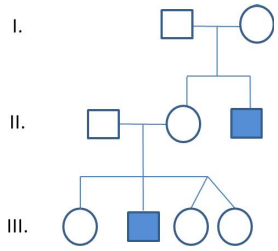
Question **1**

Given pedigree depicts occurrence of _____disease, such as_____



Select one:

- a. Autosomal dominant, Huntington disease
- b. Multifactorial type of inheritance, diabetes mellitus
- c. X-linked recessive, haemophilia
- d. Autosomal recessive, phenylketonuria

Question **2**

Which of the following molecules are the major components of biomembranes in all organisms?

Select one:

- a. proteins and saccharides
- b. phospholipids and cholesterol
- c. phospholipids and nucleic acids
- d. phospholipids and proteins
- e. proteins and oligosaccharides

Question **3**

Where can you find foramen magnum?

Select one:

- a. between occipital bone and temporal bone
- b. between occipital bone and parietal bone
- c. in temporal bone
- d. in parietal bone
- e. in occipital bone

Question **4**

Which of the following diseases **is not** a so-called civilization disease?

Select one:

- a. cancer
- b. obesity
- c. heart and circulatory system diseases
- d. diabetes mellitus
- e. rheumatism

Question **5**

Which of these is an **INCORRECT** statement concerning homeostasis?

Select one:

- a. There are few negative feedback based homeostatic systems in the human body.
- b. A positive feedback system, for instance, the blood clotting cascade or the process of delivering a baby
- c. Homeostasis is the dynamic equilibrium of the internal environment with small fluctuations that is maintained by living organisms
- d. A negative feedback system like the control of blood sugar levels by insulin and glucagon and control of urine concentration by ADH
- e. Two critical parts of homeostasis are sensory receptors and effectors which restores inner balance

Question **6**

Which inhibitor binds to the active site of an enzyme?

Select one:

- a. irreversible inhibitor
- b. competitive inhibitor
- c. inactivated inhibitor
- d. non-competitive inhibitor
- e. allosteric inhibitor

Question **7**

What is a marker gene?

Select one:

- a. It is a gene that enables a determination of a starting sequence for the translation
- b. It is a gene for the antibiotic resistance that enables bacteria that taken up the vector, with a certain gene of interest, to survive and grow in media containing antibiotics
- c. It is a DNA sequence that shows where the restriction endonuclease should start, to cut a DNA strand
- d. All answers are correct
- e. None of given answers are correct
- f. It is the first cloned gene in Human Genome Project

Question **8**

Which of the following is **NOT** a function of liver in adults?

Select one:

- a. Bile production
- b. Haematopoiesis
- c. Detoxification from poisonous substances
- d. Storage of vitamins A,D,E,K, B12 and iron
- e. Glucose storage

Question **9**

The hypothalamus

Select one:

- a. has no hormone receptors on its cells
- b. is only a target for hormones because it has numerous receptors on its cells
- c. includes neurosecretory cells that terminate in the posterior pituitary
- d. secretes hormones which directly influence function of gonads
- e. functions only in neuronal transmission

Question **10**

What is the most accurate definition of a xerophyte organism?

Select one:

- a. Autotrophic component of a plankton
- b. Plants living in an aquatic habitat
- c. Plants with the ability to survive in dry/desert habitats
- d. Organism changing modes between autotrophy and heterotrophy
- e. Parasitic plant species attacking coniferous plants

Question **11**

Choose correct statement:

Select one:

- a. the epiglottis prevents swallowed food from entering the trachea
- b. the bolus enters the larynx after leaving the oral cavity
- c. most of digestive enzymes are secreted into the oesophagus
- d. the trachea is connected to the oesophagus
- e. all types of foods begin their enzymatic digestion in the mouth

Question **12**

Choose the correct cellular parameter:

Select one:

- a. Nerve cells can have many axons but only one dendrite
- b. The Thickness of plasma membrane is 20 nm
- c. Average size of human erythrocyte is 7,5 μm
- d. Length of human nerve cell will not exceed 10 cm
- e. Size of the human egg cell is 50 μm

Question **13**

The “motor unit” in human skeletal muscle corresponds to:

Select one:

- a. one motor neuron and all of the muscle fibres on which it has synapses
- b. an entire head (origin) of the muscle in two-headed, three-headed and four-headed muscles
- c. all actin and myosin filaments of one sarcomere
- d. all sarcomeres of one myofibril
- e. one actin binding site coupled to one myosin binding site

Question **14**

Which statement is true concerning skeletal system of the human palm and fingers?

Select one:

- a. Each finger on the hand has 4 phalanges
- b. The human hand (palm) has in each finger 3 bones (phalanges)
- c. There are 7 metacarpal bones in human palm
- d. Polydactyly is a condition with more than the expected number of fingers
- e. all options are correct
- f. The thumb has 5 bones and the other 4 fingers have 3 bones each

Question **15**

Which of the following CANNOT be considered as an endocrine organ?

Select one:

- a. Thyroid gland
- b. Placenta
- c. Pituitary gland
- d. Pancreas
- e. Thymus gland
- f. Liver

Question **16**

What is the FALSE statement regarding induced pluripotent cells (iPS)?

Select one:

- a. iPS cells are prepared by reprogramming of differentiated cells, for example fibroblasts
- b. iPS arise from inner cell mass from the early stage embryo giving rise to all three germ layers
- c. For regeneration purposes it is more ethical to use iPS cells than pluripotent cells from embryos
- d. for reprogramming somatic cell into iPS four genes encoding transcription factors are added

Question **17**

Two plants are crossed, resulting in offspring with a 3 : 1 ratio for a particular trait. What does this suggest?

