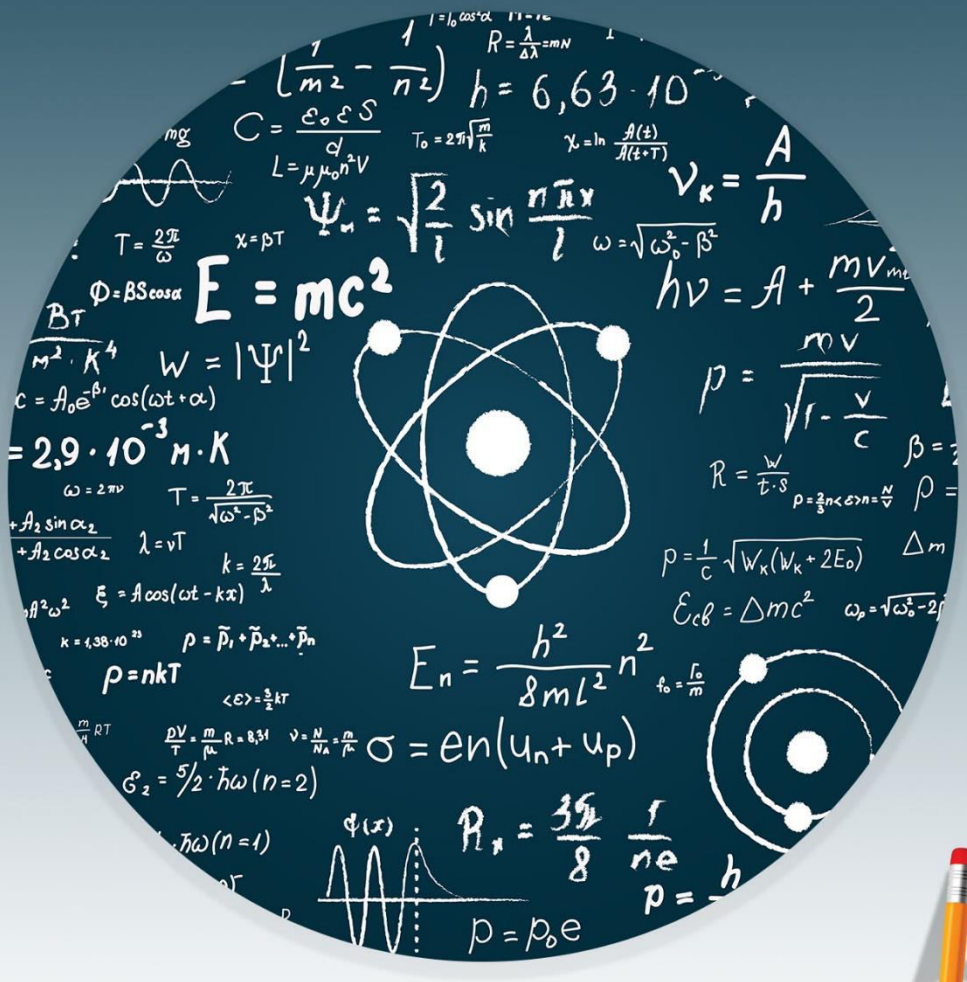
PHYSICS



WORKSHEET-10

STEP

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Worksheet-10

Topics:- Nuclear Fission & Fusion Reactions, Elementary Particles

USE THIS SPACE FOR SCRATCH WORK

Q.1 Proton belongs to:

A) Leptons C) Mesons

B) Baryons D) Neutrinos

Q.2 Which of following belong to leptons?

A) Electrons C) Neutrinos

B) Protons D) Both A & C

Q.3 Which of following has mass smaller than proton:

A) Baryon C) Neutron

B) Meson D) None of these

Q.4 Which of following is not an elementary particle?

A) Photons C) Leptons

B) Hadrons D) Muons

Q.5 A proton is assumed to be made up of _____ quarks.

