CLASS

9

BVPY QUESTION PAPER – STAGE 1

December 17, 2020

Part A – Mathematics (Q1 to Q30)

Part B – Science (Q1 to Q30)

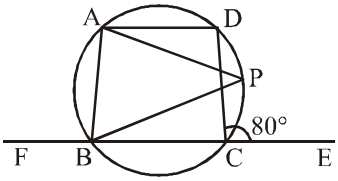
Maximum Marks: 60 **Duration : 60 minutes**

Instructions for Students :

1. Each question carries one mark.
2. This paper consists two parts i.e. Part 'A' (Mathematics) Q.1 to 30, Part 'B'(Science) Q1 to 30.
3. There is no negative marking .

PART 'A' (MATHEMATICS)

1. In the given figure (not to scale), $\overline{PA}$ and $\overline{PB}$ are equal chords and $ABCD$ is a cyclic quadrilateral. If $\angle DCE = 80°$, $\angle DAP = 30°$ then find $\angle APB$ -



A. 40° B. 80°

C. 90° D. 160°

2. In a trapezium $ABCD$, $AB \| CD$ and $AD = BC$. If P is point of intersection of diagonals AC and BD, then all of the following is wrong except -

A. $PA.PB = PC.PD$ B. $PA.PC = PB.PD$

C. $PA.AB = PD.DC$ D. None of these

3. If $x = 2 + \sqrt{3}$ then the value of $x - \frac{1}{x}$ correct to two decimal places is -

A. 3.50 B. 3.40

C. 3.46 D. 3.80

4. If $x = 3 + 2\sqrt{2}$ then the value of $x^{1/2} + x^{-1/2}$ is

A. $\sqrt{2}$ B. $2\sqrt{2}$

C. $3\sqrt{2}$ D. $\sqrt{3}$

5. A bus conductor gets a total of 220 coins of 25 paise, 50 paise and Re. 1 daily. One day he got Rs 110 and next day he got Rs 80 in that the number of coins of 25 paise and 50 paise coins are interchanged then find the total number of 50 paise coins and 25 paise coins.

A. 180 B. 190

C. 160 D. 200

6. The number of possible pairs of succesive prime numbers such that each of them is greater than 40 and their sum is atmost 100 is

A. 3 B. 2

C. 4 D. 1

7. The largest possible area of ΔABC with AB = 5 cm and the sum of other two sides as 7 cm is

A. $5\sqrt{6}\,\text{cm}^2$ B. $\frac{5}{2}\sqrt{6}\,\text{cm}^2$

C. $\frac{5}{2}\sqrt{3}\,\text{cm}^2$ D. $5\sqrt{3}\,\text{cm}^2$

8. If $(x-3)$, $(x-3)$ are factors of $x^3 - 4x^2 - 3x + 18$; then the other factor is :

A. $x + 2$ B. $x + 3$

C. $x - 2$ D. $x + 6$

9. The remainder when $1 + x + x^2 + x^3 + ...+ x^{2006}$ is divided by $x - 1$ is :

A. 2005 B. 2006

C. 2007 D. 2008

10. $x^{831} + y^{831}$ is always divisible by

A. $x - y$ B. $x^2 + y^2$

C. $x + y$ D. None of these

11. A pond 100 m in diameter is surrounded by a circular grass walk $2m$ wide. How many square meters of grass is there on the walk ?

A. 98π B. 100π

C. 204π D. 202π

12. If the perimeter of an isosceles right triangle is $(6+3\sqrt{2})$, then the area of the triangle is :

A. 4.5 m^2 B. 5.4 m^2

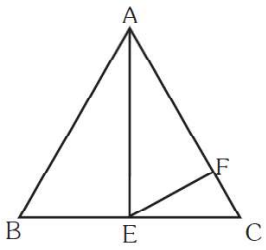
C. 9 m^2 D. 81 m^2

13. A triangle and a parallelogram are constructed on the same base such that their areas are equal. If the altitude of the parallelogram is 100 m, then the altitude of the triangle is :

A. 100 m B. 200 m

C. $100\sqrt{2}\,m$ D. $10\sqrt{2}\,m$

14. In the given figure, ABC is an isosceles triangle with AB = AC. If AE = AF and $\angle BAE = 40^\circ$, then the measure of the angle FEC is



A. 15° B. 20°

C. 60° D. 40°

15. The cross-section of a canal is in the form of a trapezium. If the canal top is 10 *m* wide and the bottom is 6 *m* wide, and the area of cross-section is 72 m^2, then the depth of the canal is :

A. 10 *m* B. 7 *m*

C. 6 *m* D. 9 *m*

16. Three cubes with sides in the ratio 3 : 4 : 5 are melted to form a single cube whose diagonal is $12\sqrt{3}$ *cm*. The sides of the cubes are :

A. 6 *cm*, 8 *cm*, 10 *cm* B. 3 *cm*, 4 *cm*, 5 *cm*

C. 9 *cm*, 12 *cm*, 15 *cm* D. None of these

17. A bag contains 2 red, 3 green and 2 blue balls. 2 balls are to be drawn randomly. What is the probability that the balls drawn contain no blue ball?

