

General Knowledge and Logical Reasoning

1. Studies are taking place to assess the benefits to dental health of adding fluoride to drinking water, a process known as mass medication. The Health Minister has urged consideration of fluoridation, particularly in deprived areas where dental care is poor. Fluoride can occur naturally in the water because of fluoride containing minerals. Fluoride, if in the water, improves dental health by up to 50 percent. Even so, fluoridation should not take place. A campaign leader opposed to fluoridation has spoken of her experiences of living in a fluoridated area of the USA. She experienced feelings of apathy and depression; her 2 year old son showed autistic tendencies and had white flecks on his teeth. These symptoms disappeared when they returned home from the USA.

Which one of the following is an underlying assumption of the argument above?

- A. The reported health symptoms were caused by fluoride in the water.
- B. Mass medication is always wrong.
- C. Fluoridation is cheaper than improving dental facilities.
- D. Fluoridation is only necessary in deprived areas.

2. Climate scientists in Greenland studying patterns of plant growth have suggested that the early arrival of spring in the Arctic threatens to drive down populations of migrating animals such as caribou. However, comparable studies elsewhere show that their fears are unfounded. A recent study of great tits in Oxfordshire showed the birds are capable of adapting to climate change better than many scientists expected. Over the past half century, the birds have brought forward the date they lay their eggs by two weeks, so that young are born when plant-eating grubs are most plentiful.

Which one of the following is an underlying assumption of the above argument?

- A. Birds are more adaptable than large mammals such as caribou.
- B. Migrating animals in the Arctic can adapt to climate change as successfully as great tits in Oxfordshire.
- C. Climate change in Greenland and climate change in Oxfordshire are of the same scale.

- D. The scientists working in Oxfordshire have greater expertise than those working in Greenland.
- E. Unless animals like the caribou produce their young earlier in the year, their population will fall.

3. Now, it might be thought an amazing coincidence if Earth were the only planet in the galaxy on which intelligent life evolved. If it happened here, the one planet we have studied closely, surely one would expect it to have happened on a lot of other planets in the galaxy – planets we have not yet had the chance to examine. This objection, however, rests on a fallacy: it overlooks what is known as an 'observation selection effect', so it wouldn't be such a coincidence. Whether intelligent life is common or rare, every observer is guaranteed to originate from a place where intelligent life did, in fact, arise. Since only the successes give rise to observers who can wonder about their existence, it would be a mistake to regard our planet as a randomly selected sample from all planets.

Which one of the following best expresses the main conclusion of the above argument?

- A. If life had evolved here on Earth, it would probably have happened on a lot of other planets in the galaxy.
- B. There would be no amazing coincidence if we discovered that Earth were the only planet in the galaxy on which intelligent life evolved.
- C. It would be an amazing coincidence if Earth were the only planet in the galaxy on which intelligent life evolved.
- D. Our planet is not a randomly selected sample from all planets.
- E. However common intelligent life is, every observer will certainly originate from a place where intelligent life did, in fact, arise.

4. Although it is sometimes suggested that the congestion caused by the bunching of cars on motorways could be eased by increasing the speed limit to 150 km/hr, such an increase would not be a good thing. An estimated 35 per cent of drivers exceed the speed limit by 20 km/hr and would continue to do so if the limit were raised. Since bunching is caused by speeding drivers trying to pass those who observe the speed limit, raising the limit to 150 km/hr would result in

the same amount of congestion, but at an increased speed. Moreover, a higher speed limit would encourage all drivers to drive faster, and thus would increase the existing danger from those who drive too close to the car in front.

Which one of the following best expresses the main conclusion of the above argument?

- A. A higher speed limit on motorways would encourage all drivers to drive faster.
- B. Raising the speed limit to 150 km/hr would not reduce congestion on motorways.
- C. It would not be a good thing to increase the speed limit to 150 km/hr.
- D. An increase in the speed limit would increase the existing danger from those drivers who drive too close.
- E. Congestion on motorways is caused by speeding drivers trying to pass those who observe the speed limit.

5. Food producers are resisting pressure to reduce still further the levels of salt in food. Although it is proven that salt intake must be reduced by those with hypertension, there is no evidence that reducing salt intake prevents hypertension. So why should we all be deprived of the pleasures of salt in food? We certainly need to identify those with hypertension and give them advice on their salt intake, but why should everyone else be deprived of salt? Food producers are right to resist the pressure.

