Power Resources P2 questions 2059/02

Compiled by: Mustafa Asif

a) Sources

Candidates should be able to:

• describe, with the help of a simple diagram for each method, how non-renewable fuels (coal, crude oil
and natural gas) are extracted:
– coal as obtained by open cast, adit and shaft mining methods
– natural gas and crude oil obtained by exploration and drilling
• understand the difference between renewable and non-renewable sources of electricity
• explain (briefly) how electricity can be generated from renewable resources (hydel, wind, solar, and
other possibilities such as wave, tidal, biofuels, geothermal)
• understand the importance of power sources for development.

b) Non-renewables

Candidates should be able to:

• describe the quality and the amount of coal available from within Pakistan and how long reserves are
likely to last, and also describe the types of coal which have to be imported for industrial purposes
• describe how coal both produced in Pakistan and imported is transported to the end users
• state how much natural gas is produced by Pakistan, and how long reserves are likely to last
• describe the extent of the natural gas pipeline network in Pakistan and explain how natural gas can be
taken to those parts of Pakistan away from the pipelines, and the limitations of doing this
• state how much oil is produced by Pakistan, how long reserves will last and how much oil is imported, and explain why it is necessary to import large amounts of oil
• describe the extent of the oil pipeline network in Pakistan and describe the other methods that are
used to transport both imported oil and oil produced in Pakistan
• understand that electricity can be generated in a variety of ways. In thermal power stations by burning
coal, oil, gas and waste, or with nuclear energy; or with renewable sources e.g. water (including
hydel), the wind and the sun
• understand that non-renewable power sources are running out, and are increasing in price.

c) Renewables

Candidates should be able to:

• explain and evaluate the advantages and disadvantages of the different methods of producing electricity from renewable resources (generated by water, wind, wave and sun)
• understand the physical and human conditions that favour the development of multi-purpose hydel
schemes
• state and explain the factors, both physical and human, which promote or hinder the availability of
electricity and other power resources listed, including the feasibility of small-scale, renewable power
generation
• explain why the supply of electricity is not sufficient or reliable to develop many parts of Pakistan.

Power Resources P2 questions 2059/02

Compiled by: Mustafa Asif

O/N18/P2/Q2

(a) **(i)** Which **one** of the following definitions correctly describes hydel power? Tick **one** box below.

	Tick (✓)
Hydel power is electricity generated by using fossil fuels.	
Hydel power is electricity generated by using heat from the sun to heat water.	
Hydel power is electricity generated by using the fast flow of water to move turbines which drive generators.	

[1]

(ii) Explain how the climate causes problems in developing hydel power in Pakistan. You should develop your answer.

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(b) (i) Study Fig. 2.1, pie charts showing the percentage share of energy produced in Pakistan and the world.

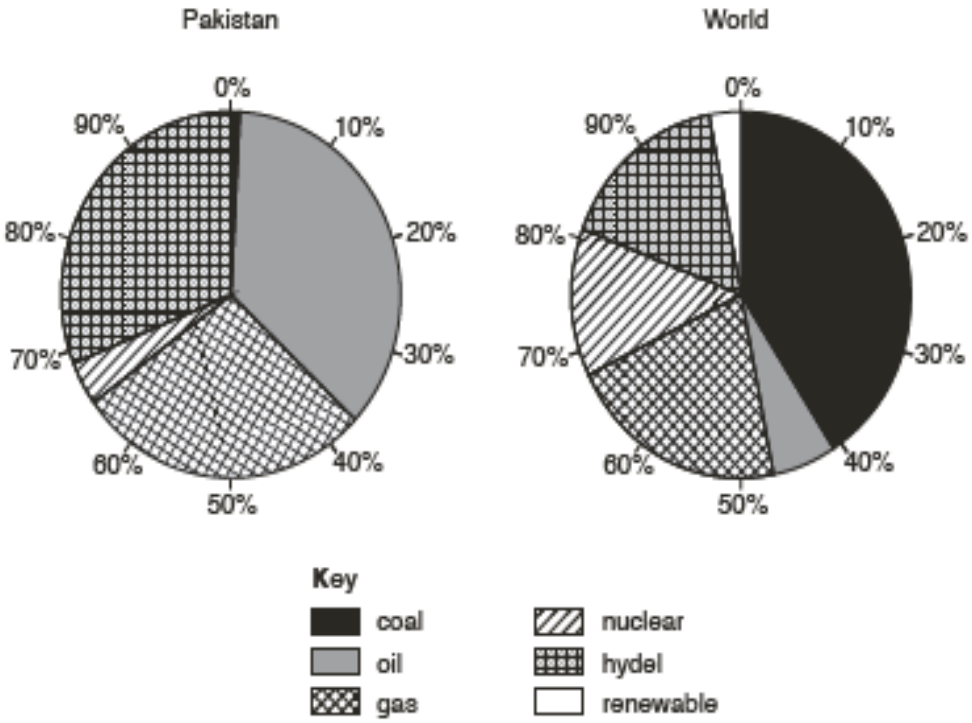

Fig. 2.1

Compare the proportion of energy produced from any two non-renewables in Pakistan with the rest of the world.

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.....[2]

(ii) State three reasons why the contribution of renewable energy sources, other than hydel power, is smaller in Pakistan compared to the rest of the world.

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.....[3]

(iii) Suggest two ways solar energy can help solve the problems of producing and distributing energy in the rural areas of Pakistan.

1 .....

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2 .....

.....[2]

(c) (i) Draw and label a diagram of a wind turbine.

[3]

(ii) Give two advantages and two disadvantages of using wind energy.

Advantages	Disadvantages
1	1 .....
.....	.....
.....	.....
.....	.....
2	2 .....
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[4]

(d) Pakistan is planning to expand its nuclear energy capacity from 1300 to 8800 megawatts between 2018 and 2030.

To what extent is further developing nuclear energy a sustainable way of generating more electricity in Pakistan? Give reasons to support your judgement and refer to examples you have studied. You should consider different points of view in your answer.

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[TOTAL: 25]

M/J17/P2/Q5

(a) Study Fig. 7, which shows the amount of oil produced in Pakistan and the amount of oil imported, for selected years.

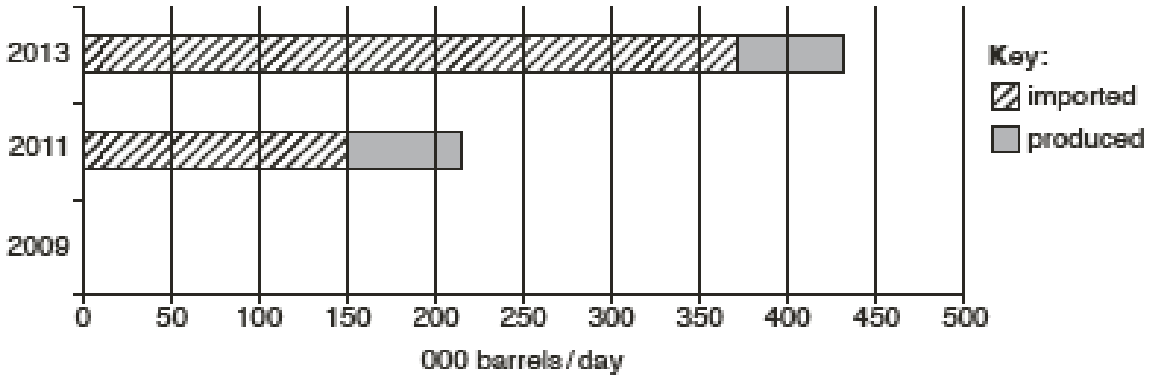

Fig. 7

(i) Name the location of one oil refinery in Pakistan. Give one reason to suggest why it is located there.

Location .....

Reason .....

.....[2]

(ii) Complete Fig. 7 by drawing the bar for 2009, using the information below:

2009	Barrels/day
Imported	185 000
Produced	60 000

[1]

(iii) Compare the amount of oil produced and the amount of oil imported in Pakistan in the years 2011 and 2013.

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.....[2]

(iv) Give two reasons why Pakistan imports large amounts of oil.

1 .....

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2 .....

.....[2]

(b) Study Fig. 8, which shows population and electricity production in Pakistan over the period 2000–2014.

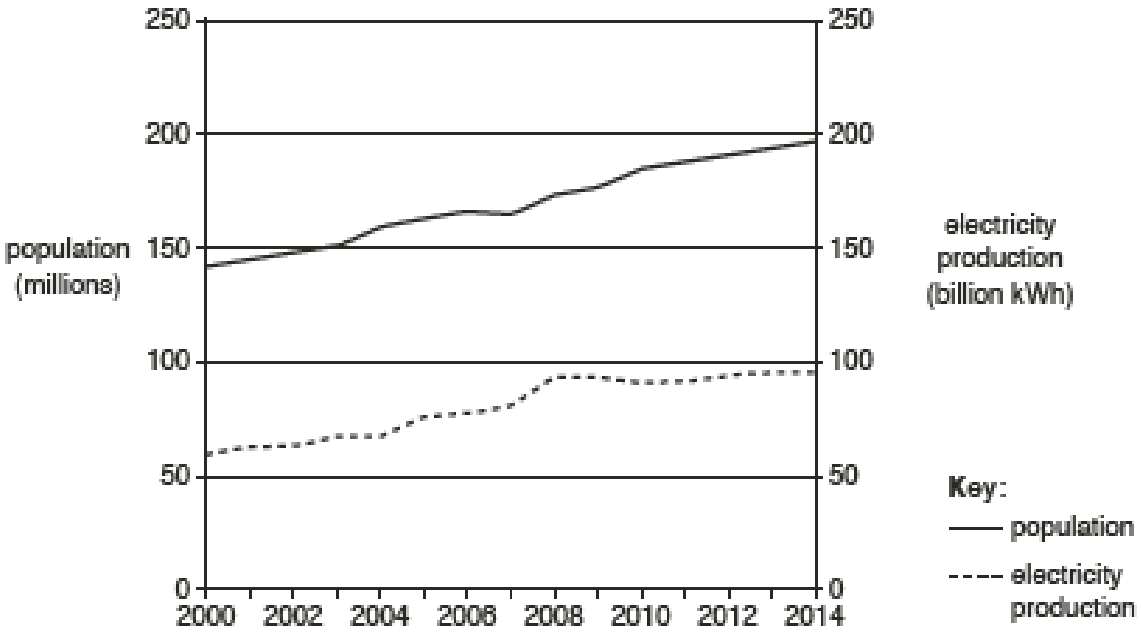

Fig. 8

(i) A Describe the relationship between population and electricity production from 2000 to 2008.

