



DPS Science & Mathematics TALENT EXAMINATION 2018-2019

2nd LEVEL

Time : 2 hrs.

Total Marks : 100

Guidelines for the Candidate

1. The paper consists of two sections –
Science (60 Questions) : Physics (20 Questions), Chemistry (20 Questions) & Biology (20 Questions) and
Mathematics (40 Questions)
2. All questions are compulsory and carry equal marks. There is no negative marking. Use of calculator is not permitted.
3. Write your Name, School Name and Roll No. clearly on the OMR sheet and do not forget to sign it.
4. There is only one correct answer hence mark one choice only.
5. Darken your choice with HB Pencil or Blue / Black Ball Point Pen only.

For example :

Q.16 : In the water cycle, condensation is the process of

- (A) Water vapour cooling down and turning into a liquid
- (B) Ice warming up and turning into a liquid
- (C) Liquid cooling down and turning into ice
- (D) Liquid warming up and turning into water vapour
- (E) None of these

As the correct answer is option (A), the candidate should darken the circle corresponding to option (A).

16. (B) (C) (D) (E)

6. Rough work should be done in the blank space provided in the booklet.
7. Return the OMR SHEET and QUESTION PAPER to the invigilator at the end of the examination.

A Collaborative Project of DPS Society & Science Olympiad Foundation

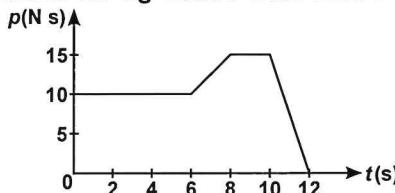


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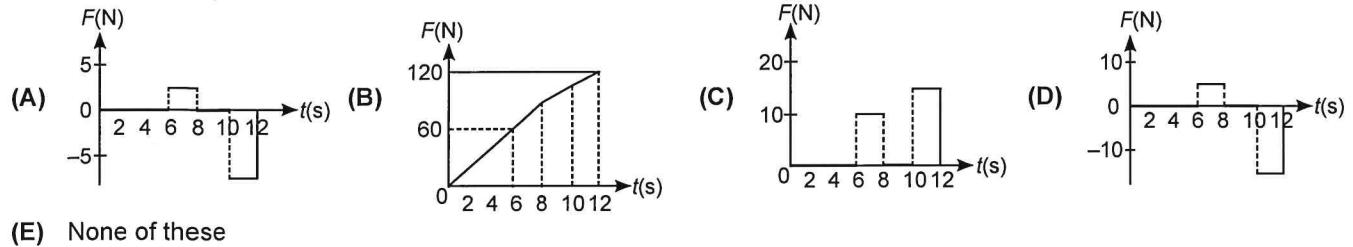
PHYSICS

1. The speed limit of a stretch of road along the victory highway is 100 km/h. A police radar speed check system detects a van speeding at its top speed of 40 m/s. Half a minute later, a police car, hiding at a distance 200 m after the speed detector, accelerates from rest at a rate of 3 m/s^2 to its full speed of 54 m/s. Which of the following statements is/are correct?
- (A) The police car travels 1200 m before it reaches its top speed.
 (B) When the police car just reaches its full speed, the distance between the van and the police car is 1234 m.
 (C) The police car travels 486 m before it reaches its top speed.
 (D) Both (B) and (C).
 (E) None of these

2. The momentum p of a particle of mass 2.0 kg varies with time t as shown in the figure.



Which of these graphs best represents how the force F acting on the particle varies with time t ?



(E) None of these

3. A 4 kg block moving with a velocity 100 m/s collides with 16 kg block moving with a velocity of 4 m/s in the same direction. If they coalesce on impact then find velocity of blocks and the loss of energy resulting from the impact.

(A) 5.2 m/s and 58 J (B) 10.4 m/s and 29 J (C) 2.5 m/s and 60 J (D) 5.2 m/s and 29 J
 (E) None of these

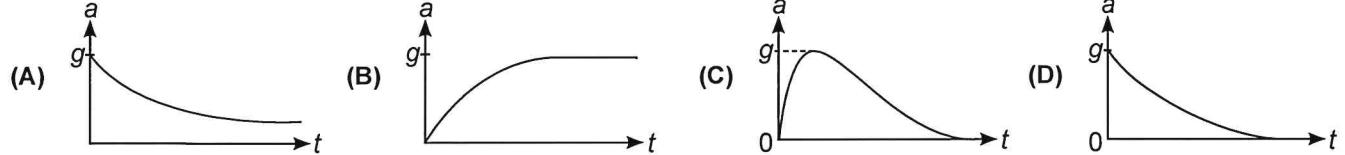
4. An anchored boat is observed to rise and fall through a total range of 2 m once every 4 s as the waves whose crests are 30 m apart pass it. Find (i) the frequency of the waves, (ii) their velocity and (iii) their amplitude.

(i) (A) 0.25 Hz	(ii) (B) 15 m/s	(iii) (C) 2 m	(i) (D) 0.5 Hz	(ii) (B) 10 m/s	(iii) (E) 2 m
(C) 0.25 Hz	(D) 7.5 m/s	(E) 1 m	(D) 0.5 Hz	(ii) (C) 15 m/s	(iii) (D) 1 m

(E) None of these

5. An object is dropped from a great height so that air resistance becomes significant. Which of the following graphs shows how its acceleration (a) varies with time (t)?

(g is the acceleration due to gravity at the given height.)



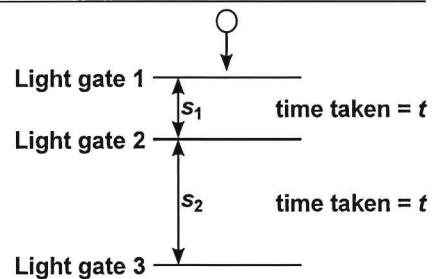
(E) None of these.

6. An object falls freely with constant acceleration a from above three light gates. It is found that it takes a time t to fall between the first two light gates a distance of s_1 apart. It then takes an additional time, also t , to fall between the second and third light gates a distance s_2 apart.

What is the acceleration in terms of s_1 , s_2 and t ?

(A) $\frac{(s_2 - s_1)}{t^2}$	(B) $\frac{(s_2 - s_1)}{2t^2}$
(C) $\frac{2(s_2 - s_1)}{3t^2}$	(D) $\frac{2(s_2 - s_1)}{t^2}$

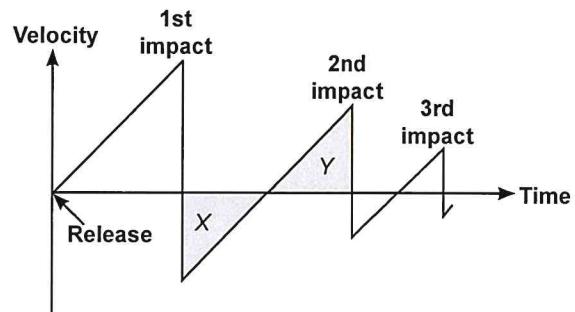
(E) None of these



7. A ball is released from rest above a horizontal surface. The graph shows the variation of its velocity with time.

The areas X and Y are equal because

- (A) For first impact, the speed at which the ball hits the surface equals the speed at which it leaves the surface.
- (B) The ball rises and falls through the same distance between impacts.
- (C) The ball's acceleration is the same during its upward and downward motion.
- (D) The speed at which the ball leaves the surface after an impact is equal to the speed at which it returns toward the surface for the next impact.
- (E) None of these



8. Assertion : The time period of revolution of a satellite close to surface of earth is smaller than that revolving away from surface of earth.

