Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Waves

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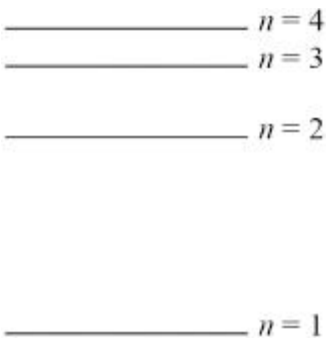
Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

The four lowest energy levels of an atom are shown.



A gas contains atoms in the n = 4 level.
The atoms de-excite to the n = 1 level.

How many photon frequencies are observed?

A 3 ⬭
B 4 ⬭
C 5 ⬭
D 6 ⬭

(Total 1 mark)

Q2.

Monochromatic light of frequency f is incident on a metal surface in a vacuum.
Photoelectrons are emitted from the surface.

The photoelectric current I is measured.

The magnitude of the stopping potential V_s is then measured.

f is increased without changing the rate at which photons arrive at the metal surface.

What are the new measurements of the photoelectric current and the magnitude of the stopping potential?

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	Photoelectric current	Magnitude of the stopping potential	
A	I	V_s	⬭
B	I	$> V_s$	⬭
C	$> I$	V_s	⬭
D	$> I$	$> V_s$	⬭

(Total 1 mark)

Q3.

An electron and a positron annihilate each other.

Which quantity is **not** conserved in the annihilation?

A electric charge ⬭

B kinetic energy ⬭

C lepton number ⬭

D momentum ⬭

(Total 1 mark)

Q4.

Which exchange particle transfers charge during electron capture?

A meson ⬭

B pion ⬭

C virtual photon ⬭

D W boson ⬭

(Total 1 mark)

Q5.

A free neutron decays to produce a proton and

A an electron and an antineutrino. ⬭

B an electron and a neutrino. ⬭

C a positron and an antineutrino. ⬭

D a positron and a neutrino. ⬭

(Total 1 mark)

Q6.

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A nucleus of bismuth-209 $\left(^{209}_{83}\mathrm{Bi}\right)$ absorbs a neutron. The newly formed nucleus subsequently decays in two stages to form a nucleus of nuclide **X**.
One beta-minus particle and one alpha particle are emitted during these two decays.

What are the nucleon number and the proton number of **X**?

	Nucleon number	Proton number	
A	205	82	⬭
B	205	83	⬭
C	206	82	⬭
D	206	83	⬭

(Total 1 mark)

Q7.

The concept of exchange particles was introduced to explain forces between elementary particles.

This concept requires that exchange particles have

A charge. ⬭

B momentum. ⬭

C phase. ⬭

D rest mass. ⬭

(Total 1 mark)

Q8.

A nucleus contains N neutrons and Z protons.

Which combination of N and Z gives a nucleus with the greatest specific charge?

	N	Z	
A	6	5	⬭
B	8	7	⬭
C	16	13	⬭
D	20	17	⬭

(Total 1 mark)

Q9.

Which statement about muons is correct?

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A They consist of a quark and an antiquark. ⬭

B They include pions and kaons. ⬭

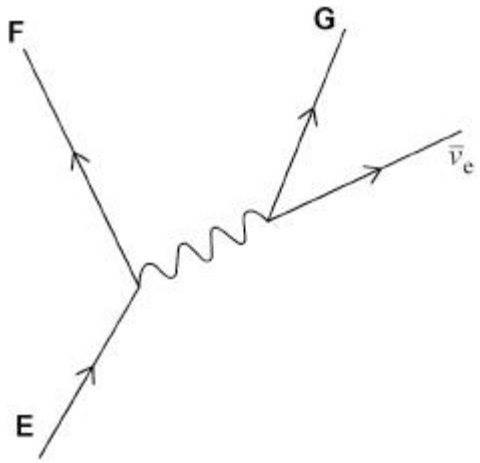
C They are subject to the strong interaction. ⬭

D They decay into electrons. ⬭

(Total 1 mark)

Q10.

The diagram represents a quark change in which an electron antineutrino is produced.



What are **E**, **F** and **G**?

	E	F	G	
A	up quark	down quark	β^-	⬭
B	down quark	up quark	β^-	⬭
C	up quark	down quark	β^+	⬭
D	down quark	up quark	β^+	⬭

(Total 1 mark)

Q11.

Which row has the largest value for

$$\frac{\text{specific charge of the particle in column X}}{\text{specific charge of the particle in column Y}}?$$

	X	Y	
A	electron	alpha particle	⬭
B	alpha particle	electron	⬭
C	electron	proton	⬭

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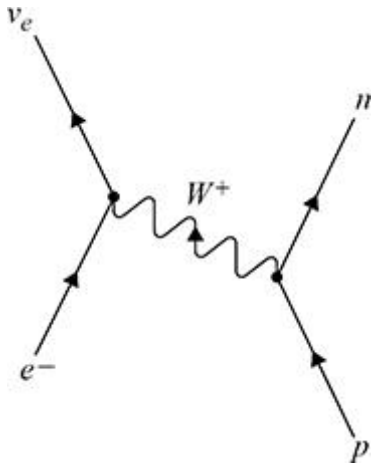
D	proton	alpha particle	⬭

(Total 1 mark)

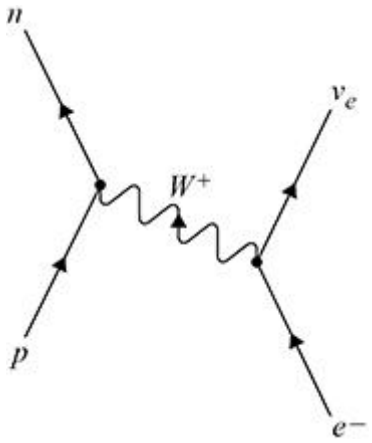
Q12.