.....

.....

B Describe the changes in population and electricity production since 2008.

.....

.....[2]

(ii) Explain why electricity production does not meet the demand for electricity in many parts of Pakistan. You should develop your answer.

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(c) (i) Electricity can be generated using solar power. Complete the passage below by choosing the correct words from the list and placing them in the spaces provided.

Rectangular, solar ..... are made up of many solar ..... which convert the ..... energy from the sun into electrical energy. They can be placed on the ..... of houses and other buildings. Large arrays of solar panels can be sited on the ground, for example in deserts. Solar panels should face ..... in order to collect as much of the sun's energy as possible. Other solar power systems use the sun to heat water and the ..... is then used to turn a turbine.

roofs panels wind steam east

heat light south cells [3]

(ii) What are the disadvantages of generating electricity by wave and tidal power?

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.....[3]

(d) Read the following two views about solutions to Pakistan's shortage of energy:

A

To produce more energy, large-scale power generation schemes such as nuclear, gas-fired, oil-fired, and multi-purpose HEP (Hydel) power stations should be built.

B

To produce more energy, small-scale power generation schemes should be set up, such as biogas, wind, and solar power plants.

Which view do you agree with more? Give reasons to support your answer and refer to examples you have studied. You should consider **both** View A and View B in your answer.

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[TOTAL: 25]

O/N16/P2/Q3

(a) Study Fig. 4 which is a diagram of a coal mine.

Type of mine .....

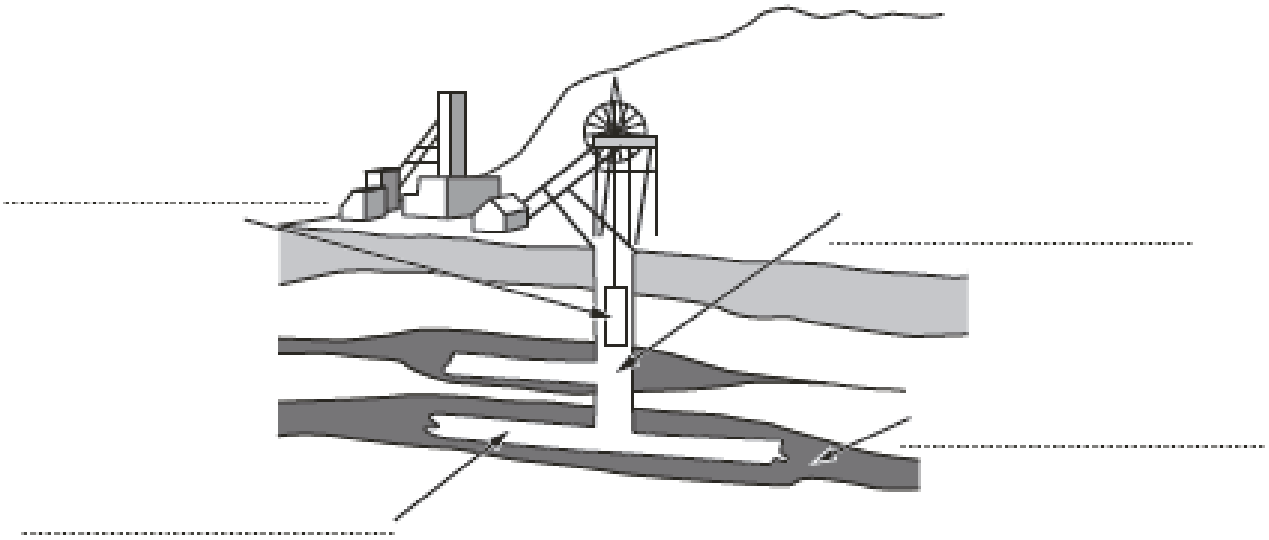

Fig. 4

(i) Choose two terms from the list below and use them to label the diagram in any two of the spaces provided.

adit cage shaft open-cast seam tunnel [2]

(ii) Suggest two reasons for using this type of mine and one disadvantage of using it.

Reason .....

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Reason .....

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Disadvantage .....

.....[3]

(iii) What type of coal is imported by Pakistan and how is it used?

Type .....

Use .....

.....[2]

(b) Explain what the fuel CNG is and state the main reasons for using this fuel.

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.....[4]

(c) Study Fig. 5 which is a graph giving information about different non-renewable fuels used for electricity production in Pakistan over the period 2006–11.

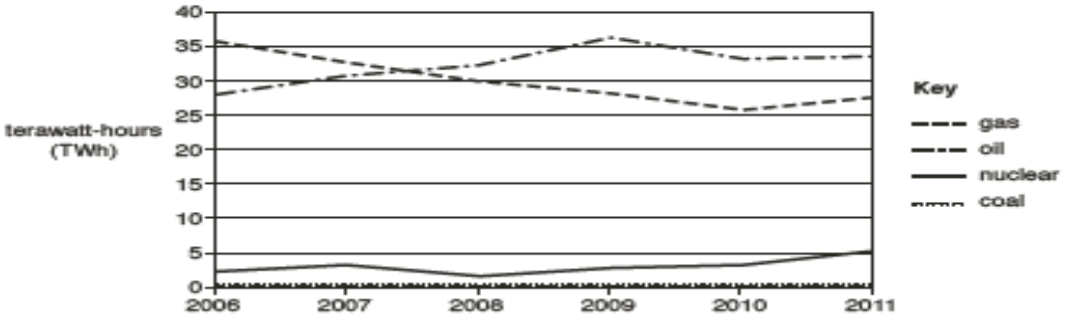

Fig. 5

(i) What is meant by the term 'non-renewable fuel'?

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.....[2]

(ii) Which fuel use has increased by the largest amount between 2006 and 2011?

.....[1]

(iii) Use information from the graph to describe one main difference between the change in gas used for electricity production and the change in oil used for electricity production.

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.....[2]

(iv) Explain why so little coal is used for electricity production in Pakistan.

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.....[3]

(d) Read the following article:

> Energy crisis
>
> Industrial growth in Pakistan relies on the availability of energy. Pakistan does not produce enough energy for its needs and therefore spends a lot of its earnings on expensive imports of fuels.

Describe briefly different measures that can be taken to solve the country's energy crisis. To what extent can these measures be successful?

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[TOTAL: 25]

M/J16/P2/Q4(a)

(a) (i) Study Fig. 7 which is a diagram of an HEP (Hydel) power station.

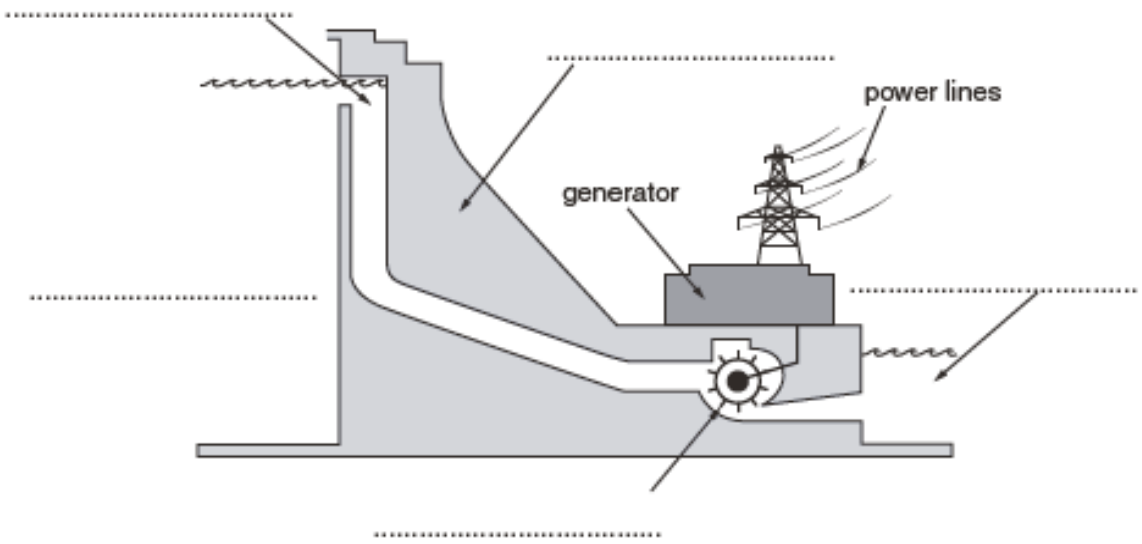

Fig. 7

A. **On the diagram** place an arrow or arrows to indicate the direction of movement of water through the power station.

B. Choose **two** terms from the list below and use them to label the diagram in **two** of the spaces provided.

outflow turbine reservoir dam [3]

(ii) Name **one** multi-purpose dam in Pakistan.

.....[1]

(iii) Give **two** uses for a dam such as the one you named in **(ii)**.

1 .....

2 .....[2]

O/N15/P2/Q2(a,b and d)

(a) (i) Study Fig. 2, which shows the usage of natural gas in Pakistan in the year 2010–11.