Which one of the following best illustrates the principle underlying the argument above?

- A. Adding fluoride to drinking water has reduced tooth decay, but fluoride is unwelcome to some people. Instead, dentists should advise patients with tooth problems on better tooth care.
- B. The requirement to wear seatbelts has reduced deaths in car accidents but was unpopular when first introduced. People eventually accepted such changes even if it has not benefited them personally.
- C. Retailers cannot sell alcohol to people under 18 years, but providing more general advice on alcohol in schools would be better, as it would encourage young people to be self limiting in their consumption of alcohol.
- D. Advice to wear sun block to protect the skin from harmful rays is ignored by some people. Those people should be charged for medical treatment for skin cancer.
- E. Passive smoking is still a problem for people who share a home with a smoker. The law should be extended to make smoking illegal even in the home.

6. Sports are played either as a means of getting exercise or as a competition with an opponent.

Some sports, such as football, involve a large amount of running and some people are more motivated to run when it is part of a game. Other sports, such as pool, do not involve much physical activity and so it is unlikely that they would be played for the exercise.

Which one of the following conclusions is best supported by the passage above?

- A. People who play pool are more likely to be interested in the competition than those who play football.
- B. Since the main reason for playing sports is to get exercise, pool should not be classified as a sport.
- C. It is easier to exercise when it is as part of another activity, such as playing sport.
- D. Football is a better sporting activity than pool.
- E. There is no point in running as a hobby, since football is more fun.

7. Concern about the effects of chemicals upon the environment has led to calls for more research. But we should not wait for further research before we ban some of the chemicals used by industry. If anyone has a good reason to think something is harmful, it should not be used until, or unless, the risk is found to be zero. We know enough about past mistakes to be forewarned. Much of the harm to wildlife and humans is long term, and the disturbing results we see today reflect the chemical environment 40 years ago. Thousands more chemicals have been released into the environment since then.

Which one of the following most closely matches the reasoning above?

- A. People should not be able to adopt children until proper checks have been carried out. Serious consequences may follow if adoptive parents are unsuitable.
- B. A suspected terrorist should be arrested at once. Waiting for conclusive evidence in the past has resulted in atrocities that could have been avoided by acting on suspicion, and the threat of terrorism has grown.
- C. Some homes for the elderly have been found to give dangerously substandard care. Therefore they should be closed down and the residents found acceptable alternatives.
- D. Some cars that have passed the annual roadworthiness test would not pass 6 months later. Cars should be tested more than once a year once they pass a certain age.

- E. Cyclists should not place too much confidence in the benefits of helmets, because there is no conclusive evidence as yet that helmets prevent serious injuries.

8. Children are being encouraged to take up gardening through special events at shows and activities in schools. It is hoped that an interest in gardening, and particularly growing one's own food, will make children more interested in learning about their food and they will therefore be deterred from eating junk food. The initiative should be supported and spread to more schools as quickly as possible.

Which one of the following, if true, would most weaken the above argument?

- A. It tends to be older people who are interested in gardening and growing their own food.
- B. The practical experience of gardening is not a traditional academic subject.
- C. Some schools do not have a garden.
- D. Most children have enjoyed the events provided, but have not gained an interest in gardening itself.
- E. The events to encourage children to garden also included stands where junk food was for sale.

9. Although the Earth supports life, it has a mysterious carbon deficit. Compared with other bodies in the solar system the Earth has far less carbon than would be expected for a planet that supports life. Originally it was thought that in the inner region of the dust disc where the Earth formed, temperatures soared high enough for the carbon to boil away. However, observations of developing solar systems have now suggested that the temperature would not have been high enough. It is more likely that fire is to blame. Hot oxygen atoms would have readily combined with carbon, burning to produce carbon dioxide. There would have been fewer of these oxygen atoms further away from the Sun.

Which one of the following, if true, would most strengthen the above argument?

- A. There is no theoretical reason why life has to be carbon based.
- B. The abundance of carbon in the asteroid belt surrounding the inner planets increases the further away you get from the Sun.
- C. At temperatures that are high enough for carbon to boil away, oxygen would also have

boiled away.

