



SADIQ PUBLIC SCHOOL

Do the right, fear no man

Class: H1

Homework Worksheet

Saturday, 10th February 2024

Subject: Physics

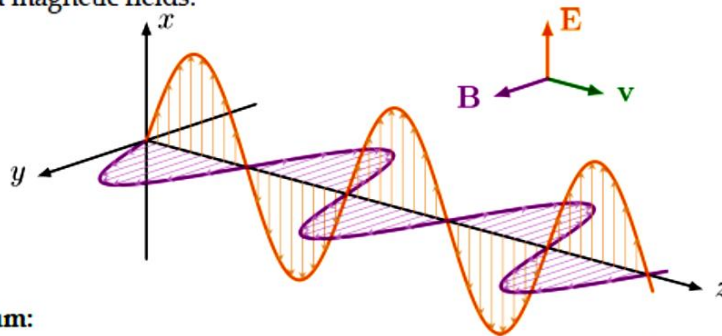
Topic: Electromagnetic spectrum (Revision)

A: Inquiry: There are different types of waves around us. Light is a form of wave that can travel through vacuum as it does not need any medium. These waves are called electromagnetic waves and their group is called electromagnetic spectrum.

B: Information:

Electromagnetic waves:

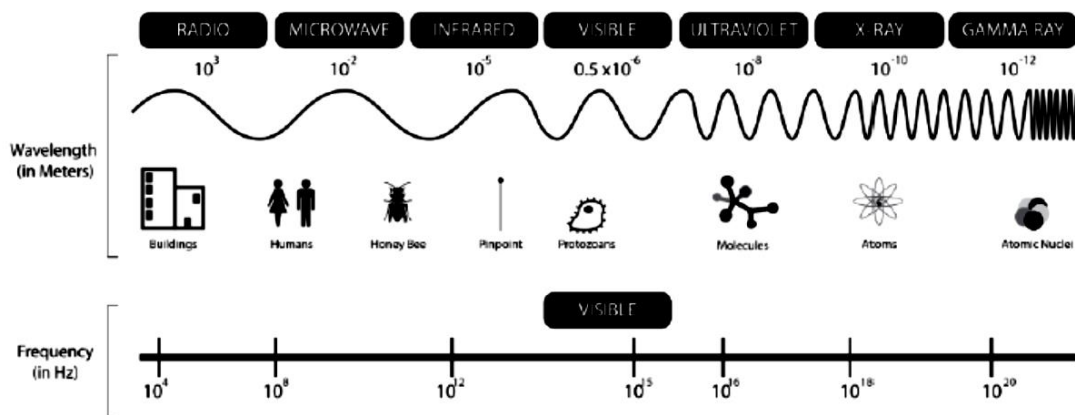
Electromagnetic radiations are composed of electromagnetic waves that are produced when an electric field comes in contact with the magnetic field. It can also be said that electromagnetic waves are the composition of oscillating electric and magnetic fields.



Electromagnetic spectrum:

The Electromagnetic Spectrum is the name given to the range of all known radiations. The spectrum is arranged in order of wavelength or frequency.

THE ELECTROMAGNETIC SPECTRUM



- As electromagnetic wave progresses, wavelength decreases and frequency increases
- Visible light: 400 nm - 700 nm
- All travel at the speed of light: $3 \times 10^8 \text{ ms}^{-1}$
- Travel in free space (don't need medium)
- Can transfer energy
- Are transverse waves

Type of Radiation	Frequency Range (Hz)	Wavelength Range
Gamma-rays	$10^{20} - 10^{24}$	$< 10^{-12} \text{ m}$
X-rays	$10^{17} - 10^{20}$	1 nm - 1 pm
Ultraviolet	$10^{15} - 10^{17}$	400 nm - 1 nm
Visible	$4 \times 10^{14} - 7.5 \times 10^{14}$	750 nm - 400 nm
Near-infrared	$1 \times 10^{14} - 4 \times 10^{14}$	2.5 μm - 750 nm
Infrared	$10^{13} - 10^{14}$	25 μm - 2.5 μm
Microwaves	$3 \times 10^{11} - 10^{13}$	1 mm - 25 μm
Radio waves	$< 3 \times 10^{11}$	$> 1 \text{ mm}$

Significance of the Electromagnetic Spectrum

The electromagnetic waves in these different bands have different characteristics depending upon how they are produced, how they interact with matter and their practical applications. Maxwell's equations predicted the existence of an infinite number of frequencies of electromagnetic waves, all travelling with the speed of light. This is the first indication of the existence of the entire electromagnetic spectrum.