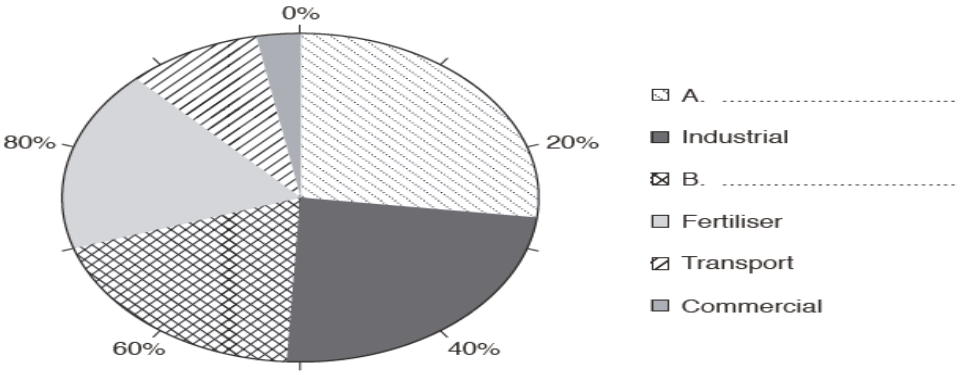

Fig. 2

In the key, name the activities A and B which are two of the main users of natural gas in Pakistan. [2]

(ii) State **two** ways in which gas is transported to homes in Pakistan.

1 .....

2 .....[2]

(b) Study Fig. 3, which is a graph showing usage of electricity in Gigawatt-hours by three different sectors over a ten-year period.

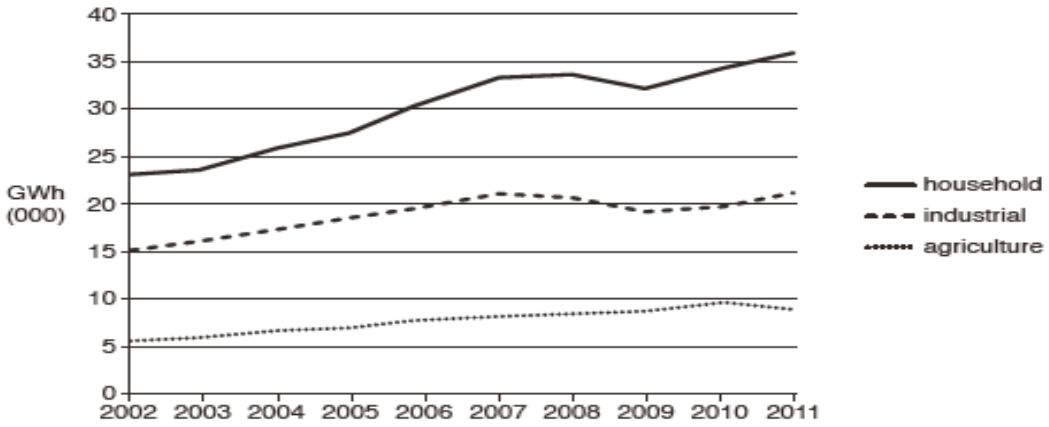

Fig. 3

(i) What was the industrial usage of electricity in 2004?

.....[1]

(ii) To what extent are the changes over the ten years similar for the three sectors?

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.....[3]

(iii) Loadshedding is the deliberate, temporary reduction in supply of electricity from a power station. Explain the effect of loadshedding on industry and business.

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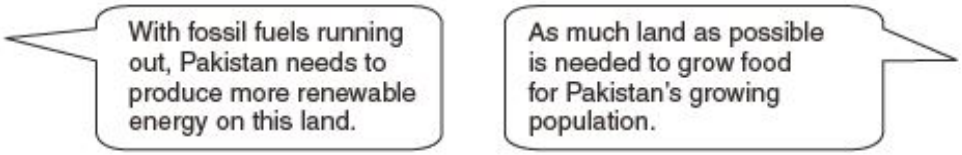
(d) It has been suggested that a power station to harness solar energy should be built in Bahawalpur District, Punjab. The solar panels and associated access roads and buildings will cover 25 km^2.

Read the following two views about this proposal:



Which view do you agree with more? Give reasons to support your answer.

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[Total: 25]

O/N15/P2/Q2(c)

(c) (I) Fig. 5 is a diagram of a thermal power station.

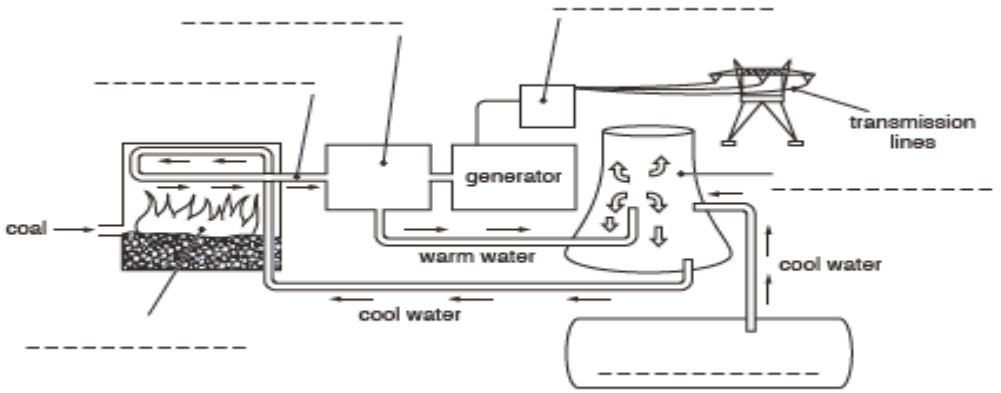

Fig. 5

Choose **three** terms from the list below and use them to label the diagram in **three** of the spaces provided.

reservoir transformer boiler turbine cooling tower steam [3]

(II) Explain why burning fossil fuels in power stations is unsustainable.

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M/J14/P2/Q2

(a) Study Fig. 2, a cross section showing an oil trap.

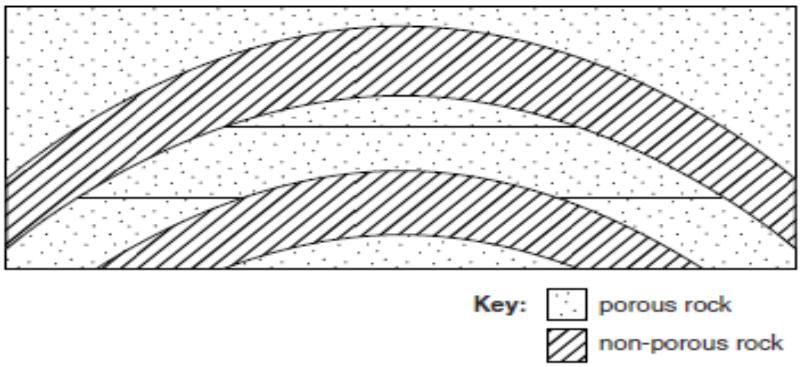

Fig. 2

(i) Label on the diagram

A the layer of rock containing oil.
B the layer of rock containing gas. [2]

(ii) What is meant by the term 'porous rock'?

.....

.....[1]

(iii) Why is the feature in Fig. 2 called 'an oil trap'?

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.....[2]

(b) Study Fig. 3 which shows the uses of oil.

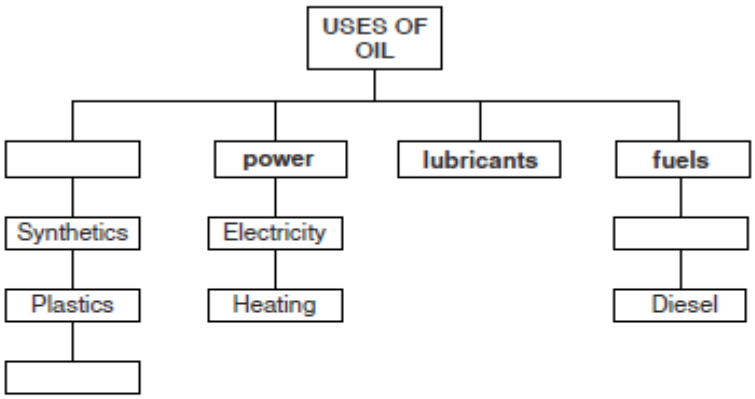

Fig. 3

Choose **three** of the following terms below to complete Fig. 3.

by-products raw materials pesticide

petrol biogas bagasse

[3]

(c) Study Fig. 4, a map showing oil refineries and pipelines in Pakistan.