Reason : The square of time period of revolution of a satellite is directly proportional to cube of its orbital radius.

- (A) Both assertion and reason are true and reason is the correct explanation of assertion.
- (B) Both assertion and reason are true but reason is not the correct explanation of assertion.
- (C) Assertion is true but reason is false.
- (D) Both assertion and reason are false.
- (E) None of these

9. Two spheres of masses m and M are situated in air and the gravitational force between them is F . The space around the masses is now filled with a liquid of specific gravity 3. The gravitational force will now be

- (A) $3F$
- (B) F
- (C) $\frac{F}{3}$
- (D) $\frac{F}{9}$
- (E) None of these.

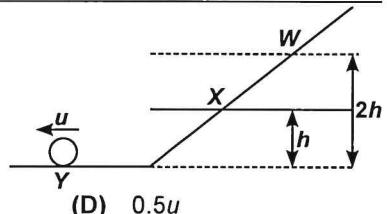
10. Which of the following statements is/are correct during the time between a parachutist leaving a plane and reaching the ground safely?

- I. The sum of her gravitational potential energy and her kinetic energy is constant.
- II. Her kinetic energy depends upon her velocity.
- III. Her gravitational potential energy is proportional to her height above the ground.
- (A) I, II and III
- (B) I and II only
- (C) II and III only
- (D) I only
- (E) None of these

11. It takes one minute for Rahul standing on an escalator to reach the top. If the escalator does not move, it takes him 3 minutes to walk up. How long will it take for Rahul to reach at the top, if he walks up the moving escalator?

- (A) 30 s
- (B) 45 s
- (C) 35 s
- (D) 40 s
- (E) None of these

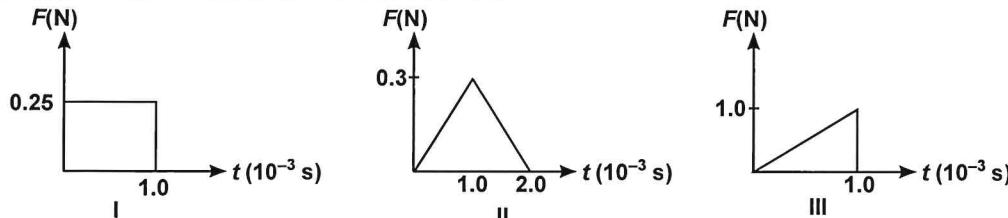
12. An object of mass m is released from rest from point X which is at a height h above Y and slides down a frictionless slope. The object passes point Y with a velocity u as shown in the figure.



A second object of mass $0.5 m$ is released from rest from point W which is at a height $2h$ above Y. The velocity with which the second object passes point Y in terms of u is

- (A) $2u$
- (B) $\sqrt{2}u$
- (C) u
- (D) $0.5u$
- (E) None of these.

13. Figures I, II and III show variation of force with time.

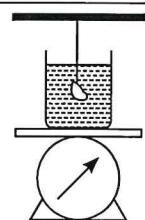


Which of following options is correct regarding impulse in the given situation?

- (A) I > II > III
- (B) I < II = III
- (C) I > II = III
- (D) I < II < III
- (E) None of these

14. If the mass of sun were ten times smaller and gravitational constant G were ten times larger in magnitudes, then which one of the following statements is incorrect?
 (A) Walking on ground would become more difficult. (B) The acceleration due to gravity on earth will not change.
 (C) Raindrops will fall much faster. (D) Airplanes will use more energy to fly.
 (E) None of these

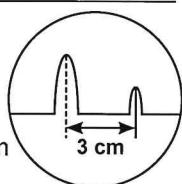
15. When a beaker containing water rests on a balance, the weight indicated is X . A solid object of weight Y in air displaces weight Z of water when immersed. What will be the balance reading when the object is suspended in the beaker containing water so that it is totally immersed as shown in the figure?



- (A) X (B) $X + Z$
 (C) $X + Y$ (D) $X + Y - Z$
 (E) None of these

16. An adulterated sample of milk has a density 1032 kg m^{-3} , while pure milk has a density of 1080 kg m^{-3} . Find the volume of pure milk in a sample of 10 litres of adulterated milk.
 (A) 1 litre (B) 2 litres (C) 3 litres (D) 4 litres
 (E) None of these

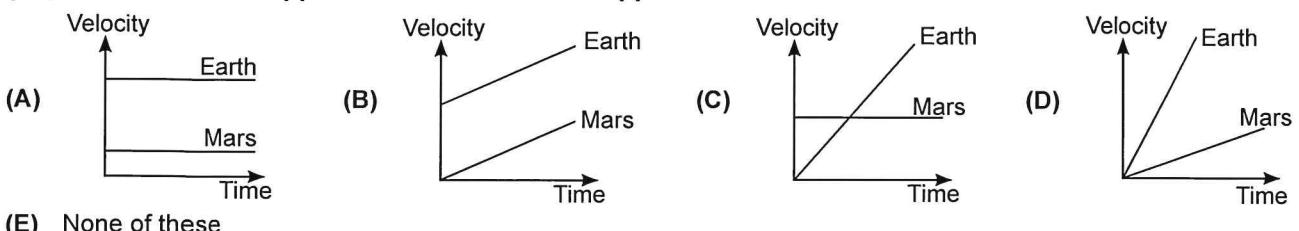
17. Sonar waves are emitted from a ship to determine the depth of the sea. The emitted signal and its reflection from the sea are displayed on an electronic device as shown in the figure. The horizontal speed of the device trace is 6 cm s^{-1} . The speed of sound in water is 1200 m s^{-1} . What is the depth of the sea?
 (A) 200 m (B) 300 m (C) 600 m (D) 2400 m
 (E) None of these



18. A car, which is travelling normally towards a cliff at a speed of 50 m s^{-1} , sounds its horn when it is 0.7 km away. Taking the speed of sound to be 300 m s^{-1} in air, find the time taken for the driver to hear its echo.
 (A) 0.0040 s (B) 4.0 s (C) 4.7 s (D) 28.0 s
 (E) None of these

19. A boy walks on a straight road from his home to a market 2.5 km with a speed of 5 km h^{-1} . Finding the market closed he instantly turns and walks back with a speed of 7.5 km h^{-1} . What is the average speed and average velocity of the boy respectively?
 (A) 0,0 (B) $6 \text{ km h}^{-1}, 0$ (C) $0, 6 \text{ km h}^{-1}$ (D) $6 \text{ km h}^{-1}, 6 \text{ km h}^{-1}$
 (E) None of these

20. When someone on the earth drops a rock, it accelerates at about 10 m s^{-2} . When a rock is dropped on the mars, the rock accelerates at about 2.0 m s^{-2} . Which of the following graphs shows the velocity time graphs for a rock dropped on the earth and dropped on the mars?



