

Marking Scheme ✓

Sr. Dubon

Chemistry

Monthly Evaluation

Test - 2021 June

(6) 1

A → 4p

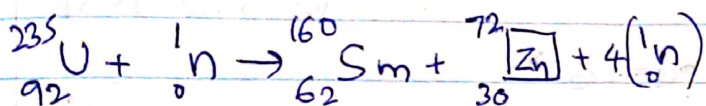
B → 4s ✓

C → 3d ✓

d → 3p ✓

(1) 3

(2) 1



3p → 4s → 3d → 4p

d < b < c < a

(3) 4

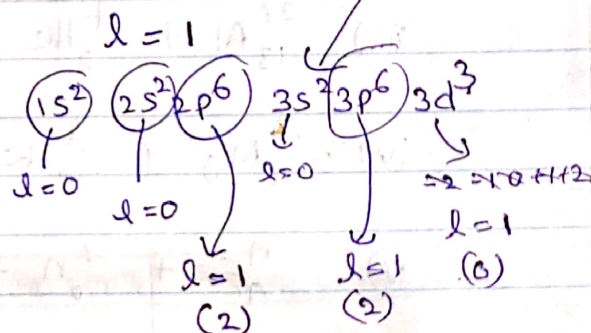
(4) 4

 $\text{Na}^+ \rightarrow 2s^2 2p^6 \rightarrow 0$ $\text{Cu}^+ \rightarrow 3d^{10} \rightarrow 0$ $\text{Fe}^{2+} \rightarrow 4$ $\text{Cu}^{2+} \rightarrow 1 \checkmark$ $\text{Cr}^{3+} \rightarrow 3$

(7) 3

(8) 1

(9) 2

 $\text{Cr}^{3+} \rightarrow 3d^3 4s^0$ $\text{Cr} \rightarrow 3d^5 4s^1$ 

(4) electrons

(5) all

$$E = \frac{hc}{\lambda}$$

$$= \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{400 \times 10^{-9}}$$

$$= 4.95 \times 10^{-19} \text{ J}$$

(10) 5

no of

photons

required

$$= \frac{100 \text{ J}}{4.95 \times 10^{-19} \text{ J}}$$

10 × 2 →

(20)

$$= 20.2 \times 10^{19}$$

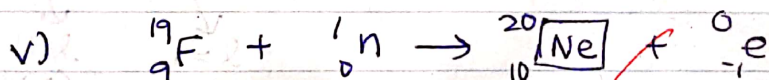
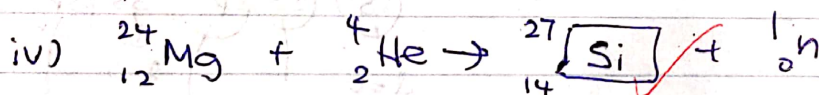
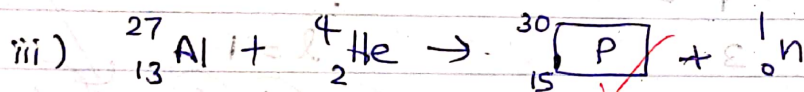
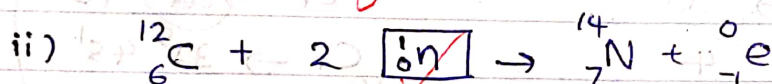
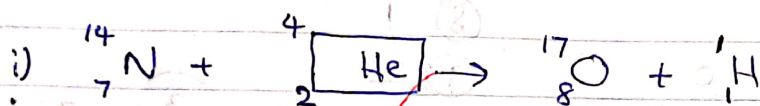
$$= 2.02 \times 10^{20}$$

II) $n=3, l=0, m_l=0 \rightarrow 3s \rightarrow \textcircled{2} \rightarrow 1s^2 2s^2 2p^6 3s^2$