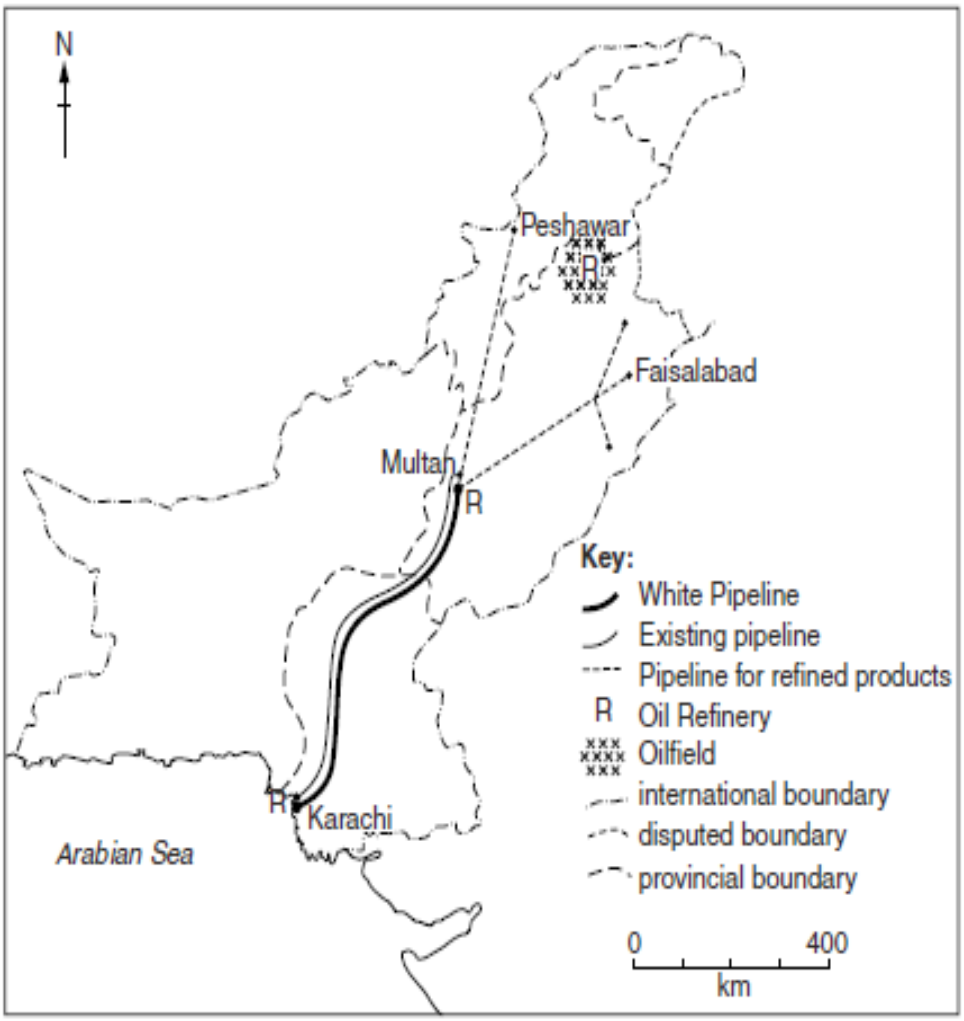

Fig. 4

(i) Name and locate the oil refinery marked on the oilfield in Fig. 4.

Name ..... Location .....[2]

(ii) Name **one** refinery where imported oil is processed.

.....[1]

(III) Explain the importance of the White Pipeline, and other pipelines to the development of Pakistan.

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.....[4]

(d) (I) Name an area where coal is mined in Pakistan, and state **one** type of coal found there.

Name ..... Type of coal .....[2]

(II) Give **two** reasons why most of the coal mined in Pakistan is called 'low quality'.

1 .....

2 .....[2]

(e) To what extent can Pakistan rely on fossil fuels to increase fuel and power supplies?

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.....[6]

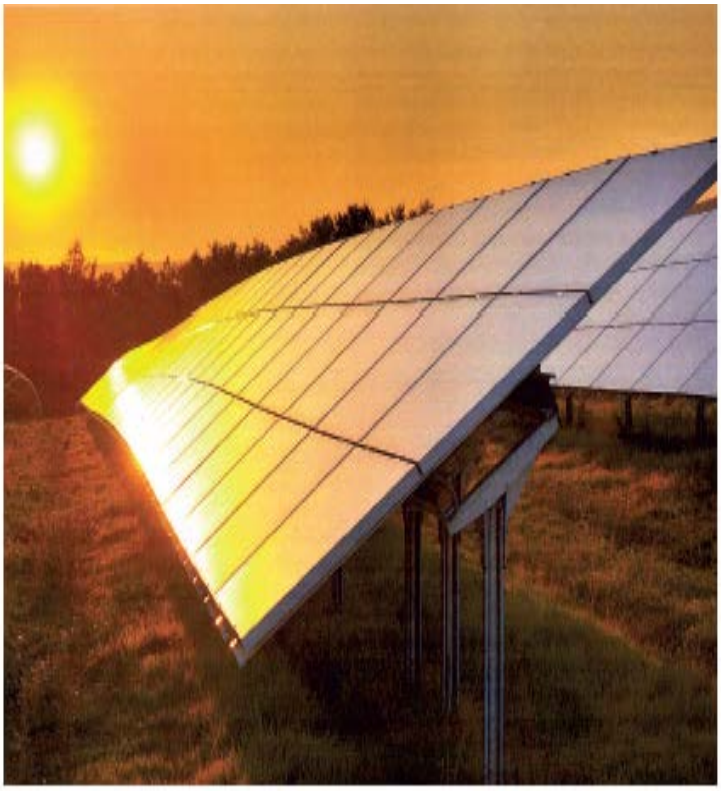
[Total: 25]

Power Resources P2 questions 2059/02

Compiled by: Mustafa Asif

O/N13/P2/Q4

INSERT



(a) Study Photographs D and E (Insert).

(i) Name the type of renewable energy being generated.

D ..... E .....

[2]

(ii) Give **three** advantages of renewable energy.

1 .....

2 .....

3 .....[3]

(iii) Give **three** disadvantages of generating energy by **either** D **or** E.

Choice.....

Disadvantages

1 .....

2 .....

3 .....[3]

(b) Study Fig. 6, a map of Pakistan.

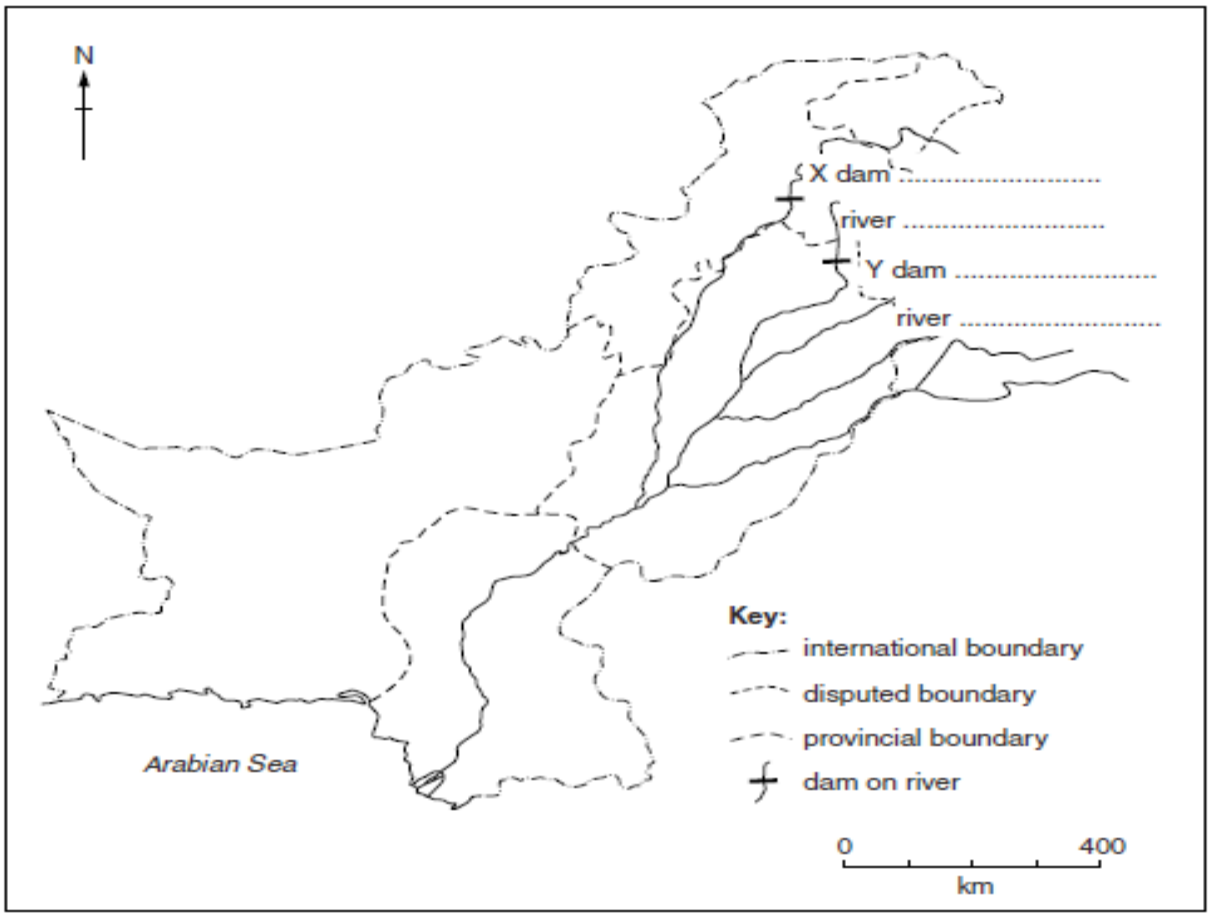


Fig. 6

On the map name the **two** dams shown, and the rivers on which they are situated. [4]

INSERT

(c) (I) With reference to water supply and relief (topography) explain why it might be possible to build more HEP (hydel) power stations in areas such as that shown in Photograph C (Insert).

Water supply .....

.....

.....

.....

Relief (topography).....

.....

.....

.....[4]

(II) Give **three** reasons why it is difficult to develop more HEP (hydel) power stations in Pakistan.

1 .....

2 .....

3 .....[3]

(d) To what extent is it possible to increase the electricity supply to rural areas?

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[Total: 25]

M/J13/P2/Q4

(a) Study Fig. 5, which shows thermal and hydel (HEP) power stations in Pakistan.

