

GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

Engineering Science 1

5155

JUNE 2023

INTERMEDIATE LEVEL

Specialty Name and Acronym	All Industrial Specialties
Centre No.	
Centre Name	
Candidate No.	
Candidate Name	

Mobile phones are **NOT** allowed in the examination room.

5155ENGINEERING SCIENCE 1: MULTIPLE CHOICE QUESTION PAPER

Duration: One Hour Thirty Minutes (1hr 30mins)

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.

1. USE A SOFT HB PENCIL THROUGHOUT THE EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the examination begins:

3. Check that this question booklet is headed "**Intermediate Level – 5155 ENGINEERING SCIENCE 1.**"
4. Fill in the information required in the spaces above.
5. Fill in the information required in the spaces provided on the answer sheet using your HB pencil:

Candidate Name, Exam Session, Subject Code and Candidate Identification Number.

Take care that you do not erase or fold the answer sheet or make any marks on it other than those asked for in these instructions.

How to answer the questions in this examination:

6. Answer **ALL** the **50** questions in this Examination. All questions carry equal marks.
7. Each question has **FOUR** suggested answers: **A, B, C** and **D**. Decide which answer is correct. Find the number of the question on the Answer Sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen.

For example, if **C** is your correct answer, mark **C** as shown below:

[A] [B] ☒ [C] [D]

8. Mark only one answer for each question. If you mark more than one answer, you will score a zero for that question. If you change your mind about an answer, erase the first mark carefully, then mark your new answer.
9. Avoid spending too much time on any one question. If you find a question difficult, move on to the next question. You can come back to this question later.
10. Do all rough work in this booklet, using, where necessary, the blank spaces in the question booklet.
11. Texts, notes and pre-prepared materials of any kind are also **NOT** allowed in the examination room..
12. **At the end of the examination, the invigilator shall collect the answer sheet first and then the question booklet. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT**

1. An example of a vector quantity is
- time.
 - pressure.
 - density.
 - force.

2. The SI unit of momentum is
- Kgm/s
 - Kgm/s²
 - Nm
 - N/Kg

3. The force that acts between charged particles is known as
- gravitational.
 - tensional.
 - electrostatics.
 - compressional.

4. Which formula gives the correct relationship between an unbalanced force F , acting on a mass m causing it to move with an acceleration a ?
- $F = m/a$
 - $m = F/a$
 - $a = m/F$
 - $F = m + a$

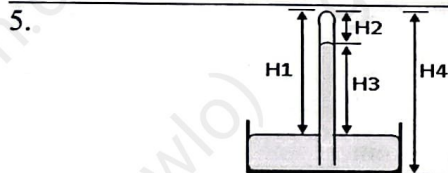


Figure 1

Figure 1 shows a simple mercury barometer. What height is a measure of atmospheric pressure?

- H1
- H3
- H2
- H4

6. A piece of uniform card is suspended freely from a horizontal pin as shown in figure 2.

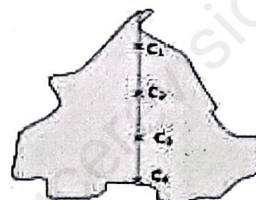


Figure 2

Which of the points is likely the centre of mass?

- C3
- C2
- C1
- C4

7. An engineer needs to determine the volume of a small, irregularly shaped rock sample. A rule and measuring cylinder, partially filled with water, are available as shown in figure 3



Figure 3

To determine the volume, which apparatus should the engineer use?

- Both the measuring cylinder and rule
 - Neither the measuring cylinder nor the rule
 - The measuring cylinder only
 - The rule only
8. Farm tractors have large tyres, so as to
- do work faster.
 - last longer.
 - reduce pressure.
 - reduce friction in the farms.
9. Energy contained in batteries or cells is
- light energy.
 - heat energy.
 - renewable energy.
 - chemical energy.
10. A non-renewable source of energy is
- petroleum.
 - geothermal.
 - wind.
 - hydro electric.

11. Figure 4 shows a builder using a frictionless pulley to lift a weight of 200 N from the ground floor to the first floor of the building. What will be the change in energy when it reaches the first floor?