Which diagram represents the process of electron capture?

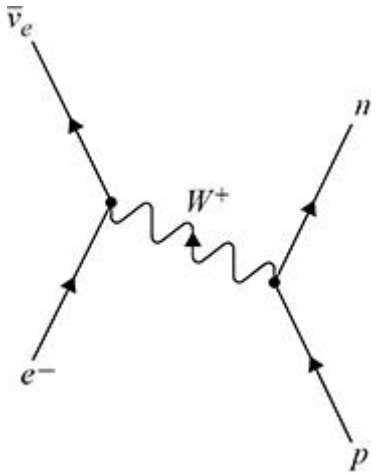
A



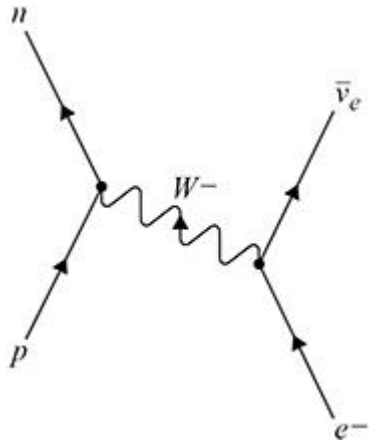
B



C



D



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q13.

Which row is correct?

Name of particle	Classification	Quark structure

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A	antineutron	meson	$\bar{u}\bar{u}\bar{d}$	⬭
B	positive kaon	baryon	$\bar{u}\ s$	⬭
C	antiproton	baryon	$\bar{u}\bar{u}\bar{d}$	⬭
D	positive pion	meson	$\bar{u}\ d$	⬭

(Total 1 mark)

Q14.

An alpha particle and a nucleus of boron $^{10}_{5}\mathrm{B}$ interact to form an unstable nucleus and a free neutron.

The unstable nucleus decays by positron emission to form a nucleus of nuclide **X**.

What is **X**?

A $^{13}_{5}\mathrm{B}$ ⬭

B $^{13}_{6}\mathrm{C}$ ⬭

C $^{13}_{7}\mathrm{N}$ ⬭

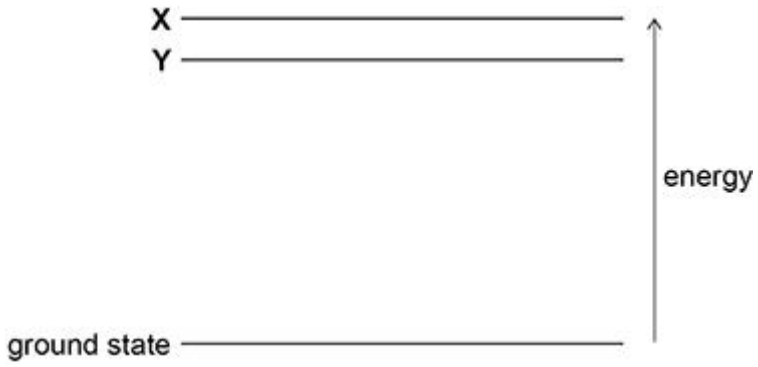
D $^{13}_{8}\mathrm{O}$ ⬭

(Total 1 mark)

Q15.

The diagram shows the ground state and two higher-energy states **X** and **Y** of an atom.

A transition from **X** to the ground state produces a photon of wavelength $147\ \mathrm{nm}$.
A transition from **Y** to the ground state produces a photon of wavelength $160\ \mathrm{nm}$.



What is the energy difference between **X** and **Y**?

A $1.5 \times 10^{-17}\ \mathrm{J}$ ⬭

B $1.4 \times 10^{-18}\ \mathrm{J}$ ⬭

C 1.2×10^{-18} ⬭

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D 1.1×10^{-19} J ⬭

(Total 1 mark)

Q16.

What is the specific charge of a $^{13}_{6}C$ nucleus?

A 4.4×10^{7} C kg^{-1} ⬭

B 5.2×10^{7} C kg^{-1} ⬭

C 8.3×10^{7} C kg^{-1} ⬭

D 2.1×10^{8} C kg^{-1} ⬭

(Total 1 mark)

Q17.

Which provides evidence for discrete atomic energy levels?

A β^{+} decay ⬭

B electron diffraction ⬭

C line spectra ⬭

D the photoelectric effect ⬭

(Total 1 mark)

Q18.

Which row describes the variation with distance of the strong nuclear force?

	Attractive	Repulsive	
A	beyond 3 fm	from 0.5 fm to 3 fm	⬭
B	from 0.5 fm to 3 fm	beyond 3 fm	⬭
C	from 0.5 fm to 3 fm	up to 0.5 fm	⬭
D	up to 0.5 fm	from 0.5 fm to 3 fm	⬭

(Total 1 mark)

Q19.

Which combination of quarks is possible?

A sd ⬭

B sū ⬭

C sūd ⬭

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D ud ⬭

(Total 1 mark)

Q20.

Which statement is correct?

A All strange particles are mesons. ⬭

B Strange particles are always created in pairs. ⬭

C Strangeness can only change in strong interactions. ⬭

D Strangeness can only have a value of 0 or −1 ⬭

(Total 1 mark)

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