Nonetheless, the main significance of the electromagnetic spectrum is that it can be used to classify electromagnetic waves and arrange them according to their different frequencies or wavelengths.

Practical Applications of Electromagnetic Waves

- The radio waves and microwaves discovered by Hertz paved the way for wireless television, radio and mobile communication.
- The visible light portion of the electromagnetic spectrum is the reason for all visual aids in daily life. This is the portion of the electromagnetic spectrum that helps us to see all objects, including colours.
- The X-rays discovered by Roentgen proved to be useful in medicine for detecting many ailments or deformities in bones.
- The high ultraviolet radiation has energies to ionise the atoms causing chemical reactions.
- The gamma rays discovered by Paul Villard are useful for ionisation purposes and nuclear medicine.

Formula for the Electromagnetic Radiation

The frequency(f), speed(c), and wavelength(λ) of electromagnetic waves are related as

$$f = \frac{c}{\lambda},$$

C: Synthesising/absorbing information:

Complete your notes in the notebooks.

D: Practising:

Q1. Solve the following questions and practice from past papers.

1. What is the approximate range of frequencies of electromagnetic radiation visible to the human eye?

- A (430–750) kHz
B (430–750) MHz
C (430–750)GHz
D (430–750)THz

2. A transmitting mast sends out microwaves of wavelength 1.5 cm and radio waves of wavelength 1.5 km.

A receiving aerial behind a mountain can detect the radio waves but not the microwaves. What is the reason for this?



A The radio waves are coherent but the microwaves are not.

B The radio waves are diffracted around the mountain but the microwaves are not.

C The radio waves are reflected by the mountain but the microwaves are not.

D The radio waves travel at the speed of light but the microwaves do not.

3. Some sources of electromagnetic waves in free space are listed.

- 1 a radio wave transmitter
- 2 a source of X-rays
- 3 a 30 mm wavelength radar transmitter
- 4 a light-emitting diode that emits red light

Which list gives the sources in order of increasing wavelength, from left to right, of the waves emitted by the sources?

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

4. A beam of visible light is in a vacuum. What could be the frequency of the light?

- A 5.0×10^5 Hz
B 5.0×10^8 Hz
C 5.0×10^{11} Hz
D 5.0×10^{14} Hz

5. An electromagnetic wave has a wavelength of 2.1 cm in a vacuum. Which region of the electromagnetic spectrum contains this wave?

- A infrared
B microwave
C radio wave
D visible light

6. Brief pulses of red, blue and green light are emitted from the Sun at the same time. The pulses travel the same distance to reach Mars. Assume that the pulses travel in a vacuum for the full duration of their journey. In which order would these pulses of light arrive at Mars?

- A all arrive at the same time
B blue first, then green, then red
C red first, then blue, then green
D red first, then green, then blue

7. Which statement about electromagnetic waves is correct?

- A A wave of wavelength 5.0×10^{-6} m is invisible to the human eye.
B They can all travel at different speeds in free space.
C They cannot be polarised.
D They consist of vibrating atoms.

8. An electromagnetic wave in free space has a frequency of 2.5×10^{14} Hz. Which region of the electromagnetic spectrum includes this frequency?

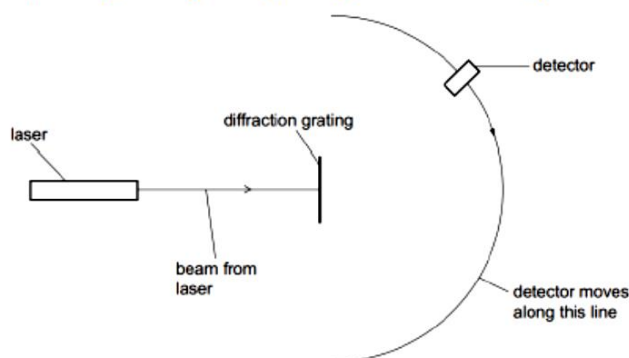
- A infrared
B microwave
C ultraviolet
D X-ray

Q2. A laser emits a beam of electromagnetic waves of frequency 3.7×10^{15} Hz in a vacuum.