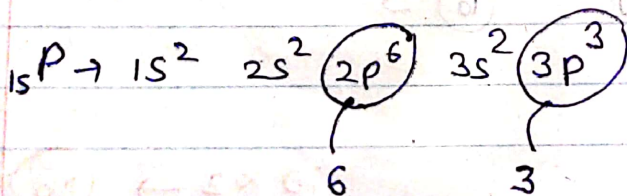
III) $n=3, l=1, m_l=-1 \rightarrow 3p_x \rightarrow \textcircled{2} \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^1$
 IV) $1s^2 2s^2 2p^6 3s^2 3p^4$

IV $\rightarrow n=3, l=0, m_l=+1, m_s=+\frac{1}{2} \rightarrow$

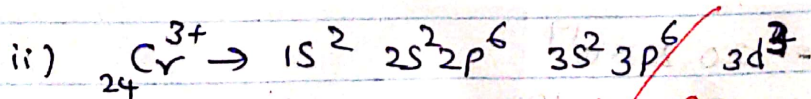
ii)



B) i) I) $l = 1 \rightarrow 9$ electrons ✓ 0.5



ii) $n=2, l=0$ $(2s) \rightarrow 2$ electrons.



ii) I) $m_s = +\frac{1}{2} \Rightarrow 1 + 1 + 3 + 1 + 3 + 3 = 9$ or 12

$$n + l = 4 \quad ; \quad m_s = -\frac{1}{2}$$

$$1 + 0 \times$$

$$2 + 0 \times$$

$$1 \times$$

$$3 + 0 \times$$

$$+ 1 \checkmark \rightarrow 3p \quad \boxed{1 \uparrow \downarrow 1 \uparrow}$$

$$4 + 0 \checkmark \rightarrow 4s \quad \boxed{1 \uparrow}$$

04 electrons
✓ 02

②

(A)

i)

ii)

16 $\times$ 6
⑧

G

H

I

E

F

C

B

A

frequency increases.

iii)

1) ABC

2) DEF

3) GH

16 $\times$ 6
 $\frac{1}{2} \times 6$
③

Name of the series	Region corresponds to EMS
Lyman ✓	UV ✓
Balmer ✓	visible ✓
Paschen ✓	IR ✓

iv)

n=5

n=4

n=3

P →

n=2

✓ ①

n=1

v)

 kJ mol^{-1}

$$n=5 \quad -52.5$$

$$n=4 \quad -82$$

$$n=3 \quad -146$$

$$n=2 \quad -328$$

$$n=1 \quad -1312$$

line with the least frequency = first line of the Paschen series

 $n=4 \text{ to } n=3$

$$\Delta E = -82 - (-146) \text{ kJ mol}^{-1}$$

$$= 64 \text{ kJ mol}^{-1}$$

energy of a photon = $\frac{64 \text{ kJ}}{6.022 \times 10^{23} \text{ mol}^{-1}}$

$$E = hf$$

$$f = \frac{E}{h} = \frac{64 \times 10^3 \text{ J}}{6.022 \times 10^{23}} \times \frac{1}{6.626 \times 10^{-34} \text{ JS}}$$

(15)

$$f = 1.6 \times 10^{14} \text{ Hz}$$

Answers for Essay Questions

No.

3 4
2 2

③ A)

- 1) ✓
- 2) X
- 3) ✓
- 4) X
- 5) X
- 6) X
- 7) ✓
- 8) ✓

$$08 \times \frac{1}{2} = 08$$

B) i) A → Lyman ✓ (01)
B → Balmer ✓ (01)

