MARKING GUIDE OF PHYSICS S6 PCB.PCM.MPC,MPG 2024

SECTION A

Q1)A Q2)B Q3)D Q4)D Q5) B Q6) D Q7)A Q8) C

Q9)A Q10)C

Q11) A. The vibrating air in a **two open ends pipe** has displacement antinodes at both ends.

B. For a **one open end pipe** the fundamental corresponds to a wavelength four times the length of the tube.

C. The **Doppler effect** refers to the change frequency of a sound due to the motion either of the source or of the observer. If source and observer are approaching each other, the perceived frequency is **lower** If they are moving apart, the perceived frequency is **greater** **(1mark for each)**

Q12. (a)

Term	Economic activity taking place in this layer
1.**Troposphere (1mark)**	agriculture
2. Stratosphere	**Strategic positioning of space crafts (1mark)**
3.Mesoshere	**Strategic layer that allows for movements of rockets. (1mark)**

(b) Water has the unique **property of expanding about 9% when it freezes**. This increase in volume occurs because, as ice form, the water molecules arrange themselves into a very open crystalline structure. As a result, when water freezes, it expands and exerts **a tremendous outward force**. This can be verified by completely filling a container with water and freezing it. After many **freezing cycle**, the rock is broken into pieces. This process is called frost wedging also as known as Freeze-thaw weathering **(2marks)**

Q13. Floods can have devastating consequences and can have serious impact on the country's economy, the environment, people and animals

During floods, especially flash floods, roads, bridges, farms, houses and automobiles are destroyed. All these come at a heavy cost to people and the government. It usually takes years for affected communities to rebuild and business to come back to normalcy.

The environment also suffers when floods happen. Chemicals and other hazardous substances end up in the water and eventually contaminate the water bodies that floods. Additionally, flooding kills animals and others insects in the affected areas, distorting the natural balance of the ecosystem.

Many people and animals may get killed during flash floods.

Many more are injured and others made homeless. Water supply and electricity are disrupted. In addition to this, flooding brings a lot of diseases and infections and sometimes insects and snakes make their ways to the area and cause a lot of havoc. However, there is also something good about floods, especially those that occur in floodplains and farm fields.

Flood water carries lots of nutrients that are deposited in the plains. Farmers love such soils, as they are perfect for cultivating any kinds of crops.

Measures : Sometimes there is no warning of flash floods, and that is why it is important to think of them and prepare for them before they happen. Here are a few things you can do. Before the floods

• Know about your local relief centers and evacuation routes.

• Keep emergency numbers and important information handy, as well as emergency supplies, kits, first aid items. These may include water, canned food; can opener, battery-operated radio, flashlight and protective clothing.

• Fold and roll up anything onto higher ground (or upper floors of your home), including chemicals and medicines.

• Make sure everything that is of importance is secured (jewelry, documents, pets, and other valuables).

• Plant trees and shrubs and keep a lot of vegetation in your compound if you are in a low-lying area as that can control erosion and help soften the speed of the flowing water. During the floods

• Flash floods occur in a short spate of time. As soon as they start, be quick, keep safe and ensure that children and elderly are safe by leaving the house to a higher ground.

• Turn off all electrical appliances, gas, heating and the like if there is a bit of time.

• Leave the area before it gets too late. Do not drive through the water as moving water can sweep you away.

• Stay away from power lines or broken power transmission cables.

• Try to keep away from flood water as it may contain chemicals or other hazardous materials.

• Don't walk, swim or drive through floodwater. Just six inches of fast-flowing water can knock you over and two feet will float a car. After the floods

• Make sure you have permission from emergency officers to get back inside your house.

• Keep all power and electrical appliance off until the house is cleaned up properly and electrical personnel has confirmed that it is OK to put them on.

• Make sure you have photographs, or a record of all the damage, as it may be needed for insurance claims.

• Clean the entire home, together with all the objects in it very well before you use them again. They may be contaminated.

• Keep children and pets away from hazardous sites and floodwater.