Select one:

- a. a blending of traits occurred
- b. both parents were heterozygous for a given trait
- c. the parents were true-breeding for contrasting traits
- d. the trait shows incomplete dominance
- e. all individuals in offspring have the same alleles for given trait

Question **18**

Trace elements are elements that are required by an organism in low quantities. Which element is a trace element that is required by humans but it is not required by bacteria and plants?

Select one:

- a. calcium
- b. sodium
- c. nitrogen
- d. phosphorus
- e. iodine

Question **19**

Human primary spermatocyte and primary oocyte:

Select one:

- a. Both can undergo mitotic division
- b. Both cells are diploid
- c. The primary oocyte is diploid but primary spermatocyte is haploid
- d. The primary oocyte cannot undergo mitotic division but the primary spermatocyte can undergo mitotic division to provide an enormous number of sperm cells
- e. Both cells are haploid

Question **20**

Autosomes are

Select one:

- a. All chromosomes that are not sex chromosomes
- b. Vesicles formed after engulfing intracellular organelles by cell itself
- c. Located only in sex chromosomes
- d. Sex chromosomes after recombination
- e. Synonym for heterochromosome

Question **21**

Which cells do produce antibodies (immunoglobulins)?

Select one:

- a. T lymphocytes only
- b. lymphocytes and macrophages
- c. mainly B lymphocytes but some antibodies are also produced by T lymphocytes
- d. macrophages
- e. B lymphocytes only

Question **22**

Which statement concerning plasma cells is correct?

Select one:

- a. Plasma cells are an activated form of activated T helper cells
- b. Plasma cells are an activated form of B lymphocytes producing specific antibodies against specific pathogen
- c. Plasma cells trigger inflammation upon infection of an organism by bacterial or viral pathogens
- d. Plasma cells mature in the pancreas
- e. Plasma cells are important in innate (non-specific) immunity

Question **23**

Which is the most correct statement regarding the human urinary system?

Select one:

- a. High levels of urea in the blood, called uraemia, is a physiologically normal condition
- b. The glomerular filtrate contains the same molecules as the final urine
- c. Uric acid is the primary nitrogenous waste, a by-product of amino acid metabolism in humans
- d. Urea, produced in the liver, is the primary nitrogenous end product of the human body

Question **24**

Which statement is true for the role of calcium ions in the cell?

Select one:

- a. Ca 2+ ions usually terminate signalling cascades
- b. Ca 2+ ions act as second messenger during cell signalling
- c. Ca 2+ ions split and degrade calmodulin
- d. Ca 2+ ions are produced in the Golgi apparatus by protein precursor
- e. Ca 2+ ions are kept at higher concentration in the cytosol than in the extracellular fluid

Question **25**

Define what is an anticodon

Select one:

- a. Four bases in tRNA complementary to a coding strand in DNA
- b. A sequence of three bases in tRNA, that is complementary to a codon in mRNA
- c. Three bases in mRNA complementary to a non-coding strand
- d. Sequence of three bases that affects promotor site where transcription factors attach

Correct answers:

1 C
2 D
3 E
4 E
5 A
6 B
7 B
8 B
9 C
10 C
11 A
12 C
13 A
14 D
15 F
16 B
17 B
18 E
19 B
20 A
21 E
22 B
23 D
24 B
25 B

Question **1**

Select the correct products of the following reaction:

$CaF_2 + H_2SO_4 \rightarrow$

Select one:

- ◯ $\rightarrow Ca(OH)_2 + SO_2F_2$
- ◯ $\rightarrow CaO + F_2 + H_2SO_3$
- ◯ $\rightarrow 2\ HF + CaSO_4$
- ◯ $\rightarrow CaF_2 + H_2SO_4$ (no reaction)

Question **2**

Select a strong acid.

Select one:

- ◯ HCl
- ◯ H_2S
- ◯ H_3PO_4
- ◯ H_2CO_3

Question **3**

Select the conjugate acid of H_2O.

Select one:

- H_2O_2
- H_3O^+
- HCOOH
- OH^-

Question **4**

Select the correct electron configuration for nitrogen (N).

Select one:

- $1s^2\ 2s^2\ 2p^5$
- $1s^2\ 2p^5$
- $1s^2\ 2s^2\ 2p^3$
- $1s^2\ 1p^5$

Question **5**

Select the true statement for the following reaction at the equilibrium state:

$4\ NH_3(g) + 5\ O_2(g) \rightarrow 4\ NO(g) + 6\ H_2O(g)$

Select one:

- The reaction will be stimulated by decrease in the concentration of O_2.
- The reaction will be stimulated by increase in the concentration of NO.
- The reaction will be stimulated by decrease in the pressure.
- Changes in the pressure will not affect the reaction.
- The reaction will be stimulated by increase in the pressure.

Question **6**

Select the atom, which possesses the same electron configuration as oxide anion (O^{2-}).

Select one:

- F
- C
- S
- Ne

Question **7**

Select the true statement for the following exothermic reaction at the equilibrium state:

$SO_2(g) + O_2(g) \rightarrow 2\ SO_3(g)$

Select one:

- The reaction will be stimulated by decrease in the concentration of O_2.
- The decrease in temperature will stimulate production of SO_3.
- The reaction will be stimulated by increase in the concentration of SO_3.
- The increase in temperature will stimulate production of SO_3.
- Changes in temperature will not affect the reaction.

Question **8**

Which of the following reactions is an oxidation-reduction reaction?