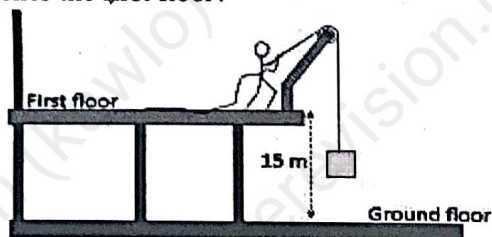


Figure 4

- A 3000 J
B 13.3 J
C 300 J
D 30000 J
12. A stone is dropped from a height of 6 m from the ground. It bounces back to a height of 3 m because
- A the ball was not thrown with much force.
B some of the ball's energy was lost as sound.
C the ball gained some energy as it hit the ground.
D the ball is made of rubber.
13. Calculate the energy supplied in one minute to a 3 kW heater
- A 3 KJ
B 180 J
C 180 KJ
D 10800 KJ
14. The building material obtained from a mixture of cement, water and aggregates is
- A concrete.
B mortar.
C brick.
D reinforced concrete.

15. Figure 5 is a graph showing the behaviour of a material subjected to an increasing force.

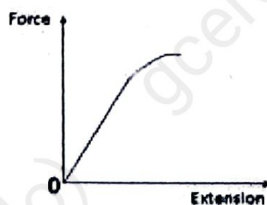


Figure 5

The material is likely to be

- A rubber.
B glass.
C plasticine.
D copper.

16. A metal wire, initially 1.000 m long, extends by 4 mm when a load of 2 N is added to it. What will be the length of the wire if a further 3 N is added, assuming it does not extend beyond its limit of proportionality?

- A 1.006 m
B 1.080 m
C 1.010 m
D 1.012 m

17. The material that is used to make the heating element of electric heaters and electric pressing irons is

- A steel.
B tungsten.
C brass.
D nichrome.

- 18.

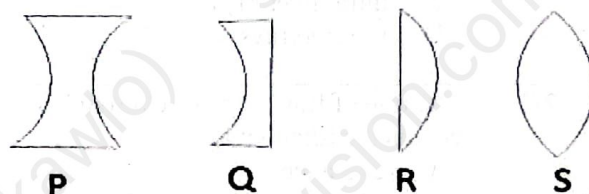


Figure 6

Which two lenses in figure 6 are diverging in nature?

- A P and Q
B R and S
C P and R
D S and Q

19. Colours are provided when white light passes through a glass prism because

- A the light wave interferes.
B the glass colours the light.
C different colours are filtered.
D different colours travel at different speeds.

20. Short sightedness (myopia) can be corrected using

- A concave lens
B convex lens
C bifocal lens
D cylindrical lens

21. Which statement about the speed of sound is correct?

- A Sound travels fastest in a vacuum.
B Sound travels fastest in gases.
C Sound travels fastest in liquids.
D Sound travels fastest in solids.

Turn Over

22. What is the amplitude of the wave in figure 7

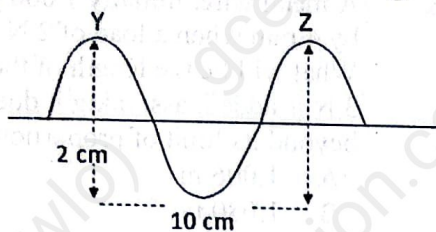


Figure 7

- A 2 cm
- B 1 cm
- C 10 cm
- D 5 cm

28. The current in the circuit represented by figure 8 is

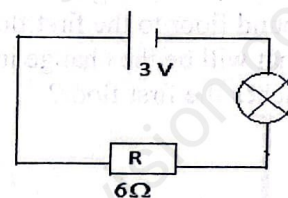


Figure 8

- A 2 A
- B 0.5 A
- C 18 A
- D 9 A

23. An electromagnetic radiation commonly used to take internal photographs of bones is

- A x-rays.
- B gamma-rays.
- C ultraviolet rays.
- D infrared rays.

24. The rate of flow of charge through a conductor is known as

- A resistance.
- B voltage.
- C conduction.
- D current.

25. Which of the following represents a capacitor?

- A
- B
- C
- D

26. Particles responsible for the conduction of electricity in metals are

- A ions.
- B protons.
- C electrons.
- D neutrons.

27. The effective resistance of a 2Ω and 4Ω resistors connected in series is

- A 1.3Ω
- B 6Ω
- C 0.75Ω
- D 2Ω

29. One of the following does not rely on magnetic field to function

- A transistor.
- B electrical bell.
- C transformer.
- D dynamos.

30. The efficiency of a lightning conductor is increased by

- A using a longer cable.
- B using a thinner cable.
- C using a thicker cable.
- D burying the cable into the ground.