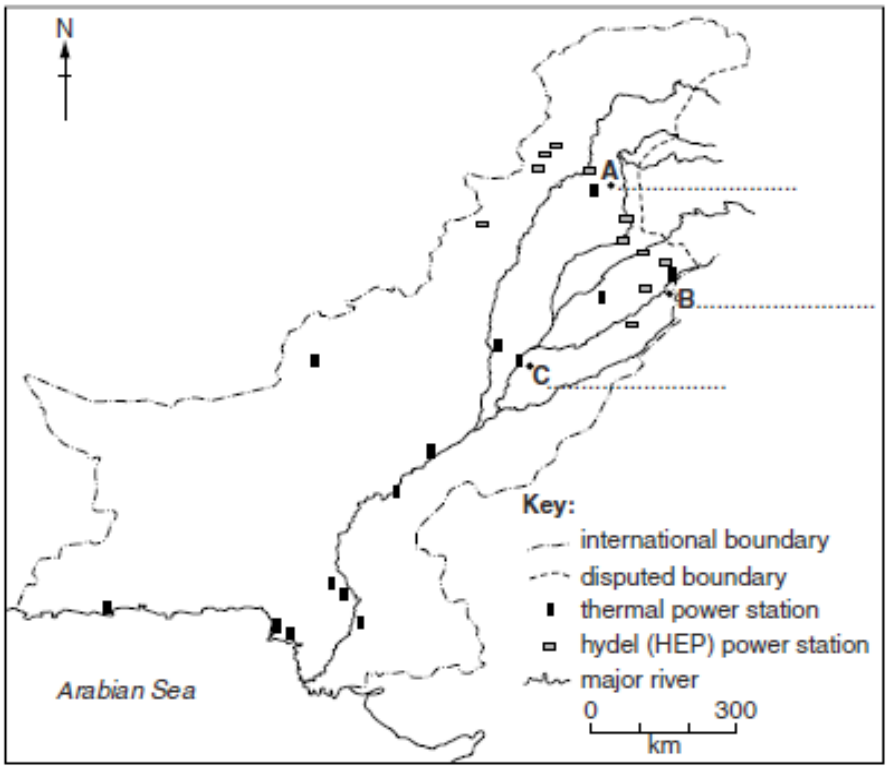

Fig. 5

(i) Name the cities **A**, **B** and **C**.

A .....

B .....

C ..... [3]

(ii) Compare the distribution of thermal and hydel (HEP) power stations.

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.....[4]

(iii) Explain why **these two** different types of power station are built in different areas in Pakistan.

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(b) Explain why the supply of electricity is not reliable in many parts of Pakistan.

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(c) Study Fig. 6, which shows the percentages of fuels used for electricity supply.

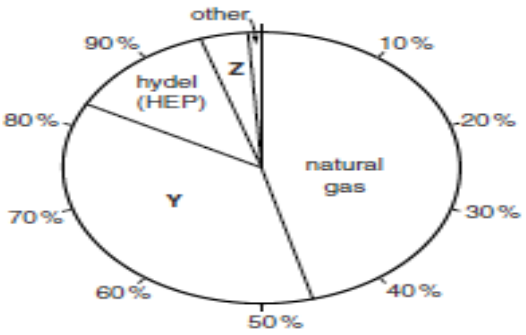

Fig. 6

(I) Use Fig. 6 to state the percentage of electricity generated from natural gas.

.....[1]

(II) Name the **two** other fossil fuels **Y** and **Z**, and explain why each is used less than natural gas.

Y ..... **Z** .....

explanation .....

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.....[3]

(d) To what extent can the development of renewable energy resources improve the reliability of electricity supply in Pakistan?

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[Total: 25]

M/J13/42/Q4

(a) (I) State what is meant by 'renewable energy' and give an example.

meaning .....

.....

example ..... [2]

(II) Name a fossil fuel, and explain why it is non-renewable.

name .....

why it is non-renewable .....

.....

.....

.....

..... [2]

(III) Explain how fossil fuels cause:

air pollution .....

.....

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land pollution .....

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..... [2]

(b) Study Fig. 7, which shows gas and oil usage in Pakistan.

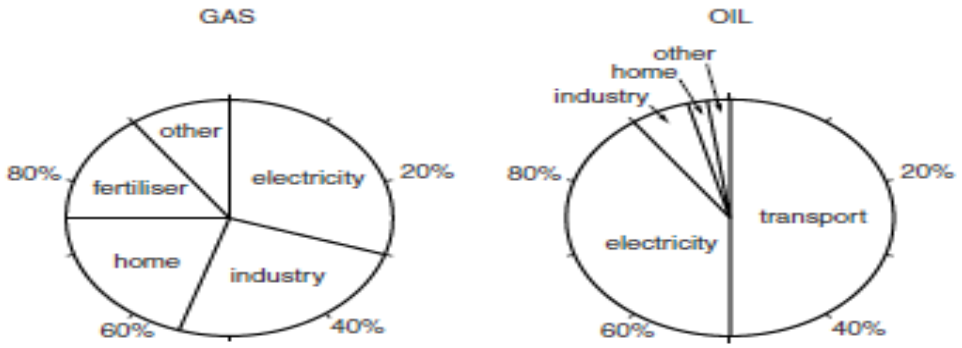

Fig. 7

(I) State the percentages of gas and oil used for electricity production.

gas .....

oil ..... [2]

(II) Which user takes 15% of gas?

..... [1]

(III) Which user takes 50% of oil?

..... [1]

(IV) Explain why a larger percentage of gas **than oil** is used in the home.

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..... [3]

(c) Study Fig. 8, which shows the usage of coal mined in Pakistan.

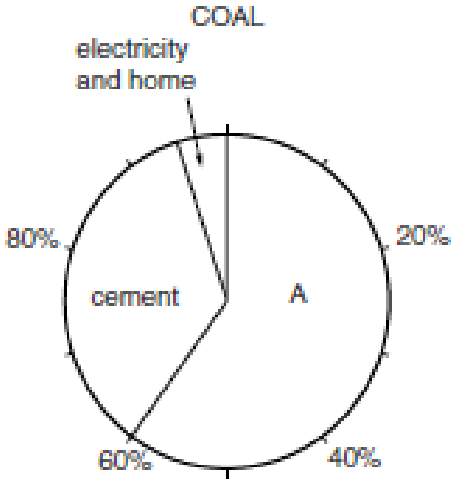

Fig. 8

(i) Name the industry **A** which uses a large amount of coal produced in Pakistan.

.....

[1]

(ii) Why is only a small percentage of coal used for electricity generation?

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[1]

(d) Name **one** type of renewable energy. Explain where the most suitable areas in Pakistan would be for its development.

name .....

explanation .....

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[4]

(e) Explain why it is important to supply electricity to rural areas. Consider to what extent it is possible.

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[Total: 25]

O/N12/P2/Q2(d)

(d) Read the article below.

> The continuing power cuts and load shedding in the expanding commercial city of Karachi must be addressed. The port city lies on the shores of the Arabian Sea, and has a windy and sunny climate.
>
> The huge population and many industries generate a huge amount of waste that needs to be disposed of.

Assess the possibilities and problems for electricity generation other than by fossil fuels at Karachi.

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[Total: 25]

O/N10/P2/Q4(a)

(a) Study Fig. 6, which shows energy sources by percentage in Pakistan.

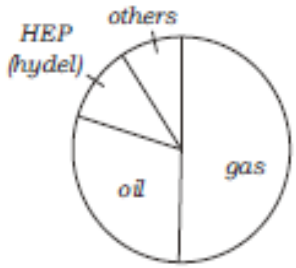

Fig. 6

(I) Name the **two** largest sources of energy.

1 ..... 2 ..... [2]

(II) Which source named on Fig. 6 is renewable?

.....[1]

(III) Suggest **two** sources of energy in the 'others' sector of Fig. 6.

1 ..... 2 ..... [2]

(b) **(I)** Name an HEP (hydel) power station and state the name of the river on which it is built.

Name ..... River ..... [2]

(II) Why is HEP(hydel) an important source of electricity in northern Pakistan?

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.....[3]

(III) Why can the supply of power from these stations be unreliable?

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.....[3]

O/N10/P2/Q4(d)

(d) The development of wind power generators off the coast of Pakistan could reduce the country's dependence on imported fuels.

Explain the advantages and disadvantages of developing alternative power sources.

Advantages .....

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Disadvantages .....

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.....[5]

[Total: 25]

Power Resources P2 questions 2059/02

Compiled by: Mustafa Asif

Answer Key (Mark Scheme)

O/N18/P2/Q2

Question	Answer	Marks
2(a)(i)	Hydel power is electricity generated by using the fast flow of water to move turbines which drive generators. 1 @ 1 mark	1
2(a)(ii)	☐ Some areas have less rainfall e.g. Gilgit and Chitral (e.g. cannot generate electricity if not enough water); ☐ Rain shadow areas; ☐ More precipitation in highland areas (e.g. where most dams are located); ☐ Less rainfall in winter / more snow / stored as snow and / or ice in mountains; ☐ Less rainfall means less water in rivers (e.g. so more difficult to generate electricity); ☐ Rainfall not evenly spread throughout Pakistan (e.g. rainfall is unpredictable); ☐ Very high temperatures – lead to evapotranspiration, less water available; ☐ Very low temperatures – lead to freezing, less water available. **Note**: One mark for identification of appropriate idea and a further mark for development (in parentheses). **Note**: Max. 2 marks if no development. 2 + 2 marks	4
2(b)(i)	☐ World uses more (41%) coal than Pakistan (1%); ☐ Pakistan (37%) uses more oil than the world (5%); ☐ Pakistan (28%) uses more (20%) gas than the world; ☐ World (13%) uses more nuclear than Pakistan (3%). 2 @ 1 mark	2
2(b)(ii)	☐ Expensive to build or develop own renewable energy / limited funding available; ☐ Limited education / skills / know how to develop these technologies; ☐ Want to use up coal / gas reserves first / cheaper to use coal / gas; ☐ Reliant on other countries to help develop renewable sources; ☐ Demand of growing population difficult to meet / not enough electricity can be produced; ☐ Areas suitable for large scale production are distant from centres of population; Etc. 3 @ 1 mark	3
2(b)(iii)	☐ Solar panels can be located anywhere / portable; ☐ Do not need to be connected to the national power gird; ☐ Energy can be produced on site / in-situ / does not have to be transported through cables; ☐ Easy to set up small scale scheme / independent schemes / every house will have their own solar panel; ☐ Limitless / will not run out; Etc. 2 @ 1 mark	2