Select one:

- $NaNO_3 + NaHSO_4 \rightarrow Na_2SO_4 + HNO_3$
- $2\ HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2\ H_2O$
- $NaNO_3 + H_2SO_4 \rightarrow NaHSO_4 + HNO_3$
- $8\ HNO_3 + 3\ Cu \rightarrow 3\ Cu(NO_3)_2 + 4\ H_2O + 2\ NO$

Question **9**

2-Methylpropan-2-ol is classified as

Select one:

- a tertiary alcohol
- a ketone
- a secondary alcohol
- an aldehyde
- a primary alcohol

Question **10**

Products of reaction between ethanol and hydrogen chloride are

Select one:

- Chloroethane and water
- Hydrogen chloride and water
- Carbon dioxide and water
- Carbon and water
- Chlorine and water

Question **11**

Reduction of ketone produces

Select one:

a. Secondary alcohol

b. Tertiary alcohol

c. Carboxylic acid

d. Aldehyde

e. Primary alcohol

Question **12**

The first step of substitution reaction of alkanes is.....

Select one:

a. termination, formation of the radical

b. propagation, radical attacks the alkane

c. initiation, formation of radical

d. propagation, formation of the radical

e. initiation, takes place in the darkness

Question **13**

The addition polymerisation is characterised by .....

Select one:

a. the polymer being completely dissolved at the end of the reaction.

b. the polymer being the only product of the reaction.

c. the product of the reaction is polymer and water.

d. the product is always colourless.

e. an unpleasant gas is produced during this reaction.

Question **14**

During the reaction of bromoethane with cyanide ions in ethanol, which one of the following is formed?

Select one:

a. ethanecyanide

b. propanenitrile

c. propanecyanide

d. ethanenitrile

e. ethane and hydrogenbromide

Question **15**

Alkylation of benzene is

Select one:

a. Nucleophilic substitution

b. Electrophilic substitution

c. Electrophilic addition

d. Elimination

e. Nucleophilic addition

Question **16**

When esters are refluxed with an alkali, the product(s) of this reaction is/are

Select one:

a. Ester and water

b. Alcohol and water

c. Alcohol and salts of carboxylic acid

d. Ester and carboxylic acid

e. Ester and alcohol

Question **17**

The presence of H^+ (aq) ions in solution of carboxylic acid means that they undergo all the usual reactions of acid. When an acid reacts with carbonates, ……. are formed.

Select one:

a. Salts and water

b. Salts, water and carbon dioxide

c. Salts and carbon dioxide and hydrogen

d. Salts and hydrogen

e. Salts and carbon dioxide

Question **18**

Amines contains nitrogen atom with a lone pair of electrons that is available to attack the carbonyl carbon atom in acyl chloride. The reaction is vigorous and organic product of this reaction is

Select one:

a. amine

b. amide

c. carboxylic acid and amine

d. alcohol and nitrogen

e. carboxylic acid and ammonia

Question **19**

Functional group isomers

Select one:

a. are compounds with the same structural formula but different molecular formula.

b. are compounds with a different position of the functional group.

c. contain a chiral centre.

d. differ in the structure of their carbon skeleton.

e. have different functional group present.

Question **20**

Optical isomers

Select one:

a. contain a chiral centre.

b. have no free rotation.

c. have different functional group present.

d. differ in the structure of their carbon skeleton.

e. are compounds with a different position of the functional group.

Question **21**

Select the FALSE statement about amines.

Select one:

a. By realising electrons to the N atom of the ethyl group of ethylamine makes the lone electron pair more readily available to bond with H+ ion than it is in ammonia.

b. Ethylamine is a stronger base than ammonia.

c. Ammonia and the amines have different strengths as bases.

d. The strongest base of the following (ammonia, ethylamine and phenylamine) is ammonia.

e. Phenylamine is a weaker base than ammonia.

Question **22**

The functional group in the following compound CH_3NH_2 is

Select one:

a. nitrile

b. amine

c. ester

d. amide

e. alcohol

Question **23**

The functional group of the following compound $CH_3COOC_2H_5$ is

Select one:

- a. ester
- b. alcohol
- c. aldehyde
- d. anhydride
- e. ketone

Question **24**

Classify this reaction, choosing from the types of reactions below

$C_2H_6 + Cl_2 \rightarrow C_2H_5Cl + HCl$

Select one:

- a. Oxidation
- b. Elimination
- c. Addition
- d. Hydrolysis
- e. Substitution

Question **25**

Characterize alanine in the environment that has pH lower than the isoelectric point of alanine

Select one:

- a. behaves as an acid
- b. has an overall zero charge
- c. it moves towards the anode in the electric field
- d. it moves towards the cathode in electric field
- e. loses its hydroxyl group

Question **26**

Which one of the following contains indole moiety?

Select one:

- a. tryptophane
- b. ethanolamine
- c. acetaldehyde
- d. histidine
- e. vinylalcohol

Question **27**

From the following select the INCORRECT statement on linoleic acid

Select one:

- a. is a hydrophobic molecule
- b. it is an essential acid
- c. complete hydrogenation of linoleic acid results in palmitic acid formation
- d. contains two double bonds in *cis* formation
- e. is part of plant oils

Question **28**

Gangliosides are:

Select one:

- a. steroids
- b. triacylglycerols
- c. polysaccharides
- d. lipoproteins
- e. glycolipids

Question **29**

Proteins are effective buffers because they contain:

Select one:

- a. a large number of hydrogen bonds in α-helices
- b. N-terminal and C-terminal residues that can donate and accept protons
- c. peptide bonds that readily hydrolyze, consuming hydrogen and hydroxyl ions
- d. amino acid residues with different pKs
- e. a large number of amino acids

Question **30**

From the following select the INCORRECT statement on ATP

Select one:

- a. xanthine and phosphoric acid are formed during its hydrolysis
- b. contains N-glycosidic, ester and anhydride bond
- c. is energy source within a cell
- d. contains macroergic bond
- e. is formed in respiratory chain

Question **31**

Transamminases catalyze the transfer of

Select one:

- a. ammonia
- b. nitrogen
- c. OH group
- d. NO_2 group
- e. NH_2 group

Question **32**

From the following select the molecule which causes lowering of blood glucose concentration:

Select one:

- a. glucagon
- b. aldosterone
- c. insulin
- d. parathyrine
- e. adrenaline

Question **33**

Starch contains:

Select one:

- a. amylopectin
- b. galactose
- c. fructose
- d. dextran
- e. amylase

Question **34**

From the following select a molecule that DOES NOT belong among polysaccharides:

Select one:

- a. agar
- b. cellulose
- c. amylase
- d. amylopectin
- e. glycogen

Question **35**

What is the concentration of $Ca(OH)_2$ with pH = 10.

