REPUBLIC OF RWANDA

EASTERN PROVINCE

PHYSICS II

2023-2024

/03/2024 8:30AM-11:30AM

RWAMAGANA DISTRICT

ADVANCED LEVEL DISTRICT COMPREHENSIVE ASSESSMENT FOR SECOND TERM,2023-2024.

SUBJECT: PHYSICS

LEVEL: SENIOR SIX (S6)

/100marks

DURATION :3 HOURS

COMBINATIONS:

MATHEMATICS PHYSICS-GEOGRAPHY (MPG)

MATHEMATICS- CHEMISTRY- COMPUTER (MPC)

PHYSICS –CHEMISTRY- BIOLOGY (PCB)

PHYSICS-CHEMISTRY- BIOLOGY (PCM)

INSTRUCTIONS:

1) Do not open this question paper until you are told to do so.
2) This paper consists of **TWO** sections: **A** and **B**

   SECTIONA: Attempt all questions **(70marks)**

   SECTIONB: Attempt any **three** questions **(30marks)**

3) **Use only a blue or black pen**.

SECTIONA: Attempt all questions **(70marks)**

Q1. Bats and dolphins use echolocation to determine distances and find prey. What characteristic of sound waves is most important for echolocation?

A. sound waves reflect when they hit a surface

B. sound waves diffract around corne

C. sound waves spread out from a source

D. sound waves interfere when they overlap **(2marks)**

Q2. Imagine two planets. Planet A is completely covered by an ocean, and has and overall average albedo of 20%. Planet B is blanketed by clouds, and has an overall average albedo of 70%. Which planet reflects more sunlight back into space?

A. Planet A B. Planet B

C. the two planets reflect the same amount of light

D. more information is needed to answer this question **(2marks)**

Q3. Which of the following is the role of the water vapors in the atmosphere?

A. Reducing temperature in the atmosphere B. Radioactive balance and the hydrological cycle

C. None of the above. D. All of the above. **(2marks)**

Q4. Richter scale is used to measure

A. Temperature of bodies B. Magnitude of earthquake

C. Intensity of wind D. Intensity of earthquake **(2marks)**

Q5. The energy released by the nuclear bomb that destroyed Hiroshima was equivalent to 12.4 kilotons of TNT. This is equivalent to 9.1×10^{26} MeV. The

mass that was Converted into energy in this explosion was (Convert MeV in Joules, use $E=mC^2$)

A.1.6 kg B. 1.6×10^{-3} kg

C. 1.4×10^{14} kg D. 1.1×10^{10} kg E. 120 kg **(2marks)**

Q6. Amplitude –modulated radio waves are received by a tuned radio-frequency (trf) Receiver. The receiver has a suitable detector circuit in order to

A. Amplifier the carrier waves B. Amplifier the audio-frequencies carried

C. Rectifier the carrier waves D. Detect the carrier waves

E. Transfer the audio-frequencies to the radio-frequency amplifier **(2marks)**

Q7. Operation of optical fiber is based on:

A. Total internal reflection B. Total internal refraction

C. Snell's law D. Einstein's theory of reality

E. None of the above **(2marks)**

Q8. Particles that make up the family of Hadrons are:

A .Protons and electrons B. Leptons and baryons

C. Baryons and mesons D. Muons and Leptons **(2marks)**

Q9. Particle which explains about mass of matter is called

A. Higgs boson B. Leptons C. protons D. neutrons **(2marks)**

Q10. X-rays have

A. short wavelength B. high frequency C. both A and B

D. longest wavelength **(2marks)**

Q11. Fill in the gap

A. The vibrating air in a/an ---------- has displacement antinodes at both ends.

B. For a /an ..... , the fundamental corresponds to a wavelength four times the length of the tube.

C. The ..... 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 ..... If they are moving apart, the perceived frequency is ..... **(5marks)**

Q12.

a. Complete the chart below. If the left column is blank, give the correct term. If the right column is blank, give an example of economic activities taking place in the corresponding layer if possible.