Question	Answer	Marks
2(c)(i)	Sketch of a wind turbine, labels can include: • Generator • Rotor Blades / fans • Tower / pole • Gear box • Transformer • Cables Etc. 3 @ 1 mark	3
2(c)(ii)	**Advantages:** • Wind is renewable / does not run out; • Does not pollute the atmosphere or water or environmentally friendly (clean or green); • Plenty of wind available in Pakistan; • Wind is free / cheap to run; • Can be deployed locally / remotely; • Wind turbines improve electricity supply in rural areas; • Wind farms attract tourists; • Wind turbines vary in size depending on requirements; • Wind energy can be generated at night unlike solar; Etc. **Disadvantages:** • Expensive to build; • Wind is not constantly blowing / variable wind speed; • Stop working during storms; • Many turbines are needed to generate enough power for a town or city / low output individually; • Need a large area to construct wind farm / can take land which could be used for agriculture; • Can kill birds; • Perceived as an eyesore; • Noise pollution; • Interfere with radio / TV signals; • Limited sites where wind is reliable; Etc. 4 @ 1 mark	4

Question	Answer	Marks
2(d)	**Levels marking** No valid response 0 **Level 1** 1–2 Simple point addressing any view (1) Simple points addressing any view (2) **Level 2** 3–4 Developed point(s) explaining one view (3) Developed point(s) explaining both views (4) No evaluation **Level 3** 5–6 Developed points explaining both views Evaluation giving clear support to one view or appropriate example (5) Evaluation giving clear support to one view and appropriate example (6) **Content Guide** Answers are likely to refer to: More sustainable because: □ Boosts economy; □ Can bridge the gap with energy shortages / deficiencies in oil and gas; □ Can be used near the coast to provide energy to nearby industries; □ Assists development; □ Provides jobs; □ A small quantity of uranium can generate a large amount of energy; □ Less than half kg of uranium contains 3 million more times energy than the same weight of coal; □ The chances of accidents in nuclear power stations is low / there have been fewer accidents in nuclear power stations than any other kind of power station; □ Nuclear power can help speed up the process of industrialisation; □ Nuclear power contributes less to the greenhouse effect and acid rain compared to fossil fuels; Etc. Less sustainable because: □ Expensive to build so may have to borrow money or seek investment from other countries / economic burden; □ Will take up valuable land space needed for more important development projects / or example; □ Renewable energy schemes such as solar energy / wind power are more appropriate; □ Have many coal reserves that can still be exploited; □ Only provides jobs in the short term whilst building them; □ Probably built in other countries so negative multiplier effect; □ Fuel rods in reactors produce dangerous rays which are cancer causing; □ Nuclear waste remains radioactive for many years; □ Finding suitable locations for storing radioactive waste is a problem; Etc.	6

M/J17/P2/Q5

Question	Answer	Marks
5(a)(i)	□ Morgah/Rawalpind – close to oilfields (in Potwar Plateau); □ Central Punjab – close to oilfield; □ Karachi/Korangi – near oil terminals/close to oilfield/port; □ Mahmood Kot/Muzaffargarh – terminus of crude oil pipeline from Karachi. **Note:** No credit for reason only 2 @ 1 mark	2
5(a)(ii)	Bar correctly drawn on Fig. 4 **Note:** Tolerance: imported 180–190, produced 55–65. 1 @ 1 mark	1
5(a)(iii)	The amount of oil imported increased/higher/rose/figures from 150 to 370–380; The amount of oil produced decreased/fallen/figures from 60–70 to 55–65/almost constant/stayed the same; The total amount of oil increased/overall it went from 210–220 to 430–440. **Note:** a tolerance of □ 5% allowed except at 150 value. 2 @ 1 mark	2
5(a)(iv)	□ Small reserves/potential oilfields not explored/small amount produced; □ Lack of government investment/funding for further exploration/lack of money for developing oil fields/ exploration/expensive equipment; □ Lack of technology/expertise for extraction/exploration/ lack of skilled labour; □ (Large/increasing demand for) oil for vehicles/transport; □ Heating/domestic use/cooking; □ Electricity generation/electricity; □ Manufacturing/manufactured products; □ Cannot exploit/explore reserves due to tribal opposition/ insurgency; □ Due to population growth. 2 @ 1 mark	2
5(b)(i)	A Positive correlation/as population increases, electricity production increases/both increasing/population is always higher/more than electricity production (or vice versa); B Population increases: electricity production remains same/very slightly increases/population kept increasing/ electricity did not have much change. 2 @ 1 mark	2

Question	Answer	Marks
5(b)(ii)	□ Population increasing (greater need/greater use of electricity in homes/businesses) (named example of new technology in home/business)/(new towns have to be built because growing population puts a burden on electricity); □ Increased affluence for some (enables more electrical appliances in the home or named examples/items are becoming more affordable); □ Little new investment in new power stations (foreign investors less willing to invest due to political instability) (other government priorities such as healthcare/ education/housing/transport/alleviating poverty); □ Pakistan has small/inaccessible/depleting fossil fuel reserves (fossil fuels expensive to extract/poor quality/ have to import); □ Renewable energy plants expensive to construct; □ Power losses due to old/long transmission lines; □ Power theft (people diverting existing power sources for their own use); □ Most people live in rural areas (electricity does not reach there/lack of infrastructure/power lines); □ Many power plants are not working to full capacity (as a result of siltation in dams and reservoirs)/(they are still under construction); □ Power breaks down (lack of expertise to handle it)/(due to old machinery); □ More rural to urban migration (means demand cannot be fulfilled); □ Seasonal variations (less HEP generation in winter as less rainfall/snowmelt at times of peak demand). ETC. **Note:** One mark for identification of appropriate idea and a further mark for development (in parentheses). **Note:** Max 2 marks if no development. 2 @ 2 marks	4
5(c)(i)	Rectangular, solar **panels** are made up of many solar **cells** which convert the **light** energy from the sun into electrical energy. They can be placed on the **roofs** of houses and other buildings. Large arrays of solar panels can be sited on the ground, for example, in deserts. Solar panels should face **south** in order to collect as much of the sun's energy as possible. Other solar power systems use the sun to heat water and the **steam** is then used to turn a turbine. 5 or 6 @ 3 marks 3 or 4 @ 2 marks 1 or 2 @1 mark	3

Question	Answer	Marks
5(c)(ii)	Expensive technology/expensive investment for government; Small scale/only generates small amounts of electricity; Only at coastal sites; Hazardous to marine life/damages habitats; Disruption to shipping/fishing areas; Difficult to set up/inadequate technology; Not enough output to meet demand; Can be damaged or disrupted by cyclones or tsunamis; Shortage of expertise/knowledge/skills to set up. 3 @ 1 mark	3

Question	Answer	Marks
5(d)	Levels marking Level 1 (1–2 marks) Simple point addressing any view (1). Simple points addressing any view (2). Level 2 (3–4 marks) Developed point(s) explaining one view (3). Developed point(s) explaining both views (4). No evaluation. Level 3 (5–6 marks) Developed points explaining both views. Evaluation giving clear support to one view or a named example (5). Developed points explaining both views. Evaluation giving clear support to one view and a named example (6). Content Guide: Answers are likely to refer to: For large-scale □ Funding available from China □ Provide very large amounts of power from small amount of uranium □ Large coal reserves Against large-scale □ Large sums of money/loans needed □ Problems with disposing of/reprocessing/storing waste □ Danger of insurgency threat/accident □ Danger of flooding □ Coal extracted in Pakistan is poor quality for power generation □ Oil expensive to import □ Large coal reserves not exploited □ Fossil fuel reserves are depleting □ Political issues between provinces with the construction of multi-purpose dams over division of water For small-scale □ Lower cost to maintain □ Renewable resources do not deplete □ Renewable resources do not pollute the environment □ Biogas – cheap source of energy □ Wind – available land in Balochistan highlands □ Solar – many parts of Pakistan experience 250–300 sunny days per year Against small-scale □ Do not contribute/only small amount to national grid □ Renewables only generate small amount of energy □ Wind/solar have high construction cost □ Wind is considered unsightly/harms wildlife □ Not constantly producing energy □ Biogas decreases availability of manure for organic fertiliser ETC.	6

O/N16/P2/Q3

(a) Study Fig. 4 which is a diagram of a coal mine.
(i) Choose two terms from the list below and use them to label the diagram in any two of the spaces provided.
adit cage shaft open-cast seam tunnel [2]
Any two of (left to right): cage, tunnel, shaft, seam, shaft, (type of mine)
(ii) Suggest two reasons for using this type of mine and one disadvantage of using it. [3]
Reasons – *2 marks*
To access seams deep below surface
To access seams of different depths
Can exploit further along the seams
Where seam does not appear at / near surface / hillside
Disadvantage – *1 mark*
More expensive
Greater risk of accident / flooding / gas build-up – credit all reasonable ways that accidents can happen
Dependent on [power for] lift to the surface
(iii) What type of coal is imported by Pakistan and how is it used? [2]
Type: Anthracite / bituminous – *1 mark*
Use: Steel industry / heavy engineering / smelting – *1 mark*
(b) Explain what the fuel CNG is and state the main reasons for using this fuel. [4]
Definition – *Reserve 1 mark*
Compressed natural gas
Gas compressed to 1% volume it has at normal pressure
Methane under high pressure
Reasons – *Reserve 1 mark*
Used (instead of petrol / diesel) in transport / vehicles
Especially buses / rickshaws
(Compared to petrol / diesel) cheaper, cleaner / reduces air pollution, safer
Can be stored / transported in cylinders
(c) Study Fig. 5 which is a graph giving information about different non-renewable fuels
used for electricity production in Pakistan over the period 2006–11.
(i) What is meant by the term 'non-renewable fuel'? [2]
An energy source that depletes / runs out / is not being replaced / has fixed reserves / is finite – *1 mark*
With any one example e.g. fossil fuels, wood, coal, oil – *1 mark*
(ii) Which fuel use has increased by the largest amount between 2006 and 2011? [1]
Oil
iii) Use information from the graph to describe one main difference between the change in gas used for electricity production and the change in oil used for electricity production. [2]
Gas overall decrease: oil overall (throughout / 2006–2011 / over the years) increase
Gas from 36 to 27–28 TWh / by 8–9 TWh: oil from 27–28 to 33–34 TWh / by 6–7 TWh
Reserve 1 mark for use of data with unit (TWh)
(iv) Explain why so little coal is used for electricity production in Pakistan. [3]
Coal mined in Pakistan is unsuitable
Lignite, sub-bituminous to peat
Contains impurities / sulfur
Low heat producing, low carbon content, large amount of ash, does not give out much energy
Coal reserves not exploited due to shortage of funds / technical skills
Not imported (because expensive)

Difficult / expensive to transport around country because bulky
International agreements / pressure to use less coal since is a dirty fuel / causes high emissions of smoke / CO2

(d) Read the following article:

Energy crisis

Industrial growth in Pakistan relies on the availability of energy. Pakistan does not produce enough energy for its needs and therefore spends a lot of its earnings on expensive imports of fuels.