Select one:

- a. 0.00005
- b. 0.1
- c. 0.0005
- d. 0.0004
- e. 0.0001

Question **36**

From the following select the reaction with correct stoichiometric coefficients. The reaction is:

$Cr^{3+} + H_2O_2 + OH^- \rightarrow CrO_4^{2-} + H_2O$

Select one:

- a. $2Cr^{3+} + 2H_2O_2 + 12OH^- \rightarrow 2CrO_4^{2-} + 8H_2O$
- b. $2Cr^{3+} + 4H_2O_2 + 8OH^- \rightarrow 2CrO_4^{2-} + 8H_2O$
- c. $2Cr^{3+} + 3H_2O_2 + 10OH^- \rightarrow 2CrO_4^{2-} + 8H_2O$
- d. $2Cr^{3+} + 5H_2O_2 + 4OH^- \rightarrow 2CrO_4^{2-} + 7H_2O$
- e. $2Cr^{3+} + H_2O_2 + 6OH^- \rightarrow 2CrO_4^{2-} + 6H_2O$

Question **37**

Calculate the content of carbon, in mass percentage, in lactic acid $CH_3CH(OH)COOH$.

M(C) = 12.0 g/mol, M(O) = 16.0 g/mol, M(H) = 1.0 g/mol.

Select one:

- 13.33%
- 40.00%
- 53.33%
- 26.67%

Question **38**

Sample weighing 800 mg contains glucose and 20% water, it is dissolved in 145 cm^3 of solution. Calculate the molar concentration of glucose in mmol/dm^3. Mr (glucose) = 180, density of glucose solution is 1 g/cm^3.

Select one:

- a. 30.6 mmol/dm^3
- b. 306 mmol/dm^3
- c. 2.45 mmol/dm^3
- d. 3.06 mmol/dm^3
- e. 24.5 mmol/dm^3
- f. 245 mmol/dm^3

Question **39**

Calculate the pH of 0.2M H_2SO_4.

Select one:

- a. 0.2
- b. 0.1
- c. 0.3
- d. 0.5
- e. 0.4

Question **40**

Calculate pOH of 0.1 M $Ca(OH)_2$.

Select one:

- a. 0.7
- b. 13
- c. 1
- d. 12
- e. 13.3

Question **41**

Balance the following molecular equation by the oxidation-number-change method.

$C_3H_7OH + Na_2Cr_2O_7 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + Na_2SO_4 + H_2O + HC_3H_5O_2$

Select one:

- a. $3C_3H_7OH + 3Na_2Cr_2O_7 + 12H_2SO_4 \rightarrow 3Cr_2(SO_4)_3 + 2Na_2SO_4 + 11H_2O + 3HC_3H_5O_2$
- b. $3C_3H_7OH + 2Na_2Cr_2O_7 + 6H_2SO_4 \rightarrow 2Cr_2(SO_4)_3 + 2Na_2SO_4 + 9H_2O + 3HC_3H_5O_2$
- c. $3C_3H_7OH + 2Na_2Cr_2O_7 + 10H_2SO_4 \rightarrow 3Cr_2(SO_4)_3 + 2Na_2SO_4 + 11H_2O + 4HC_3H_5O_2$
- d. $2C_3H_7OH + Na_2Cr_2O_7 + 4H_2SO_4 \rightarrow Cr_2(SO_4)_3 + Na_2SO_4 + 7H_2O + 3HC_3H_5O_2$
- e. $3C_3H_7OH + 2Na_2Cr_2O_7 + 8H_2SO_4 \rightarrow 2Cr_2(SO_4)_3 + 2Na_2SO_4 + 11H_2O + 3HC_3H_5O_2$

Question **42**

How many grams of glucose are needed to prepare 800 mL of 500 mmol/L glucose solution?

M(glucose) = 180.16 g/mol.

Select one:

- 144.1 g
- 36.0 g
- 90.1 g
- 72.1 g

Correct answers:

1 C	11 A	21 D	31 E	41 E
2 A	12 C	22 B	32 C	42 D
3 B	13 B	23 A	33 A	
4 C	14 B	24 E	34 C	
5 C	15 B	25 D	35 A	
6 D	16 C	26 A	36 C	
7 B	17 B	27 C	37 B	
8 D	18 B	28 E	38 E	
9 A	19 E	29 D	39 E	
10 A	20 A	30 A	40 A	

Question **1**

It's very kind of you to bring some cakes with you, but you really ___ to.

Select one:

- a. not need
- b. needn't
- c. needn't have
- d. didn't need

Question **2**

"Why are you taking your PlayStation games?"
"Oh, just ___ Tommy wants to borrow them."

Select one:

- a. as long as
- b. in case
- c. unless
- d. provided that

Question **3**

He managed to eat a big lunch ___ having eaten an enormous breakfast.

Select one:

- a. however
- b. in spite
- c. despite
- d. although

Question **4**

I haven't seen George for ages. When I last saw him, he ___ to find a job in London.

Select one:

- a. had been trying
- b. was trying
- c. tried
- d. had tried

Question **5**

The hotel is ___ close by, but quite cheap, too.

