COMPOSITION OF ATOM

SOLUTIONS

WORKSHEET-4

Teaching Task

1.The charge of an electron is -1.6 $\times 10^{-19}$C. What is the charge of a Na^+ ion?
a) +1.6 $\times$ 10^{-19}C
b) -1.6 $\times$ 10^{-19}C
c) +3.2 $\times 10^{-19}$C
d) -3.2 $\times 10^{-19}$C
Answer:A
Solution:Na^+ has a charge of +1, which means it has one less electron than a neutral sodium atom.
The charge is equal in magnitude but opposite in sign to an electron's charge.

2.The charge of an electron is (4.8 x 10^{-10} esu). What is the charge of a F^- ion?
a) 4.8 $\times 10^{-10}$ esu
b) 9.6 $\times$ 10^{-10}esu
c) 1.44 $\times 10^{-9}$ esu
d) 2.4 $\times 10^{-10}$esu
Answer:A
Solution:F? has a charge of -1, meaning it has one extra electron compared to a neutral fluorine atom.
The charge is the same as an electron's charge but in the esu system.

3.The increasing order of (e/m) (charge/mass ratio) for electron (e), proton (p), and neutron (n) is:
a) (e, p, n)
b) (n, p, e)
c) (p, e, n)
d) (n, e, p)
Answer:B
Solution:Electron (e) has the highest e/m ratio (~1.76 × 10^{11} C/kg).
Proton (p) has a much lower e/m ratio (~9.58 × 107 C/kg).
Neutron (n) has zero charge, so e/m = 0.
Increasing order: (n, p, e).

4.The specific charge (e/m) of a proton is 9.58 $\times 10^7$ C/kg. What is the approximate (e/m) of an alpha particle (α)?
a) 4.79 $\times 10^7$ C/kg
b) 9.58 $\times 10^7$ C/kg
c) 1.92 $\times$ 10^8 C/kg
d) 2.39 $\times 10^7$ C/kg

Answer:A

Solution:An α particle has twice the charge (+2e) and four times the mass of a proton. Thus, e/m for α = (2e)/(4m) = (1/2)(e/m) of a proton.
Given e/m for proton = 9.58×10^7 C/kg, e/m for α = 4.79×10^7 C/kg.

5.The charge-to-mass ratio of an electron is 1.76×10^{11} C/kg. If a deuteron D^+ has twice the mass of a proton but the same charge, its (e/m) ratio will be:

a) Half that of a proton
b) Equal to that of a proton
c) Twice that of a proton
d) Four times that of a proton

Answer:A

Solution:A deuteron has the same charge as a proton (+e) but twice the mass (2m). Thus, e/m for deuteron = e/(2m) = (1/2)(e/m) of a proton.

6.The nature of cathode rays depends on:

a) The gas in the discharge tube
b) The material of the cathode
c) Both gas and cathode material
d) Neither gas nor cathode material

Answer:D

Solution:Cathode rays are streams of electrons, and their properties (e/m, velocity, etc.) are independent of the gas or cathode material.

7.If the (e/m) ratio of an electron is (x) in a hydrogen discharge tube, what will it be in a helium-filled tube?

a) (x)
b) (x/2)
c) (2x)
d) (4x)

Answer:A

Solution:The (e/m) ratio depends only on the electron's charge and mass, which are constant regardless of the gas in the tube.

8.The (e/m) ratio for a C^{2+} ion is 3.03×10^6 C/kg. What is its mass if the charge is (3.2×10^{-19}C?

a) 1.06×10^{-25} kg
b) 2.11×10^{-25} kg
c) 3.17×10^{-25}kg
d) 4.22×10^{-25} kg

Answer:A

Solution: $m = \frac{e}{e/m} = \frac{3.2 \times 10^{-19}}{3.03 \times 10^6} = 1.06 \times 10^{-25}$

9.The (e/m) ratio of a Fe^{3+} ion is 1.82 $\times 10^6$ C/kg. If the charge on the ion is (4.8×10^{-19}C, its mass is:

a) 2.64×10^{-25} kg
b) 5.28×10^{-25} kg
c) 1.32×10^{-25} kg
d) 3.96×10^{-25} kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{4.8 \times 10^{-19}}{1.82 \times 10^{6}} = 2.63 \times 10^{-25}$