Describe briefly different measures that can be taken to solve the country's energy crisis. To what extent can these measures be successful? [6]

Indicative content (development of points in parentheses)
Measures
Moving away from non-renewable / large-scale schemes to renewable / small-scale schemes
E.g. wind, solar, biogas (details / examples)
Investment in large-scale power stations
E.g. nuclear, wind, solar, HEP, gas, coal gas (details / examples)
Energy saving in workplaces / homes
Public / media awareness about not wasting energy resources
Evaluation *(depends on measures)*
Successful
Small-scale schemes can be maintained locally / in rural areas
Given sufficient government / private / foreign investment
Wind – large empty areas of uplands / Makran coast
Solar – lack of cloud (250–300 sunny days per year)
Biogas – large agricultural sector producing manure / plant waste
Unsuccessful
Opposition to new technology / power stations
High cost (leading to domestic / foreign debt)
Changes of government priorities (large projects may be delayed / cancelled)
Limited skills / expertise (in using advanced technology)
Other issues considered higher priority than saving energy (e.g. escaping poverty / increasing levels of education / health)
Hydro in north – far from the major centres of population, transport costs
Green energy is less reliable

M/J16/P2/Q4 (a)

4 (a) (i) Study Fig. 7 which is a diagram of an HEP (Hydel) power station.

A: On the diagram place an arrow or arrows to indicate the direction of movement of water through the power station.

B: Choose two terms from the list below and use them to label the diagram in two of the spaces provided. [3]

A: Arrow(s) drawn downwards through channel
B: From L to R: reservoir dam turbine outflow
NB: 'water intake' top left space not used

(ii) Name one multi-purpose dam in Pakistan. [1]

Tarbela/Mangla/Warsak

(iii) Give two uses for a dam such as the one you named in (ii). [2]

HEP/electricity [generation]
Irrigation
Water supply / stores water [for industrial/domestic use]
Controlling floods
Recreation/named recreational use/tourist attraction
Fishing

Power Resources P2 questions 2059/02

Compiled by: Mustafa Asif

O/N15/P2/Q2(a,b and d)

2 (a) (i) Study Fig. 2, which shows the usage of natural gas in Pakistan in the year 2010–

11. In the key, name the activities A and B which are two of the main users of natural gas in Pakistan. [2]

A Power [stations]/electricity [generation] 1 mark

B Household/domestic/residential 1 mark

USE LIST RULE

(ii) State two ways in which gas is transported to homes in Pakistan. [2]

By pipeline [to major cities]

In cylinders / as LPG / by tanker

(b) Study Fig. 3, which is a graph showing usage of electricity in Gigawatt-hours by three different sectors over a ten-year period.

(i) What was the industrial usage of electricity in 2004? [1]

17 400 GWh/Gigawatt-hours Accept 17 000–18 000 '17.4 (000) GWh' = 0

(ii) To what extent are the changes over the ten years similar for the three sectors? [3]

All/overall increase

Not much/little/some fluctuation

Steady/gradual increase

Similar rate of increase

Agriculture increases least

Household increases most

Increase to be qualified

(iii) Loadshedding is the deliberate, temporary reduction in supply of electricity from a power station. Explain the effect of loadshedding on industry and business. [4]

Interrupts/loss of /delays in production / work stops (increasing costs)

Loss of orders/cannot meet deadlines (which will lose customers)

Loss of income/profit (preventing further investment in the business)

Lower quality of products (leading to fewer exports)

Machinery/ computers/IT likely to get damaged (increasing costs to the company)

Labour idle

Difficult working conditions (due to lack of air conditioning/lights/computers/IT)

Cost of using generators (increasing costs of production)

Email communication / communication with other businesses disrupted/hindered

Loss of reputation/customer confidence (which deters investors)

Accept development of points (examples in parentheses).

Do not credit same explanation more than once

(d) It has been suggested that a power station to harness solar energy should be built in

Bahawalpur District, Punjab. The solar panels and associated access roads and buildings will cover 25 km_2. Read the following two views about this proposal:

1. With fossil fuels running out, Pakistan needs to produce more renewable energy on this land.

2. As much land as possible is needed to grow food for Pakistan's growing population.

Which view do you agree with more? Give reasons to support your answer. [6]

Indicative content (developed points in parentheses)

Renewables

For

Large areas of open land are needed to produce renewable energy (since each unit e.g. one wind turbine or one solar panel does not generate much electricity)

Need to have alternative sources of energy to fossil fuels (which will run out/exhaust eventually/cannot be replaced/are not sustainable)

Fossil fuels becoming expensive (because of scarcity/costs of production from increasingly inaccessible/inhospitable places/prices controlled by cartels e.g. OPEC)
Bahawalpur District is largely desert and suitable for solar power generation (because of lack of cloud cover/high number of sunny days per year)
Against
There are sufficient deposits of fossil fuels (as well as the funds/expertise to extract them)
Agriculture
For
Population growing at a fast rate (nationally about1.6% per year)
Increasing demand for food
Although a desert area land can be reclaimed for agriculture by irrigation (from R. Panjnad and R. Sutlej)(and crops such as wheat/edible oil seeds /citrus fruits/apricots/mangoes can be grown)
Against
Desert areas of Bahawalpur District unsuitable for agriculture (due to requirement for expensive irrigation systems)
[Total: 25]

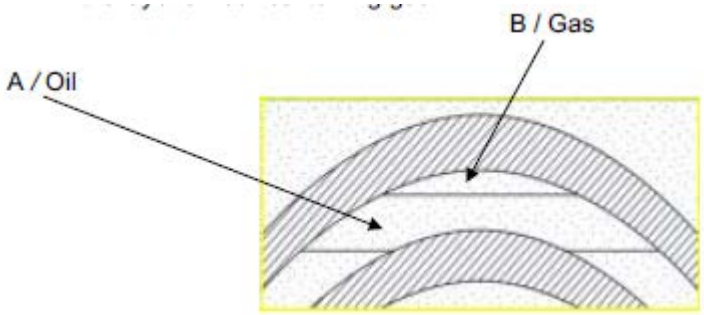
O/N15/P2/Q2(c)

(c) (i) Fig. 5 is a diagram of a thermal power station.
Choose three terms from the list below and use them to label the diagram in three of the spaces provided. [3]
Credit any three correct of (L to R): boiler, steam, turbine, transformer, reservoir, cooling tower
(ii) Explain why burning fossil fuels in power stations is unsustainable. [4]
Releases carbon dioxide/contributes to global warming/climate change
Will exhaust/run out eventually/non-renewable/cannot be replaced
Having to be extracted from increasingly inaccessible/inhospitable places, e.g. Arctic/ deep sea
Named environmental damage other than air pollution, e.g. oil spills from tankers/ pipelines
Becoming expensive
Production/prices controlled by cartels, e.g. OPEC
Many countries, e.g. Pakistan, have few deposits and have to import

M/J14/P2/Q2

2 (a) Study Fig 2, a cross section showing an oil trap.

(i) **Label on the diagram [2]**



(ii)

(ii) What is meant by the term 'porous rock' [1]
Rock with pores / holes / spaces / that lets liquids or gases pass through
(iii) Why is the feature in Fig. 2 called 'an oil trap'? [2]
Oil cannot get through the rocks around it
Oil lies / trapped between layers of non-porous / impervious / impermeable rock
Oil rises to the top of the anticline / top of bend in rocks
(b) Study Fig. 3 which shows the uses of oil.
Choose three of the following terms to complete Fig. 3. [3]
by products – in the LHS heading box
pesticide – below plastics
petrol – below fuels
(c) Study Fig. 4, a map showing oil refineries and pipelines in Pakistan.
(i) Name and locate the oil refinery marked on the oilfield in Fig. 4. [2]
Attock (oil refinery)
Morga(h) / Rawalpindi / Potwar Plateau / SE of Peshawar / NW of Faisalabad
(ii) Name one refinery where imported oil is processed. [1]
National Refinery / Pakistan Refinery / Pak-Arab Refinery / Korangi / Mahmood Kot
(iii) Explain the importance of the White Pipeline, and other pipelines to the development of Pakistan. [4]
White Pipeline will carry refined oil / frees existing pipeline for crude oil – Res 1
Reduce rail / road transport
Cheaper method of transport (than tanker / rail transport)
Faster method of transport (than tanker)
To meet (increasing) demand for oil
Will increase industrialisation / employment / economic prosperity / living standards / attracts investment (in inland areas)
(d) (i) Name an area where coal is mined in Pakistan, and state one type of coal found there. [2]
Quetta – coking coal / Sharig coal / sub-bituminous
Lower Sindh / Thar (desert) – lignite
Salt Range / Dandot Pidh – sub-bituminous / lignite
Makerwal – sub-bituminous
If no or incorrect named area, 0 marks [2 × 1 mark]
(ii) Give two reasons why most of the coal mined in Pakistan is called 'low quality'. [2]
High ash content
High moisture content
High sulphur content
Low (hydro)carbon content
Gives off less heat / low heating value / low burning temperature
Crumbles easily / soft / not compressed
(e) To what extent can Pakistan rely on fossil fuels to increase fuel and power supplies?
[6]
Possibilities – Res 2
Large reserves of gas
Sui / Pirkoh / Mari / Potwar Plateau area
Large / new reserves of coal
Of a type suitable for use in power stations / power generation
Coal a cheap fuel
Potential of coal gas
Port at Karachi for imports
Problems – Res 2
Small oil reserves / oil has to be imported
Will run out / not renewable
Coal is heavy / bulky to transport

