2014

PHYSICAL SCIENCE

(Bifurcated Syllabus)

(For Regular & External Candidates)

Time : 3 Hours 15 Minutes   Full Marks : 90 (for Regular Candidates)

(First *fifteen* minutes for   : 100 (for External candidates)

reading question paper only

and 3 hours for writing)

Special credit will be given for answers which are brief and to the point.

Marks will be deducted for spelling mistakes, untidiness and bad handwriting.

Group 'A' is compulsory. Answer ten questions from Groups

'B', 'C' and 'D' taking at least two from Group 'B' and at

least three from each of the Groups 'C' and 'D'.

Besides this only the External Candidates will answer Group 'E'.

Figures in the margin indicate full marks for each question.

Group 'A'

1.   Give very short answers to any *ten* questions.   1x10

1.1   What is the number of neutrons in $_{92}U^{235}$?

1.2   How many groups are present in the long form of

periodic table?

1.3   How many oxygen atoms are there in 1 mole of

CO_2 ?

1.4   What is gram molecular mass of nitrogen ?

(N=14)

1.5   Where will the image of sun be formed by a

convex lens with respect to the sun?

1.6   Between a thick and thin wore of copper of

same length which wire has greater resistance ?

1.7   What is the boiling point of water in Kelvin

       scale at standard pressure ?

1.8   What is SI unit of electric power ?

1.9   Which gas is evolved by the reaction of common

       salt with concentrated H_2SO_4 ?

1.10   What is the difference in number of hydrogen

       atoms between an alkene and an alkyne having

       the same number of carbon atoms ?

1.11   Which component is present in higher percentage

       in brass ?

1.12   Mention one use f acetylene.

1.13   Which acid produces brown fumes on heating ?

Group 'B'

2.1   The atomic number of an element is 13; write

        electronic arrangement of its atom.   2

2.2   There are seven electrons in the outer most orbit of

        an atom of an element. What are its atomic

       number and valency ? (Outermost orbit is M

       orbit)   1+1

2.3   State Charles's law. At constant pressure the volume

       of a definite mass of a gas at 0^0 C is doubled by

       heating. What will be its final temperature?   2+2

3.1 $_1H^1$, $_1H^2$, $_1H^3$ – what is the relation among them?

       In the nucleus of which of them there is no

       neutron ?   1+1

3.2   What is absolute zero temperature ? What is its

value in Celsius scale ?   2+1

3.3   What is the value of standard pressure ? How

does the pressure of a gas depend on the motion

of a gas molecule ?   1+2

4.1   Define ion. How many types of ion are there?

Write with example.   2+1+1

4.2   At a constant temperature the volume of a

certain amount of gas is compressed to half of

its initial volume by applying pressure. Calculate

the increase in pressure.   2

4.3 SO_3 is prepared by oxidizing SO_2 with oxygen

in presence of a catalyst. How many gram of

SO_2 will be required to produce 40 g of SO_3 ?

(O=16, S=32)   2

5.1.1 Define molecular mass in C-12 scale.

5.1.2 At STP n number of N_2 molecules occupies a

volume of v litre. What volume $n/2$ number of

CO_2 molecules will occupy at STP?   2+1

5.2   If the number of molecules present in 9 gram of

water is n, what will be the number of

 molecules present in 44 gram of carbon

 dioxide ? [H=1, C=12, O=16]   2

5.3   What is molar volume of a gas ? What is its

value at STP ?   2+1

Group 'C'

6.1   Define specific heat.

6.2   Write two differences between thermal capacity

        and water equivalent of a body. Write their SI units. 2+2

6.3   The temperature of a body is increased by 72^0

        in Fahrenheit scale. What would be the increase

        in Celsius scale ?   2

7.1   What is lens ? How would you identify

        whether a lens is convex or concave ?   2+2

7.2   What is meant by optical centre of a convex

        lens ?   2

7.3   At which point does a beam of light parallel to

        the axis of a convex lens being incident on it

        meet on the axis after emergence ? Whether the

        image formed at this point is real or virtual ?   1+1

8.1   The linear magnification of an image of an

        objects is 2.5 What is mean by this ?   2

8.2.1   What are meant by pure and impure spectrum ?

8.2.2   What are the terminal colours of the spectrum

        of white light formed by a prism ?   2+2

8.3   How is convex lens used as a magnifying glass ?   2

9.1   What is the importance of 'earthing' in

        household wiring ?   2

9.2   Why is one pin of a three pin plug top kept

	comparatively thicker ?	2
9.3.1	What is a fuse and why is it used ?	
9.3.2	State Fleming's left hand rule.	2+2