- (E) None of these

CHEMISTRY

21. Melting and boiling points of a few substances are given in the table.

Substance	Melting point ($^{\circ}\text{C}$)	Boiling point ($^{\circ}\text{C}$)
W	435	625
X	-15	35
Y	1295	892
Z	-215	-52

Study the given table carefully and select the correct statement regarding W, X, Y and Z.

- (A) X and Z exist as solids at room temperature.
 (B) X can be categorised as a volatile liquid.
 (C) The order of strength of interparticle forces of the given substances is $Y > W > Z > X$.
 (D) Z will exist as a solid at -205°C .
 (E) None of these

- 22. Match Column-I with Column-II and select the correct option from the given codes.**

Column-I	Column-II
P. A trivalent anion	(i) Ferric
Q. A divalent cation	(ii) Ammonium
R. A monovalent cation	(iii) Phosphate
S. A monovalent anion	(iv) Ferrous
	(v) Permanganate
(A) P-(v), Q-(i), R-(ii), S-(iv)	(B) P-(v), Q-(ii), R-(i), S-(iv)
(C) P-(iii), Q-(iv), R-(ii), S-(v)	(D) P-(iii), Q-(v), R-(ii), S-(iv)
(E) None of these	

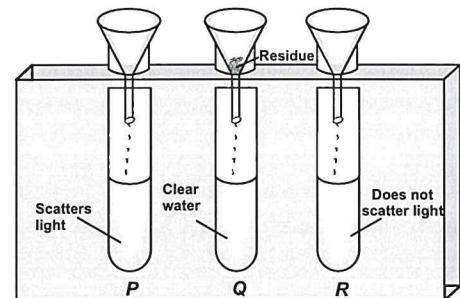
- 23. Select the incorrect statement.**

- (A) There is no increase in volume of water when sugar is dissolved in it because of interparticle space between the water molecules.
 - (B) It is easier to break a chalk into pieces as compared to an iron nail because of weaker interparticle forces in chalk.
 - (C) We can easily move our hands in air because air particles have no mass.
 - (D) Two metal blocks when tightly bound together and left undisturbed for years, get joined together because of diffusion of particles of one metal into another.
 - (E) None of these

24. Samaira, a class 9 student took three different substances P , Q and R in water separately and filtered them using an ordinary filter paper. Results of the experiment are shown in the figure.

Substances P, Q and R could be respectively

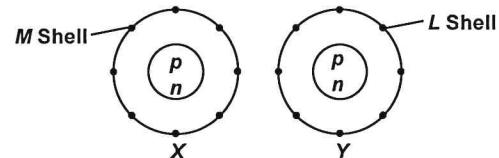
- (A) Paint, alcohol and sodium chloride
 - (B) Sodium chloride, paint and milk
 - (C) Milk, milk of magnesia and sodium chloride
 - (D) Milk of magnesia, paint and milk
 - (E) None of these.



- 25. Select the correct statement(s).**

26. If X is a dipositive ion of element P and Y is a dinegative ion of element Q then, the atomic numbers of successive elements of P and Q are respectively

- (A) 20 and 8
 - (B) 21 and 9
 - (C) 18 and 6
 - (D) 20 and 6
 - (E) None of these.



- 27.** A few substances are listed in the given box.

- (i) Sodium (ii) Soil (iii) Dry ice (iv) Methane (v) Slaked lime (vi) Sugar solution (vii) Blood (viii) Milk

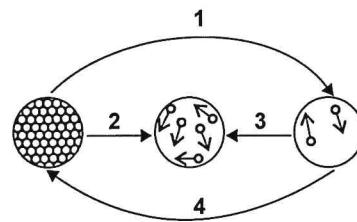
Which of the following statements is/are correct regarding these substances?

- I. (i), (iii) and (viii) are pure substances.
II. (iv), (v) and (vii) are mixtures.
III. If a strong beam of light is passed through (vii) and (viii), the path of light becomes visible.
IV. (iii) and (v) are compounds.

(A) II and IV only (B) IV only (C) III and IV only (D) I, II and IV only
(E) None of these

28. Study the given figure carefully and select the correct match regarding the changes 1, 2, 3 and 4.

- (A) Change 1 – Carried out at low temperature, high pressure and is exothermic
- (B) Change 2 – Occurs faster when pressure is decreased and is endothermic
- (C) Change 3 – Occurs faster when temperature is increased and is exothermic
- (D) Change 4 – Occurs in low pressure condition only
- (E) None of these



29. Study the given table carefully.

Species	No. of Protons	No. of Neutrons	No. of Electrons
I	16	6	18
II	6	7	6
III	18	22	18
IV	19	21	19
V	20	20	20

Which of the following statements is incorrect regarding elements I, II, III, IV and V?

- (A) III and V are isobars.
- (B) II forms a stable divalent cation while I is a divalent anion.
- (C) V loses two electrons from M shell to form a stable ion. (D) Both (B) and (C)
- (E) None of these

30. A few mixtures are listed as :

- I. Hexane (B. pt. 342 K) + Toluene (B. pt. 384 K)
- II. Acetone (B. pt. 329 K) + Water
- III. Chloroform (B. pt. 334 K) + Benzene (B. pt. 353 K)
- IV. Molten slag + Molten iron
- V. Sand + Ammonium chloride

Which of the following represents the incorrect match of the mixture and the technique used to separate its components?

Mixture(s)	Separation technique
(A) IV	Separating funnel
(B) V	Sublimation
(C) I and II	Simple distillation
(D) III and V	Fractional distillation
(E) None of these	

31. Read the given passage and fill in the blanks by selecting an appropriate option.

Gunpowder is a mixture of sulphur, (i) and (ii). To separate the components, the mixture is first dissolved in (iii) and the soluble component is separated by evaporation of filtrate. The residue is then dissolved in water and aqueous solution so obtained on evaporation gives (iv).

(i)	(ii)	(iii)	(iv)
(A) Sodium sulphate	Coke powder	Hydrochloric acid	Sodium nitrate
(B) Potassium nitrate	Charcoal	Carbon disulphide	Potassium nitrate
(C) Sodium nitrate	Coke powder	Alcohol	Sodium sulphate
(D) Potassium sulphate	Charcoal	Carbon tetrachloride	Potassium sulphate
(E) None of these			

32. Read the given statements carefully.

- I. Water boils at a higher temperature on mountains as the pressure is low there.
- II. Temperature remains constant during the change of state as the heat supplied is used to increase the kinetic energy of molecules.
- III. Camphor directly gets converted into vapours without passing through the intervening liquid state because its vapour pressure becomes equal to the atmospheric pressure much before its boiling point.
- IV. Decrease in pressure favours the process of evaporation while increase in pressure favours the process of condensation.