10.The (e/m) ratio for a Mg^{2+} ion is 7.9 $\times 10^6$ C/kg. If the charge is 3.2 $\times 10^{-19}$ C, what is its mass?

a) 4.05×10^{-26} kg
b) 8.10×10^{-26}kg
c) 1.62×10^{-25} kg
d) 2.43×10^{-25} kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{3.2 \times 10^{-19}}{7.9 \times 10^{6}} = 0.405 \times 10^{-25} = 4.05 \times 10^{-26}$

11.If the (e/m) ratio of aBe^{2+} ion is 4.82 $\times 10^6$ C/kg, what is its mass given its charge is 3.2 $\times 10^{-19}$ C?

a) 6.64×10^{-26}kg
b) 1.33×10^{-25}kg
c) 2.66×10^{-25}kg
d) 5.32×10^{-25}kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{3.2 \times 10^{-19}}{4.82 \times 10^{6}} = 0.663 \times 10^{-25} = 6.63 \times 10^{-26}$

12.The (e/m) ratio of a U^{6+} ion is 1.45 $\times 10^5$ C/kg. If the charge is 9.6 $\times 10^{-19}$C,what is its mass?

a) 6.62×10^{-24} kg
b) 3.31×10^{-24} kg
c) 1.65×10^{-24} kg
d) 4.96×10^{-24} kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{9.6 \times 10^{-19}}{1.45 \times 10^{5}} = 6.62 \times 10^{-24}$

13.The (e/m) ratio of a Th^{4+} ion is 8.65 $\times 10^4$ C/kg. If the charge is 6.4$\times 10^{-19}$C, its mass is:

a) 7.40 $\times 10^{-24}$kg
b) 3.70 $\times 10^{-24}$kg
c) 1.85 $\times 10^{-24}$kg
d) 5.55$\times 10^{-24}$kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{6.4\times10^{-19}}{8.65\ \times10^{4}} = 7.3\times10^{-24}$

14.The (e/m) ratio of a Pb^{2+} ion is 4.79 $\times$ 10^5 C/kg. If the charge is 3.2 $\times 10^{-19}$ C, its mass is:
a) 6.68 $\times$ 10^{-25} kg
b) 3.34 $\times$ 10^{-25} kg
c) 1.67 $\times$ 10^{-25} kg
d) 5.01 $\times$ 10^{-25} kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{3.2\ \times10^{-19}}{4.79\ \times\ 10^{5}} = 0.668\times10^{-24} = 6.68\times10^{-25}$

15.The (e/m) ratio of a Ag^{+} ion is 8.89 $\times$ 10^5 C/kg. If the charge is 1.6 $\times 10^{-19}$ C, its mass is:
a) 1.80 $\times$ 10^{-25} kg
b) 3.60 $\times$ 10^{-25} kg
c) 7.20 $\times$ 10^{-25} kg
d) 1.44 $\times$ 10^{-25} kg
Answer:A

Solution: $m = \frac{e}{e/m} = \frac{1.6\ \times10^{-19}}{8.89\ \times\ 10^{5}} = 0.18\times10^{-24} = 1.8\times10^{-25}\,kg$

MULTIPLE CORRECT ANSWER TYPE

16..Which of the following relations are correct?

a) Specific charge (e/m) order: neutron < α -particle < electron

b) Mass order: neutron ˜ α -particle > electron

c) Magnitude of charge: neutron (0) < electron = proton < α -particle

d) Mass of hydrogen atom ˜ mass of proton (electron mass negligible)
Answer:A,C,D
Solution:a) Correct
Neutron: 0 charge $\rightarrow$e/m = 0
α -particle: charge = +2e, mass ˜ 4 amu $\rightarrow$small e/m
Electron: charge = –e, mass ˜ 1/1836 amu $\rightarrow$ very high e/m
b) Incorrect
Neutron ˜ 1 amu
α -particle ˜ 4 amu