Select one:

- a. not only
- b. in addition
- c. as well as
- d. also

Question **6**

I'd rather you ___ the bus every day instead of driving.

Select one:

- a. took
- b. were taking
- c. will take
- d. take

Question **7**

I get along with my brother, but I wish he ___ his clothes lying around the house.

Select one:

- a. hadn't left
- b. wouldn't leave
- c. shouldn't leave
- d. couldn't leave

Question **8**

Oh, I am sorry. If I had seen you walking, I ___ you a lift.

Select one:

- a. would offer
- b. could have offered
- c. should have offered
- d. could offer

Question **9**

Apparently, he ___ them since he was a child.

Select one:

- a. has been knowing
- b. has known
- c. is knowing
- d. knows

Question **10**

I've got a good chance of getting the job ___ I do okay in the interview.

Select one:

- a. unless
- b. provided
- c. in case
- d. only

Question **11**

It's really time you ___ thinking about setting up your own business.

Select one:

- a. to start
- b. started
- c. start
- d. have started

Question **12**

I can't help ___ that Peggy would look better if she lost some weight.

Select one:

- a. thinking
- b. to think
- c. think
- d. to thinking

Question **13**

“Shall we stay at home or go for a walk?”

“Which ___ do yourself?”

Select one:

- a. did you rather
- b. do you rather
- c. will you rather
- d. would you rather

Question **14**

Would you mind ___ so much noise, I’m trying to get some work done.

Select one:

- a. not to make
- b. not make
- c. not to making
- d. not making

Question **15**

“Which of these pullovers do you like?”

___. I think they’re both ugly.”

Select one:

- a. None
- b. Nothing
- c. No
- d. Neither

Question **16**

John ___ on a bit of weight lately, and he is trying to lose it.

Select one:

- a. puts
- b. has put
- c. had put
- d. is putting

Question **17**

“This time next week we ___ on the beach. I can’t wait.”

Select one:

- a. will be lying
- b. will have been lying
- c. will have lain
- d. are lying

Question **18**

Steve, I wish you ___ drive like a crazy person!

Select one:

- a. couldn’t
- b. wouldn’t
- c. mustn’t
- d. could

Question **19**

Yesterday, I met an old school friend whom I ___ for years.

Select one:

- a. didn't see
- b. saw
- c. hadn't seen
- d. haven't seen

Question **20**

Our car broke down, so we had to take it to the garage to___.

Select one:

- a. having had it fixed
- b. have had it fixed
- c. have it fixed
- d. have fixed it

Question **21**

If you want to lose weight and get fit, you should try ____.

Select one:

- a. to go swimming
- b. go swimming
- c. swimming
- d. to swim

Question **22**

Do you remember ___ to school for the first time? What was it like?

Select one:

- a. go
- b. to go
- c. of going
- d. going

Question **23**

“It was hard work getting back from the hospital with my leg in plaster.”

“You should ___ me. I’d have picked you up.”

Select one:

- a. have called
- b. be calling
- c. had called
- d. call

Question **24**

It was clear that the new owners were not _____ of taking charge of the restaurant.

Select one:

- a. responsible
- b. capable
- c. reliable
- d. able

Question **25**

If you ___ iron, it starts to get red hot and then white hot.

Select one:

- a. heat
- b. will heat
- c. would heat
- d. heated

Question **26**

I ___ buy a present for Mark because his graduation is on Monday.

Select one:

- a. need
- b. need to
- c. am needing to
- d. will need

Question **27**

___ the fire, many birds lost their nests.

Select one:

- a. Because
- b. Consequently
- c. As a result
- d. Due to

Question **28**

Do you know how many comedies ___?

Select one:

- a. Shakespeare wrote
- b. has written Shakespeare
- c. has Shakespeare written
- d. wrote Shakespeare

Question **29**

You ___ have lied to your dad about taking the car. He would have found out anyway.

Select one:

- a. couldn't
- b. shouldn't
- c. can't
- d. mustn't

Question **30**

I don't think there's ___ point in apologising now.

Select one:

- a. very
- b. such
- c. any
- d. little

Question **31**

The world around us is being destroyed, but we may still have time to do something about it. Every day, during the rush hour, you can see cars stuck in traffic jams, polluting the atmosphere with their ___.

Select one:

a. smog layer

b. exhaust fumes

c. global warming

d. greenhouse effect

Question **32**

Sheffield Football Club was founded in 1857, and is the oldest in the world. As part of its 150th anniversary celebrations, the club ___ forces with the world's largest express transportation company, FedEx Express, in a charitable scheme known as Boots for Africa.

Select one:

a. linked

b. added

c. tied

d. joined

Question **33**

One of the most difficult but rewarding of pastimes is mountain climbing. The modern climber must possess many different skills. Rock climbing ___ a combination of gymnastic ability, imagination and observation.

Select one:

- a. insists
- b. calls
- c. requires
- d. orders

Question **34**

Napoleon III of France was responsible for the invention of the butter substitute known as margarine. He was looking for a cheap ___ to butter for the poorer people of society, and for his army and navy.

Select one:

- a. replacement
- b. alternative
- c. choice
- d. option

Question **35**

There are two reasons why listening to other people is often such hard work. The first is simply that people much prefer to speak and often ___ what someone has said because they are thinking about what they are going to say in reply.

Select one:

- a. slip
- b. lose
- c. miss
- d. drop

Question **36**

Lots of people think that stunt artists are just 'extras' who play small, unimportant parts in films and television. Nothing could be further from the truth. A stunt artist must ___ the skills of an actor with physical abilities of a first-class athlete.

Select one:

- a. consider
- b. mix
- c. consist
- d. combine

Question **37**

Sir Isaac Newton, the English scientist and mathematician, was one of the most important figures of the 17th century scientific revolution. One of his greatest ___ was the discovery of the three laws of motion, which are still used today.