(i) Show that the wavelength of the waves is 8.1×10^{-8} m. [2]

(ii) State the region of the electromagnetic spectrum to which these waves belong. [1]

(iii) The beam from the laser now passes through a diffraction grating with 2400 lines per millimetre. A detector sensitive to the waves emitted by the laser is moved through an arc of 180° in order to detect the maxima produced by the waves passing through the grating, as shown in Fig. 2.2.



Calculate the number of maxima detected as the detector moves through 180° along the line shown in Fig. 2.2.

Show your working. [4]

(iv) The laser is now replaced with one that emits electromagnetic waves with a wavelength of 300 nm. Explain, without calculation, what happens to the number of maxima now detected. Assume that the detector is also sensitive to this wavelength of electromagnetic waves. [2]

Subject: Chemistry

Lesson 1-This lesson is about: the chemistry of aldehydes and ketones

You know that Aldehydes and ketones contain the carbonyl group, $>C=O$: in aldehydes, the carbonyl group is bonded to one other carbon atom and a hydrogen atom in ketones, the carbonyl group is bonded to two other carbon atoms.

The names of aldehydes are derived from the name of the alkane with the '-e' at the end replaced by '-al'. Similarly, ketones are named with the '-e' replaced by '-one'.

The reagent 2,4-dinitrophenylhydrazine (2,4-DNPH) can be used to identify the presence of a carbonyl group in an aldehyde or ketone. It produces an orange precipitate. The melting point of the product is used to identify particular aldehydes and ketones. As aldehydes are readily oxidised, they may be distinguished from ketones on warming with suitably mild oxidising reagents: with aldehydes, Tollens' reagent produces a silver mirror inside a warmed test-tube and Fehling's solution turns from a blue solution to a red / orange precipitate when warmed with ketones, there is no oxidation reaction, so no changes are observed when ketones are warmed with Tollens' reagent or Fehling's solution. Chemists can use alkaline iodine solution to test for: methyl ketones (and ethanal) ethanol or secondary alcohols with an adjacent methyl group. A yellow precipitate of tri-iodomethane is formed in a positive test.

Write answers of following questions from the book exercise on page 515-516 (Q3-6) on your note book

Subject: Biology

Lesson

Chapter No 1: Cell structure

Answer following questions.

TOTAL [33]

1. The table below describes the structure and function of organelles in eukaryotic cells. Complete the table by filling in the empty boxes A, B, C, D and E

Organelle	Structure/Feature	Function of feature
Nucleus	Nucleoli present	A
B	Inner membrane folded into cristae	C
D	Vesicles containing hydrolytic enzyme	Breakdown of old organelles. Cell lysis.
Smooth endoplasmic reticulum	Consists of flattened membrane- bound sacs called cisternae	E

TOTAL /5

2. The table below refers to a bacterial cell, a liver cell and a palisade mesophyll cell and to the structures which may be found inside them.
If a feature is present in the cell, place a tick (✓) in the appropriate box and if a feature is absent from the cell, place a cross (×) in the appropriate box.

Feature	Bacterial cell	Liver cell	Palisade cell
Nuclear membrane			
Vacuole			
Cell wall			
Microvilli			
Chloroplasts			
Mesosomes			
Glycogen granules			

TOTAL /14

3. The diagram below shows some of the components of the plasma membrane.



(a) (i) Using the information shown and your own knowledge, draw a diagram to show the structure of the plasma membrane.

(ii) On your diagram label the components drawn and indicate the outer surface of the membrane. [3]
 (b) State two functions of the proteins in the plasma membrane. [5]

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(c) Explain how the following substances cross the plasma membrane. [2]
 (i) carbon dioxide.

.....

