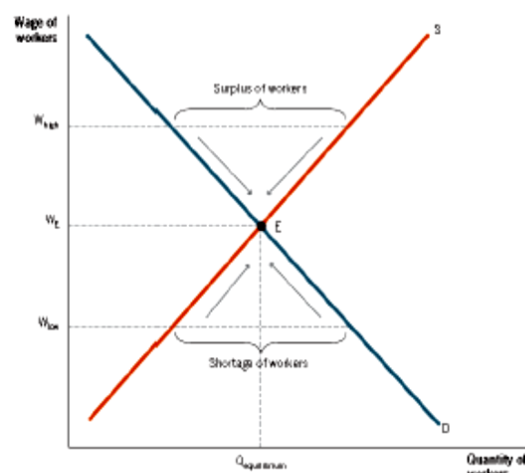
Information: Wage determination in perfect markets

Equilibrium in the Labor Market

At high wages (W_{high}), a surplus of workers exists.

This drives the wage rate down until the supply of workers and the demand for workers reach the equilibrium. At low wages

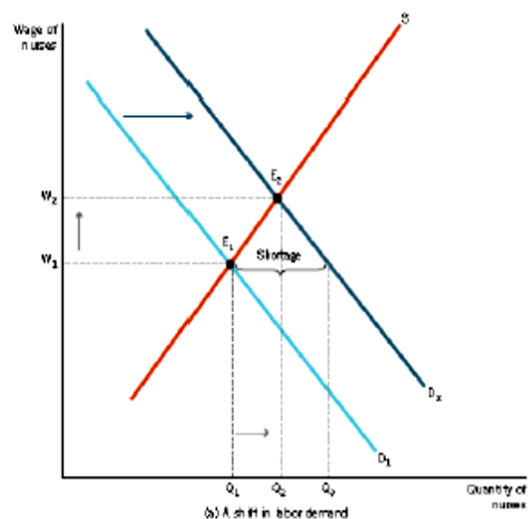
(W_{low}), a shortage occurs. The shortage forces the wage rate up until the equilibrium wage is reached and the shortage disappears.



Shifting the Labor Market Equilibrium

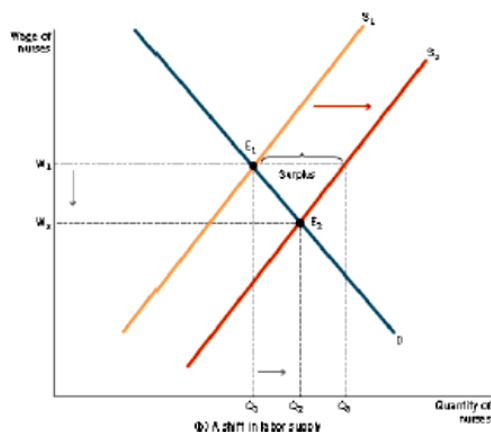
Effects of an increase in demand for labour

In this fig., the demand for nurses increases. This creates a shortage of workers equal to $Q_3 - Q_1$, which leads to a higher equilibrium wage (E_2) and quantity of nurses employed (Q_2) than before.



Effects of an increase in the supply of labour

In this figure, the supply of nurses increases. This leads to a surplus of workers equal to $Q_3 - Q_1$, and causes the equilibrium wage to fall (E_2) and the number of nurses employed to rise (Q_2).



Please read what your textbook says about wage determination in perfect market (pages 208-209)

Please watch this brief YouTube video on equilibrium wage in perfect market

(<https://www.youtube.com/watch?v=0G156goU1Bg>)

Synthesising/absorbing the information:

Write your own summary notes in your note book based on the information you read in your textbook and what you saw on the youtube video.

Practising:

Solve the following question in your note book. Please do not send screenshots.

1 What could cause a perfectly competitive firm's marginal revenue product of labour curve to shift to the right?

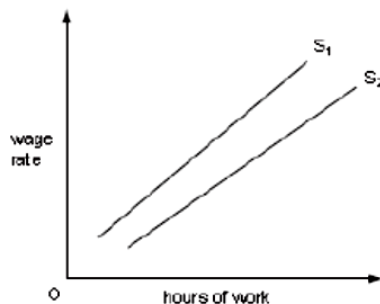
A an increase in wages

B a higher rate of sales tax

C an increase in labour supply

D a rise in the price of the final product

2 In the diagram S_1 is an individual worker's supply of labour curve.



What could cause the curve to shift from S_1 to S_2 ?

A a decrease in the hourly wage rate

B a decrease in work satisfaction

C a decrease in the opportunity cost of leisure

D a decreased preference for leisure

Subject: Law

Read the topic “ consideration “ and answer the following questions:

1. Discuss the principle that consideration must not be from the past.
2. Discuss the rule that existing duty will not amount to a valid consideration.