A) 2u+1d C) 2u+2d

B) 2d+1u D) 3u+1d

Q.6 In any nuclear reaction, the energy is released if the binding of reactants is _____ than binding energy of products:

A) Less C) Equal

B) Greater D) Any of these

Q.7 If an α-particle moving with energy 1 MeV strikes with Nitrogen atom $^{14}_{7}N$, the product formed is $^{14}_{7}N + ^{4}_{2}He \rightarrow$ _____?

A) $^{16}_{8}\mathrm{O} + ^{1}_{1}\mathrm{H} + ^{1}_{0}\mathrm{H}$ C) $^{17}_{8}\mathrm{O} + ^{1}_{0}\mathrm{n} + ^{0}_{+1}\mathrm{e}$

B) $^{17}_{8}\mathrm{O} + ^{1}_{1}\mathrm{H}$ D) Reaction can't happen

Q.8 The missing particle in following nuclear reaction is:

$^{9}_{4}Be + ^{4}_{2}He \rightarrow ^{12}_{6}C +$ _____

A) $^{1}_{1}H + ^{0}_{-1}e$ C) $^{1}_{0}n$

B) $^{1}_{1}H + ^{0}_{+1}e$ D) None of these

USE THIS SPACE FOR SCRATCH WORK

Q.9 **During the nuclear fission of $^{235}_{92}U$ into $^{132}_{50}Sn$ and $^{101}_{42}Mo$, the number of neutrons emitted are:**

A) 2 C) 4

B) 3 D) 1

Q.10 **The mass of uranium used in atomic bomb is _____ than/to critical mass?**

A) Less C) Equal

B) More D) Much smaller

Q.11 **In a nuclear reactor, the quantity of ^{235}U is increased from:**

A) 0.7 to 1% C) 5 to 10%

B) 2 to 4% D) None of these

Q.12 **Which of following is used as a moderator?**

A) Water C) Hydrocarbon

B) Heavy water D) All of these

Q.13 **The temperature of steam coming out of turbine is:**

A) 200° C C) 500° C

B) 300° C D) 700° C

Q.14 **Fast reactors are designed to make use of _____.**

A) ^{235}U C) ^{238}U

B) ^{239}U D) ^{233}U

Q.15 **When two deuterons are fused to form a Helium atom, the energy given out is:**

A) 17 MeV C) 6 MeV

B) 24 MeV D) 4 MeV

Q.16 **The nuclear waste is dumped into:**

A) Old salt mine C) Populated areas

B) Oceans D) None of these

Q.17 **In a nuclear reactor the mass of uranium used is _____ than/ to critical mass:**

A) Greater C) Equal

B) Less D) Any of these

Q.18 **In Karachi nuclear power plant _____ is used as moderator.**

A) Water C) Hydrocarbons

B) Heavy water D) None of these

Q.19 **The missing reactant in the reaction is:**

$${}^{3}_{2}He + \_\_\_\_ \rightarrow {}^{4}_{2}He + 2{}^{1}_{1}H + energy$$

A) ${}^{2}_{1}H$ C) ${}^{3}_{1}H$

B) ${}^{3}_{2}He$ D) $2{}^{1}_{1}H$

Q.20 **The temperature of core of sun is:**

A) 10 million degree Celsius

B) 6000 degree Celsius

C) 20 million degree Celsius

D) None of these

Q.21 **The number of protons taking part in P-P reaction:**

A) 4 C) 5

B) 6 D) 2

Q.22 **The number of protons used in one complete P-P reaction:**

A) 4 C) 5

B) 6 D) 2

Q.23 **In the P-P reaction, the energy given out per nucleon is:**

A) 25.7 MeV C) 4.0 MeV

B) 17.6 MeV D) 6.4 MeV

Q.24 **In the following reaction, the energy given out is:**

$${}^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n + \_\_\_\_$$

A) 17.6 MeV C) 24 MeV

B) 3.3 MeV D) 4.0 MeV

Q.25 **The sun is primarily composed of:**

A) Hydrogen C) Helium

B) Oxygen D) Neon

USE THIS SPACE FOR SCRATCH WORK

ANSWER KEY (Worksheet-10)					
1	B	11	B	21	B
2	D	12	D	22	A
3	B	13	B	23	D
4	B	14	C	24	A
5	A	15	B	25	A
6	A	16	A		
7	D	17	C		
8	C	18	B		
9	B	19	B		
10	B	20	C		

SOLUTIONS

Unit – 11 (WS-10)

Q.1 Answer is "B"

Solution:- Particles with mass equal or greater than protons belong to baryons.