Both are much heavier than electron (1/1836 amu)
But α-particle > neutron, so statement is slightly incorrect
C)Correct
|charge| of neutron = 0
|charge| of electron = |charge| of proton = 1.6×10^{-19} C
|charge| of α-particle = $2 \times 1.6 \times 10^{-19}$ C
D) Correct
Electron mass is ~0.00055 amu
So hydrogen atom (1 proton + 1 electron) ˜ proton mass

17.Which of the following statement(s) is/are correct?

a) The e/m value of anode rays depends on the gas in the discharge tube and is maximum for hydrogen gas (H^+ ions).

b) Neutrons exist in all isotopes of every element (except ^1H, which has no neutrons).

c) The neutron was discovered in the nuclear reaction: 4Be + 4He (α) $\rightarrow$ ^{12}C + °n (Chadwick's experiment).

d) Neutrons do not deflect in an external magnetic field (uncharged)

Answer:A,B,D

Solution:
A) Correct
Anode rays are positive ions; their e/m depends on the gas.
H^+ (proton) has the highest e/m (since it is the lightest ion).
B)Correct
^1H (protium) has no neutrons; all other isotopes (even of hydrogen like ^2H, ^3H) contain neutrons.
C)Incorrect
The neutron was discovered in the nuclear reaction: ${}_4{}^9Be + {}_2{}^4He \rightarrow {}_6{}^{12}C + {}_0{}^1n$ (Chadwick's experiment).
D)Correct
Neutrons are neutral, so no deflection in electric/magnetic fields.

COMPREHENSION TYPE

COMPREHENSION-I

When a solid object is placed in the path of cathode rays, its shadow is observed at the anode. This shows that cathode rays travel in straight line. Cathode rays travel with high speed approaching that of light (ranging between 10^{-9} to10^{-11} *cm/sec*)

18.When a solid object is placed in the path of cathode rays, a shadow is observed at the anode. This observation proves that cathode rays:

a) Carry a negative charge

b) Travel in straight lines

c) Are affected by magnetic fields

d) Have wave-particle duality

Answer:B

Solution:The shadow formation is a classic proof of rectilinear propagation (travel in

straight lines), similar to light casting a shadow.

While cathode rays also exhibit other properties (e.g., deflection in magnetic/electric fields), the shadow experiment specifically demonstrates their straight-line motion.

19.The speed of cathode rays is closest to:

a) 10^3 cm/sec **b) 10^7 cm/sec**

c) 10^{10} cm/sec **d) 10^{15} cm/sec**

Answer:C

Solution:Cathode rays are fast-moving electrons with speeds ~1/10th the speed of light (~ $10^{1°}$ cm/sec).

MATRIX MATCHING TYPE

20.

Column-I	**Column-II**
A) Electron	**P)Na^+ ion**
B)Proton	**Q)Deuterium nucleus(D)**
C)Neutron	**R)O^{-2} ion**
D)Alpha particle(α)	**S)Be^{2+} nucleus**
E)Positron(e^+)	**T)C^{14} atom**

Answer:A-R,B-Q,C-T,D-S,E-P

Solution:

Column-I	Column-II	Reason
A) Electron	R)O^{-2} ion	Both negatively charged (though charge differs).
B)Proton	Q)Deuterium nucleus(D)	Proton is the primary component of deuterium.
C)Neutron	T)C^{14} atom	C-14 is a heavy isotope with extra neutrons; matches neutral neutron
D)Alpha particle(α)	S)Be^{2+} nucleus	Both are small, highly charged nuclei.
E)Positron(e^+)	P)Na^+ ion	Both have +1 charge.

Learners Task

Conceptual Understanding Questions (CUQ's)

1. The electron was named by:

a) J.J. Thomson b) G.J. Stoney c) William Crookes d) Ernest Rutherford

Answer:B

Solution:George Johnstone Stoney (1874) coined the term "electron" to describe the fundamental unit of electric charge.

J.J. Thomson (1897) discovered the electron experimentally but did not name it.

2.Anode rays consist of:

a) Positively charged ions of the gas in the discharge tube

b) Negatively charged electrons

c) Neutral neutrons

d) Alpha particles

Answer:A

Solution:Anode rays are positive ions formed when gas atoms in the tube lose electrons. Their e/m ratio depends on the gas used (e.g., H^+ for hydrogen, O^+ for oxygen).