Incorrect statement(s) is/are

- (A) III and IV only
- (B) IV only
- (C) I only
- (D) I, II and III only
- (E) None of these.

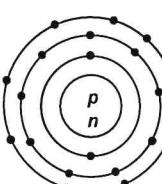
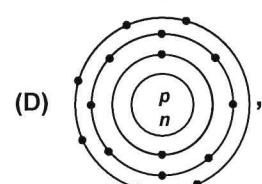
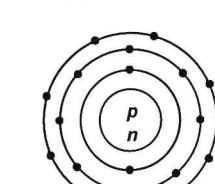
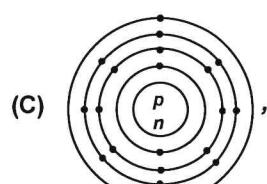
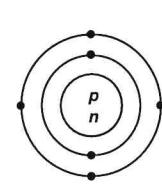
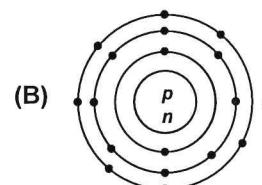
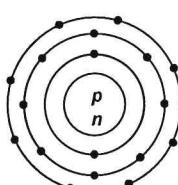
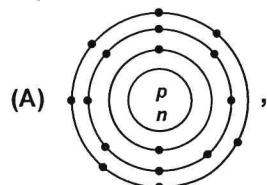
33. Rewa, a class 9 student classified a few common colloids as shown in the given table.

S.No.	Substances	Type of colloid
I.	Coloured glasses	Solid sol
II.	Shoe polish	Gel
III.	Toothpaste	Foam
IV.	Face cream	Aerosol
V.	Cod liver oil	Emulsion

Substances classified incorrectly are

- (A) I, III and IV only (B) II and III only (C) III and IV only (D) IV and V only
 (E) None of these.

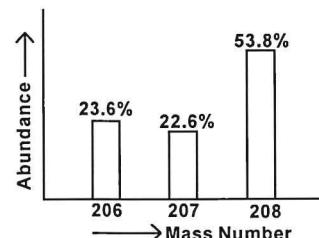
34. X, which is a stable unipositive ion of an element Y contains three fully filled electron shells. Z is an element having equal number of protons and neutrons. If mass number of Z is 32, then which of the following represents the schematic atomic structures of Y and stable ion of Z respectively?



- (E) None of these

35. Study the given graph carefully and find the relative atomic mass of lead.

- (A) 208
 (B) 205.5
 (C) 207.3
 (D) 209
 (E) None of these



36. A colourless liquid P boils between 45 to 55°C. Substance Q, which is a reddish brown liquid boils at 63°C. What can be concluded from this information?

- (A) P and Q are pure liquids. (B) P and Q, both are soluble in water.
 (C) Q is a pure liquid while P is an impure liquid. (D) P and Q, both have fixed melting points.
 (E) None of these

37. Read the following statements and select the correct option.

Statement 1 : 18 g of H_2O and 34 g of H_2O_2 have same number of hydrogen atoms.

Statement 2 : H_2O and H_2O_2 both contain 1 g atom of hydrogen.

- (A) Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
 (B) Both statement 1 and statement 2 are true but statement 2 is not the correct explanation of statement 1.
 (C) Statement 1 is true but statement 2 is false.
 (D) Both statement 1 and statement 2 are false.
 (E) None of these

38. An oxide of manganese has the formula Mn_2O_x . If percentage by mass of oxygen in the compound is 50.45%, then the value of x is [Given : Atomic mass of Mn = 55 u, O = 16 u]

- (A) 3 (B) 4 (C) 5 (D) 7
 (E) None of these

39. Arrange the following compounds in increasing order of their molecular masses.

I. Aluminium oxide II. Calcium carbonate III. Sodium nitrate IV. Potassium sulphate

[Given : Atomic mass of Al = 27 u, Ca = 40 u, O = 16 u, C = 12 u, Na = 23 u, N = 14 u, K = 39 u, S = 32 u]

(A) III < II < I < IV

(B) II < III < IV < I

(C) III < I < IV < II

(D) I < II < III < IV

(E) None of these

40. A few atoms are represented as:



Which of the following statements is not correct regarding these elements?

(A) Element Q will form hydride of the formula H_2Q .

(B) Formula of oxide of element R is R_2O .

(C) Formula of chloride of S is SCI .

(D) R and S have 3 and 4 electron shells respectively.

(E) None of these.

BIOLOGY

41. Read the given statements and select the correct ones.

I. In plants, macronutrients like iron, magnesium and zinc are involved in enzyme activities and electron transport.

II. Insects like aphids and bugs damage a plant by cutting its root, stems and leaf with their chewing mouth parts.

III. Plants such as sweet clover and cluster bean are used to enrich the soil in nitrogen and phosphorus.

IV. Red Sindhi and Deoni are good milch animals which provide us milk and milk products.

(A) I and II

(B) II and III

(C) III and IV

(D) I and IV

(E) None of these

42. Identify P and Q in the given cropping pattern X and select the correct option regarding them.

P

Q

(A) Groundnut

Sunflower

(B) Chickpea

Groundnut

(C) Peanut

Gram

(D) Moong bean

Cow pea

(E) None of these

P	P	P	P	P	P
P	P	P	P	P	P
Q	Q	Q	Q	Q	Q
Q	Q	Q	Q	Q	Q
P	P	P	P	P	P
P	P	P	P	P	P

Cropping Pattern X

43. Identify cell organelles P, Q, R and S in the given Venn diagram and select the incorrect option regarding them.

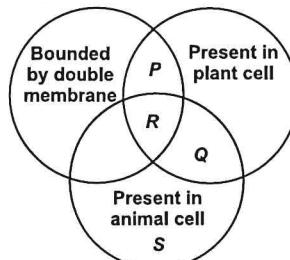
(A) P could be an organelle that helps in pollination and dispersal of seeds and fruits.

(B) Q could be an organelle that synthesises acrosome in animal sperm.

(C) R could be an organelle that provides important intermediates for synthesis of steroids and cytochromes.

(D) S could be an organelle that is involved in removal of toxic substances by oxidative reactions.

(E) None of these



44. The phenomenon shown in the figure helps in

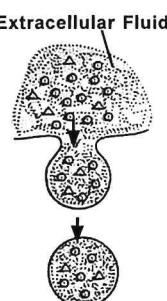
(A) Removal of undigested food left in the food vacuoles in the cells.

(B) Movement of hormones or growth factors from one side of a cell to the other.