- D. The carbon that is present on the Earth could have arrived at a later date from an asteroid.

10. Undercover police investigators sometimes commit 'crimes' in order to convince the 'real criminals' that they are on the same side as them. Some of these activities have victims, although in the main these are other criminals – rival gang members for example. In committing what are technically offences the officers are preventing many more serious crimes by helping to convict and imprison dangerous criminals who might otherwise remain at liberty. But that is not really the point. A breach of the law is a breach of the law, whoever commits it and for whatever reason. Preventing a crime does not make it right to commit another crime.

Which one of the following is the general principle underlying the above argument?

- A. There is no such thing as a victimless crime
- B. Serious crime must be prevented by any reasonable means.
- C. An act is criminal only if it is committed for criminal reasons.
- D. The end does not justify the means.
- E. The police have a duty to protect law-abiding citizens from violence.

11. Alberto has decided to paint his dining room. Paint comes in 1 litre cans. The paint in one can will cover an area of approximately 24 square metres. The dining room is 4 m x 6 m x 3.5 m high. There is just one window which is in one of the long walls and is 1.5 m x 2 m.

All of the walls, door and ceiling are to be painted with the same type of paint.

Approximately 20% of the wall area to be painted is wood which will need a second coat of paint.

What is the minimum number of cans of paint that Alberto should buy to have sufficient to complete the room?

- A. 6 cans
- B. 2 cans
- C. 3 cans

- D. 4 cans
- E. 5 cans

12. There are two services between Sandpoint and Genville: a fast hovercraft service which takes 50 minutes and a slow ferry which takes 1 hour 40 minutes. They both stop in port for 20 minutes at each end before starting the return journey. They start out from Sandpoint together at the same time each morning.

For how long has the slow ferry been sailing before it meets the hovercraft coming back?

(Answer to the nearest minute if necessary.)

- A. 1 hour and 30 minutes
- B. 1 hour and 10 minutes
- C. 1 hour and 7 minutes
- D. 1 hour and 25 minutes
- E. 1 hour and 20 minutes

13. When I made a hotel reservation online yesterday I was given an 8-digit booking reference which contained no zeros. It did, however, consist of three 2-digit odd numbers followed by the sum of these three numbers, and all eight digits were different.

The first digit of the booking reference was 4. What was the last digit?

- A. 9
- B. 1
- C. 3
- D. 5
- E. 7

14. Which one of the following pairs of scholar/field of study is NOT correct?

- A. Max Weber Pedagogy
- B. Amartya Sen Economics
- C. Ludwig Wittgenstein Philosophy
- D. Konrad Lorenz Ethology

E. Doris Lessing Literature

15. Which one of the following public figures was NOT awarded the Nobel Peace Prize?

- A. Mahatma Gandhi
- B. Willy Brandt
- C. Martin Luther King
- D. Nelson Mandela
- E. Aung San Suu Kyi

16. Ever since Uranus was discovered, astronomers have thought there might be more planets in the Solar System. Because of small deviations in the orbits of Uranus and Neptune - deviations which would occur if another planet existed - some astronomers think there must be an undiscovered planet - Planet X. But these deviations cannot tell us whether Planet X exists, because they would occur if the orbits had been wrongly predicted. Since Uranus and Neptune take many decades to circle the sun, astronomers rely on old data to calculate their orbits. As this is likely to be inaccurate, the calculated orbits are probably wrong, and so Uranus and Neptune will deviate from them even if there is no Planet X.

Which one of the following best expresses the main conclusion of the above argument?

- A The deviations in the orbits of Uranus and Neptune cannot tell us whether Planet X exists.
- B Astronomers are right to think that there must be an undiscovered planet.
- C The calculations of the orbits of Uranus and Neptune are probably wrong.
- D Uranus and Neptune will deviate from the predicted orbits whether or not Planet X exists.
- E The use of old and inaccurate data indicates that Planet X cannot exist.

17. Coffee granules are available in two jar sizes, regular and large. The regular jar contains 250 grams and costs €4.50. The large jar is 60% bigger, containing 400 grams, but at €6.30 costs only 40% more than the regular jar.