3.The neutron was discovered by:

a) J.J. Thomson b) James Chadwick c) Ernest Rutherford d) Goldstein

Answer:B

Solution:Chadwick (1932) identified neutrons by bombarding beryllium with alpha particles

4.Which reaction led to the discovery of the neutron?

$a)\,{}_2^4He + {}_4^9Be \rightarrow {}_6^{12}C + {}_0^1n$

$b)\,{}_1^1H + {}_0^1n \rightarrow {}_1^2D$

$c)\,{}_{92}^{238}U \rightarrow {}_{90}^{234}Th + {}_2^4He$

$d)\,{}_1^2D + {}_1^3T \rightarrow {}_2^4He + {}_0^1n$

Answer:A

Solution:Chadwick (1932) identified neutrons by bombarding beryllium with alpha particles

${}_2^4He + {}_4^9Be \rightarrow {}_6^{12}C + {}_0^1n$

5.The e/m ratio of cathode rays is maximum when the discharge tube is filled with:

a) Hydrogen (H_2) b) Oxygen (O_2) c) Neon (Ne) d) All give the same e/m ratio

Answer:D

Solution:Cathode rays are electrons, so their e/m ratio does not depend on the gas in the tube.

6.Positive rays have a lower e/m ratio than cathode rays because:

a) They are heavier (ions vs. electrons) b) They have a smaller charge

c) They move slower d) They are neutral

Answer:A

Solution:Positive rays are ions , which are thousands of times heavier than electrons, reducing their e/m ratio.

7.In a discharge tube, if deuterium (D_2) is used instead of hydrogen (H_2), the e/m ratio of cathode rays will:

a) Increase b) Decrease c) Remain the same d) Become zero

Answer:C

Solution:Cathode rays are electrons, so their e/m is unaffected by the gas (even if the gas contains heavier isotopes like deuterium).

8.Which statement about neutrons is FALSE?

a) They stabilize the nucleus despite having no charge.

b) They were discovered later than protons due to their neutrality.
c) They deflect in electric fields.
d) They are present in all isotopes except (^{1}H).

Answer:C

Solution:Neutrons are neutral, so they do not deflect in electric or magnetic fields.

9.If a discharge tube is filled with helium (He), the anode rays will primarily consist of:

a) He^{+} ions **b) He^{2+} ions** **c) Electrons** **d) Neutrons**

Answer:A

Solution:Anode rays are singly ionized gas atoms. Helium typically loses one electron first, forming He^{+}.

10.The specific charge (e/m) of an alpha particle (α) is approximately:

a) Half that of a proton **b) Equal to that of a proton**
c) Twice that of a proton **d) Four times that of a proton**

Answer:A

Solution:

$$\text{Alpha particle}: +2e\text{charge}, 4\text{u mass} \rightarrow e/m = \frac{2e}{4u}$$

$$\text{Proton}: +1\text{e charge}, 1\text{u mass} \rightarrow e/m = \frac{e}{1u}$$

$$\text{Thus}, \frac{(e/m)_{\alpha}}{(e/m)_{p}} = \frac{2/4}{1/1} = \frac{1}{2}$$

11.Which of the following is NOT a property of cathode rays?

a) They cast sharp shadows. **b) Their e/m ratio depends on the gas used.**
c) They rotate a paddle wheel in their path.
d) They are deflected toward a positively charged plate

Answer:B

Solution:The e/m ratio of cathode rays (electrons) is constant

JEE MAIN LEVEL QUESTIONS

1.Which statement about cathode rays is FALSE?

a) They travel in straight lines in absence of fields.
b) Their e/m ratio depends on the gas in the discharge tube.
c) They are deflected by electric and magnetic fields.

d) They consist of negatively charged particles.

Answer : B

Solution:Cathode rays are electrons, so their e/m ratio (1.76×10^{11}C/kg) is constant and independent of the gas.

2.Anode rays are produced due to:
a) Ionization of gas molecules in the discharge tube.
b) Emission of electrons from the cathode.
c) Radioactive decay of the anode material.
d) Nuclear fusion reactions.

Answer:A

Solution: Anode rays are positive ions formed when gas molecules lose electrons due to collisions in the tube.