(ii) glucose. [2]

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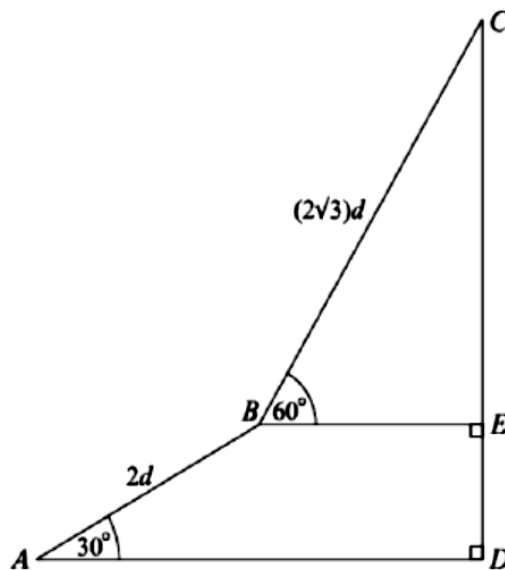
[2]

Total: /14

Subject: Mathematics

- 1 (i) Show that the equation $\sin^2 \theta + 3 \sin \theta \cos \theta = 4 \cos^2 \theta$ can be written as a quadratic equation in $\tan \theta$. [2]
- (ii) Hence, or otherwise, solve the equation in part (i) for $0^\circ \leq \theta \leq 180^\circ$. [3]
- 2 (i) Sketch and label, on the same diagram, the graphs of $y = 2 \sin x$ and $y = \cos 2x$, for the interval $0 \leq x \leq \pi$. [4]
- (ii) Hence state the number of solutions of the equation $2 \sin x = \cos 2x$ in the interval $0 \leq x \leq \pi$. [1]
- 3 (i) Show that the equation $\sin \theta + \cos \theta = 2(\sin \theta - \cos \theta)$ can be expressed as $\tan \theta = 3$. [2]
- (ii) Hence solve the equation $\sin \theta + \cos \theta = 2(\sin \theta - \cos \theta)$, for $0^\circ \leq \theta \leq 360^\circ$. [2]
- 4 Solve the equation $3 \sin^2 \theta - 2 \cos \theta - 3 = 0$, for $0^\circ \leq \theta \leq 180^\circ$. [4]

5



In the diagram, $ABED$ is a trapezium with right angles at E and D , and CED is a straight line. The lengths of AB and BC are $2d$ and $(2\sqrt{3})d$ respectively, and angles BAD and CBE are 30° and 60° respectively.

- (i) Find the length of CD in terms of d . [2]
- (ii) Show that angle $CAD = \tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$. [3]

Subject: Computer

Lesson: This lesson is about stepwise Refinement.

Inquiry :

Many problems that we want to solve are bigger than the ones we met in previous lessons. To make it easier to solve a bigger problem, we break the problem down into smaller steps. These might need breaking down further until the steps are small enough to solve easily. For a solution to a problem to be programmable, we need to break down the steps of the solution into the basic constructs of sequence, assignment, selection, repetition, input and output. What is this style of coding called? How can we work out complex tasks tactfully and make them manageable? The answer for these questions is 'Stepwise Refinement'.

Information

The most effective way to solve a complex problem is to break it down into successively simpler sub-problems. You start by breaking the whole task down into simpler parts. Some of those tasks may themselves need subdivision. This process is called stepwise refinement or decomposition.

Stepwise refinement is the idea that software is developed by moving through the levels of abstraction, beginning at higher levels and, incrementally refining the software through each level of abstraction, providing more detail at each increment. At higher levels, the software is merely its design models; at lower levels there will be some code; at the lowest level the software has been completely developed.

At the early steps of the refinement process the software engineer does not necessarily know how the software will perform what it needs to do. This is determined at each successive refinement step, as the design and the software elaborated upon.

For further details please Read what your textbook says about the topic (pages 233 -235)

3. Please watch the Youtube videos:

- <https://youtu.be/LcjGW9SUuV0>
- <https://youtu.be/6WuVZ2QUvGE>

Practising

- Read, understand and then solve Activity 9H (page 234) and Activity 9I (page 235) of your textbook.
- Solve End of Chapter Question (pages 236 and 237)

Inquiry

Contribution or marginal costing

Contribution costing solves the problem of deciding on the most appropriate way to allocate or share out overhead costs between products – it does not allocate them at all.

Instead, the method concentrates on two very important accounting concepts:

- **Marginal cost** – the cost of producing an extra unit – is a variable direct cost. For example, if the total cost of producing 100 units is \$400 000 and the total cost of producing 101 units is \$400 050, the marginal (or extra) cost is \$50.
- The contribution of a product is the revenue gained from selling a product less its marginal (variable direct) costs. *This is not the same as profit.* Profit can only be calculated after overheads have also been deducted. For example, if the 101st unit with a marginal cost of \$50 is sold for \$70, it has made a contribution towards indirect costs of \$20. The unit contribution is the difference between the sale price (\$70) and the marginal cost (\$50) = \$20.