Select one:

- a. aims
- b. goals
- c. prizes
- d. achievements

Question **38**

A volcanic eruption is possibly the most spectacular example of the incredible power of nature – and few eruptions in history have been quite as spectacular as that of Krakatoa. ___ the summer of 1833 this volcano had been quiet for over two hundred years. In May that year came the first signs of renewed activity.

Select one:

- a. When
- b. For
- c. During
- d. Until

Question **39**

It's a fact that blue skies tend to lift the spirits and make the world seem a better place. It's also true that overcast rainy days can make us feel gloomy and depressed. Or is it? It may come as a surprise to some of us to learn that there is, in fact no hard evidence to ___ the theory that the weather plays an important part in influencing our moods.

Select one:

- a. allow
- b. support
- c. reveal
- d. base

Question **40**

Since the first satellites were launched by rocket over 50 years ago, the number of communications satellites in space has increased enormously. As part of ___ positioning systems they tell us where we are on the planet, and can help save lives by, for instance, directing the emergency services to the scene of an accident.

Select one:

- a. external
- b. global
- c. universal
- d. regional

Question **41**

Have you managed to work ___ how much overtime we've earned this week?

Select one:

- a. up
- b. in
- c. out
- d. at

Question **42**

My father, who was always curious about the world, ___ us that something really extraordinary was about to happen.

Select one:

- a. explained
- b. said
- c. told
- d. suggested

Question **43**

Staying with my friend in China was a(n) ___ opportunity to learn about the culture.

Select one:

- a. unique
- b. common
- c. usual
- d. particular

Question **44**

It is important to ___ security precautions before going online.

Select one:

- a. take
- b. do
- c. make
- d. have

Question **45**

I would like to thank you all ___ behalf of the department.

Select one:

- a. on
- b. for
- c. at
- d. in

Question **46**

___ we are very close, my sister and I are so different. I think she takes after my mother while I take after my father.

Select one:

- a. Since
- b. Although
- c. Despite
- d. However

Question **47**

He was a young sailor on his first see ___ across the Atlantic.

Select one:

- a. journey
- b. travel
- c. trip
- d. voyage

Question **48**

The film was a failure and had very bad ___ in the national press.

Select one:

- a. notes
- b. reviews
- c. advertisements
- d. critics

Question **49**

She was only just getting ___ the flu when she got a stomach bug.

Select one:

- a. through
- b. over
- c. by
- d. across

Question **50**

The hospital is ____ out tests to find out what's wrong with the patient.

Select one:

- a. carrying
- b. doing
- c. following
- d. bringing

Correct answers:

1 D	11 B	21 C	31 B	41 C
2 B	12 A	22 D	32 D	42 C
3 C	13 D	23 A	33 C	43 A
4 B	14 D	24 B	34 B	44 A
5 A	15 D	25 A	35 C	45 A
6 A	16 B	26 B	36 D	46 B
7 B	17 A	27 D	37 D	47 D
8 B	18 B	28 A	38 D	48 B
9 B	19 C	29 B	39 B	49 B
10 B	20 C	30 C	40 B	50 A

Question **1**

What is the product of all the solutions of of the equation $x + \dfrac{10}{x-4} = -1$?

Select one:

- a. -6
- b. -5
- c. 6
- d. 1

Question **2**

In certain village, the ratio between adult men and adult women is $5:3$ and the ratio between adult men and children is $7:2$. What is the ratio between adults (men and women) and children?

Select one:

- a. $15:7$
- b. $28:5$
- c. $28:1$
- d. $5:1$

Question **3**

What is the unit digit of the number $324^3 + 324^0 + 324^2 + 324^5$?

Select one:

- a. 3
- b. 5
- c. 4
- d. 6

Question **4**

Five positive real numbers x, y, z, u and v are such that $xy = 2$, $yz = 3$, $zu = 4$, $uv = 5$. What is the value v/x?

Select one:

- a. $\frac{3}{2}$
- b. $\frac{15}{8}$
- c. $\frac{5}{6}$
- d. $\frac{4}{5}$

Question **5**

The perimeter of two similar triangles ABC and KLM are $18\ \mathrm{cm}$ and $12\ \mathrm{cm}$, respectively. The length of the line segment KL is $6\ \mathrm{cm}$. What is the length of the line segment AB?

Select one:

- a. $9\ \mathrm{cm}$
- b. $18\ \mathrm{cm}$
- c. $12\ \mathrm{cm}$
- d. $4\ \mathrm{cm}$

Question **6**

The sum of three consecutive integers is 15^{2020}. What is the middle number?

Select one:

- a. $5 \cdot 15^{2019}$
- b. 3^{2020}
- c. 5^{2020}
- d. $15 \cdot 5^{2019}$

Question **7**

If the price of an article is first decreased by 30 % and then increased by 20 %, then the net change in the price of the article will be:

Select one:

- a. 10 % decrease
- b. 10 % increase
- c. 4 % decrease
- d. 16 % decrease

Question **8**

The number $8^{2020} + 8^{2021} + 8^{2022} + 8^{2023}$ is divisible by

Select one:

- a. 11
- b. 3
- c. 17
- d. 7

Question **9**

We are given a regular hexagon $ABCDEF$. The area of the quadrilateral $BCEF$ is $4\,\text{cm}^2$. What is the area of the given hexagon in square centimetres?

Select one:

- a. 8
- b. $6\sqrt{2}$
- c. 6
- d. 5

Question **10**

How many different positive odd integers can be formed using the digits $3, 5, 6$ and 7 in which repetition of digits is not alowed?