By how much per kilogram is the large jar of coffee better value for money than the regular jar?

A €3.60

B €0.90

C €2.25

D €3.15

E €6.00

18. According to a recent analysis of university entrance records, you are more likely to go to university if your name is John than if it is Wayne. Therefore, if you want your child to go to university, you are better off calling him John than Wayne.

Which one of the following is the best statement of the flaw in the argument above?

A It jumps to a conclusion without any evidence.

B It confuses a correlation with a cause.

C It fails to consider other names than Wayne or John.

D It draws a general conclusion from specific evidence.

E It confuses a necessary condition with a sufficient one

19. Horrific images of the earthquake in Haiti were seen immediately all over the world, and by the next day the full extent of the damage was seen by the entire world. Clearly, the main problem was moving aid from the airport to distant areas, and with the roads largely blocked the only practical method was to use helicopters. The great nations of the world should be ashamed that food was not getting to the people who needed it, and that even a week later their relief still depended on the ability of courageous and skillful drivers to reach them in trucks.

Which one of the following is an underlying assumption of the argument above?

A The great nations of the world had helicopters at their disposal which could reach Haiti within a week.

B The images failed to prompt the great nations of the world into relief operations after the earthquake.

C There was enough food in Haiti to supply all the people in the weeks after the earthquake.

D The relief agencies were able to import trucks to Haiti but not helicopters.

E The people of Haiti were able to clear their roads within a week of the earthquake.

20. The pasta that I buy in the local supermarket usually costs €1.60 per packet. This week the packet is marked '€0.20 off normal price'.

In addition the following sign is on display '10% off all bills when you spend €10 or more'.

Assuming that I spend over €10 altogether, how much will the packet of cereal cost?

A €1.24

B €1.12

C €1.26

D €1.30

E €1.18

21. There is an increasing number of historical or significant buildings in the UK which are said to be 'At Risk'. Without a change in the law most of these buildings are doomed to crumble into the ground.

This is because these buildings are no longer structurally sound. The existing strict renovation laws mean that they are too expensive or impractical for private individuals or developers to renovate or repair. There are certainly people out there who would be willing to maintain these buildings if they could use more modern and less expensive techniques and materials. Surely it is better to sacrifice some of the original building's character rather than lose the entire structure.

Which one of the following best expresses the main conclusion of the above argument?

A A change in the law is needed if we hope to preserve more 'At Risk' buildings.

B Existing laws make 'At Risk' buildings too expensive for most developers.

C 'At Risk' buildings need to be renovated according to strict rules.

D Historians can learn more from buildings which have not been modernised by modern

developers.

E There is nothing wrong with changing the character of historic buildings

22. A nationwide survey showed that the majority of people would not be willing to give up their car in favour of public transport. However, in a recent survey of people living in an area with heavy traffic problems, 76% stated that they would prefer to travel to work by public transport if the system was made more reliable. This shows that the previous findings were wrong. We should, therefore, restrict car use and start a programme of improving the nation's public transport network as soon as possible.

Which one of the following is the best statement of the flaw in the argument above?

A The statistic presented may not be representative of the whole population.

B It fails to specify which types of public transport are to be improved.

C It does not consider the 24% who would not prefer to use public transport.

D The counter arguments are not explained in detail.

E It fails to explain how the public transport system can be improved.

Biology

23. In a prokaryote, transcription can occur in which of the following?

1. cytoplasm

2. mitochondria

3. ribosomes

A. 1 and 2 only

B. 2 only

C. 3 only

D. 1 only

E. 1 and 3 only

24. The genotype QqRr produces a certain phenotype. If two individuals with a genotype of QqRr reproduce, how many different possible phenotypes could be created, assuming all allele

combinations are equally viable and the phenotypes are the result of complete dominance?

- A. 8
- B. 5
- C. 4
- D. 16
- E. 9

25. Which of the following are directly produced during photolysis of water?

- 1. oxygen
- 2. carbon dioxide
- 3. protons

- A. 2 and 3 only
- B. 1 and 2 only
- C. 1 and 3 only
- D. 1 only
- E. 2 only

26. Which of the following could be the outcome of evolution?

- 1. speciation
- 2. a change in allele frequency
- 3. increased biodiversity

- A. 1, 2 and 3
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1 and 3 only
- E. 1 only

27. Where in a shoulder joint are osteocytes found?

- A. muscle tissue
- B. bone tissue
- C. skin
- D. ligament
- E. cartilage

28. Some local anaesthetics affect nervous impulse transmission by making it more difficult for Voltage-gated sodium channels to open. In a human patient treated with these anaesthetics which of the following statements would be true?