(C) Replacement of internalised membrane by fusion of vesicle with cell membrane.

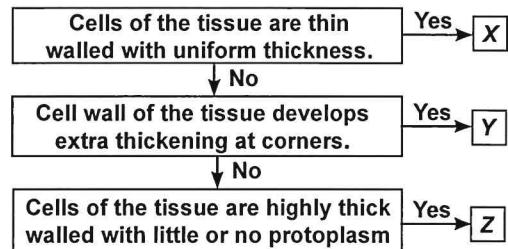
(D) Removal of pathogenic microbes from the blood.

(E) None of these



45. Refer to the given flow chart regarding types of plant tissue. Identify X, Y and Z and select the incorrect option regarding them.

- (A) X could provide elasticity and tensile strength to plant body whereas Y could help to store products such as tannin gum, crystals, etc.
 (B) Y could manufacture sugar and may store it as starch whereas Z could provide mechanical support to plants.
 (C) X could help in assimilation and storage of reserve food material whereas Z could provide protective covering around seeds and nuts.
 (D) Y could prevent tearing of leaves whereas Z could provide fibres which are commercially exploited.
 (E) None of these



46. Correct the given statements by replacing the underlined word (wherever necessary) and select the correct option regarding them.

- I. Squamous epithelium lines vagina and lower parts of urethra and generally helps provide protection against abrasion.
 II. Cuboidal epithelium lines the intestine and is specialised for absorption of water and digested food.
 III. Columnar epithelium lines mammary gland ducts and parts of urethra and helps in protection and secretion.
 IV. Transitional epithelium forms epidermis of skin of tetrapods, in tongue and oesophagus and protects from mechanical wear and tear.
 (A) Squamous epithelium in I should be replaced by cuboidal epithelium.
 (B) Cuboidal epithelium in II should be replaced by squamous epithelium.
 (C) Columnar epithelium in III should not be replaced as it is correctly mentioned.
 (D) Transitional epithelium in IV should be replaced by simple columnar epithelium
 (E) None of these

47. Identify the type of muscular tissues from the given table and select the incorrect option regarding L, M, and N.

Characteristics	Tissue		
	L	M	N
Cylindrical	✓	✓	✗
Sarcolemma present	✓	✓	✗
Branched fibres	✗	✓	✗
Involuntary	✗	✓	✓
Oblique bridges	✗	✓	✗

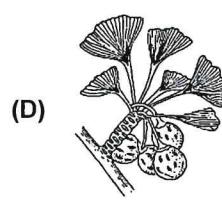
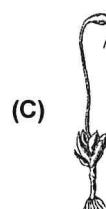
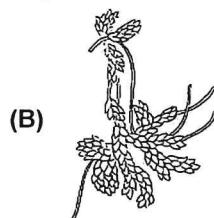
- (A) L could be striated muscle fibre that occurs in tongue, pharynx and beginning of oesophagus and it soon get fatigued.
 (B) M could be cardiac muscle fibre that is present in pulmonary veins and superior vena cava and it never get fatigued.
 (C) N could be smooth muscle fibre that occurs in the iris and ciliary body of eye and it does not get fatigued.
 (D) Muscle fibres M and N are uninucleated whereas that of L are multinucleated.
 (E) None of these

48. Study the given features.

- I. Seeds are naked.
 II. Male and female cones produce microspore and megasporangia respectively.
 III. Vascular tissue such as xylem lacks vessels and phloem lacks companion cells.
 IV. Endosperm cells are haploid.

Select the option that correctly identifies the plant from the given features.

- (A) 
 (E) None of these



49. Refer to the given dichotomous key and select the correct option regarding P, Q, R, S and T.

- I. (a) Mouth arises anteriorly and anus develops from blastopore. – Go to II
 (b) Mouth arises from or near the blastopore of gastrula. – Go to III
- II. (a) Notochord is absent. – P
 (b) Notochord is present. – Go to IV
- III. (a) Animal with unjointed appendages and closed circulatory system. – Q
 (b) Animal with jointed appendages and open circulatory system. – R
- IV. (a) Animal with three chambered heart, having moist and glandular skin. – S
 (b) Animal with four chambered heart and has dry skin. – T

P	Q	R	S	T
(A) <i>Astropecten</i>	<i>Aphrodite</i>	<i>Palinurus</i>	<i>Triturus</i>	<i>Struthio</i>
(B) <i>Holothuria</i>	<i>Scolopendra</i>	<i>Nereis</i>	<i>Chelone</i>	<i>Gavialis</i>
(C) <i>Limax</i>	<i>Hirudinaria</i>	<i>Turbinella</i>	<i>Calotes</i>	<i>Bufo</i>
(D) <i>Ascaris</i>	<i>Chiton</i>	<i>Antedon</i>	<i>Scoliodon</i>	<i>Milvus</i>
(E) None of these				

50. Select the correct statement.

- (A) Water borne diseases like tuberculosis, cholera and leprosy can be prevented by drinking treated or boiled water.
- (B) Natural passive immunity occurs when pre-formed antibodies extracted from one individual are injected into another as serum.
- (C) Drug Zidovudine bind itself with reverse transcriptase enzyme of HIV and stops it from replication by blocking its action.
- (D) Antibiotics ciprofloxacin inhibits ribosomal functioning whereas erythromycin and streptomycin inhibit DNA replication in bacteria.
- (E) None of these

51. Match column I with column II and column III and select the correct option from the given codes.

Column I	Column II	Column III
P. Syphilis	a. <i>Varicella zoster virus</i>	I. Bite of infected Tse-Tse fly
Q. Chickenpox	b. <i>Escherichia coli</i>	II. Through sexual act
R. Sleeping sickness	c. <i>Bacillus anthracis</i>	III. Through inhalation of spores
S. Diarrhoea	d. <i>Treponema pallidum</i>	IV. Contaminated food and water
T. Anthrax	e. <i>Trypanosoma gambiense</i>	V. Direct contact
(A) P-d(II); Q-b(IV); R-a(V); S-e(I); T-c(III)	(B) P-d(II); Q-a(V); R-e(I); S-b(IV); T-c(III)	
(C) P-b(I); Q-d(III); R-a(IV); S-e(II); T-c(V)	(D) P-c(II); Q-d(IV); R-e(I); S-a(III); T-b(V)	
(E) None of these		

52. Refer to the given table and select the option which correctly identifies L – P.

Name of the disease	Cause of the disease
Cheilosis	L
Pernicious anemia	M
N	Hyposecretion of thyroid hormones
Addison's disease	O
P	Deficiency of Niacin