Contribution costing and decision-making

Contribution costing has very important advantages over full costing when management plans to take important decisions based on cost data.

Synthesis/ Absorption of Information

An example contribution costing statement is shown in Table 31.5.

\$000	Novel	Textbook
Revenue	50	100
Direct materials	15	35
Direct labour	20	50
Other direct costs	10	5
Total direct costs	45	90
Contribution	5	10

Table 31.5: Contribution costing statement for Cambridge Printers Ltd

This statement does not allocate overhead costs between the two products. Overheads cannot be ignored altogether, however. They are needed to calculate the profit or loss of the business:

- Total contribution for Cambridge Printers Ltd = \$15 000.
- Total indirect costs amounted to \$12 000.
- Profit = contribution less overheads.
- Therefore, the business has made a profit of \$3 000.

This link between contribution to overheads and profit is a crucial one.

The following activities illustrate how contribution costing can be useful.

Practice Question:

Exam Style Question 7 & 8

Subject: Accounting

Deposals of Non- Current Assets

Inquiry

Do you know that a non-current asset can give gain/ loss at the time of disposal? What is main difference between cash disposal and part exchange? How ledger accounts are prepared when disposing a non- current asset?

Information

- (i) When a non-current asset is sold, the difference between its net book value and the proceeds of sale represents a profit or loss on disposal. This is transferred to the income statement. The profit or loss is calculated in a disposal account. On the sale of a fixed asset, in this example a computer, the following entries are needed:

(A) Transfer the cost price of the asset sold to an assets disposal account (in this case a computer disposals account):

Debit computer disposals account

Credit computer account

(B) Transfer the depreciation already charged to the assets disposal account:

Debit accumulated provision for depreciation: computer

Credit computer disposals account

(C) For the amount received on disposal:

Debit cash book

Credit computer disposals account

(D) Transfer the difference (i.e. the amount needed to balance the computer disposals account) to income statement. Debit balance will represent a loss and credit balance will be a profit.

- (ii) Watch this short video that shows a summary of disposal: <https://youtu.be/NSoHP29j3FQ>

Synthesising /Absorbing

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

Practice

Solve ten topical MCQs from past papers.

Subject: Economics

Lesson is about Arguments for trade protection

Inquiry:

Why do countries use protectionism?

Is protectionism good or bad?

Does protectionism help the economy?

Information: Arguments for trade protection (arguments against free trade)

Trade protection can help to protect domestic jobs. In extreme cases, fierce competition from foreign rivals can even force domestic firms out of business if there is no trade protection.

Protectionism might be used for reasons of national security, i.e. to safeguard the country from being too reliant on certain imports from other countries (such as weapons and war machines). Protection is vital during times of political conflict and turmoil such as a war.

Protectionist measures help to safeguard infant industries (new, unestablished businesses) from foreign competition - for example, subsidies help to reduce costs of production, quotas help to limit the degree of rivalry and tariffs help domestic sunrise industries to gain a price advantage.

Protection is used to maintain health, safety and environmental standards in the country. Governments may set minimum health, safety and environmental standards for imported products such as medicines, food products and motor vehicles to protect its citizens.

Trade protection prevents dumping and other forms of unfair competition.

Dumping occurs when foreign firms sell their products in large quantities at prices deliberately below those charged by domestic firms, often below the cost value.

The impacts of anti-dumping protection include:

- Higher domestic consumption caused by lower expenditure on imports.
- Higher sales and profits for domestic firms.
- Improvement in the balance of payments on the current account for the protected country.

Protection is a means of overcoming a balance of payments deficit. If a country's expenditure on imports exceeds the revenue earned from its exports, protectionist measures can be used to rectify this imbalance.

Protection can also be a source of government revenue.

Please read what your textbook says about the arguments in favour of protectionism.

- Please watch this brief YouTube video on the arguments in favour of protectionism (<https://www.youtube.com/watch?v=Wt0pL8DRe1I>)

Synthesising/absorbing the information

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

Practising:

Give two arguments for protectionism and two arguments against protectionism.

Subject: Law

Attempt question no. 1 and 2 of May/June 2023 Paper 12.

Subject: Psychology

Chap No. 5 - Social Approach

Page No. 174

Solve Exam style questions