- A. It would become harder to depolarise the neuron.
- B. The axon membrane would become more difficult to repolarise.
- C. The membrane potential of the neuron at rest would decrease below -90 mV.
- D. The sodium/potassium pump may need to work faster to maintain the resting potential.
- E. The threshold potential required to generate an action potential would be lowered.

29. The changes in concentration of hormones in a healthy woman's blood were monitored during several menstrual cycles.

During which stage of the menstrual cycle was the concentration of oestrogen falling, the concentration of luteinising hormone (LH) and follicle-stimulating hormone (FSH) maximal and the progesterone concentration rising?

- A. four days before ovulation and the time of ovulation
- B. at the end of menstruation
- C. between the end of menstruation and four days before ovulation
- D. after ovulation but before the start of menstruation
- E. at the start of menstruation

30. The following events occur during a reflex response to a person placing a hand on a hot object.

1. Myosin binding sites on actin filaments uncovered.
2. ADP and phosphate ion released from myosin head.
3. Sodium voltage-gated channels open.
4. Myosin head detaches from binding site on actin.
5. Calcium ions released by sarcoplasmic reticulum.

Which of the following options places four of these events in the correct order (from left to right)?

- A. 5, 2, 1, 4
- B. 5, 1, 2, 4
- C. 1, 2, 4, 3
- D. 3, 1, 4, 2
- E. 3, 5, 4, 2

31. Place the following structures in a human sperm cell in descending order of size (left to right):

- 1. mitochondria
- 2. nucleus
- 3. ribosome

- A. 1, 2, 3
- B. 2, 1, 3
- C. 1, 3, 2
- D. 2, 3, 1
- E. 3, 1, 2

32. Which one of the following is NOT a carbohydrate?

- A. maltose
- B. glucagon
- C. amylopectin
- D. ribose
- E. amylase

33. Which one of the following does not contain amino acids?

- A Amylose
- B Enzymes
- C Viruses
- D Antibodies
- E Cell membranes

34. A liver cell in the metaphase of mitosis can be identified as being eukaryotic because it has:

- 1. mitochondria

2. ribosomes

3. a nucleus

A 1 and 3 only

B 1 and 2 only

C 1 only

D 2 and 3 only

E 1, 2 and 3

35. In which of the following stages of mammalian respiration is CO₂ released?

1. Glycolysis

2. Anaerobic respiration

3. Krebs cycle

A 2 and 3 only

B 1 only

C 1 and 2 only

D 2 only

E 3 only

36. Which one of the following molecules is made in both photosynthesis and respiration?

A ATP

B Glucose

C Oxygen

D Carbon dioxide

E Reduced NADP

37. Which of the following comes immediately after anaphase in mitosis?

A Telophase

B Interphase

C Cytokinesis

D Metaphase

E Prophase

38 Which statement about ribosomes is NOT correct?

A Ribosomes

B Ribosomes are involved in protein synthesis.

C Ribosomes can be found on rough endoplasmic reticulum (RER).

D Ribosomes can have RNA associated with them.

E Ribosomes can carry out transcription.

39. A section of one strand of DNA has a base sequence of:

ACG-GCT-GGT-TCC

Which of the following are correct?

1. The other DNA strand would include a CGA triplet.

2. If adenine always binds with 2 H bonds to its complementary base and guanine with 3 H bonds, then each of these triplets will have a total of 8 H bonds.

3. The mRNA sequence transcribed from this DNA sequence would contain 3 uracil bases.

A 1 only

B 1 and 2 only

C 2 only

D 3 only

E 2 and 3 only

40. The direct product of transcription of recombinant DNA can be:

A mRNA.

B insulin.

C monoclonal antibodies.

D the primary structure of a protein.