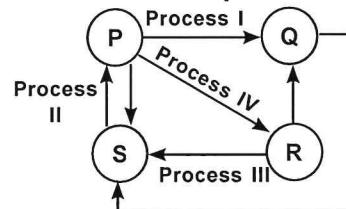
L M N O P

- (A) Deficiency of Vitamin B₂ Deficiency of Vitamin B₁ Myxedema Hypersecretion of aldosterone Scurvy
- (B) Deficiency of Vitamin B₁₂ Deficiency of Vitamin B₂ Cretinism Hypersecretion of aldosterone Beri-beri
- (C) Deficiency of Vitamin B₂ Deficiency of Vitamin B₁₂ Cretinism Hyposecretion of aldosterone Pellagra
- (D) Deficiency of Vitamin B₁ Deficiency of Iron Grave's disease Hyposecretion of aldosterone Xerophthalmia
- (E) None of these

53. Refer to the given diagram showing flow of carbon in a carbon cycle and select the correct option.

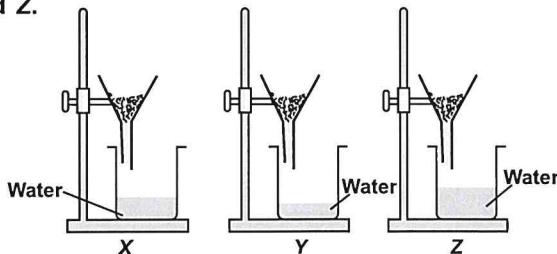
- Remove carbon dioxide from the atmosphere
- (A) Process I, II and III
(B) Process I and III
(C) Process I and II
(D) Process II
(E) None of these

- Add carbon dioxide to the atmosphere
- Process IV
Process II
Process III and IV
Process I and III



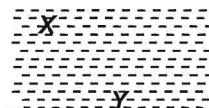
54. Study the given experimental set-ups in which equal amount of water is added to three different funnels containing equal amount of three different types of soil. The amount of water collected in beakers after 20 minutes is shown in the figure.

- Select the correct statement regarding soil in set-ups X, Y and Z.
- (A) Soil of set-up X is best suited for growth of watermelon whereas soil of set-up Z is best suited for growth of paddy.
(B) Soil of set-up Y is difficult to plough whereas soil of set-up Z can be ploughed easily.
(C) Soil of set-up X is found at sea-shore whereas soil of set-up Z is found in basin of river.
(D) Soil of set-up Y could trap more air than the soil of set-up Z.
(E) None of these



55. Identify the plants species X and Y present in the water body.

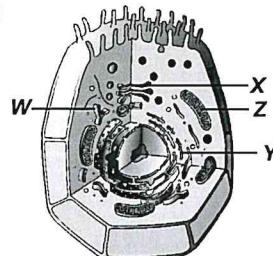
- | | |
|------------------------|----------------------|
| X | Y |
| (A) <i>Vallisneria</i> | <i>Hydrilla</i> |
| (B) <i>Lemna</i> | <i>Nymphaea</i> |
| (C) <i>Utricularia</i> | <i>Potamogeton</i> |
| (D) <i>Pistia</i> | <i>Ceratophyllum</i> |
| (E) None of these | |



56. Identify the organelles in the given ultra structure of a cell and select the option that correctly matches them with their functions/characteristics P - S.

- P. Modifies newly synthesised protein by adding carbohydrate.
Q. Synthesises hormones that are responsible for development of secondary sexual characters in males and females.
R. Oxidises carbohydrates and fats to carbon-dioxide and water vapour by using molecular oxygen.
S. It contains cisternae and is abundant in exocrine pancreatic cells.

- | | | | |
|-------------------|---|---|---|
| P | Q | R | S |
| (A) X | W | Z | Y |
| (B) W | Y | X | Z |
| (C) X | Y | W | Z |
| (D) Y | X | Z | W |
| (E) None of these | | | |



57. 'X' is an air-borne disease that attacks all aerial parts of a plant whereas 'Y' is a soil-borne disease that spreads through soil and mostly affects roots and stem of crop plants.

Identify 'X' and 'Y' in the above paragraph and select the correct option.

- (A) X could be red rot of sugarcane whereas Y could be smut of bajra.
(B) X could be rust of wheat whereas Y could be smut of bajra.
(C) X could be bacterial blight of rice whereas Y could be tikka disease of groundnut.
(D) X could be leaf spot of rice whereas Y could be red rot of sugarcane.
(E) None of these

58. List of some cattle diseases is given below :

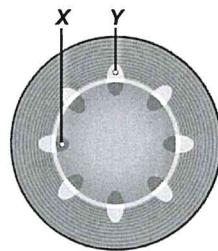
- | | |
|----------------------------|--------------------|
| (i) Foot and mouth disease | (ii) Anthrax |
| (iii) Cow pox | (iv) Salmonellosis |
| (v) Rabies | (vi) Black quarter |
| (vii) Brucellosis | (viii) Dermatitis |

How many of these diseases are bacterial and viral respectively?

- (A) 5, 3 (B) 3, 5 (C) 4, 4 (D) 2, 6
(E) None of these

59. Identify plant tissues X and Y in the given figure and select the incorrect option regarding them.

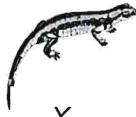
- (A) In vascular plants, X conducts water and inorganic solutes whereas Y conducts organic solutes.
- (B) Conducting channels in X are tracheids and vessels whereas in Y they are sieve tubes.
- (C) Parenchymatous tissue of Y is living whereas in X it is dead.
- (D) Movement of solute is in upward direction in X whereas in Y it occurs in both directions, i.e., upward and downward.
- (E) None of these.



60. Identify organisms W, X, Y and Z and select the incorrect option regarding them.



W



X



Y



Z

- (A) Number of cranial nerves in X is 10 pairs whereas in W, Y and Z it is 12 pairs.
- (B) X belongs to the same phylum to which Y and Z belong.
- (C) Heart is three chambered in X whereas in W, Y and Z it is four chambered.
- (D) Fertilisation is external in X and Z whereas in W and Y it is internal.
- (E) None of these

MATHEMATICS

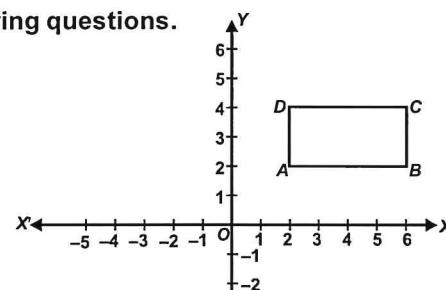
61. Simplify : $\frac{4\sqrt{3}}{2-\sqrt{2}} - \frac{30}{4\sqrt{3}-\sqrt{18}} - \frac{\sqrt{18}}{3+2\sqrt{3}}$

- (A) 1
- (B) $2\sqrt{3}$
- (C) $\frac{1}{\sqrt{3}}$
- (D) 0
- (E) None of these

Direction (62 and 63) : Study the given graph carefully and answer the following questions.