• Let friends and family know you're safe. Register yourself as safe on the Safe and Well website **(1mark for one point in 10 points)**

Q14. (a) Muon is one of the fundamental sub atomic particles. Muons are similar to electrons but weigh more than 207 times as much **(1 mark)**

Neutrino: It is one of fundamental particles, made of smaller particles and its charge is zero. It is one of leptons. **(1 mark)**

Anti-particle: particle of the same mass but opposite charge **(1 mark)**

Hadrons :any member of subatomic particles that are build from quarks and thus react through strong forces. They are baryons and mesons **(1 mark)**

Lepton: elementary particle of half integer spin that does not undergo strong interactions. **(1 mark)**

(b) fermions(6 **quarks** and 6 **leptons**) and 5**bosons**. **(2 marks)**

(c) (i) gluons are type of elementary particle that mediates strong interaction between quarks **(2 marks)** while a photon is an elementary particle that is a quantum of the electromagnetic radiation **(2 marks)**

(ii) Fermions are particles with half integer spin **(1 mark)** while bosons are particles with full integers spin **(1 mark)**

Q15. (a) Signals are amplified in several stages . The **initial stages** are **small** signal amplifiers, they are designed to give good voltage gain, so they are called voltage amplifiers. **(2 marks)** While At the **final stage**, the signal becomes **large**, the large-signal amplifier is called power amplifier, as it is designed for good power gain.

(2 marks)

(b) Carrier waves are waves which carry information **(2 marks)**

(c) type of antenna : Wire antennas**(1 mark)** , Aperture antennas**(1 mark)** ,Reflector antennas**(1mark)**, Array antennas**(1 mark)**

(d) Oscillators a**re electronic circuits that produce a periodic waveform on its output with only the DC supply voltage as an input**. The output voltage can be either sinusoidal or non-sinusoidal, depending on the type of oscillator, thus, the outputs signals can be sine waves, square waves, triangular waves, and saw tooth waves. **(2 marks)**

Q16.(a) Color is property of quarks and gluons that is related to strong force. It can annihilate any other property called color. **(2 marks)**

(b) for the particle uds

(i) baryon number B $=\frac{1}{3}+\frac{1}{3}+\frac{1}{3}=1$ **(1 mark)**

(ii) charge $=\frac{2}{3}e-\frac{1}{3}e-\frac{1}{3}e=0$ **(1 mark)**

(iii) stranginess$=0+0-1=-1$ **(1 mark)**

SECTION B

Q17) (a)(i) Attenuation in fiber optics, also known as transmission loss, is the reduction in intensity of the light beam **(1 mark)**

(ii) **Intrinsic** attenuation is due to something inherent to the fiber such as **impurities** in the glass during manufacturing. The interaction of such impurities with light results in the scattering of light or its absorption. **(1 mark)**

• **Extrinsic** attenuation can be caused by **macro bending** and **microlending**. **(1 mark)**

(iii) The lost energy is $\frac{5}{100}\ x20=10\%$ **(1 mark)**

Strength remain=100% − 10% = 90% **(1 mark)**

Given data	**Asked**	**Formula**	
N_1=1.53	θ=?	θ= $\sin^{-1}\sqrt{n_1^2 - n_1^2}$	**(1 mark)**
N_2=1.39			

Application

θ =$\sin^{-1}\sqrt{1.53^2 = 1.39^2}$ =39.74^o **(1 mark)**

(c) main types of optical fibers: Monomode **(1 mark)**, Multimode fibers **(1 mark)**, Special-purpose optical fiber**(1 mark)**

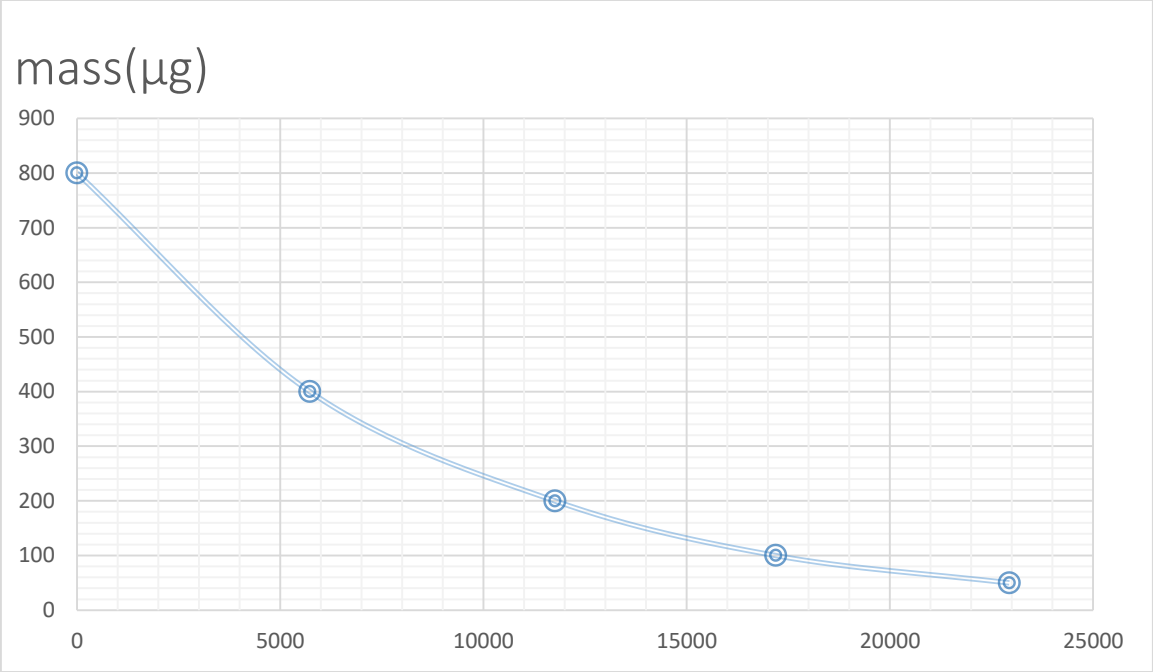
Q18) (a) the activity A of a radioactive sample is **the number of decay events in a unit time** we obtain a similar expression for the radioactive decay law **(2marks)**