E a replicate DNA molecule

Chemistry

41. What is the correct formula of propanal?

- A. $\text{CH}_3\text{CH}_2\text{OCH}_3$
- B. $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$
- C. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- D. $\text{CH}_3\text{CH}_2\text{CHO}$
- E. CH_3COCH_3

42. Which two of the following oxides would NOT give acidic solutions in water?

CO, CO₂, SO₂, NO

- A. CO and NO₂
- B. CO and CO₂
- C. CO and SO₂
- D. NO and CO
- E. NO and SO₂

43. Assume that the oxidation numbers are as shown below:

$\text{N} = -3$ $\text{H} = +1$ $\text{Cr} = +6$ $\text{O} = -2$

Which compound formula given below is correct?

- A. $(\text{NH}_4)_2\text{CrO}_4$
- B. $\text{NH}_4\text{Cr}_2\text{O}_7$
- C. $[(\text{NH}_4)_2\text{CrO}_4]^+$
- D. $(\text{NH}_4)_3\text{CrO}_4$
- E. $[(\text{NH}_4)_3\text{CrO}_4]^-$

44. 0.75 g of a hydrocarbon compound contains 0.60 g of carbon.

(Ar : C = 12.0; H = 1.0)

Which one of the following could be the molecular formula of the hydrocarbon compound?

- A. C₂H₄
- B. CH₄
- C. C₃H₈
- D. C₂H₆
- E. C₂H₃

45. The atomic number of aluminium is 13.

Which electron configuration given below corresponds to the Al²⁺ ion in its ground state?

- A. $1s^2 2s^2 2p^6 3s^1$
- B. $1s^2 2s^2 2p^5 3s^2$
- C. $1s^2 2s^2 2p^6 3s^2 3p^1$
- D. $1s^2 2s^2 2p^6 3s^2 3p^3$
- E. $1s^2 2s^2 2p^6$

46. When propan-1-ol is burnt in excess oxygen the only products formed are carbon dioxide and water.

In the balanced equation for this reaction what is the ratio of CO₂ : H₂O molecules formed?

- A. 3 : 8
- B. 3 : 4
- C. 4 : 7
- D. 5 : 12
- E. 2 : 7

47. 2,2 – dimethylpropane, C(CH₃)₄, is an isomer of pentane, CH₃(CH₂)₃CH₃.

Pentane has a boiling point of 36 °C whilst the boiling point of 2,2 – dimethylpropane is 10 °C.

Which statement below explains the difference in the boiling points for these two substances?

- A. Longer chain, less branched molecules have stronger spontaneous/induced dipoles.
- B. The molecules have different relative molecular masses.
- C. Isomers have different chemical properties.
- D. 2,2 – dimethylpropane has stronger intermolecular forces.
- E. Pentane has permanent dipoles.

48. Potassium nitrate was found to have a solubility of 120 g in 100 g of water at 80 °C and 50 g in

100 g of water at 25 °C. 50 g of water was heated to 80 °C and solid potassium nitrate added until the solution was just saturated.

The solution was then cooled to 25 °C when solid potassium nitrate separated out to leave a saturated solution. Using the information provided in this question, what is the minimum mass of water that must now be added to the mixture of the solution and the solid in order to make this solid potassium nitrate re-dissolve at 25 °C?

- A. 20 g
- B. 70 g
- C. 120 g
- D. 140 g
- E. 200 G

49. Pure water selfionises. This endothermic reaction is represented by the equation:

Which of the following statements is true for pure water between the temperatures of 0 °C and 100 °C?

1. The concentrations of $\text{H}^+(\text{aq})$ and $\text{OH}^-(\text{aq})$ are equal between 0 °C and 100 °C.
2. An increase in temperature causes the pH to fall.
3. An increase in temperature causes the electrical conductivity to decrease.

- A. 1 only
- B. 1 and 2 only
- C. 2 only
- D. 3 only
- E. 1 and 3 only

50. Which one of the following 0.01 M aqueous solutions has a pH > 7.0?

- A. AlBr_3
- B. Na_2CO_3
- C. NH_4Cl
- D. NaI
- E. $\text{CH}_3\text{CO}_2\text{H}$

51. Atoms X and Y form an ionic compound with formula XY_2 .

Which option below could give the correct atomic numbers for X and Y?