62. The coordinates of S and C are (i) and (ii) respectively.

- | | |
|-------------------|--------|
| (i) | (ii) |
| (A) (-3, 4) | (6, 4) |
| (B) (-4, -3) | (6, 4) |
| (C) (-3, -4) | (4, 6) |
| (D) (-4, -3) | (4, 6) |
| (E) None of these | |

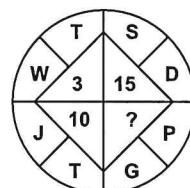


63. Find the difference between the area of square PQRS and rectangle ABCD.

- | | |
|-------------------|-----------------|
| (A) 1 sq. unit | (B) 2 sq. units |
| (C) 4 sq. units | (D) 6 sq. units |
| (E) None of these | |

64. Find the missing number.

- (A) 5
- (B) 8
- (C) 11
- (D) 9
- (E) None of these



65. A right angled triangle ABC with sides 5 cm, 12 cm and 13 cm is first revolved about the side 5 cm and then revolved about the side 12 cm. What would be the ratio of the volumes of the two solids obtained?

- (A) 13 : 5
- (B) 6 : 5
- (C) 3 : 13
- (D) 1 : 3
- (E) None of these

66. Two circles of radii 17 cm and 10 cm intersect at two points. If length of the common chord is 16 cm, then find the distance between their centres.

- (A) 18 cm
- (B) 15 cm
- (C) 21 cm
- (D) 19 cm
- (E) None of these

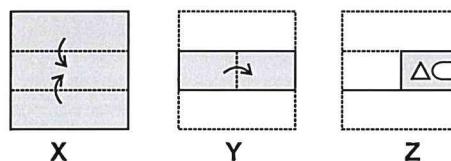
67. Which of the following is incorrect ?

- (A) In a triangle, angle opposite to the larger side is larger.
(B) Sum of any two sides of a triangle is greater than the third side.
(C) If two angles and a side of one triangle are equal to two angles and the corresponding side of the other triangle, then the two triangles are always congruent.
(D) Two circles of the same radii are congruent.
(E) None of these

68. In a four sided field, the length of the longer diagonal is 128 m. The length of the perpendiculars from the opposite vertices upon this diagonal are 22.7 m and 17.3 m. Find the area of the field.

- (A) 1280 m^2 (B) 2560 m^2 (C) 1386 m^2 (D) 2814 m^2
(E) None of these

69. The given question consists of a set of three figures X, Y and Z showing a sequence of folding of a piece of paper. Fig. (Z) shows the manner in which the folded paper has been cut. Select a figure from the options which would most closely resembles the unfolded form of Fig. (Z).



- (A)
- (B)
- (C)
- (D)

- (E) None of these

70. Find the value of $\frac{x^{a(a-c)}}{x^{b(a-c)}} \div \left(\frac{x^b}{x^a} \right)^c$.

- (A) 0 (B) x^a (C) x^{abc} (D) 1
(E) None of these

71. How many pair of letters are there in the word UNPRECEDENTED which have same number of letters between them in the word as in the English alphabet?

- (A) Two (B) Three (C) Four (D) More than four
(E) None of these

72. Which of the following Venn diagrams best represents the relationship amongst, "Men, Women and Musicians"?

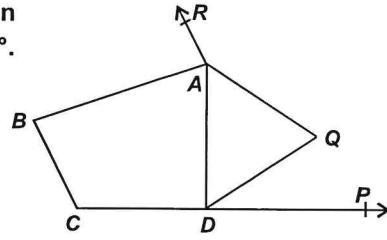
- (A)
- (B)
- (C)
- (D)
- (E) None of these

73. On one page of a telephone directory, there are 200 phone numbers. The frequency distribution of their unit digits is given below:

Unit digit	0	1	2	3	4	5	6	7	8	9
Frequency	19	22	23	19	21	24	23	18	16	15

One of the numbers is chosen at random from the page. What is the probability that the unit digit of the chosen number is (i) more than 7? (ii) less than 3?

- (i) (ii) (i) (ii)
(A) $4/25$ 4/25 (B) $9/100$ 6/25
(C) $4/25$ 7/25 (D) $31/100$ 8/25
(E) None of these

93. If ' $-$ ' denotes ' \div ', ' $+$ ' denotes ' \times ', ' \div ' denotes ' $-$ ' and ' \times ' denotes '+', then which of the following is correct?
 (A) $52 \div 4 + 5 \times 8 - 2 = 36$
 (B) $43 \times 7 \div 5 + 4 - 8 = 25$
 (C) $36 \times 4 - 12 + 5 \div 3 = 420$
 (D) $36 - 12 \times 6 \div 3 + 4 = 60$
 (E) None of these
-
94. In which quadrant does the point $Q(a, b)$ lie, if $ab < 0$?
 (A) I or II
 (B) II or IV
 (C) I or III
 (D) III or IV
 (E) None of these
-
95. A well with 10 m inside diameter is dug 14 m deep. Earth taken out of it is spread all around to a width of 5 m to form an embankment. Find the height of embankment.
 (A) 4.67 m
 (B) 5.25 m
 (C) 2.12 m
 (D) 3.52 m
 (E) None of these
-
96. Find the greatest 5-digit number which is exactly divisible by 10, 12, 15 and 18, when 3769 is added to it.
 (A) 99819
 (B) 99911
 (C) 99900
 (D) 99111
 (E) None of these
-
97. In the given figure (not drawn to scale), CDP is a straight line, $\triangle AQD$ is an equilateral triangle, $\angle BAR = 90^\circ$, $\angle QAR = 135^\circ$, $\angle BCD = 106^\circ$ and $\angle ABC = 100^\circ$. Then, $\angle PDQ$ equals
 (A) 39°
 (B) 21°
 (C) 41°
 (D) 53°
 (E) None of these
- 
-
98. Following are the steps of constructing a triangle ABC in which $AB = 5$ cm, $\angle A = 30^\circ$ and $AC - BC = 2.5$ cm. Which of the following steps is/are incorrect?
 Steps of construction :
 Step I : Draw $AB = 5$ cm.
 Step II : Draw $\angle BAX = 30^\circ$.
 Step III : From ray AX , cut off line segment $AD = 2.5$ cm ($= AC - BC$).
 Step IV : Join BD .
 Step V : Draw the perpendicular bisector of AD which cuts BX at C .
 Step VI : Join BC to obtain the required triangle ABC .
 (A) Only III
 (B) Only V
 (C) Only III and V
 (D) Only III and IV
 (E) None of these
-
99. Ajay ranked sixteenth from the top and twenty-ninth from the bottom among those boys who passed an examination. Six boys did not participate in the competition and five boys failed in it. How many boys were there in the class?
 (A) 40
 (B) 44
 (C) 50
 (D) 55
 (E) None of these
-
100. Which of the following is correct?
 (A) Only a unique line can be drawn to pass through a given point.
 (B) Infinitely many lines can be drawn to pass through two given points.
 (C) A plane surface is a surface which lies evenly with the straight lines on itself.
 (D) A line has a definite length.
 (E) None of these

SPACE FOR ROUGH WORK

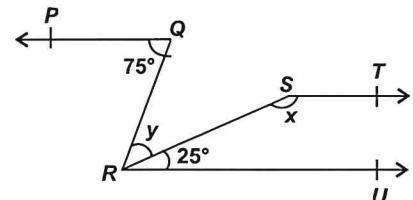
74. If one angle of a parallelogram is 24° less than twice the smallest angle, then the largest angle of the parallelogram is
 (A) 68° (B) 102° (C) 112° (D) 136°

75. For an isosceles triangle having base b units and each of the equal sides as a units, which of the following statements is/are true?
 I. Area = $\frac{b \times \sqrt{4a^2 - b^2}}{4}$ sq. units II. Perimeter = $(2a + b)$ units
 III. Height = $\frac{1}{2} \sqrt{4a^2 - b^2}$ units

- (A) I only (B) I and II only (C) II and III only (D) I, II and III
 (E) None of these

76. In the given figure (not drawn to scale), if $PQ \parallel ST \parallel RU$, then find the values of x and y respectively.