10.1	The electromotive force of a cell is 6 volt.	
	What is meant by this ?	2
10.2	At what rate heat will be produced when 10 ampere current is passed through a conductor of resistance 30 ohm ?	2
10.3.1	Write how the resistance of a conducing wire depends on the length and area of cross-section of the wire.	
10.3.2	A 220 V- 40W bulb is connected to 220 volt mains. What is the current flowing through the bulb ?	2+2

11.1.1	Which particle is emitted when a metal is heated at high temperature in vacuum ?	
11.1.2	Compare the charge and the penetrating power of α and β rays.	1+2
11.2	How is x rays produced ?	2
11.3.1	Mention one similarity and one dissimilarity between x ray and γ ray.	
11.3.2	Mention one harmful effect of radioactivity ?	2+1

Group 'D'

12.1	Cl(17), Na(11), Mg(12), Ca(20), S(16), F(9) –
	among these

(i) Which metallic elements belong to the

second group of Mendeleef's periodic table?

(ii) which non-metallic element belong to the

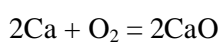third period of Mendeleef's periodic table?

[The atomic numbers of the elements are given

within the brackets after the symbols of the elements].   2

12.2   Match the right column with the left column.

Left Column	Right Column
1. Calcium chloride s a	(i) 4
2. The number of elements in the third period of the long periodic table is	(ii) bigger
3. The total number of covalent bonds in ethylene molecule is	(iii) electrovalent compound
4. Water is a	(iv) 7
5. The number of electrons in the outermost orbit of fluorine is	(v) smaller
6. The atomic size of Na in comparison to the atomic size of K is	(vi) 8
7. The total number of covalent bonds in methane molecule is	(vii) 6
8. The atomic size of S in comparison to the atomic size of Cl is	(viii) covalent compound

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12.3   When calcium is burnt in air calcium oxide is

produced :

$2Ca + O_2 = 2CaO$

From the theory of oxidation-reduction

show that the above reaction is an oxidation-reduction reaction.

13.1   The atomic numbers of the elements A, B, C and D are 3, 9, 11 and 17 respectively. Which one among these is the most electropositive element and which one is the most electronegative element ?   2

13.2   Mention one use of each of blue vitriol and vinegar.   2

13.3.1 What are used as electrolyte, cathode and anode in the electrolytic method of extraction of aluminium ?

13.3.2 An acid may be either nitric acid r sulfuric acid . By one experiment identify which one is sulfuric acid. Write the balanced chemical equation of the reaction.   2+2

14.1   Write the balanced chemical equation of the reaction used for the laboratory preparation of nitric acid and mention the condition for this preparation.   2

14.2   Write the balanced chemical equations of the reactions involved in the preparation of nitric acid by the catalytic oxidation of ammonia.   4

14.3   What is aqua regia ? Mention one use of it.   2

15.1   Give one example of one ore of each of copper and

zinc.   2

15.2   What is 'stone cancer' ?

15.3   Write with balanced chemical equation what

        happens when :

        (i) concentrated nitric acid is heated with copper

            tunings

        (ii) aluminium powder is boiled with concentrated

             aqueous solution of sodium hydroxide.   2+2

16.1   Name one alloy of aluminium. Mention one use

        of it.   2

16.21   From the functional group given below choose

        the functional group present in acetone and ethyl

        alcohol :

        $-C \equiv C-$, $>C=O$, $-OH$, $-COOH$, $-CHO$.   2

16.3   How would you convert?

        (i) $CH_4 \rightarrow CH_3Cl$

        (ii) $H_2C=CH_2 \rightarrow CH_3-CH_3$ 2+2

17.1   How does polymer differ from monomer ? Write

        with one example.   3

17.2   How is 'will-o'-the-wisp' produced ?   2

17.3.1 What is fuming sulfuric acid?

17.3.2 MA_2 is an electrovalent compound (M is a

        metallic element and A is a non-metallic

        element). To which ions it is dissociated in

        aqueous solution ? Which ion goes to the

        cathode during the electrolysis of aqueous

        solution of MA_2 ?   1+2

Group-'E'

18. Answer any *five* questions :   2x5

18.1   What is gram atomic mass? Answer with an

        example.

18.2   What are group and period in the periodic

        table ?

18.3   How many gram HCl will be required to

        completely neutralize 80g of NaOH ?

        (H=1, O=16, Na=23, Cl=35.5)

18.4   Write Ohm's law.

18.5   From which part of the atom of a radioactive

        element α-particle is emitted? Give one reason

        in support of your answer.

18.6   Mention one use of each of the metals copper

        and magnesium.

18.7   Give one example of addition reaction of

        acetylene.

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