- A. X = 3; Y = 17
- B. X = 12; Y = 9

- C. $X = 6; Y = 16$
- D. $X = 11; Y = 16$
- E. $X = 14; Y = 8$

52. In the reaction $C_3H_7Br + KOH \rightarrow C_3H_7OH + KBr$ 24.6 g of 1bromopropane reacts with excess potassium hydroxide to produce 8.00 g of propan1ol.

Mr : $C_3H_7Br = 123$

Ar : H = 1.0; C = 12.0; O = 16.0

What is the percentage yield of this reaction?

- A. 53.1%
- B. 32.5%
- C. 33.3%
- D. 66.7%
- E. 93.0%

Physics and Mathematics

53. The variables x and y satisfy the following two equations:

$$x + 3y = 13$$

$$2x - y = 5$$

What is the value of $x + y$?

- A. 8
- B. 6
- C. 7
- D. 9
- E. 10

54. Evaluate:

$$(27^2 - 23^2) + (14^2 - 6^2)$$

- A. 340
- B. 80
- C. 360
- D. 840
- E. 1680

55. The arithmetic mean of the three numbers a , b , c is 8.

Find the arithmetic mean of the four numbers: $a + 1$, $b + 2$, $c + 6$, 3.

- A. 7
- B. 9
- C. 5
- D. 11
- E. 27

56. Which one of the following equations is dimensionally consistent (has consistent units)?

[All the symbols have their usual meanings:

v = velocity; F = force; m = mass; t = time; V = voltage; Q = charge; R_1, R_2, R_3, R_4 = resistance]

- A. electrical current = $(V/R_1) + (Q/t)$
- B. acceleration = $(\frac{1}{2}vt^2) + (F/m)$
- C. energy = $(\frac{1}{2}mv^2) + Fv$
- D. resistance = $R_1 + R_2 + (1/R_3) + (1/R_4)$
- E. temperature change = energy $\times m \times$ specific heat capacity

57. What is the set of values for which $12 - x^2 > 8$ and $2x + 3 \geq 5$?

- A $-1 \leq x < 2$
- B $1 \leq x < 2$
- C $2 < x$
- D $1 < x \leq 2$
- E $1 \leq x$

58. A mass is connected to a spring and it vibrates up and down, forming a simple harmonic system.

Which of the following are correct?

1. The kinetic energy of the mass is at a maximum half way up.
2. The potential energy of the system is at a maximum at the top of the mass's motion.
3. The potential energy of the system is at a maximum at the bottom of the mass's motion.

A 1 only

B 1 and 2 only

C 1, 2 and 3

D 2 only

E 3 only

59.

In the expressions below: g = gravitational acceleration; h = height; m = mass; R = electrical resistance; t = time; v = velocity; V = voltage.

Which of the following expressions have units of power?

1. $\frac{mv^2}{2t}$

2. $\frac{V^2}{R}$

3. $\frac{mgh}{t}$

A 1, 2, and 3

B 1 only

C 1 and 2 only

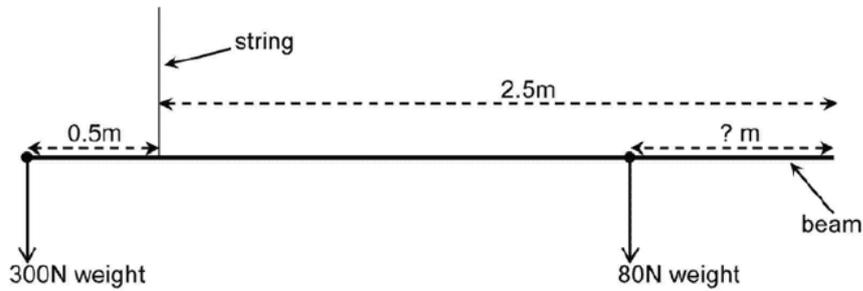
D 1 and 3 only

E 2 and 3 only

60.

A uniform beam, 3.0m long, of weight 100N has a 300N weight placed 0.50m from one end. The beam is suspended by a string 1.0m from the same end.

A diagram of the weights placed on the beam is given below:



How far from the other end must a weight of 80N be placed for the beam to be balanced?

- A 0.75m
- B 1.25m
- C 2.25m
- D 1.875m
- E 0.125m