A. $\frac{5}{7}$ B. $\frac{10}{21}$

C. $\frac{2}{7}$ D. $\frac{11}{21}$

18. Two dice are tossed. The probability that the total score is a prime number is -

A. $\frac{1}{6}$ B. $\frac{5}{12}$

C. $\frac{1}{2}$ D. $\frac{7}{9}$

19. The probability that an event A happens in one trial of an experiment is 0.4. Three independent trials of the experiment are formed. The probability that the event A happens at least once is -

A. 0.934 B. 0.784

C. 0.548 D. 0.343

20. Find the value of p, if the mean of following distribution is 7.5.

x : 3 5 7 9 11 13

y : 6 8 15 p 8 4

A. 1 B. 3

C. 2 D. 4

21. The median of 0, 2, 2, 2, –3, 5, –1, 5, 5, –3, 6, 6, 5, 6 is :

A. 0 B. –1.5

C. 2 D. 3.5

22. If the ratio of mode and median is 9 : 7, then find the ratio of mean and mode.

A. 2 : 3 B. 4 : 5

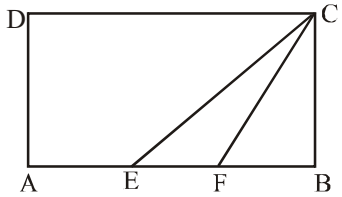
C. 5 : 9 D. 8 : 9

23. The square root of a perfect square containing '*n*' digits has _____ digits

A. $\frac{n+1}{2}$ B. $\frac{n}{2}$

C. A or B D. None of these

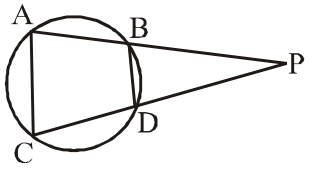
24. In the adjoining diagram, *ABCD* is a rectangle with *AE* = *EF* = *FB*. What is the ratio of the area of the triangle *CEF* and that of the rectangle?



A. 1 : 4 B. 1 : 6

C. 2 : 5 D. 2 : 3

25. In the given figure (not to scale), *AB* = *CD* and $\overline{AB}$ and $\overline{CD}$ are produced to meet at the point *P*. If $\angle BAC = 70°$, then find $\angle P$ -



A. 30° B. 40°

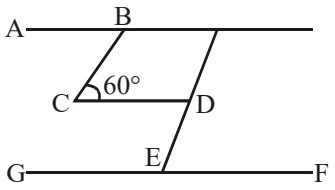
C. 45° D. 50°

26. The last digit of the number $(373)^{333}$ is -

A. 1 B. 2

C. 3 D. 9

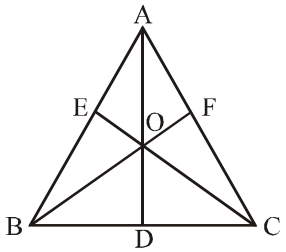
27. In the given figure, $AB \| CD$, $CD \| EF$ and $BC \| DE$. Find $\angle DEG$ given that $\angle BCD = 60°$



A. 60° B. 120°

C. 90° D. 150°

28. In the given figure, AD, BF and CE are medians of a triangle ABC and O is a point of concurrence of medians. If $AD = 6\ cm$, then OD is equal to -



A. $2\ cm$ B. $3\ cm$

C. $4\ cm$ D. $\frac{2}{3} cm$

29. Find the approximate value of $\angle A$ in ΔABC is $8\angle A = 9\angle B = 4\angle C$

A. 56° B. 58°

C. 49° D. 46°

30. A number is picked up at random from the numbers from 1 to 1000. The probability that it is of the form m^n (where $m > 1$, $n > 1$) is

A. $\frac{1}{20}$ B. $\frac{1}{25}$

C. $\frac{1}{30}$ D. $\frac{1}{39}$

PART 'B' (SCIENCE)