3.The neutron was discovered by bombarding beryllium with:
a) Protons b) Alpha particles c) Electrons d) Gamma rays

Answer:B

Solution:Chadwick (1932) used alpha particles (^{4}He) to bombard ^{9}Be, producing neutrons: ${}_2^4He + {}_4^9Be \rightarrow {}_6^{12}C + {}_0^1n$

4.Which particle has the highest specific charge (e/m)?
a) Proton b) Electron c) Alpha particle d) Neutron

Answer: B

Solution: Electrons have very small mass and unit charge $\rightarrow$ highest e/m.

5.The e/m ratio of cathode rays is unaffected by changing the gas in the tube because:
a) Cathode rays are always electrons.
b) Gases ionize uniformly.
c) The anode material compensates.
d) Magnetic fields stabilize the ratio.

Answer:A

Solution: Cathode rays are electrons , which are identical regardless of the gas.

6.If a discharge tube is filled with neon (Ne), the anode rays will primarily consist of:
a) Ne^+ ions b) Ne^{2+} ions c) Electrons d) Neutrons

Answer:A

Solution:Anode rays are singly ionized gas atoms (Ne loses 1 electron first).

7.The specific charge (e/m) of a deuteron (D^+) compared to a proton (p^+) is:
a) Half b) Equal c) Twice d) Four times

Answer:A

Solution:Deuteron has same charge as proton (+e) but double the mass (1 proton + 1 neutron).

$$(e/m)_{D^+} = \frac{1}{2}(e/m)_{p^+}$$

8.Which statement about alpha particles is TRUE?
a) They have the same e/m as protons.
b) They are helium nuclei.
c) They are negatively charged.
d) They have higher e/m than electrons.

Answer:B

Solution:Alpha particles = He^{2+} = 2 protons + 2 neutrons

9.When uranium-238 decays by alpha emission, the product nucleus has:
a) 92 protons and 146 neutrons.
b) 90 protons and 144 neutrons.
c) 94 protons and 144 neutrons.
d) 88 protons and 138 neutrons.

Answer:B

Solution:Thorium-234 has 90 protons and 234-90=144 neutrons.

10.The deflection of cathode rays in a magnetic field depends on:
a) Charge and mass of the particle.
b) Speed of the particle.
c) Strength of the magnetic field.
d) All of the above.

Answer:D

Solution:Lorentz force F=qvB — depends on charge, mass, velocity, and field strength

11.The mass of an atom is 3.5 × 10^{25} kg. If its m/e ratio is 2.2 × 10^{-8} kg/C, the charge on the ion is:
a) +1.6 × 10^{-19} C b) +3.2 × 10^{-19} C c) +4.8 × 10^{-19} C d) +1.6 × 10^{-18} C

Answer: None

Solution:m/e=**2.2 × 10^{-8} kg/C,**

m=3.5 × 10^{25} kg

$$e = \frac{m}{m/e} = \frac{3.5 \times 10^{25}}{2.2 \times 10^{-8}} = 1.6 \times 10^{33}$$

12.Which isotope has the highest specific charge (e/m) for its +1 ion?
a) $^1H^+$ b) $^2D^+$ c) $^3T^+$ d) All have the same e/m.

Answer:A

Solution: $_1H^+$ (proton) has the lightest mass among the options, giving the highest e/m.

13.In a mass spectrometer, a Mg^{2+} ion (A=24) and an Al^{3+} ion (A=27) have the same radius. Their accelerating voltages are in the ratio:

a) 8:9 b) 9:8 c) 3:2 d) 2:3

Answer: NONE

Solution:

$$r=\sqrt{\frac{2mV}{q}} \Rightarrow V\alpha\frac{qr^2}{2m} \Rightarrow V\alpha\frac{q}{m}$$

$$\frac{V_{Mg}}{V_{Al}}=\frac{2/24}{3/27}=\frac{2}{24}\times\frac{27}{3}=\frac{1}{12}\times 9=\frac{3}{4}$$

14.When a beta particle (β^-) is emitted, the neutron-to-proton ratio in the nucleus:

a) Increases b) Decreases c) Remains the same d) Becomes zero.

Answer:B

Solution:Beta decay converts a neutron to a proton: $n \rightarrow p+e^-+\bar{\vartheta}_e$

Thus, neutrons decrease while protons increase.