- (A) $125^\circ, 75^\circ$
 (B) $50^\circ, 50^\circ$
 (C) $105^\circ, 75^\circ$
 (D) $155^\circ, 50^\circ$
 (E) None of these



77. What must be added to $x^4 + 2x^3 - 2x^2 + x - 1$ so that the result is exactly divisible by $x^2 + 2x - 3$?

- (A) $x - 1$ (B) $x - 2$ (C) $x^2 + x - 1$ (D) $x^2 - x$
 (E) None of these

78. If in a certain code language, 'DISTANCE' is coded as 'UTJEGEPC', then how will 'DOCUMENT' be coded in the same language?

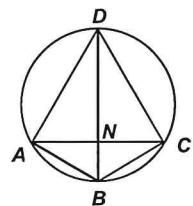
- (A) NFOUFQEW (B) WEQFUOFN (C) EPDVNFNU (D) VDPEVPGO
 (E) None of these

79. Which of the following pairs are the solutions of the equation $4x - 2y = 10$?

- (A) $(1, 1), (2, 1)$ (B) $(1, -3), \left(\frac{5}{2}, 0\right)$ (C) $(0, 5), (1, 3)$ (D) $(2, -1), (-3, 1)$
 (E) None of these

80. The diagonals of the quadrilateral ABCD cut at N. If $\angle BAC = 42^\circ$, $\angle BNC = 114^\circ$ and $\angle ADB = 33^\circ$, then find $\angle BCD$.

- (A) 85°
 (B) 105°
 (C) 35°
 (D) 75°
 (E) None of these

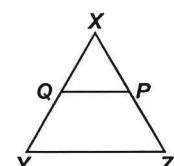


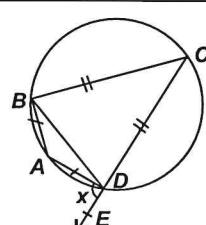
81. Water flows out through a circular pipe of internal diameter 2 cm at the rate of 7 m/sec into a cylindrical tank of radius 40 cm. By how much will the level of water rise in 30 minutes?

- (A) 7.875 m (B) 9 m (C) 8.5 m (D) 5.25 m
 (E) None of these

82. In the given figure, if $QX = \frac{1}{2}XY$, $PX = \frac{1}{2}XZ$ and $QX = PX$, then by which of the following axioms, $XY = XZ$?

- (A) If equals are added to equals the wholes are equal.
 (B) The whole is greater than the part.
 (C) If equals are subtracted from equals, the remainders are equal.
 (D) Things which coincide with one another are equal to one another.
 (E) None of these



83. A tent is in the shape of a right circular cylinder upto a height of 3 m and conical above it. The total height of tent is 13.5 m. Calculate the cost of painting the inner side of the tent at the rate of ₹ 2 per m^2 , if the radius of the base is 14 m.
- (A) ₹ 2068 (B) ₹ 658 (C) ₹ 1034 (D) ₹ 2540
 (E) None of these
-
84. The mean of 6 numbers is 20. If one number is deleted, then their mean is 15. Find the deleted number.
- (A) 30 (B) 40 (C) 45 (D) 28
 (E) None of these
-
85. If AB and CD are respectively the smallest and the longest sides of a quadrilateral $ABCD$, then which of the following is definitely true?
- (A) $\angle A = \angle B$ (B) $\angle A = \angle C$ (C) $\angle A > \angle C$ (D) $\angle D > \angle B$
 (E) None of these
-
86. An urn contains 6 oranges, 7 apples and 11 mangoes. A fruit is drawn at random. Find the probability that the drawn fruit is not an orange?
- (A) $18/25$ (B) $6/25$ (C) $3/4$ (D) $1/4$
 (E) None of these
-
87. If $\sqrt{2} = 1.414$ and $\sqrt{3} = 1.732$, then find the value of $\frac{4}{3\sqrt{3}-2\sqrt{2}} + \frac{3}{3\sqrt{3}+2\sqrt{2}}$.
- (A) 2.063 (B) 3.245 (C) 1.212 (D) 4.263
 (E) None of these
-
88. I am facing South. I turn right and walk 20 m. Then I turn right again and walk 10 m. Then I turn left and walk 10 m and then after turning right walk 20 m. Then I turn right again and walk 60 m. In which direction am I from the starting point?
- (A) North (B) North-West (C) East (D) North-East
 (E) None of these
-
89. Simplify :
$$\frac{(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3}{(a - b)^3 + (b - c)^3 + (c - a)^3}$$
- (A) abc (B) $a + b + c$ (C) $(a + b)(b + c)(c + a)$ (D) $(a + b + c)(abc)$
 (E) None of these
-
90. Fill in the blanks and select the correct option.
- I. The line segment joining the mid-points of two sides of a triangle is _____ (P) to the third side.
 II. Diagonals of a _____ (Q) bisect each other at right angles.
 III. A diagonal of a parallelogram divides it into _____ (R) congruent triangles.
- | | | |
|-------------------|-----------|-------|
| (P) | (Q) | (R) |
| (A) Equal | rectangle | two |
| (B) Parallel | rhombus | two |
| (C) Equal | rectangle | three |
| (D) Parallel | rhombus | three |
| (E) None of these | | |
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91. In the given figure (not drawn to scale), CDE is a straight line and A, B, C and D are points on the circle. If $\angle BCD = 44^\circ$, then find the value of x .
- (A) 44°
 (B) 68°
 (C) 90°
 (D) 56°
 (E) None of these
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92. An amount of ₹ 90 is paid by means of ₹ 20 notes and ₹ 5 notes. 6 notes are used in all. If x is the number of ₹ 20 notes and y is the number of ₹ 5 notes, then
- (A) $x - y = 6, 4x + y = 18$ (B) $x + y = 6, x + 4y = 16$ (C) $x - y = 6, x + 4y = 16$ (D) $x + y = 6, 4x + y = 18$
 (E) None of these