- ii) A₁ n=4 to n=1 ✓
A₂ n=3 to n=1 ✓
A₃ = n=2 to n=1 ✓
B₁ n=5 to n=2 ✓
B₂ n=4 to n=2 ✓
B₃ = n=3 to n=2 ✓

$$06 \times \frac{1}{2} = 06$$

ii) I) $E = \frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \text{ Js} \times 3 \times 10^8 \text{ m s}^{-1}}{420 \times 10^{-9} \text{ m}}$ ✓ (02)

energy of a photon = $4.73 \times 10^{-19} \text{ J}$ ✓ (01)

$$E = hf \quad v = f\lambda \quad f = \frac{3 \times 10^8 \text{ m s}^{-1}}{420 \times 10^{-9} \text{ m}} = 7.14 \times 10^{14} \text{ Hz}$$

✓ (01)

II) visible ✓ (400-700) ✓ (01)

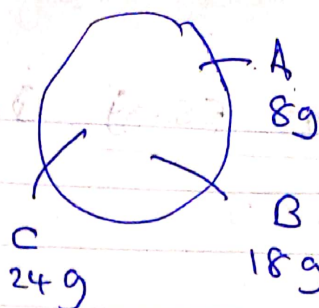
III) photography ✓ (01)

vision ✓ (01)

25

④ (A)

i)



$$\frac{w}{W} A = \frac{8}{8+24+18}$$

$$= \frac{4}{25} //$$

$$\frac{w}{W} B = \frac{18}{8+24+18}$$

$$= \frac{9}{25} //$$

$$\frac{w}{W} C = \frac{24}{8+24+18}$$

$$= \frac{12}{25} //$$

ii) moles of A = $\frac{8g}{4g/mol} = 2mol$

moles of B = $\frac{18g}{18g/mol} = 1mol$

moles of C = $\frac{24g}{12g/mol} = 2mol$

$$X_A = \frac{2}{5}$$

$$X_B = \frac{1}{5}$$

$$X_C = \frac{2}{5}$$

iii) mole % of A = $\frac{2}{5} \times 100\%$

$$= 40\%$$

mole % of C = $\frac{2}{5} \times 100\%$

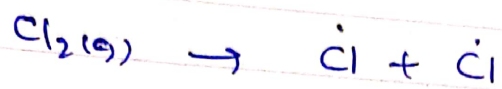
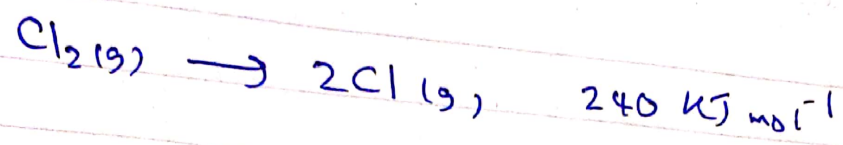
C

mole % of B = $\frac{1}{5} \times 100\%$

$$= 20\%$$

$$= 40\%$$

B)



i)

energy required for one bond = $\frac{240 \times 10^3 \text{ J mol}^{-1}}{6.022 \times 10^{23} \text{ mol}^{-1}}$

$$E = hf \quad \checkmark \quad \text{01}$$

$$\frac{E}{h} = f \quad \rightarrow \quad \frac{240 \times 10^3}{6.022 \times 10^{23}} \times \frac{1}{6.626 \times 10^{-34}} \quad \checkmark \quad \text{02}$$

$$\rightarrow 6 \times 10^{14} \text{ Hz}$$

ii)

$$v = f\lambda$$

$$\frac{v}{f} = \lambda \quad \checkmark \quad \text{01} \rightarrow \frac{3 \times 10^8 \text{ ms}^{-1}}{6 \times 10^{14} \text{ Hz}} \quad \checkmark \quad \text{01}$$

$$\rightarrow 5 \times 10^{-7} \text{ m}$$

$$\rightarrow \frac{5 \times 10^{-7} \times 10^2}{10^{-2}} \text{ m}$$

iii) visible region.

500 nm /

(25)

$$\text{MCR} \rightarrow 20$$

$$\text{SE} \rightarrow 15 \times 2 \rightarrow 30$$

$$E \rightarrow 25 \times 2 \rightarrow 50$$

100%.

Dilans