31. A hard magnetic material is one that is

- A difficult to cut with a knife.
- B easily magnetized and easy to demagnetize.
- C difficult to magnetize and difficult to demagnetize.
- D easy to magnetize but difficult to demagnetize.

32. A permanent magnet that is moved up and down in a coil induces an e.m.f. The induced emf can be increased by

- A increasing the speed of the magnet.
- B decreasing the speed of the magnet.
- C cutting the magnet.
- D galvanizing the magnet.

33. What is the suitable metal for the core of an electromagnet?

- A aluminium.
- B copper.
- C iron.
- D steel.

34. Lenz's law states that the direction of the induced emf and hence the direction of current
- is determined by the rate of current flux.
 - is found by the right hand grip rule.
 - is found by the left hand rule.
 - always opposes the cause producing it.

35. A piece of iron and a piece of steel are picked up by an electromagnet as shown in figure 9.

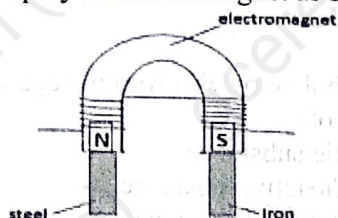


Figure 9

What will happen if the current in the electromagnet is switched off?

- The iron retains its magnetism.
- The steel falls off.
- The steel remains in contact.
- The iron remain in contact.

36.

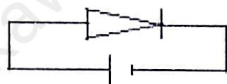


Figure 10

Figure 10 represents

- a capacitor connected to a battery.
 - a diode in forward bias.
 - a NOT gate connected to a battery.
 - a diode in reversed bias.
37. The gate that has only one input and one output is
- OR
 - NOT
 - NOR
 - AND

38. Which method of thermal energy transfer involves changes in density?
- Conduction only.
 - Convection only.
 - Radiation only.
 - Conduction, convection and radiation.

39. The volume of a fixed mass of gas is directly proportional to the absolute temperature provided the pressure remains constant. This is

- Boyle's law
- Graham's law
- Dalton's law
- Charles's law

40. A 700 W heater raises the temperature of some water from 20°C to 100°C in 10 minutes. If the specific heat capacity of water is 4.2 J/gK , the mass of water heated will be
- 1.3 Kg
 - 2.0 Kg
 - 3.0 Kg
 - 4.5 Kg

41. Mercury-in-glass thermometers are made with different dimensions of length bore. Which modification will make the thermometer most sensitive?
- Narrow bore
 - Wide bore
 - Long length
 - Short length

42. An atom of sodium can be represented as ${}_{11}^{23}\text{Na}$. The number 23 represents
- number of protons.
 - number of electrons.
 - number of neutrons.
 - mass number.

43. A bottle of perfume is opened in one corner of a room and the scent is soon picked up in another part of the room. The perfume moves through the air in the room by
- convection.
 - evaporation.
 - diffusion.
 - osmosis.

44. Aluminium is extracted from an ore called
- magnetite.
 - pyrites.
 - haematite.
 - bauxite.

45.

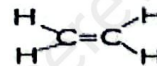


Figure 11

To which homologous series does the compound with the structural formula above belong?

- Alkanes
- Alkenes
- Ethene
- Alkyne

Turn Over

46. Which of the following is a physical change ?

- A Rusting of iron.
- B Burning of paper.
- C Melting of ice.
- D Action of acids on metals.

47. Which of the following pairs may be considered as isotopes?

- A $^{81}_{35}\text{X}$, $^{79}_{35}\text{X}$
- B $^{35}_{35}\text{X}$, $^{79}_{81}\text{X}$
- C $^{81}_{35}\text{X}$, $^{35}_{79}\text{X}$
- D $^{35}_{81}\text{X}$, $^{35}_{79}\text{X}$

48. Unripe mangotastes sour due to the presence of

- A acid.
- B base.
- C alkali.
- D salt.

49. A possible cause of acid rain is due to

- A chloroflurocarbons in the atmoosphere.
- B inert gases in the atmosphere.
- C sulphurdioxide in the atmosphere.
- D nitrogen gas in the atmosphere.

50.



Figure 12

The symbol below is a warning against the presence of

- A toxic substance.
- B radioactivesubstance.
- C corrosive substance.
- D explosives.

STOP

GO BACK AND CHECK YOUR WORK