15.The penetrating power of neutrons compared to alpha particles is higher because neutrons:

a) Have no charge. **b) Move at relativistic speeds.**

c) Are smaller in size. **d) Have higher mass.**

Answer:A

Solution: Neutral neutrons do not interact with electric fields in matter, allowing deeper penetration.

ADVANCED LEVEL QUESTIONS

MULTIPLE CORRECT ANSWER TYPE

16.Which of the following statements about alpha (a) particles are CORRECT?

A) Their e/m ratio is approximately half that of a proton.

B) They are deflected more than electrons in the same magnetic field.

C) They are emitted during the radioactive decay of heavy nuclei like uranium.

D) Their penetration power is higher than gamma rays due to their large mass.

Answer:A,C

Solution: A)Correct

$$\text{Alpha particle}: e/m = \frac{2e}{4m_p} = \frac{1}{2}\frac{e}{m_p}$$

$$\text{Proton}: e/m = \frac{e}{m_p}$$

$$Thus (e/m)_\alpha = \frac{1}{2}(e/m)_p$$

C)Correct: Alpha decay occurs in heavy nuclei

17.Which of the following statement(s) is/are INCORRECT about deuterium (^2H)?

A) Its nucleus contains one proton and one neutron.

B) Its specific charge (e/m) is twice that of a proton.

C) It is radioactive and decays to form tritium (^3H).

D) Its atomic mass is exactly 2 atomic mass units (amu).

Answer:B,C,D

Solution:B) False: Deuteron ($^2H^+$) has the same charge as a proton (+e) but double the mass, so e/m is half that of a proton.

C) False: Deuterium is stable and does not decay.

D) False: Actual mass = 2.014 amu (slightly > 2 due to binding energy).

STATEMENT TYPE

A) Both A & R are true and R is the correct explanation of A

B) Both A & R are true and R is not the correct explanation of A

C) A is true, R is false. **D) A is false, R is true.**

18.Assertion (A): Cathode rays consist of negatively charged particles.

Reason (R): They are deflected towards the positively charged plate in an electric field.

Answer:A

Solution:Assertion (A) is true because cathode rays are electrons, which are negatively charged.

Reason (R) is true and explains (A):

Negatively charged particles (electrons) are attracted to the positive plate in an electric field.

This deflection behavior confirms their negative charge.

19. Assertion (A): The e/m ratio of anode rays depends on the gas in the discharge tube.

Reason (R): Anode rays are ionized gas atoms/molecules, so their mass varies with the gas.

Answer:A

Solution:Assertion (A) is true because anode rays are positive ions, and their e/m depends on the ion's mass and charge.

Anode rays are gas-dependent and their mass varies with the gas, altering e/m.

COMPREHENSION

COMPREHENSION-I

The television picture tube is a cathode ray tube in which a picture is produced due to fluorescence on the television screen coated with suitable material. Similarly, fluorescent light tubes are also cathode rays tubes coated inside with suitable materials which produce visible light on being hit with cathode rays.

20.What is the primary function of the coated material inside a television picture tube?

a) To generate sound waves

b) To produce fluorescence when struck by cathode rays

c) To block external magnetic fields

d) To cool the cathode ray tube

Answer:B

Solution:The inner coating of the screen is made of phosphors (e.g., zinc sulfide).

When cathode rays (electrons) hit the coating, they excite the phosphors, causing them to fluoresce and emit visible light, creating the image.

21.How is a fluorescent light tube similar to a television picture tube?

a) Both use anode rays to produce light

b) Both rely on fluorescence caused by cathode rays

c) Both require a vacuum to function

d) Both emit X-rays for illumination

Answer:B

Solution:Fluorescent tubes use cathode rays to excite a mercury vapor coating, which emits UV light. This UV light then strikes the phosphor coating inside the tube, producing visible light.

TV tubes work similarly but direct cathode rays to specific phosphor dots to form images.

Key similarity: Both use cathode rays ? fluorescence for light production.