Select one:

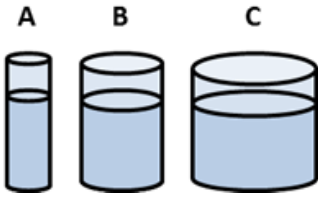
- a. 36
- b. 48
- c. 18
- d. 24

Correct answers:

1 C
2 B
3 B
4 B
5 A
6 A
7 D
8 B
9 C
10 B

Question **1**

Consider three vessels with different diameters that are filled with same liquid to the same height. In which vessel is the surface tension of the liquid the greatest?

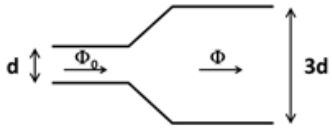


Select one:

- a. A
- b. B
- c. C
- d. in none of them

Question **2**

A pipe has input diameter d. The water flow at the input is Φ_0. Output diameter is 3d. What is the water flow Φ at the pipe output?



Select one:

- a. $1/3\ \Phi_0$
- b. Φ_0
- c. $9\ \Phi_0$
- d. $3\ \Phi_0$

Question **3**

Kinetic friction is always

Select one:

- a. lower that static friction
- b. greater than static friction
- c. zero
- d. equal to static friction

Question **4**

Sound intensity level is measured in

Select one:

- a. dynes
- b. pascals
- c. decibels
- d. pounds

Question **5**

Which of the following is a vector?

Select one:

- a. frequency
- b. distance
- c. work
- d. velocity

Question **6**

Constructive interference happens when two waves are

Select one:

- a. high amplitude
- b. in phase
- c. out of phase
- d. low amplitude

Question **7**

Name the physical quantity that determines the amount of heat needed to warm up 1 kg of a substance by 1 K

Select one:

- a. heat capacity
- b. entropy
- c. specific heat capacity
- d. molar heat capacity

Question **8**

The energy of 1 keV is equal to

Select one:

- a. 1×10^{19} J
- b. 1×10^{3} J
- c. 1.6×10^{-16} J
- d. 1 J

Question **9**

Sublimation is called a change of state

Select one:

- a. from solid to liquid
- b. from liquid to solid
- c. from solid to gas
- d. from liquid to plasma

Question **10**

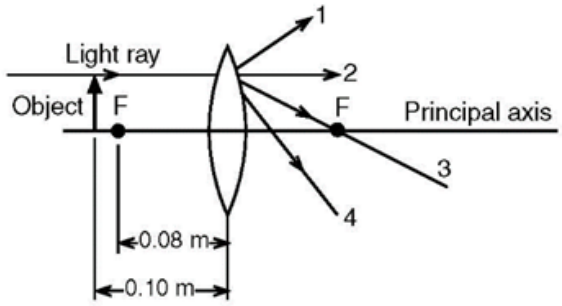
Moving a coil in and out of magnetic field indices

Select one:

- a. none of mentioned
- b. voltage
- c. force
- d. resistance

Question **11**

A converging lens has a focal length of 0.080 meter. A light ray travels from the object placed 0.1 m from the lens parallel to the principal axis. Which line best represents the path of the ray after it leaves the lens?



Select one:

- a. 1
- b. 2
- c. 3
- d. 4

Question **12**

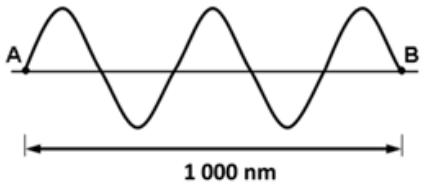
Density of air is

Select one:

- a. 1/8 of water
- b. 1/80 of water
- c. 1/800 of water
- d. 1/8000 of water

Question **13**

In the diagram below, the distance between points A and B on a wave is 1 000 nm. What is wavelength of this wave?



Select one:

- a. 100 nm
- b. 200 nm
- c. 250 nm
- d. 400 nm

Question **14**

Consider three types of the elementary particles neutron, proton and electron. Between which two particles would you expect the highest electric force when they are placed at the same mutual distances?

Select one:

- a. between two electrons
- b. between neutron and proton
- c. between neutron and electron
- d. between two neutrons

Question **15**

When two mechanical waves meet in one point, their displacements

Select one:

- a. destruct each other
- b. add up
- c. cancel out
- d. remain the same

Question **16**

Which graph best represents the motion of an object in the Earth's field that was thrown vertically upward?

Select one:

- a. 

- b. 

- c. 

- d. 

Question **17**

In the reaction $_{11}Na^{24} \rightarrow {}_{12}Mg^{24}$ + X, particle X is a

Select one:

a. neutron

b. proton

c. electron

d. positron

Question **18**

Current through each resistor when they are connected in series is

Select one:

a. same

b. gradually increasing

c. zero

d. different (according to the resistance)

Question **19**

What is the SI unit of magnetic flux?

Select one:

- a. 1 weber
- b. 1 farad
- c. 1 tesla
- d. 1 henry

Question **20**

Gravitational force acting on two point masses is directly proportional to

Select one:

- a. sum of masses
- b. distance between masses
- c. difference of masses
- d. product of masses

Question **21**

Infrasound

Select one or more:

- [ ] a. is used for diagnostic purposes in medicine
- [ ] b. can be transferred through a vacuum
- [ ] c. is a form of electromagnetic radiation
- [ ] d. has the frequency lower than 15 Hz
- [ ] e. has longer wavelength than hearable sound
- [ ] f. has the speed of propagation lower in solid materials than any other materials

Question **22**

Glasses with diverging lenses are used

Select one or more:

- [ ] a. when the location of the near point (punctum proximum) and the location of the far point (punctum remotum) are same
- [ ] b. to correct nearsightedness
- [ ] c. when the image is formed in front of the retina
- [ ] d. when the image is formed behind the retina
- [ ] e. to correct glaucoma
- [ ] f. to correct farsightedness

Question **23**

Select the correct statements

Select one or more:

- [ ] a. The volume pumped out per unit of time by the right ventricle is less than the volume pumped out by the left ventricle.
- [ ] b. The diastolic value of the blood pressure is always greater than the systolic value.
- [ ] c. The diastolic pressure is related to elastic recoil of the aorta wall.
- [ ] d. The work performed by the left ventricle is much greater than the work performed by the right ventricle because the wall of the left ventricle is thicker than the wall of the right ventricle.
- [ ] e. In all parts of the cardiovascular system two values of the blood pressure can be distinguished, namely the systolic and diastolic value.
- [ ] f. The volume of blood pumped by the heart in a minute is about 5 liters at rest.