Term	Economic activity taking place in this layer
1.	agriculture
2. Stratosphere	
3.Mesoshere	

(3marks)

b. Cracks in rocks widen as water in them freezes and thaws. How does this affect the surface of Earth? **(2marks)**

Q13. Discuss impact of floods on human activities and suggest ways of minimizing their negative impact? **(10marks)**

Q14. (a) In short note describe particle-terms: muon, neutrino, antiparticle, hadrons and lepton. **(5marks)**

(b) In now days what are fundamental particles you know. **(2marks)**

(c) Distinguish between (i) gluon and photon **(4marks)**

(ii) fermions and bosons **(2marks)**

Q15. (a)Distinguish between voltage amplifiers and power amplifiers? **(4marks)**

(b) What is the application of a carrier wave in a telecommunication system? **(2marks)**

(c) State four types of antenna used in telecommunication system. **(4marks)**

(d) Define the term" oscillator " **(2marks)**

Q16. (a) What is anti-colour ? **(2marks)**

(b)Find the(i)baryon number, (ii)Charge, and (iii) Strangeness for combination of quarks uds **(3marks)**

SECTIONB: Attempt any **three** questions **(30marks)**

Q17.(a)(i) What do we mean by attenuation in optical fibers? **(1mark)**
(ii) State two ways in which energy is lost along the length of an optical fiber. **(2marks)**

(iii) If a fiber loses 5% signal strength per km, how much strength would be left after 20 km? **(2marks)**

(b) An optical fiber has a core index of 1.53 and a cladding index of 1.39. What is the maximum acceptance angle θ_m for light rays incident on the fiber face such that the refracted ray in the core of the fiber is incident on the cladding at the critical angle? **(2marks)**

(c) What are three main types of optical fibers? **(3marks)**

Q18.a.Define the term "activity" for a radio element **(2marks)**

b. The half-life of carbon14 is 5730 years the mass of certain sample of this isotope is 800 μg .

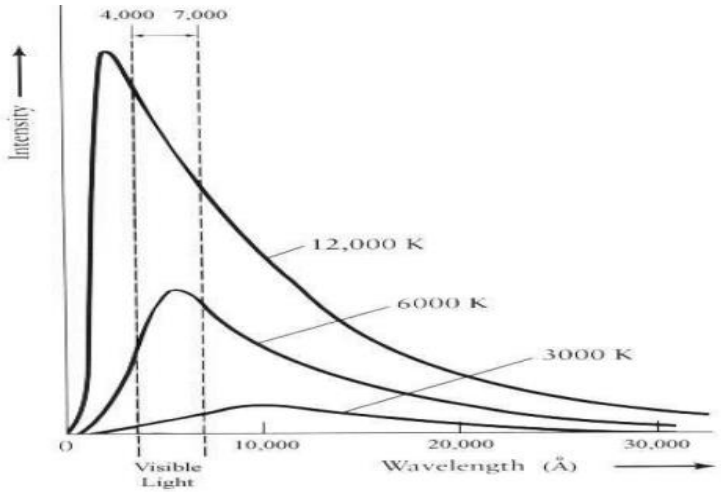
i. Find its radioactive coefficient **(2marks)**

ii. Graph the activity for the first 4 half-lives. **(5marks)**

c. Define term "isotones " **(1mark)**

Q19 a) State Wien's displacement law **(1mark)**

b) Use the graph indicated below to answer the questions that follow



i) What does the graph explain?

(2marks)

ii) Explain the spectrum that is found between temperatures of 4000 and 7000 K **(1mark)**

iii) Why do you think the three curves have different shapes?

(2marks)

c. State at least any three main reasons that brings about variation of sun's Intensity **(3marks)**

d.What mean “albedo”? **(1mark)**

Q20. a) What is meant by Doppler Effect? **(1mark)**

b) A police car sounds a siren of 1000 Hz as it approaches a stationary observer at a speed of 33.5 m/s. What is the apparent frequency of the siren as heard by the observer if the speed of sound in air is 340 m/s. **(2marks)**

c) Give one application of the Doppler Effect . **(1mark)**

d. When two waves interfere constructively or destructively, is there any gain or loss in energy? Explain. **(3marks)**

END

e. A piano string is 1.10 m long and has mass of 9 g.

i. How much tension must the string be under if it is to vibrate at a fundamental frequency of 131 Hz? **(2marks)**

ii. What is the frequency of the third harmonic? **(1mark)**