1. The water flows through three holes made at different heights of a vessel. The pressure is maximum at :

   A. the topmost hole
   B. the middle hole
   C. the lowermost hole
   D. is same at all holes

2. If 10 *C* charge flows through a conductor in 2*s* then the value of the current flowing through the conductor is

   A. 5*A*
   B. 2*A*
   C. 3*A*
   D. 1*A*

3. The phenomenon of the change in the path of the light as it passes from one optical medium to another is called :

   A. Reflection of light
   B. Refraction of light
   C. Dispersion of light
   D. Both *A* and *B*

4. A stone is dropped from the top of a tower. Its velocity after it has fallen 20 *m* is [Take g = 10 ms^{-2}] :

   A. 5 ms^{-1}
   B. 10 ms^{-1}
   C. 15 ms^{-1}
   D. 20 ms^{-1}

5. *S.I.* unit of *G* is :

   A. $Nm^2\ kg^{-2}$
   B. $Nm\ kg^{-2}$
   C. $N\ kg^2\ M^{-2}$
   D. $Nkg\ m^{-2}$

6. When a body is dropped form same height on surface of the earth and the moon the ratio of time to reach the ground will be :

   A. 1 : 6
   B. 6 : 1
   C. $\sqrt{6}$: 1
   D. 1 : $\sqrt{6}$

7. Buoyant force is inversely proportional to :

   A. Volume body immersed in a liquid
   B. Density of fluid
   C. Acceleration due to gravity
   D. Temperature of fluid

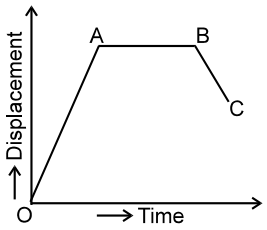
8. If a stone of mass '*m*' falls a vertical distance '*d*' the decrease in gravitational potential energy is :

   A. $\frac{Mg}{d}$
   B. $\frac{Mg^2}{2}$
   C. mgd
   D. $\frac{Mg}{d^2}$

9. A weight lifter lifts 240 *kg* from the ground to a height of 2.5 *m* in 3 second his average power is :

A. 1960 *W*
B. 19.6 *W*
C. 1.96 *W*
D. 196 *W*

10. In figure *BC* represents a body moving : (take forward direction as positive and backward direction as negative)



A. Backward with uniform velocity
B. Forward with uniform velocity
C. Backward with non-uniform velocity
D. Forward with non-uniform velocity

11. Match column I with column II and select the correct option from the codes given below.

Column I	Column II
A. Sublimation	(i) Separation of water and CCl_4
B. Magnetic separation	(ii) Separation of NaCl from KNO_3
C. Distillation	(iii) Separation of benzene and aniline
D. Separating funnel	(iv) Separation of iron and sand
E. Fractional crystallisation	(v) Separation of iodine and sand

A. A. - (i), B. - (ii), C. - (iii), D. - (iv), E. - (v)
B. A. - (v), B. - (iv), C. - (iii), D. - (i), E. - (ii)
C. A. - (iv), B. - (v), C. - (ii), D. - (i), E. - (iii)
D. A. - (i), B. - (ii), C. - (iv), D. - (v), E. - (iii)

12. The boiling points of a few gases found in air are given below:

Element	Krypton	Neon	Nitrogen	Oxygen
Boiling point (^{0}C)	–152	–264	–196	–183

If liquid mixture is fractionally distilled, the order of gases distilling out is:

A. Krypton, Neon, Nitrogen, Oxygen
B. Neon, Nitrogen, Oxygen, Krypton
C. Nitrogen, Neon, Oxygen, Krypton
D. Oxygen, Neon, Nitrogen, Krypton

13. An organic compound '*X*' has a melting point of -33º*C* and a boiling point of 66º*C*. The physical states of substance '*X*' at temperature -100º*C*, 0º*C* and 100º*C* are respectively:

A. Solid, liquid and liquid
B. Liquid, solid and liquid
C. Solid, liquid and gas
D. Gas, liquid and liquid

14. Sulphate of divalent metal *M* exists in hydrated form. If 0.10 *mol* of metal sulphate combines with 9.0 *g* of water to form the hydrated salt then, the formula of hydrated metal sulphate will be :

A. $MSO_4.H_2O$ B. $M_2SO_4.2H_2O$

C. $M_2SO_4.3H_2O$ D. $MSO_4.5H_2O$

15. Which of the following statement is/are correct?

(I) 5 moles of CO_2 and 5 moles of H_2O have the same mass.

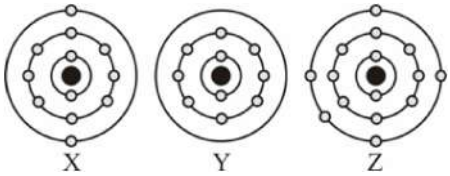
(II) 100 g of NH_3 has more atoms than that present in 100 g of N_2.

(III) 16 g of solid sulphur contains 3.76×10^{22} molecules.

A. I and II only B. II and III only

C. III only D. I only

16. The schematic atomic structures of three elements *X, Y* and *Z* are given as :



Which of the following statements is/are incorrect?