Q.2 Answer is "D"

Solution:- Electrons, muons and neutrinos are leptons.

Q.3 Answer is "B"

Solution:- Particles with mass less than protons belong to mesons.

Q.4 Answer is "B"

Solution:- Hadrons are not elementary particles but are composed of elementary particles called Quarks.

Q.5 Answer is "A"

Solution:- A proton is made up of two up one down quark.

Q.6 Answer is "A"

Solution:- Energy released = $B.E_P - B.E_R$

Q.7 Answer is "D"

Solution:- For this nuclear reaction, minimum energy of α-particle must be 1.13 MeV.

Q.8 Answer is "C"

Solution:- Balance mass on both sides

Q.9 Answer is "B"

Solution:-

$$^{235}_{92}\mathrm{U} + ^{1}_{0}\mathrm{n} \longrightarrow ^{132}_{50}\mathrm{Sn} + ^{101}_{40}\mathrm{Mo} + 3^{1}_{0}n + Q$$

Q.10 Answer is "B"

Solution:- The mass of uranium used in atomic bomb is greater than critical mass.

Q.11 Answer is "B"

Solution:- In a nuclear reactor, the quantity of uranium is increased from 2 to 4%, this process is called enrichment.

Q.12 Answer is "D"

Solution:- Moderators can be water, heavy water, carbon or hydrocarbon etc.

Q.13 Answer is "B"

Solution:- The temperature of the core is about 500 °C. The temperature of the steam coming out of the turbine is about 300 °C.

Q.14 Answer is "C"

Solution:- Fast reactors are designed to make use of U-238, which is about 99% content of natural Uranium.

Q.15 Answer is "B"

Solution:- The reaction in which two deuterons are fused to form helium is

$$^{2}_{1}\mathrm{H} + ^{2}_{1}\mathrm{H} \longrightarrow ^{4}_{2}\mathrm{He} + 24\ \mathrm{MeV}$$

Q.16 Answer is "A"

Solution:- Unfortunately, there is no proper arrangement of the disposal of the nuclear waste. This cannot be dumped

into oceans or left in any place where they will contaminate the environment, such as through the soil or the air. They must not be allowed to get into the drinking water. The best place so far found to store these wastes is in the bottom of old salt mines.

Q.17 Answer is "C"

Solution:- In a nuclear reactor the mass of uranium used is equal to critical mass to carry fission chain reaction at constant speed.

Q.18 Answer is "B"

Solution:- In Karachi nuclear power plant (KANUP), heavy water is used as a moderator and for the transportation of heat also from the reactor core to heat exchanger, heavy water is used.

Q.19 Answer is "B"

Solution:-

$${}_{2}^{3}He + {}_{2}^{3}He \rightarrow {}_{2}^{4}He + 2{}_{1}^{1}H + energy$$

Q.20 Answer is "C"

Solution:- The temperature of core of sun is 20 million degree Celsius.

Q.21 Answer is "B"

Solution:- The no. of protons taking part in P-P reaction are 6 while no. of protons used in one P-P reaction are 4.

Q.22 Answer is "A"

Solution:- The no. of protons taking part in P-P reaction are 6 while no. of protons used in one P-P reaction are 4.

Q.23 Answer is "D"

Solution:- In P-P reaction, the energy given out per nucleon is 6.4 MeV.

Q.24 Answer is "A"

Solution:- In this given fusion reaction the energy released is 17.6 MeV.

Q.25 Answer is "A"

Solution:- The sun is primarily composed of Hydrogen.

STEP

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