(b (i))$\lambda = \frac{ln2}{T_{1/2}}$ **(1 mark)**

$\lambda = \frac{ln2}{5730}$ =0.00012 per year **(1 mark)**

(ii)

Time /years	5730	11760	17190	22940
Mass/µg	400	200	100	50

Graph 

(1 mark for each point and 1 mark for fit line)

(c) Isotones: these are nuclei in which the number of neutrons is the same but the mass number A and the atomic number Z differ **(1 mark)**

Q19 a) Wien's displacement law It states that "the maximum wavelength of the emitted energy from a blackbody is inversely proportional to its absolute temperature".

$\lambda_{max}T = b$ with λ_{max} maximum wavelength, T temperature and b Wien' s constant **(1 mark)**

(b) (i) It shows that:

- **As temperature increases, the total energy emitted increases,** because the total area under the curve increases.

- The relationship **is not linear as the area does not increase in even steps.** The rate of increase of area and therefore energy increases as temperature increases. **(2 marks)**

(ii) Between 4000 and 7000 K, is visible spectrum from red (long wavelength) to violet of short wavelength. At 4000 K the particles are vibrating with a less energy, hence red. As temperatures increase, the energy of particles increases

shifting to particles of higher frequency. Hence changing their color to blue, indigo and then Violet. **(1 mark)**

(iii) This is because the curves represent radiations emitted by a black body at different temperatures. **(2marks)**

(c) Main reasons that brings about variation of sun's Intensity :

The shape of the earth, **(1 mark)** the earth's rotation **(1 mark)** and the angle of the surface to the horizontal at that particular location **(1 mark)**

(d) Albedot is any character that describes the degree to which a surface reflects light that strikes it. **(1 mark)**

Q20.(a) Doppler's effect is the apparent variation in frequency of a wave due to the relative motion of the source of the wave and the observer. **(1 mark)**

(b) **Given data**	**Asked**	**Formula**
F=1000hz	fr=?	$fr = \frac{c}{c-v}$ **(1 mark)**
C=340m/s		
V=33.5m/s		

Application

$fr = 1000hz\frac{340m/s}{\frac{340m}{s}-33{,}5m/s} = 1000hz\frac{340m/s}{306.5m/s} = 1109.3Hz$ **(1 mark)**

(c) One application of the Doppler Effect:

Trafic police for detect speed, flow meter,….. **(1 mark)**

(d) No **(1 mark)**. The total energy of the pair of waves remains the same. Energy missing from zones of destructive interference appears in zones of constructive interference. **(2marks)**

Given data	**Asked**	**Formula**
L=1.10m/s	T=?	$f = \frac{1}{2L}\sqrt{\frac{TL}{m}}$
M=9g=0.009Kg		$f^2 = \frac{1}{4L^2}\frac{TL}{m} = \frac{T}{4Lm}$
$f = 131\,Hz$		$T = 4Lmf^2$ **(1 mark)**

Application

$T = 4x1.10m/sx0.009Kgx(131HZ)^2 = 679.57N$ **(1 mark)**

(b) $f_n = nf$ $f_3 = 3x131Hz = 393Hz$ **(1 mark)**