I. *Z* can form ZCl_3 and ZCl_5.

II. *Y* exists in monoatomic form.

III. *X* and *Z* combine to form X_3Z type compound.

IV. *X* and *Y* combine to form XY_2 type compound.

V. *X* will gain two electrons to form a stable compound.

A. I and II only B. I, II and IV only

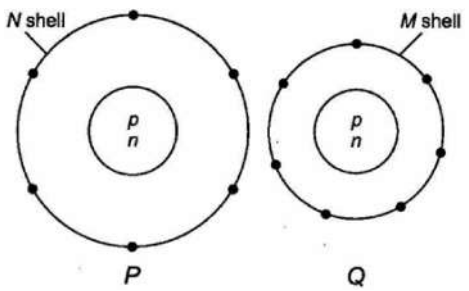
C. II, IV and V only D. III, IV and V only

17. The nucleon number of an atom *Q* is 49. Atom *Q* exists as a tetraatomic molecule, Q_4. One molecule of Q_4 contains 68 protons. How many neutrons are present in the nucleus of atom *Q* ?

A. 32 B. 68

C. 49 D. 57

18. Electrons distribution of two elements *P* and *Q* in their outermost shell is shown below.



Atomic numbers of *P* and *Q* are respectively.

A. 9, 17
B. 15, 17
C. 34, 17
D. 17, 24

19. Properties of substances *W, X, Y* and *Z* are listed below:

W : *A* liquid metal

X : *A* liquid non - metal

Y : Non-metal essential for respiration

Z : Non-metal which can conduct electricity

W, X, Y and *Z* are respectively

A. Iron, iodine, hydrogen and oxygen
B. Gold, sulphur, chlorine and hydrogen
C. Copper, phosphorus, nitrogen and carbon
D. Mercury, bromine, oxygen and graphite.

20. Calorific values of some fuels are given;

Fuel	Calorific value (kJ / kg)
Coal	25000 - 33000
Diesel	45,000
LPG	55,000
CNG	50,000

On the basis of this data, find out the correct order of efficiency of fuels.

A. LPG > CNG > Diesel > Coal
B. Coal > Diesel > LPG > CNG
C. Diesel > CNG > Coal > LPG
D. CNG > LPG > Diesel > Coal

21. Humans are classified according to the following hierarchy :

Animalia → Chordata → Mammalia → Primates → Hominidae → Homo → sapiens

Which category is represented by Primates in the above hierarchy ?

A. Order
B. Genus
C. Family
D. Kingdom

22. Which of the following statement is true regarding nitrogen fixation ?

A. Nitrosomonas converts ammonia into nitrate
B. Nitrobacter converts nitrites into nitrate
C. Both steps A. and B. can be called nitrification
D. Bacteria carrying out these conversions are usually called photoautotrophs.

23. A non membrane bound organelle exclusively in animal cell :

A. Sphaerosome
B. Glyoxisome
C. Peroxisome
D. Centriole

24. Rapid elongation of a bamboo stem is due to

A. Intercalary meristem
B. Apical meristem
C. Cambium
D. Lateral meristem

25. Find out the correct sentence.

(i) Hybridisation means crossing between genetically dissimilar plants
(ii) Cross between two varieties is called as inter specific hybridisation
(iii) Introducing genes of desired character into a plant gives genetically modified crop
(iv) Cross between plants of two species is called as inter varietal hybridisation

A. (i) and (iii)
B. (ii) and (iv)
C. (ii) and (iii)
D. (iii) and (iv)

26. This organism is not an example of eukaryotic cells

A. Euglena viridis
B. Escherichia coli
C. Amoeba proteus
D. Paramoeciumcaudatum

27. Choose the vascular plants out of these.

A. mosses
B. liverworts
C. hornworts
D. ferns

28. Bacterium divides every 35 minutes. If a culture containing 10^5 cells per mL is grown for 175 minutes, what will be the cell concentration per mL after 175 minutes ?

A. 5×10^5 cells
B. 35×10^5 cells
C. 32×10^5 cells
D. 174×10^5 cells

29. Sets of reproductive terms are given below. Choose the set that has an incorrect combination.

A. Sperm, testis, sperm duct, penis
B. Menstruation, egg, oviduct, uterus
C. Sperm, oviduct, egg, uterus
D. Ovulation, egg, oviduct, uterus

30. Animals exhibiting external fertilisation produce a large number of gametes. Pick the appropriate reason from the following

A. The animals are small in size and want to produce more offsprings
B. Food is available in plenty in water
C. To ensure better chance of fertilisation
D. Water promotes production of large number of gametes

Space for rough work

Space for rough work