Question **24**

Select the correct statements about human body

Select one or more:

- [ ] a. The potential energy of a 70 kg man standing on the Earth's surface is about 70 kJ.
- [ ] b. The normal blood pressure is about 120/80 Pa.
- [ ] c. The breathing frequency is 1 Hz in adults at rest.
- [ ] d. At low luminance the eye sensitivity to the blue light is higher than that to red light.
- [ ] e. The hair cells inside the organ of Corti are mechanoreceptors.
- [ ] f. The cardiac output is about 0.5 l/min.

Question **25**

What are the names of the devices that are used by ophthalmologist to determine a degree of nearsightedness?

Select one or more:

- [ ] a. pachymeter
- [ ] b. ophthalmoscope
- [ ] c. perimeter
- [ ] d. optotype
- [ ] e. tonometer
- [ ] f. refractometer

Question **26**

A stone is thrown upwards with initial velocity of 20 m/s. Gravitational acceleration g = 9.8 m/s^2.The height that stone will reach would be approximately

Select one:

- ◯ a. 20 m
- ◯ b. 60 m
- ◯ c. 40 m
- ◯ d. 10 m
- ◯ e. 30 m
- ◯ f. 50 m

Question **27**

What is the magnitude of the gravitational force between Earth and Moon? Assume their distance 3.84 $\times 10^5$ km, masses 6 $\times 10^{24}$ kg and 7.3 $\times 10^{22}$ kg, and gravitational constant 6.7 $\times 10^{-11}$ $m^3 \cdot kg^{-1} \cdot s^{-2}$.

Select one:

- a. 7.6×10^{14} N
- b. 2.0×10^{20} N
- c. 2.5×10^{4} N
- d. 1.1×10^{16} N
- e. 7.6×10^{18} N
- f. 4.4×10^{14} N

Question **28**

An ideal gas is inside of a tube at 60 °C. If the pressure remains constant, but the volume increases from 3 m^3 to 5 m^3, what will be the final temperature in the tube?

Select one:

- a. -73 °C
- b. 463 °C
- c. 36 °C
- d. 100 °C
- e. -162 °C
- f. 282 °C

Question **29**

A 800 kg car was accelerated from 20 m/s to 30 m/s. What is the increase in kinetic energy?

Select one:

- a. 12 kJ
- b. 80 kJ
- c. 200 kJ
- d. 24 kJ
- e. 400 kJ
- f. 40 kJ

Question **30**

Calculate the impedance of a capacitor (capacitive reactance) with the capacitance of 60 μF when it is connected to an AC voltage source at the frequency of 50 Hz.

Select one:

- a. 8.3×10^{5} Ω
- b. 5.3×10^{1} Ω
- c. 1.2×10^{-1} Ω
- d. 1.2×10^{-6} Ω
- e. 1.7×10^{2} Ω
- f. 3.7×10^{-4} Ω

Question **31**

If a 15 Ω resistor is connected in parallel with a 30 Ω resistor, the equivalent resistance is

Select one:

- a. 45 Ω
- b. 22.5 Ω
- c. 20 Ω
- d. 15 Ω
- e. 10 Ω
- f. 60 Ω

Question **32**

A wire carries a current of 20 A from east to west. Assume that at this location the magnetic field of the earth is horizontal and directed from south to north, and has a magnitude of 0.50×10^{-4} T. Calculate the magnetic force on a 300 m length of the wire.

Select one:

- a. 4.0×10^{5} N
- b. 0 N
- c. 3.0×10^{5} N
- d. 0.3 N
- e. 3.3 N
- f. 1.3×10^{3} N

Question **33**

What is the wavelength of a particle, if its momentum is 2.6 $\times 10^{-22}$ kg·m·s^{-1}? Consider that the Planck's constant is 6.63 $\times 10^{-34}$ m^2·kg·s^{-1} and the charge of the particle 1.6 $\times 10^{-19}$ C.

Select one:

- a. 4.14×10^{-15} m
- b. 2.55×10^{-12} m
- c. 1.08×10^{-36} m
- d. 1.62×10^{-3} m
- e. 4.08×10^{-31} m
- f. 2.76×10^{-74} m

Question **34**

Determine the optical power of the human eye if its effective focal length is 17 mm.

Select one:

- a. 34 D
- b. 17 D
- c. 8.5 D
- d. 0 D
- e. 59 D
- f. 1.7 D

Question **35**

Calculate the time required for a sample of radioactive technetium to lose 90 % of its activity. Consider that the half-life of technetium is 6 hours?

Select one:

- a. 19.9 h
- b. 10.8 h
- c. 54.0 h
- d. 23.4 h
- e. 9.3 h
- f. 13.8 h

Correct answers:

1 D	11 C	21 D, E	31 E
2 B	12 C	22 B, C	32 D
3 A	13 D	23 C, F	33 B
4 C	14 A	24 D, E	34 E
5 D	15 B	25 D, F	35 A
6 B	16 A	26 A	
7 C	17 C	27 B	
8 C	18 A	28 F	
9 C	19 A	29 C	
10 B	20 D	30 B	