Gas is difficult to transport / explosive
Fossil fuels expensive to import
Because becoming inaccessible / higher cost of production / exploration / extraction / rising world prices
[Total 25]

O/N13/P2/Q4

4 (a) Study Photographs D and E (Insert).
(i) Name the type of renewable energy being generated. [2]
D wind
E solar
(ii) Give three advantages of renewable energy. [3]
Will not run out/does not deplete natural resources
Clean/do not pollute (environment)
Free at source
Can be small scale
(iii) Give three disadvantages of generating energy by either D or E. [3]
Wind
Not constant, ineffective if wind speed too low/too high, unsightly, noisy, expensive to build, small output, can harm wildlife e.g. birds
Solar
Not constant, needs clear skies, not at night, less in winter, expensive to build, small Output
(b) On the map name the two dams shown, and the rivers on which they are situated. [4]
X Tarbela, Indus
Y Mangla, Jhelum
(c) (i) With reference to water supply and relief (topography) explain why it might be possible to build more HEP (hydel) power stations in areas such as that shown in Photograph C (Insert). [4]
Water supply
High rainfall, melting glaciers, melting snow, low temperatures/evaporation, continuous supply from rivers/rain (max 2)
Relief (topography)
Deep valleys, narrow valleys, steep slopes/steep-sided valleys, waterfalls, high altitude (max 2)
(ii) Give three reasons why it is difficult to develop more HEP (hydel) power stations in Pakistan. [3]
(Climate change so) less rainfall
(Climate change so) higher temperatures and more evaporation/glaciers smaller
Liable to siltation in reservoirs
High cost
No investment/government support/changing government policies
Opposition from tribal areas (in mountains)/security issues
Lack of skilled labour/expertise
Opposition to loss of land (for reservoir)
Dispute over share of water (between provinces)
(d) To what extent is it possible to increase the electricity supply to rural areas? [6]
Possibilities
Extend national grid
Increase (national) power generation/nuclear power
More/good potential for renewable schemes, wind, solar, HEP (max 2)
(allow dev to further max 2 for details)
More small-scale power generation schemes

E.g. biogas using animal/plant waste/molasses (dev)
Problems
High cost of technology/fuel/maintenance
Theft
Damage/energy loss…
…Due to long transmission lines/siltation in reservoirs for HEP
Distance from grid stations/remoteness of some rural areas
Tribal opposition
Insufficient power generation…
…So urban needs met first
Lack of government support/loans/investment/policies
Difficult construction in rugged/mountainous terrain
Lack of named skilled personnel, e.g. engineers
[TOTAL MARKS: 25]

M/J13/P2/Q4

4 (a) Study Fig. 5 which shows thermal and hydel (HEP) power stations in Pakistan.
(i) Name the cities A, B and C.
A Islamabad or Rawalpindi
B Lahore
C Multan [3]
(ii) Compare the distribution of thermal and hydel (HEP) power stations.
Both near rivers
Credit any relevant comparison from the list below
Thermal (res. 1)
in cities/towns/urban areas
along River Indus in Sindh
more widespread
Hydel (res. 1)
away from cities/towns/urban areas
on River Indus in Punjab, KPK (accept NWFP)
in Northern part of the country
none in Sindh/Baluchistan [4]
(iii) Explain why these two different types of power station are built in different areas in Pakistan.
Thermal
built where fuel is locally available,
e.g. coal at Quetta, Potwar plateau
oil/gas at Sui, N Punjab
oil/coal imported at Karachi
near demand in cities/towns
Hydel
needs large volume of water in river
high rainfall
deep/steep-sided valley
only available in North/in mountains [4]
(b) Explain why the supply of electricity is not reliable in many parts of Pakistan.
shortage due to lack of oil, gas, coal
less water in reservoirs due to silting, less melting of glaciers
damage to grid/transmission
long transmission lines
theft
poor maintenance/old machinery/breakdowns
demand exceeds supply/increasing demands/load shedding

lack of investment in new power stations/alternative energy [4]
(c) Study Fig. 6 which shows the percentages of fuels used for electricity supply.
(i) Use Fig. 6 to state the percentage of electricity generated from natural gas.
46–47 [1]
(ii) Name the two other fossil fuels Y and Z, and explain why each is used less than natural gas.
coal – poor quality, small reserves, remote/in Balochistan, heavy to carry
oil/petroleum/diesel – small reserves, unexplored, expensive. [3]
(d) To what extent can the development of renewable energy resources improve the reliability of electricity supply in Pakistan?
Reliability (res. 2)
available everywhere
free after installation
possibilities, e.g. sunshine for solar, exposure for wind, coast for tidal or wave (max. 3)
Problems (res. 2)
costly to install
lack of technology
lack of skills
low output
variable output, e.g. wind, sun [6]
[Total: 25]

M/J13/42//Q4

4 (a) (i) does not run out
e.g. wind, solar, HEP, wave, etc. [2]
(ii) coal, oil, natural gas
formed millions of years ago, taken out of ground [2]
(iii) A air pollution
Create CO2, smoke, smell
B land pollution.
Mining, quarrying, oil spills [2]
(b) (i) A gas 30
B oil 40 [2]
(ii) fertiliser [1]
(iii) transport [1]
(iv) cheaper
more in Pakistan
transported in pipes
reaches other areas in cylinders / compressed gas
less needed for other uses e.g. Transport [3]
(c) (i) brick making [1]
(ii) low quality [1]
(d) (NO credit for named type)
Solar – deserts, sunshine, lack of cloud
Wind – coast or mountains, stronger winds
HEP – mountains, deep valleys, more rainfall
Biomass – e.g. bagasse from sugar cane factory, other farm waste e.g. straw
Wave – along coast
Tidal – " " [4]
(e) Tubewells
Agricultural machinery / processing eg. milling
Small scale industries
Standard of living
Information technology
Education

Healthy living
(see Sethi p. 136)
potential of renewable sources
BUT cost of technology, maintenance, need? [6]
[25]

O/N12/P2/Q2(d)

(d) Read the article below.
Assess the possibilities for electricity generation other than by fossil fuels at Karachi. [6]
The article refers to waves/tidal, wind, sun and waste, but there may be reference to others eg nuclear power.
The answer should make reference to the suitability of Karachi as a coastal location / just north of the Tropic of Cancer
Possibilities (Res 2)
Arabian Sea - so wave and tidal power
Windy coast - so wind turbines, windmills
Sunny weather - so solar
Waste - so possibilities of burning waste
Port / industrial so nuclear ie.there is a port for importing uranium, water for cooling, there already is a nuclear power station in the area
Geothermal Energy
Pakistan is near a plate boundary, active geological zone
Problems
Arabian Sea is in the extreme south / away from other large towns
(res. 2) Wind turbines may obstruct shipping / fishing
Winds do not blow all the line / with a regular speed
Sun does not shine at night / can be covered by clouds
Burning waste causes air pollution
Problems of nuclear power (Sethi page 127)
Low output from these generators (except nuclear)
Modern technology needed for geothermal energy
Problems must concern people and environment of Karachi.

O/N10/P2/Q4(a)

4 (a) Study Fig. 6, which shows energy sources by percentage in Pakistan.
(i) Name the two largest sources of energy. [2]
Gas and oil
(ii) Which source named on Fig. 6 is renewable? [1]
HEP
(iii) Suggest two sources of energy in the 'others' sector of Fig. 6. [2]
2 of
coal, coke, solar, wind, nuclear, etc.
(b) (i) Name an HEP (hydel) power station and state the name of the river on which it is built. [2]
Tarbela on the River Indus
Mangla on the River Jehlum
Warsak on the River Kabul
(see atlas or textbook for others)
Credit correct dam for 1 mark even if not on correct river (
ii) Why is HEP (hydel) an important source of electricity in northern Pakistan ? [3]
Cheap to generate
Renewable

Available / no fossil fuels / no thermal power stations
Rivers / water from glaciers
High rainfall
Lack of evaporation / lower temperatures
Deep / steep sided valleys for dams
No air pollution / CO_2
(iii) Why can the supply of power from these stations be unreliable? [3]
Shortage / not enough for every user/ load shedding
Silting in reservoir (reduces capacity)
Silt in turbines (causes damage)
Seasonal shortages e.g. winter / frozen / monsoon etc.
Lack of rainfall / changing climate
Theft
Damage to power lines
Old / worn machinery

O/N10/P2/Q4(d)

(d) The development of wind power generators off the coast of Pakistan could reduce the country's dependence on imported fuels.
Explain the advantages and disadvantages of developing alternative power sources. [5]

NB The introduction refers to wind, but the question is about any alternative power supply.
Advantages (of any alternative power supply) (res. 2)
Cheap power (after construction)
Renewable / do not run out.
Reduces CO_2 emissions / air pollution / harmful gases
Free resource / readily available
E.g. sunny climate, coast, mountains for HEP
Increases supply of electricity / less loadshedding / power cuts
Can be used in remote areas / mountains / deserts / etc.
Lower cost of oil / coal imports / improves balance of trade / can pay off debt
Disadvantages (of any alternative power supply) (res. 2)
Expensive to build / cost of import
Expensive / foreign technology
Unreliable (referring to weather etc.)
Lack of skills / expertise
Low output from generators
May not be in areas where power is needed / much of country a long way from coast
[Total: 25]