22.Why are cathode rays essential in both television tubes and fluorescent lights?

a) They carry a positive charge to neutralize the screen

b) They provide kinetic energy to trigger fluorescence in coated materials

c) They generate heat to warm the tubes

d) They create a magnetic field for image formation

Answer:B

Solution:Cathode rays are high-speed electrons that transfer energy to the phosphors/ coating, exciting electrons in the material.

When these electrons return to their ground state, they release energy as light (fluorescence).

Without cathode rays, the energy transfer needed for fluorescence would not occur.

INTEGER TYPE

23.The total charge on 1 mole of nitride ions (N^{3-}) is _____ Faraday.

Answer:3

Solution:Each nitride ion (N^{3-}) carries 3 negative charges.

For 1 mole of N^{3-} ions:

Total charge=3×1Faraday=3F.

24.Number of neutrons in one molecule of tritium oxide (T_2O) is _____.

Answer:12

Solution:Tritium (^3H): 1 proton, 2 neutrons

Each T has 2 neutrons $\rightarrow$ 2 T atoms = 4 neutrons

Oxygen (^{1}6O): 8 protons, 8 neutrons

Total neutrons = 4 (from 2 tritium) + 8 (from oxygen) = 12

25.Mass of 1 mole of neutrons is approximately equal to _____ grams.

Answer:1

Solution:Mass of 1 neutron $\approx 1.675\times10^{-24}$g

Mass of 1 mole (Avogadro number) = $6.022\times10^{23}\times1.675\times10^{-24}$ ˜1.008g

26.The number of electrons in 4.8 g of Mg^{2+} ions is _____ × 10^{23}.

Answer:12

Solution:

$$No.ofmoles = \frac{4.8}{24} = 0.2moles$$

$$Mg^{2+} = 10Electrons$$

$$TotalElectrons = 0.2\times10\times6\times10^{23} = 12\times10^{23}$$

27.How many grams of phosphorus-31 (^{31}P) contain the same number of neutrons as 7 g of lithium-7 (^{7}Li)?

Answer:7.75

Solution:Li $\rightarrow$7gms$\rightarrow$4 x 6 x10^{23} Neutrons

P$\rightarrow$31gms$\rightarrow$16 x 6 x10^{23} Neutrons

P$\rightarrow$4 x 6 x10^{23} Neutrons= x grams

$$31gms \rightarrow 16\times6\times10^{23}$$

$$xgms \rightarrow 4\times6\times10^{23}$$

$$x = \frac{31\times4\times6\times10^{23}}{16\times6\times10^{23}} = 7.75$$

MATRIX MATCHING TYPE

28. Column-I **Column-II**

A) Electron (e^-) **P) Negative charge, negligible mass**

B) Proton (p^+) **Q) Positive charge, ~1 amu mass**

C) Neutron (n°) **R) No charge, ~1 amu mass**

D) Alpha particle (α) **S) Double positive charge, ~4 amu**

E) Deuterium ion (D^+) **T) Single positive charge, ~2 amu**

Answer:A-P,B-Q,C-R,D-S,E-T

Solution:

A) Electron (e^-) P) Negative charge, negligible mass

B) Proton (p^+) Q) Positive charge, ~1 amu mass

C) Neutron (n°) R) No charge, ~1 amu mass

D) Alpha particle (α) S) Double positive charge, ~4 amu

E) Deuterium ion (D^+) T) Single positive charge, ~2 amu

KEY

				Teaching Task					
1	2	3	4	5	6	7	8	9	10
A	A	B	A	A	D	A	A	A	A
11	12	13	14	15	16	17	18	19	
A	A	A	A	A	A,C,D	A,B,D	B	C	
20									
A-R,B-Q,C-T,D-S,E-P									
				Learners Task					
			Conceptual Understanding Questions (CUQ's)						
1	2	3	4	5	6	7	8	9	10
B	A	B	A	D	A	C	C	A	A
11									
B									
			JEE MAIN LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	A	B	B	A	A	A	B	B	D
11	12	13	14	15					
NONE	A	NONE	B	A					
			ADVANCED LEVEL QUESTIONS						
16	17	18	19	20	21	22	23	24	25
A,C	B,C,D	A	A	B	B	B	3	12	1
26	27	28							
12	7..75	A-P,B-Q,C-R,D-S,E-T							

EdOS
Educational Operating System